Australian Orthopaedic Association National Joint Replacement Registry

2025 ANNUAL REPORT

Hip, Knee and Shoulder Arthroplasty



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Australian Orthopaedic Association National Joint Replacement Registry

2025 ANNUAL REPORT

Data Period 1 September 1999 – 31 December 2024

Hip, Knee and Shoulder Arthroplasty

Preface

The Registry's strength lies in its ability to turn detailed surgical data into insights that guide practice, improve outcomes, and support excellence in patient care.

The Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) has now entered its 26th year of reporting. Over this time, the Registry has become one of the most significant sources of arthroplasty data globally. Its scale, depth, and independence ensure that it continues to shape surgical practice and policy, while driving improvements in joint replacement care across Australia.

The 2025 Annual Report reflects both continuity and progress. The Registry's data now encompass more than 2.2 million procedures, providing the basis for robust long-term analyses. This year, for the first time, the Registry presents ten-, fifteen-, and twenty-year outcomes for modern prostheses. These benchmark results demonstrate the sustained performance of devices still in use, offering clear evidence to guide surgeons, health systems, and regulators in evaluating quality and durability.

The Special Chapter of the 2025 report focuses on aseptic revision arthroplasty. Revision procedures are a critical area for both patients and the profession, given their complexity and the resources required to achieve successful outcomes. Building on previous chapters published in 2015 and 2020, this year's analysis expands to include revision shoulder surgery. It offers a comprehensive account of changing revision practices, reasons for reoperation, and the outcomes achieved over time. Such analyses provide valuable insight into the challenges of revision surgery and identify opportunities to reduce its burden.

The structure of reporting has also evolved. Partial hip and knee replacement data, previously published separately, have now been integrated into the main report. This change strengthens the clarity and accessibility of the Registry's reporting. At the same time, expanded coverage of shoulder arthroplasty reflects the increasing number of procedures being performed in Australia. This includes detailed analyses of implant types, prosthesis design features, and revision pathways, helping to build an evidence base that will support practice in this rapidly developing field.

The Registry continues to evaluate the impact of surgeon assistive tools. Analyses of computer navigation, image-derived instrumentation, and robotic assistance in hip and knee arthroplasty provide evidence to inform debate around the benefits and limitations of these tools. As new technologies emerge and are adopted, the Registry remains uniquely positioned to provide objective and independent evaluation of their effect on outcomes.

These achievements are the product of a coordinated effort. I wish to acknowledge the leadership of Clinical Director Paul Smith; Deputy Clinical Directors Peter Lewis, Chris Vertullo and Michael McAuliffe; Assistant Deputy Clinical Directors Chris Wall, David Gill and James Stoney; and the Registry's Executive Manager. I also thank the dedicated AOANJRR and SAHMRI teams whose commitment to accuracy and analysis underpins the quality of the Registry's outputs.

Above all, I recognise the contribution of surgeons across Australia. Their willingness to provide data to the Registry ensures that it remains a trusted national resource. Through their efforts, the Registry continues to deliver knowledge that strengthens practice and, most importantly, supports the care they provide to their patients.

As the AOANJRR enters its second quarter-century, its role as a foundation for clinical excellence and innovation is clear. This year's report demonstrates how comprehensive, high-quality data can be used to inform decision-making at every level of the health system and to shape the future of arthroplasty in Australia.

Sincerely,



Scott Fletcher

President, Australian Orthopaedic Association

AOANJRR Data Snapshot 2024

2,285,453
Total number of joint replacement procedures reported by the Registry at the end of 2024

171
Data Requests

$$$$
Over a billion dollars of estimated benefit to the national health system accruing from AOANJRR activities

Joint replacement procedures performed in 2024

60,414	79,331	11,306
Hips	Knees	Shoulders

43
Hospital Audit Requests

1,173
Individual Surgeon Reports

33
Conference presentations

37
Journal Articles Published

National PROMs Data Collection

June 2025 Update

Participating Hospitals
244

Pre-Op PROMs
149,121

Post-Op PROMs
108,818

Pre-Op Completion Rate
74.1%

Post-Op Completion Rate
63.0%



% patient-reported change following hip, knee, or shoulder joint replacement as "much better"
84.9%

% patient "very satisfied" or "satisfied" following hip, knee, or shoulder joint replacement
87.5%

841
Total number of surgeons participating

Total Number of Hospitals Onboard per State /Territory:

- SA: **29**
- ACT: **6**
- NSW: **66**
- VIC: **66**
- NT: **3**
- WA: **22**
- QLD: **45**
- TAS: **7**

162,434
Patient participation through AOANJRR patient dashboards

Executive Summary

This summary provides a brief overview of some of the major findings from the 2025 Annual Report. As with last year's Annual Report, to ensure that the relevance and currency of AOANJRR data are maintained, almost all analyses (unless specifically stated) have been confined to hip, knee and shoulder prostheses that were still being used in 2024. Again, historic data are still available in previous Annual Reports on the AOANJRR website.

In addition to the main report, the Registry continues to publish Supplementary Reports. The Supplementary Reports are listed in the introductory chapter and will be available on the AOANJRR website https://aoanjrr.sahmri.com/ annual-reports-2025 from 1 October 2025. They include a Lay Summary of the main report and 13 additional reports on arthroplasty topics, as well as detailed analyses of all prostheses identified as having a higher than anticipated rate of revision.

Ten, Fifteen and Twenty Year Outcomes

This section of the report provides 10 and 15 year benchmarks for prostheses used in >350 procedures in primary total conventional hip and primary total knee replacement undertaken for osteoarthritis. Ten year benchmarks for prostheses used in total stemmed anatomic shoulder replacement for osteoarthritis and primary total stemmed reverse shoulder replacement performed for any diagnosis are also included. This chapter reports 20 year outcomes for a small number of prostheses that are still used. All analyses in this chapter are restricted to modern prostheses.

The 10 year benchmark standard is 4.2% for hips and 4.7% for knees. For shoulders, the 10 year benchmark is 7.4% for total stemmed anatomic and 5.4% for total stemmed reverse. The calculated 15 year benchmark standard is 6.0% for hips and 6.3% for knees. The benchmarks reflect proven long- term success.

The AOANJRR uses the benchmark approach recommended by the ISAR International Prosthesis Benchmarking Working Group to identify those devices that have superior and non-inferior performance at 10 years and 15 years. Of those hip, knee and shoulder prosthesis combinations with a sufficient number of procedures and follow-up, 27.1% of hip and 21.1% of knee prosthesis combinations achieved a 10 year superiority benchmark. There was one total stemmed anatomic and one total stemmed reverse shoulder prosthesis combination that achieved a 10 year superiority benchmark. In addition, 2 total stemmed reverse shoulder prosthesis combinations qualified for a 10 year non-inferiority benchmark.

At 15 years, 5 of the hip and 1 of the knee prosthesis combinations still in use achieve a superiority benchmark. There are 11 hip and 7 knee replacement combinations used in >350 procedures for over 20 years. At this time there is no 20 year benchmark standard established.

Special Chapter: Revision Arthroplasty

This year, the Registry special chapter is providing an updated comprehensive analysis of the outcome of revision hip, knee and shoulder replacement surgery. In 2023, the Registry special chapter focussed on the outcomes of revision for infection. The 2025 Registry special chapter focusses on the outcomes of aseptic revision arthroplasty.

The aim of this chapter is to expand on the previous chapters on revision arthroplasty, from 2015 and 2020, and to add analyses of revision shoulder surgery. It is timely to review this important topic on a regular basis to reflect on changes in revision techniques and evolving reasons for revision. For each joint, information is provided on revisions for specific reasons, and the outcomes of major total, partial and minor revisions. The Registry also examines mortality after the 1st revision.

REVISION HIP REPLACEMENT

There are 18,936 1st revision aseptic THR procedures recorded where the primary diagnosis was osteoarthritis. The mean age at the 1st revision is 71.8 years. The median time from the primary procedure to the 1st revision is 3 years, ranging from 1 year for dislocation/instability to 4.2 years for loosening. There are more females undergoing a 1st revision, and this is most pronounced with 1st revision for dislocation/instability . Most patients have an ASA score of 3 and are pre-obese at the time of 1st revision.

Over time there has been an increase in the proportion of 1st revisions for fracture, while there has been a decrease in 1st revisions for dislocation/instability and loosening/lysis. The analysis compares the outcomes of 1st revisions over four successive time periods: 1999-2005, 2006-2012, 2013-2019 and 2020-2024. There has been a reduction in the rate of 2nd revision comparing the most recent period to 1999-2005 and 2006-2012, but no difference is shown in comparison with 2013-2019.

Of the 18,936 1st revision THR procedures, 2,803 have had a 2nd revision. The cumulative percent 2nd revision at 20 years is 26.4%. The most common reasons for 2nd revision are prosthesis dislocation/instability (33.1%), infection (23.3%), loosening (22.5%) and periprosthetic fracture (10.2%).

When the femoral component is revised for loosening, revision procedures using cementless femoral fixation have a lower rate of all-cause 2nd revision (after 6 months) compared to revision procedures using cemented femoral fixation. Similarly, when the femoral component is revised for loosening, there is also a lower rate of 2nd revision for recurrent loosening using cementless femoral fixation compared to when cemented femoral fixation is used.

When the bearing surfaces used for the 1st revision for loosening are compared, there is a higher rate of 2nd revision when metal/non-XLPE is compared to metal or ceramic with XLPE after 3 months.

Where a first revision is performed for dislocation/Instability, the most common reason for 2nd revision is for further dislocation/instability (50.8%). Over time the bearing choice in first revision for dislocation/instability has changed, with an increase in the use of dual mobility bearings. Dual mobility bearings have a lower rate of all-cause 2nd revision compared to other head sizes. Dual mobility prostheses also have a lower rate of 2nd revision for dislocation/instability compared to all femoral head size groups.

When a first revision is performed because of fracture, the most common reason for 2nd revision is infection (28.1%), followed by loosening (24.7%). A revision of the femoral component (35.5%) is the most common type of 2nd revision. When the 1st revision is for fracture, cemented fixation used for revision of the femoral component has a higher rate of 2nd revision compared to cementless femoral fixation after 3 months

For revision hip replacement the posterior approach is the most frequently used surgical approach (69.3%). When the outcomes of the surgical approaches used for the 1st revision are compared, procedures using the anterior approach have a higher rate of 2nd revision.

Mortality following the 1st revision of primary conventional THR and the reason for the 1st revision have been examined. In this analysis 1st revision for infection is included. The overall mortality after a 1st revision procedure is 0.9% at 30 days, 1.9% at 90 days, 4.4% at 1 year and 37.5% at 10 years. Compared to other reasons for revision, 1st revision for loosening has the lowest mortality. 1st Revision for fracture has the highest mortality at all time points.

REVISION KNEE REPLACEMENT

This analysis includes 30,460 1st revision TKR procedures undertaken for aseptic reasons. The mean age at 1st revision is 68.7 years. There is some variation in mean age with revision diagnosis, with patients revised for arthrofibrosis being younger (66.1 years) and those revised for fracture being older (74.3 years). 1st revision TKR is more common in females and the highest proportion of patients have an ASA score 2 or 3 and have a BMI in the obese class 1 category.

Of the 30,460 1st revision procedures, 4,825 have had a 2nd revision. The cumulative percent 2nd revision at 20 years is 25.6%.

The most common reasons for 2nd revision are loosening (31.9%), infection (25.8%), instability (12.5%) and pain (6.7%).

Revision of both the tibial and femoral components is the most common 2nd revision procedure.

Patients with an ASA score of 3 have a higher rate of revision compared to patients with an ASA score of 1 in the first 6 months only, but there is no difference between patients with other ASA scores. As ASA score increases, the incidence of 2nd revision for early infection increases. The incidence of 2nd revision for infection also increases with increasing BMI.

The outcomes of 1st revisions of total knee replacement over four successive time periods are compared: 1999-2005, 2006-2012, 2013-2019 and 2020-2024. When all aseptic 1st revisions are included, there is a lower rate of 2nd revision comparing the most recent period to 1999-2005 and 2006-2012, but there is no difference compared to 2013-2019.

Over time there has been a decrease in the proportion of 1st revisions for loosening. There has been an increase in major total revisions and a decrease in major partial knee revisions.

Likewise, over time there has also been an increase in the proportions of fully stabilised and hinge prostheses used for 1st revision, and a decrease in minimally stabilised revision procedures.

When the femoral component and tibial components are revised, over 90% of 1st revision procedures use cemented fixation and this has slightly increased with time.

There has been an increase in 1st revision procedures where the patella component was used in the primary and no patella component was needed in the revision. Correspondingly, there has been a decrease in the proportion of 1st revisions where the patella was initially unresurfaced and left unresurfaced at revision.

Minor revisions are the most common class of 1st revision procedure (52.4%), followed by major total revisions (33.1%) and then major partial revisions (14.4%). Major total revisions have a lower rate of 2nd revision compared to major partial revisions, and also compared to minor revisions, but only until 2.5 years, after which time there is no longer a difference. Minor revisions have a lower rate of 2nd revision compared to major partial revisions.

The risk of 2nd revision varies depending on the reason for the 1st revision, more detailed analyses have been carried out for the 1st revision diagnoses of loosening, patella reasons, instability, pain, arthrofibrosis and fracture. The lowest 15 year cumulative percent 2nd revision is 18.9% when the 1st revision was performed for patella reasons, and the highest is 29.3% for arthrofibrosis.

Loosening is the most common 1st revision diagnosis for total knee replacement with a primary diagnosis of osteoarthritis. Where the 1st revision was for loosening, the most common reasons for the 2nd revision are further loosening (38.8%), infection (28.9%) and instability (10.1%).

When the first revision is for loosening, the use of metaphyseal sleeves, cones and stem extensions have all increased. There is a lower rate of second revision when these technologies are used compared to when they are not used.

Revision for patella reasons is the 2nd most common reason for 1st revision. When the 1st revision is for patella reasons 99.0% of revisions are patella revisions either alone or combined with a tibial insert revision. For knees revised for patella reasons, 97.2% did not have a patella component inserted in the primary procedure.

Executive Summary

Revision for instability is the 3rd most common reason for 1st aseptic revision. The most common types of 1st revision procedures for instability are insert only and TKR (both femoral and tibial components revised).

When a major revision is performed for instability, fully stabilised and hinged components are the most commonly used. Over time the proportions of minimally stabilised and posterior stabilised components used in 1st revision for instability have declined. There is a lower rate of 2nd revision when fully stabilised prostheses are used in the 1st revision for instability compared to posterior stabilised components. There is no difference in rate of 2nd revision when minimally stabilised or hinged prostheses are compared to fully stabilised designs.

The overall mortality following a first revision knee replacement is 0.4% at 30 days, 0.7% at 90 days, 1.5% at 1 year and 24.8% at 10 years. Compared to 1st revisions for loosening, 1st revisions for infection and fracture have a higher rate of mortality, while those revised for arthrofibrosis have a lower rate of mortality.

REVISION SHOULDER REPLACEMENT

There are 4,472 aseptic 1st revisions of primary shoulder replacements and due to small numbers of revisions for some classes, the analysis considered only aseptic 1st revisions of total stemmed anatomic (n= 1,581) and total stemmed reverse shoulder replacements (n= 1,851).

The mean age of 1st revision of primary total stemmed anatomic shoulder replacement was 70.1 years and were predominately performed in females. Most patients are ASA score 2 (44.0%) or 3 (50.9%) and are either pre obese (31.3%) or obese class 1 (29.2%).

The cumulative incidence of aseptic 2nd revision at 10 years is 19.9% from 259 2nd revisions. The most common reason for 2nd revision was instability/dislocation followed by loosening. Revision of both the humeral and glenoid components is the most common 2nd revision procedure (32.8%) followed by humeral component only (32.0%). A total stemmed anatomic shoulder replacement has a lower rate of 2nd revision when revised to a total stemmed reverse replacement compared to a primary total stemmed reverse undergoing a 1st revision to another reverse replacement. Primary total stemmed anatomic shoulder replacement implants may encompass a single design platform prosthesis (SDPP). These platform implant ranges include both anatomic and reverse shoulder replacement. They feature common design, composition metallurgy, coatings, and bearing surfaces. They allow polarity change of humeral or glenoid prostheses by modular exchange. In revision surgery the humeral stem may be retained if in the primary procedure a SDPP implant was used. The 2nd revision rate is not different regardless of whether or not the humeral stem is retained in-1st revision total stemmed anatomic replacements.

Major total is the most common class of 1st revision procedure of a primary total stemmed anatomic total shoulder replacement in 2024, but overall, there are more major partial (53.6%), followed by major (34.7%) and then minor revision (11.7%). Minor revisions have a higher rate of 2nd revision compared to major total and major partial revisions for the entire period. Major total revisions have a higher 2nd revision rate than major partial at all time periods.

The most common type of 1st revision for total stemmed anatomic shoulder replacements is a humeral component followed by humeral/glenoid combination. Isolated head revision has an increased risk of 2nd revision the humeral revision. In addition, glenoid and glenoid/humeral revision has a higher rate of 2nd revision than humeral 1st revision.

There are 710 early 1st revisions (44.9%). 1st revisions performed within 2 years have a higher rate of 2nd revision from 3 months onwards when compared to late 1st revisions, with a lower revision rate prior to this. In addition, there has been an improvement in the rate of 2nd revision comparing the most recent period to pre-2016

The outcome of the 1st revision of primary total stemmed anatomic shoulder replacement varies by age and gender. Females aged <65 years having a higher rate of 2nd revision than females aged ≥65 years. Males aged <65 years have a higher rate of 2nd revision than males aged ≥65 years from 3 months after 1st revision. ASA score and BMI class did not change the rate of 2nd revision.

When comparing to rotator cuff insufficiency, loosening and prosthesis instability/dislocation have a higher rate of 2nd revision. Implant breakage of the glenoid insert also has a higher rate of 2nd revision compared to rotator cuff insufficiency but after 6 months only.

The overall mortality of 1st revision of primary total stemmed anatomic shoulder replacement is 0.1% at 30 days, 0.1% at 90 days, 0.7% at 1 year and 24.0% at 10 years.

The mean age for patients undergoing a 1st revision total stemmed reverse shoulder replacement is 73 years. 1st revision procedures are more common in males (50.1%) and the highest proportion of patients have an ASA score of 2 (26.4%) or 3 (66.1%) and have a BMI in the pre obese category (30.5%).

There are 366 2nd revisions of the 1,851 1st revision procedures and the cumulative percent 2nd revision at 10 years is 25.6%. The most common reasons for 2nd revision are instability/dislocation (45.6%), infection (19.1%), loosening (18%), and fracture (5.2%). Isolated revision of the humeral component is the most common 2nd revision procedure (25.4%) followed by humeral and glenoid revision (17.8%). The 2nd revision rate is not different if the humeral stem is retained or not for 1st revision total stemmed reverse replacements, except in the first two weeks after 1st revision when retaining the humeral stem has a higher revision rate.

Minor revision is the most common class of 1st revision procedure of a primary total stemmed reverse shoulder replacement (51.6%), followed by major partial (39.6%) and then major total revision (8.8%). When the outcomes of the

1st revision by class of 1st revision are compared there is no difference in the rate of 2nd revision.

The most common 1st revision of a total stemmed reverse was a humeral component followed by a cup and or head exchange. A humeral/glenoid 1st revision has a higher rate of 2nd revision than head and or cup revisions in the first 3 months, but no difference after that time.

1st revisions performed within 2 years have a higher rate of 2nd revision in the first 2 weeks when compared to late 1st revisions and do not differ after that time. There is no difference in the rate of 2nd revision of 1st revision total stemmed reverse shoulder replacements on comparing pre 2016 and 2016–2024.

The outcome of the 1st revision of a primary total stemmed reverse shoulder replacement varies by age and gender, with females aged <65 years having a higher rate of 2nd revision than females aged ≥65 years. Males do not differ by age or in comparison to females of the same age. ASA score and BMI class did not change the rate of 2nd revision.

When comparing to fracture, loosening and prosthesis dislocation/instability and rotator cuff insufficiency have a higher rate of 2nd revision.

The overall mortality of 1st revisions of primary total stemmed reverse is 0.2% at 30 days, 0.8% at 90 days, 3.3% at 1 year and 47.0% at 10 years.

Hip Replacement

There are an additional 62,206 hip replacement procedures compared to the number reported last year. The revision burden in 2024 is 6.7% which is the lowest burden yet reported by the Registry. This equates to 3,747 fewer revision procedures in 2024 than would have been expected if the proportion of revision procedures had remained at the level reported in 2003.

This year, the partial hip data previously found in the partial hip supplementary report has been incorporated back into the main report. The use of bipolar hip replacement continues to increase at the expense of unipolar modular partial hip replacement. Bipolar prostheses continue to be associated with the lowest rate of revision for the management of femoral neck fractures requiring arthroplasty.

Of the two types of primary total hip replacement, total conventional hip has a lower cumulative percent revision than total resurfacing hip replacement. For total conventional hip replacement, the 20 year cumulative percent revision for currently used prostheses undertaken for osteoarthritis is 7.9%. Age has an impact on the risk of revision, particularly in females. Updated information on the effect of ASA score and BMI are provided with the cumulative percent revision increasing with increasing ASA score and increasing BMI category. There is little difference in outcomes based on fixation except for patients aged ≥75 years where the revision rate is lower when either hybrid or cemented fixation is used.

The use of collared cementless stems has increased since 2015. Collarless stems have a higher rate of revision compared to collared stems. Collarless stems have a higher rate of revision for fracture and loosening.

This year there is an analysis of the combination of acetabular and femoral head size used in total conventional hip replacement. In this analysis, all modern bearing surfaces are combined. Acetabular size has been categorised <52mm, 52mm or >52mm according to the outer diameter.

There continues to be an increase in the use of dual mobility prostheses. They have the same risk of revision as standard acetabular prostheses when used in the management of osteoarthritis but have half the risk of being revised for dislocation.

For the first time, the use and outcome of computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of total hip replacements are shown. Theses have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 64.6% of primary hip procedures in 2024. Results for primary total hip replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016. Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

When adjusted for age, gender, ASA score, BMI category, femoral fixation, and head size, the anterior approach has a lower rate of revision compared to the lateral and posterior approaches. The posterior approach has a lower rate of major revision. There are also differences in the reasons for revision. The anterior approach has a higher rate of revision for loosening and early fracture compared to the posterior and lateral approach and a lower rate of revision for infection and dislocation.

Data on the outcomes of primary total hip replacement used for the management of femoral neck fracture are also provided and the cumulative percent revision of primary total conventional hip replacement for fractured neck of femur is 10.5% at 20 years.

A summary table indexing statistically significant characteristic comparisons in hip replacements is located at the beginning of the Hip Chapter, while a comprehensive bibliography of hip replacement research utilising AOANJRR data from 2020-2025 is provided at the conclusion of the chapter.

Knee Replacement

There are an additional 80,402 knee replacement procedures since the last report. The revision burden has remained constant at 6.9%. This equates to 1,552 fewer revision procedures in 2024 than would have been expected if the proportion of revision procedures had remained at the level reported in 2004.

Executive Summary

There has been a continued decrease in the use of partial knee replacement, and in 2024 it remains a small proportion (5.0%) of all knee replacement procedures. As with hips, this year the information from the partial knees supplementary report has been incorporated into the main report.

Younger age and male gender are associated with higher rates of revision for patella/trochlea knee replacement. Whereas younger age and female gender are associated with higher rates of revision for unicompartmental knee replacement. When adjusted for age, gender, ASA, BMI, and mobility, there is no difference in the rate of revision when robotic assistance is used in patella/trochlea knee replacement or when used in unicompartmental knee replacement. Mobile bearings increase revision risk for unicompartmental knee replacement, but their use is restricted to only two prostheses. There is no difference in revision risk between medial and lateral unicompartmental knee replacement.

Primary total knee replacement increased by 0.4% in 2024. The 20 year cumulative percent revision of knee prostheses still used in 2024 for the management of osteoarthritis is 8.0%. The impact of patient and prosthesis factors on the outcome of knee replacement surgery is similar to previous reports.

There are higher revision rates in younger patients and males, and there is an increased risk of revision for infection associated with increasing ASA score and BMI category. There is a reduced rate of revision when patella resurfacing is used, and when a patella component is used the revision rate is lowest with an all-polyethylene rather than a metal-backed prosthesis.

With respect to bearing surface, the use of XLPE continues to increase. Its impact on the revision rate varies depending on the prosthesis but it is never detrimental and often associated with a reduced revision rate. Femoral components with an alternate bearing surface (that is not cobalt-chrome) have a higher rate of revision, but the rate varies with the material used.

When adjusted for age, gender, fixation, and patella component usage, fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses for the majority of the early period, but after 7 years mobile designs have a lower rate of revision.

Posterior stabilised prostheses have higher rates of revision compared to minimally stabilised prostheses. Medial pivot design prostheses have a higher rate of revision compared to minimally stabilised prostheses in the first 1.5 years, no difference between 1.5 and 3 years, and a lower rate after 3 years. Medial pivot designs have a lower rate of revision compared to posterior stabilised prostheses.

The effect of fixation varies depending on prosthesis stability and often with time. For minimally stabilised prostheses, hybrid and cemented fixation have the lowest rates of revision. For posterior stabilised prostheses, cement fixation initially has the lowest revision rate. For medial pivot prostheses, the use of cement for tibial fixation is associated with a lower early rate of revision. There has been renewed interest in cementless fixation over the last few years but, at least for minimally stabilised prostheses, cementless tibial component fixation has a higher rate of revision for all age groups and both genders.

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. There has been a continued rise in the use of robotic assistance. Analyses of these tools to aid knee replacement insertion have been undertaken with hazard ratios adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and stability. There is no difference in the rate of revision when procedures using computer navigation are compared to procedures with no technology assistance. Similarly, with the same adjustments for potential confounding factors, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures with no technology assistance.

A summary table indexing statistically significant characteristic comparisons in knee replacements is located at the beginning of the Knee Chapter, while a comprehensive bibliography of knee replacement research utilising AOANJRR data from 2020-2025 is provided at the chapter's conclusion.

Shoulder Replacement

In 2024, shoulder replacement increased by 6.9% compared to the previous year. The revision burden remained low at 7.5%. There has been an increasing interest in partial shoulder replacements in younger patients (hemi stemmed anatomic), and the outcomes with alternate bearing surfaces. Summary data for partial shoulder anatomic procedures are in the Annual Report and a full analysis in the Partial Shoulder Arthroplasty Supplementary Report.

Of the three classes of primary total shoulder replacement (total stemmed anatomic, total stemless anatomic, and total stemmed reverse) total stemmed reverse shoulder replacement is by far the most common type of total shoulder replacement undertaken in Australia and accounts for 74.4% of all total shoulder procedures. Total stemless anatomic is more frequently utilised than total stemmed anatomic shoulder replacements.

A special clinical assessment compared implant choices in patients under 60 years of age with osteoarthritis. A hemi stemmed anatomic with a pyrocarbon head was not different to traditional total shoulder replacement options in this age group. In a second assessment, total stemmed reverse replacement with custom, augmented or standard glenoid components found custom glenoid prostheses failed earlier than more conventional options.

The most common primary anatomic shoulder replacement, total stemless, had differing outcomes depending upon the age or BMI stratified by gender. Prosthetic factors including

fixation and glenoid component type influenced outcome. By contrast, the outcome of primary total stemmed anatomic shoulders changed depending upon age, gender and gender stratified by ASA score and BMI. There were also many implant, and sizing variations that were associated with the revision rate including glenoid component type, augmentation, and fixation, along with bearing surface, humeral head size and humeral stem length. Surgeon assistive tools did not reduce rates of revision.

Total stemmed reverse shoulder replacement revision rates are higher when used for rotator cuff arthropathy compared to osteoarthritis. Younger age, male gender, ASA score and BMI are associated with an increased risk of revision. In contrast to anatomic shoulder replacements, surgeon assistive tools, prostheses characteristics (bearing surface, glenosphere size and fixation), implant sizing variations (glenoid augmentation, humeral stem length and type), along with rotator cuff repair during the joint replacement surgery influence the outcome depending on the primary diagnosis.

The Registry continues to report on the impact of glenoid morphology on the different types of shoulder replacement. At this point, it appears to have little effect on the early revision rates. This is true for each of the three most common total shoulder designs.

A summary table indexing statistically significant characteristic comparisons in total shoulder replacement is located at the beginning of the Shoulder Chapter, while a comprehensive bibliography of shoulder replacement research utilising AOANJRR data is provided at the chapter's conclusion.

Prostheses with Higher than Anticipated Rates of Revision

Each year, the AOANJRR identifies prostheses with higher than anticipated rates of revision. This year, 1 total conventional hip prosthesis, 1 total knee prosthesis, and 1 total stemmed reverse shoulder prosthesis have been identified.

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The Registry acknowledges the ongoing support of all hospitals, both public and private, that undertake arthroplasty surgery nationally. The support provided by each hospital through their nominated coordinator(s) is appreciated. A complete list of participating hospitals and coordinators is presented at the end of the Hip, Knee and Shoulder Arthroplasty Annual Report.

The Registry greatly appreciates the participation of all joint replacement patients throughout Australia. Their contribution allows ongoing improvements in arthroplasty outcomes to be achieved.

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Introduction

The 2025 Hip, Knee and Shoulder Arthroplasty Report is based on the analysis of 2,285,453 (972,256 hip, 1,205,616 knee and 107,581 shoulder) primary and revision procedures recorded by the Registry, with a procedure date up to and including 31 December 2024. Shoulder arthroplasty has been included in this report with hip and knee arthroplasty since 2017.

In addition, there are 14 supplementary reports that complete the AOANJRR Annual Report for 2025:

1. Lay Summary – Hip, Knee and Shoulder Replacement
2. Patient Reported Outcome Measures (PROMs): Hip, Knee and Shoulder Arthroplasty
3. Demographics of Hip, Knee and Shoulder Arthroplasty
4. Mortality of Hip, Knee and Shoulder Arthroplasty
5. Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report
6. Shoulder Replacement in Australia
7. Cement in Hip and Knee Arthroplasty
8. Metal/Metal Bearing Surface in Total Conventional Hip Arthroplasty
9. Primary Partial Shoulder Arthroplasty
10. Prosthesis Types with No or Minimal Use
11. Demographics and Outcome of Elbow and Wrist Arthroplasty
12. Demographics and Outcome of Ankle Arthroplasty
13. Demographics of Spinal Disc Arthroplasty
14. Comparative Prosthesis Performance

In addition to the 14 supplementary reports, investigations of prostheses with higher than anticipated rates of revision are published on https://aoanjrr.sahmri.com/annual-reports-2025.

All hospitals, public and private, undertaking joint replacement submit their data to the Registry. Currently, there are 319 participating hospitals. However, this may vary from time to time due to hospital closures, new hospitals, or changes to services within hospitals.

Background

The Australian Orthopaedic Association (AOA) recognised the need to establish a national joint replacement registry in 1993. At that time, the outcome of joint replacement in Australia was unknown. Patient demographics were not available, and the types of prostheses and techniques used to implant them were unknown.

The need to establish a Registry was, in part, based on the documented success of a number of arthroplasty registries in other countries. In particular, the Swedish arthroplasty registries. In Sweden, the ability to identify factors important in achieving successful outcomes has resulted in both improved standards and significant cost savings.

In 1998, the then Commonwealth Department of Health (DoH) funded the AOA to establish the Registry. The Department of Health, Disability and Ageing continues to provide funding to maintain the Registry. In June 2009, Federal Parliament passed legislation to enable the government to cost recover this funding from the orthopaedic industry. This legislation was updated in 2015.

The Registry began hip and knee data collection on 1 September 1999. Implementation was undertaken in a staged manner in each of the Australian states and territories, becoming national during 2002. The first year of full national data collection for shoulder procedures was 2008 (Appendix 6).

The AOA contracts the South Australian Health and Medical Research Institute (SAHMRI) to provide data management and independent data analysis services for the Registry. The SAHMRI team contribute crucial data management and analysis expertise through the Registry Working Group and a variety of project working groups.

The AOA also contracts the University of South Australia to provide specific expertise in the ongoing development of analytical techniques for Registry data.

Purpose

The purpose of the Registry is to define, improve and maintain the quality of care for individuals receiving joint replacement surgery. This is achieved by collecting a defined minimum data set that enables outcomes to be determined based on patient characteristics, prosthesis type and features, method of prosthesis fixation and surgical technique used.

The principal outcome measure is time to first revision surgery. This is an unambiguous measure of the need for further intervention. Combined with a careful analysis of potential confounding factors, this can be used as an accurate measure of the success, or otherwise, of a procedure. The Registry also monitors mortality of patients, which is critical when determining the rate of revision.

Introduction

Aims

1. Establish demographic data related to joint replacement surgery in Australia.
2. Provide accurate information on the use of different types of prostheses.
3. Determine regional variation in the practice of joint surgery.
4. Identify the demographic and diagnostic characteristics of patients that affect outcomes.
5. Analyse the effectiveness of different prostheses and treatment for specific diagnoses.
6. Evaluate the effectiveness of the large variety of prostheses currently on the market by analysing their survival rates.
7. Educate orthopaedic surgeons on the most effective prostheses and techniques to improve patient outcomes.
8. Provide surgeons with an auditing facility.
9. Provide information that can instigate tracking of patients if necessary.
10. Provide information for the comparison of the practice of joint replacement in Australia and other countries.

Benefits

Since its inception, the Registry has enhanced the outcome of joint replacement surgery in Australia.

There are many factors known to influence the outcome of joint replacement surgery. Some of these include age, gender, diagnosis, ASA score and BMI of patients, as well as the type of prosthesis and surgical technique used.

Another coexisting influence is the rapid rate of change in medical technology. There is continual development and use of new types of prostheses and surgical techniques, for many of which the outcome remains uncertain.

Information obtained by the analysis of Registry data is used to benefit the community. The Registry releases this information through publicly available annual and supplementary reports, journal publications and data reports. These data reports are specific analyses requested by surgeons, hospitals, academic institutions, government, and government agencies as well as orthopaedic companies.

The Registry provides surgeons with access to their individual data and downloadable reports through a secure online portal. Separate online facilities are available for orthopaedic companies to monitor their own prostheses, and for Australian and regulatory bodies in other countries to monitor prostheses used in Australia. The data obtained through the online facilities are updated daily and are over 90% complete within six weeks of the procedure date.

The percentage of revision hip procedures has declined from a peak of 12.9% in 2003 to 6.7% in 2024. The percentage of revision knee procedures has declined from a peak of 8.8% in 2004 to 6.9% in 2024. Revision shoulder arthroplasty peaked at 10.9% in 2012 and has declined to 7.5% in 2024.

A major reason for the reduction in revision following hip, knee and shoulder joint replacement is the increased use of the type and class of prostheses shown to have better outcomes, and an associated decline in use of prostheses when less satisfactory outcomes are identified.

There are many examples of AOANJRR data enhancing the outcome of joint replacement surgery in Australia. These include:

- The identification of high revision rates associated with the use of Austin Moore hemiarthroplasty for the treatment of fractured neck of femur (2003). Its use subsequently reduced, particularly in younger patients with this diagnosis.
- The reduction in the use of unicompartmental knee replacement. This reduction followed the identification of high revision rates (2004) and subsequent reporting, that the results of revision of primary unicompartmental knee replacement, were similar to revising primary total knee replacements.
- The identification of the high revision rate associated with unispacer use (2004).
- The AOANJRR was the first to identify ASR Resurfacing and ASR XL THR as protheses with higher than anticipated rates of revision (2007/2008). These prostheses were subsequently removed from the market in Australia, a year earlier than the global recall.
- The importance of gender, age, and femoral head size to the outcomes of resurfacing prostheses (2007/2008).
- The identification of the entire class of large head metal/metal conventional total hip prostheses (2010).
- The reduction in revision associated with patella resurfacing (2010).
- Detailed analysis of the revision rates relating to bearing surface, including the improved outcomes associated with XLPE for both hips (2011), knees (2013) and shoulders (2017).
- Determining that the rate of revision for total stemmed anatomic shoulder replacement class is confounded by modular metal back glenoids.
- The identification of large numbers of prostheses with higher than anticipated rates of revision. This is almost always associated with a rapid reduction in use. Many of these devices have subsequently been removed from the market.
- The increasing adoption of Registry-identified best practice and use of better performing devices.

Governance

The AOANJRR is an initiative of the AOA funded by the Commonwealth Government. In 2009, the Commonwealth established the AOANJRR Consultative Committee, which was administered and chaired by the Department of Health. The purpose was to provide advice on the overall strategic direction of the Registry. The Consultative Committee has been under review and is not currently meeting.

The National Board of the AOA established the AOA Registry Committee to review and recommend AOANJRR policies to the Board. The Committee reports to the AOA Board. Members include the Chair, Registry Clinical Director with the three Deputy Registry Clinical Directors and four Assistant Deputy Registry Clinical Directors in attendance. In addition, an orthopaedic surgeon from each state, the ACT, and a representative from each of the AOA specialty arthroplasty groups are included. A complete list of the current AOA Registry Committee is provided in the acknowledgements section of this report.

The Registry Clinical Director, Deputy Registry Clinical Directors and Assistant Deputy Registry Clinical Directors are appointed by the AOA Board and are responsible for providing strategic and clinical guidance. Additionally, the Registry Clinical Directors are responsible for ensuring the cooperation of hospitals, surgeons, and government, maintaining the profile and reputation of the Registry, continued collaboration with other arthroplasty registries internationally, and sustaining the current level of excellence.

The AOANJRR staff include the Registry Services Manager, , Core Data Coordinator, PROMs Coordinator, Data Requests and Publications Manager, Data Requests Coordinator, Data Requests Officer, Publications Coordinator, and Administrative Coordinator. The AOANJRR team are responsible for the day-to-day operations, implementing new strategies, provision of data reports, research, and publications activity, and coordinating the preparation of the Annual Report.

Data Collection

Hospitals provide joint replacement data on specific Registry forms which are completed in theatre at the time of surgery. The completed forms are submitted to the Registry each month. Examples of these forms are available on the website: https://aoanjrr.sahmri.com/data-collection.

Hard copy forms are sent to the Registry where a small team of expert data entry staff enter the data directly into the database. Onsite Data Managers are available to resolve queries at the time of data entry to reduce any potential data entry errors. The Registry data entry system uses a predictive text function which greatly reduces the possibility of transcription errors and enables the experienced data entry staff to enter the data rapidly and accurately.

The Registry has also established mechanisms to collect data electronically when it becomes feasible for contributing hospitals to do so. To date, there are no hospitals providing data electronically.

Data Validation

The Registry validates data collected from both public and private hospitals by comparing it to data provided by state and territory health departments. Validation of Registry data is a sequential multi-level matching process against health department unit record data.

Data Quality

The validation process identifies:

1. Registry procedure records for procedures notified to state/territory health departments by hospitals.
2. State/territory records for procedures not submitted to the Registry by hospitals.
3. 'Exact match' procedures, that is, records held by the Registry and state/territory health departments.
4. Procedures that match on some parameters, but which require additional checking with hospitals to enable verification.

Initial validation is performed using hospital and patient identity numbers with subsequent verification undertaken on relevant procedure codes and appropriate admission periods.

Data errors can occur within Government or Registry data at any of these levels; that is, errors in patient identification, coding, or admission period attribution by either the hospital, state/ territory health department or the Registry. Data mismatches are managed depending on the nature of the error. For example, a health department record for a primary 'knee' may match a Registry-held record for a 'hip' on all parameters except procedure type. The Registry would regard the Registry data to be correct in this instance as the Registry record contains details of the prostheses implanted. Other errors may be resolved by contacting hospitals for clarification. Most commonly, this may include a reassessment of procedure codes or admission period.

The validation process identifies procedures not submitted to the Registry. As in previous years, the majority of these procedures have an ICD10 code for hemiarthroplasty of the femur. Sufficient information is provided in the state unit record data to enable the Registry to request hospitals to provide forms for unreported procedures.

Outcome Assessment

The Registry describes the time to first revision using the Kaplan-Meier estimates of survivorship. The cumulative percent revision (CPR) at a certain time, for example, 5 years, is the complement in probability) of the Kaplan-Meier survivorship function at that time, multiplied by 100. The cumulative percent revision accounts for right censoring due to death and 'closure' of the database at the time of analysis. Closure of the database occurs in April of the report year for procedures up to 31 December of the preceding year. Due to

delays in receipt of the procedure form, some procedures are not included until the following annual report.

Mortality information is obtained by matching all procedures with the National Death Index (NDI) biannually. The NDI is the national mortality database maintained by the Australian Institute of Health and Welfare (AIHW). The AIHW requires ethics approval for access to the NDI data.

Prior to 2013, the Registry reported the revisions per 100 observed component years. This statistic provides a good estimate of the overall rate of revision. However, it does not allow for changes in the rate of revision over time. A more informative estimate of the rate of revision over time is the cumulative percent revision.

Confidence intervals for the cumulative percent revision are unadjusted point-wise Greenwood estimates and should not be used to infer significant differences in revision between groups. Reported hazard ratios should be used when judging statistical significance.

Hazard ratios (HR) from Cox proportional hazards models, adjusting for age and gender where appropriate, are used to compare rates of revision. For each model, the assumption of proportional hazards is checked analytically. If the interaction between the predictor and the log of time is statistically significant in the standard Cox model, then a time varying model is estimated. Time points are iteratively chosen until the assumption of proportionality is met, then the hazard ratios are calculated for each selected time period. If no time period is specified, then the hazard ratio is over the entire follow-up period. All tests are two-tailed at the 5% level of significance.

The cumulative percent revision is displayed until the number at risk for the group reaches 40, unless the initial number for the group is less than 100, in which case the cumulative percent revision is reported until 10% of the initial number at risk remains. This avoids uninformative, imprecise estimates at the right tail of the distribution where the number at risk is low. Analytical comparisons of revision rates using the proportional hazards model are based on all available data.[1]

In the presence of a competing risk for revision, the Kaplan-Meier method is known to overestimate the true probability of revision. Death of the patient before revision presents such a competing risk. In circumstances where the risk of death is high, e.g., in elderly patients with fractured neck of femur, the bias in the Kaplan-Meier estimates may be substantial and the reported cumulative percent revision should be interpreted with caution.

Cumulative incidence is one method of estimating the probability of revision in the presence of competing risks. Cumulative incidence revision diagnosis graphs deal with the competing risks of reasons for revision, highlighting the differences between groups in the pattern of revision over time. They also provide important insight into different mechanisms of failure. A further approach to address the issue of death is to assess the probability of revision in only those patients that are still alive at the time of assessment. This is referred to as conditional probability.

More detailed information on the statistical methods used in this report is presented in Appendix 2.

An important Registry focus has been the continued development of a standardised algorithm to identify prostheses or combination of prostheses not performing to the level of others in the same class. The Registry refers to this group as 'prostheses with a higher than anticipated rate of revision'. A three-stage approach has been developed and is outlined in detail in the relevant chapter of the report.

Annual Report Review Prior To Publication

Prior to publication, three workshops were held to review, comment, and provide advice on all sections of the Annual Report. Members of the AOA, Arthroplasty Society, and Shoulder and Elbow Society were invited to attend these surgeon workshops.

The hip, knee and shoulder surgeon workshops were held in Adelaide on the weekend of the 2 and 3 August 2025. In addition to AOANJRR and SAHMRI staff, 33 hip, knee and shoulder arthroplasty specialists from the AOA membership attended the workshops.

Following these meetings, the Annual Report was provided to the AOA Board for consideration and final approval prior to publication.

[1] Pocock SJ, Clayton TC, Altman DG. Survival plots of time to event outcomes in clinical trials: good practice and pitfalls, Lancet 2002; 359: 1686-89.



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Ten Year Outcomes

The Registry first reported 10 year outcomes in 2011. Since that time, the Registry has reported on an increasing number of hip and knee prostheses that have achieved this length of follow-up. This outcome is widely regarded as an important milestone in assessing the performance of prostheses.

Since the Registry commenced data collection revision rates have declined and many prostheses are no longer used. In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prostheses combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

HIP REPLACEMENT

Individual femoral and acetabular prosthesis combinations are reported. A combination is included if >350 procedures have been reported and the follow-up period is ≥10 years.

There are 48 femoral and acetabular combinations with 10 year outcome data. These prosthesis combinations have been used in 83.9% of all primary total conventional hip procedures performed for osteoarthritis.

The 10 year cumulative percent revision for the individual prosthesis combinations ranges from 1.9% to 7.9%. In the past, when assessing superior and non-inferior performance the commonly accepted benchmark standard of 5% cumulative percent revision at 10 years was used. In the 2021 Annual Report, the AOANJRR changed the approach to determining the benchmark so that it is now calculated each year and is based on the aggregate performance of modern prostheses. The 10 year benchmark for this year is 4.2%.

Approaches to benchmarking hip and knee prostheses have been reviewed by the ISAR International Prosthesis Benchmarking Working Group.[2] An important recommendation was to use confidence intervals (CI) for individual prostheses rather than the revision rate, as the CI reflects the precision in estimating the true population revision rate.

The superiority and inferiority approaches suggested by the ISAR International Prosthesis Benchmarking Working Group are utilised in this chapter to identify better performing hip prosthesis combinations.

Superiority approach: the upper confidence interval is less than, or equal to, the benchmark standard. Using the benchmark of 4.2% for modern prostheses at 10 years, 13 (27.1%) hip prosthesis combinations qualify for the superiority benchmark. These are highlighted in green in Table BM1.

Non-inferiority approach: the permitted upper confidence interval level is 20% above the benchmark standard. For the benchmark standard of 4.2% at 10 years, the accepted upper confidence interval is 5.0% or less. Using this approach, an additional 8 prosthesis combinations can be benchmarked, i.e., 21 (43.8%) prosthesis combinations would receive either a superiority or non-inferiority benchmark. The additional 8 devices with a non-inferiority benchmark are highlighted in blue in Table BM1.

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, it is clear that those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

[2] Report by ISAR International Prosthesis Benchmarking Working Group May 2018: https://www.isarhome.org/publications

Table BM1 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 10 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				THR	Femoral	Acetabular	Other			
Accolade II	Trident (Shell)	474	18666	45	162	74	193	2.2 (2.0, 2.4)	2.8 (2.6, 3.1)	3.9 (3.3, 4.6)
Anthology	R3	285	8388	27	83	58	117	2.4 (2.1, 2.7)	2.9 (2.5, 3.3)	3.7 (3.3, 4.2)
Avenir	Continuum	62	1332	5	13	13	31	3.7 (2.8, 4.9)	4.3 (3.3, 5.5)	5.3 (4.1, 6.9)
C-Stem AMT	Marathon	10	517	2	2	3	3	0.8 (0.3, 2.1)	1.5 (0.7, 3.1)	2.4 (1.3, 4.5)
C-Stem AMT	PINNACLE	159	5347	15	67	15	62	1.6 (1.3, 2.0)	2.7 (2.3, 3.2)	4.2 (3.5, 5.0)
CORAIL	PINNACLE	2488	63139	226	955	366	941	2.0 (1.9, 2.1)	3.0 (2.8, 3.1)	4.5 (4.3, 4.7)
CORAIL	Trident (Shell)	25	640	4	5	3	13	3.0 (1.9, 4.7)	4.0 (2.6, 6.1)	6.2 (3.8, 10.1)
CPCS	R3	282	8054	27	86	56	113	2.4 (2.1, 2.7)	3.3 (2.9, 3.8)	4.6 (4.0, 5.2)
CPCS	Reflection (Cup)	88	863	28	6	41	13	1.6 (0.9, 2.7)	2.8 (1.9, 4.2)	7.9 (6.0, 10.4)
CPCS	Reflection (Shell)	115	2845	17	49	14	35	0.9 (0.6, 1.4)	1.6 (1.2, 2.2)	3.2 (2.6, 4.0)
CPT	Allofit	62	1747	8	30	6	18	1.4 (0.9, 2.1)	3.0 (2.3, 4.0)	4.5 (3.5, 5.9)
CPT	Continuum	143	2575	9	56	18	60	3.3 (2.7, 4.0)	4.4 (3.7, 5.3)	6.2 (5.3, 7.3)
CPT	Trabecular Metal (Shell)	121	2110	11	54	18	38	2.7 (2.1, 3.5)	4.0 (3.2, 5.0)	6.4 (5.2, 7.7)
CPT	Trilogy	435	7895	48	172	46	169	2.3 (2.0, 2.7)	3.5 (3.2, 4.0)	5.5 (5.0, 6.1)
CPT	ZCA	43	868	16	10	10	7	1.2 (0.6, 2.2)	2.4 (1.6, 3.7)	4.5 (3.2, 6.3)
Evolve	Logical G	73	2806	6	11	10	46	1.9 (1.5, 2.5)	2.8 (2.2, 3.5)	3.5 (2.7, 4.5)
Exeter V40	Exeter	138	1635	32	17	67	22	1.2 (0.8, 1.9)	2.9 (2.1, 3.9)	4.6 (3.6, 5.8)
Exeter V40	Exeter Contemporary	183	2978	59	37	62	25	1.9 (1.4, 2.4)	3.0 (2.4, 3.7)	4.5 (3.8, 5.4)
Exeter V40	Exeter X3 Rimfit	129	4614	31	37	34	27	1.7 (1.4, 2.2)	2.5 (2.1, 3.0)	3.3 (2.7, 3.9)
Exeter V40	Trabecular Metal (Shell)	21	496	2	3	2	14	2.7 (1.6, 4.5)	3.7 (2.3, 5.8)	4.6 (3.0, 7.2)
Exeter V40	Trident (Shell)	2509	82676	344	824	306	1035	1.5 (1.5, 1.6)	2.3 (2.2, 2.4)	3.5 (3.3, 3.6)
Exeter V40	Trident/Tritanium (Shell)	167	5174	20	44	28	75	1.9 (1.6, 2.3)	2.9 (2.4, 3.4)	4.0 (3.3, 4.7)
H-Max	Delta-TT	79	1741	6	37	12	24	2.4 (1.8, 3.3)	3.7 (2.9, 4.7)	6.0 (4.7, 7.5)
MS 30	Continuum	17	916	1	2	3	11	1.7 (1.0, 2.7)	1.9 (1.2, 3.1)	1.9 (1.2, 3.1)
MS 30	Fitmore	19	620	0	2	8	9	1.5 (0.8, 2.9)	2.6 (1.6, 4.4)	3.9 (2.4, 6.2)
MS 30	Low Profile Cup	16	412	6	1	7	2	0.7 (0.2, 2.3)	1.3 (0.6, 3.2)	2.8 (1.4, 5.4)
Metafix	Trinity	458	21551	51	126	89	192	1.8 (1.7, 2.0)	2.4 (2.2, 2.6)	3.1 (2.7, 3.6)
MiniHip	Trinity	40	1307	2	21	10	7	2.7 (1.9, 3.7)	3.0 (2.2, 4.1)	3.3 (2.4, 4.5)
Optimys	RM Cup	66	2955	9	25	10	22	2.0 (1.6, 2.6)	2.5 (2.0, 3.2)	2.8 (2.1, 3.7)
Origin	Logical G	152	4478	7	42	26	77	2.9 (2.5, 3.5)	3.8 (3.2, 4.5)	6.0 (4.5, 7.9)
Polarstem	R3	612	22165	35	204	89	284	2.2 (2.0, 2.4)	2.9 (2.6, 3.1)	3.8 (3.5, 4.2)
Quadra-C	Versafitcup CC	38	2206	7	8	8	15	1.4 (1.0, 2.0)	1.8 (1.3, 2.5)	2.5 (1.7, 3.6)
Quadra-H	Mpact	249	6318	24	126	31	68	2.5 (2.1, 2.9)	3.9 (3.4, 4.4)	6.4 (5.1, 8.1)
Quadra-H	Versafitcup CC	422	11091	49	197	76	100	2.1 (1.8, 2.4)	3.0 (2.7, 3.4)	4.7 (4.3, 5.3)
S-Rom	PINNACLE	162	2668	16	91	16	39	2.8 (2.3, 3.6)	4.4 (3.7, 5.3)	5.7 (4.8, 6.7)
SL-Plus	EP-Fit Plus	48	1124	3	20	9	16	2.0 (1.3, 3.0)	2.9 (2.1, 4.1)	4.1 (3.0, 5.5)
SL-Plus	R3	104	1695	7	28	24	45	3.1 (2.4, 4.0)	4.2 (3.3, 5.3)	6.0 (4.9, 7.3)
Secur-Fit	Trident (Shell)	546	9895	40	243	99	164	2.4 (2.1, 2.8)	3.6 (3.2, 4.0)	4.8 (4.4, 5.2)
Secur-Fit Plus	Trident (Shell)	92	2956	9	32	22	29	1.6 (1.2, 2.1)	2.2 (1.7, 2.8)	3.1 (2.5, 3.9)
Spectron EF	R3	105	2169	18	22	21	44	2.4 (1.9, 3.2)	3.8 (3.1, 4.8)	5.1 (4.2, 6.2)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	1.3 (0.8, 2.0)	2.9 (2.1, 4.0)	7.2 (5.8, 8.9)
Synergy	R3	196	5403	6	55	48	87	2.2 (1.8, 2.6)	2.8 (2.4, 3.3)	3.5 (3.0, 4.1)
Synergy	Trident (Shell)	22	439	0	4	9	9	1.2 (0.5, 2.7)	1.9 (0.9, 3.7)	3.8 (2.3, 6.2)
Taper Fit	Trinity	125	5556	13	38	16	58	1.8 (1.5, 2.3)	2.7 (2.2, 3.2)	4.0 (2.8, 5.7)
Taperloc	G7	158	6580	11	39	21	87	2.2 (1.8, 2.6)	2.6 (2.2, 3.1)	3.0 (2.5, 3.5)

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				THR	Femoral	Acetabular	Other			
Taperloc Microplasty	G7	100	6065	10	43	10	37	1.6 (1.3, 1.9)	1.9 (1.5, 2.3)	2.8 (1.6, 4.7)
Tri-Fit TS	Trinity	136	5085	15	58	23	40	1.9 (1.5, 2.3)	2.5 (2.1, 3.0)	3.2 (2.6, 3.8)
twinSys (cless)	RM Cup	59	1510	6	16	7	30	2.5 (1.8, 3.4)	3.3 (2.5, 4.4)	4.9 (3.6, 6.4)
TOTAL		12161	353676	1383	4215	2001	4562			

Note: Only prostheses with >350 procedures have been listed.
Green: prosthesis combination qualifies for a superiority benchmark.
Blue: prosthesis combination qualifies for non-inferiority benchmark.
Restricted to modern prostheses

KNEE REPLACEMENT

The Registry has information on individual femoral and tibial prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry and the follow-up is ≥10 years.

The listed prostheses most often represent a family of devices that have a range of different femoral and tibial components, combined with different tibial inserts, listed under one prosthesis name. Prosthesis types are further characterised according to whether they are minimally stabilised (cruciate retaining) or posteriorly stabilised.

As with hips, to ensure that the data reflects contemporary practice only procedures using modern prostheses are included in the analyses. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prosthesis combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

There are 38 total knee replacement combinations with 10 year outcome data. These prosthesis combinations were used in 98.9% of all primary total knee replacement procedures performed for osteoarthritis.

The 10 year cumulative percent revision ranges from 2.8% to 11.9%. In the past, as with primary total conventional hip replacement, when assessing superior and non-inferior performance the benchmark standard used was a cumulative percent revision at 10 years of 5%. The cumulative percent revision benchmark at 10 years, calculated this year based on the aggregate performance of modern prostheses within the AOANJRR is 4.7%.

The superiority and inferiority approaches suggested by the ISAR International Prosthesis Benchmarking Working Group are utilised in this chapter to identify better performing knee prosthesis combinations.

Applying the recommendations of the ISAR International Prosthesis Benchmarking Working Group, using the new benchmark of 4.7% at 10 years, then 8 (21.1%) knee prosthesis combinations qualify for the superiority benchmark. These are highlighted in green in Table BM2.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard which is 5.6% or less. An additional 10 knee prosthesis combinations can be benchmarked, i.e., 18 (47.4%) prosthesis combinations would receive either a superiority or a non-inferiority benchmark. The additional 10 devices with a non-inferiority benchmark are highlighted in blue (Table BM2).

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, patella resurfacing rates, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

Table BM2 Cumulative Percent Revision of Primary Total Knee Replacement Prosthesis Combinations with 10 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				TKR	Femoral	Tibial	Other			
ACS	ACS Fixed	170	3850	47	10	21	92	2.8 (2.3, 3.3)	4.2 (3.6, 4.9)	5.4 (4.6, 6.3)
ACS	ACS Mobile	108	2246	38	9	4	57	3.0 (2.3, 3.8)	4.6 (3.8, 5.6)	5.8 (4.8, 7.1)
Active Knee	Active Knee	934	11106	282	30	43	579	2.4 (2.1, 2.7)	4.6 (4.2, 5.0)	7.8 (7.2, 8.4)
Apex Knee CR	Apex Knee	270	14421	60	24	13	173	1.3 (1.1, 1.5)	2.2 (1.9, 2.5)	3.1 (2.6, 3.7)
Apex Knee PS	Apex Knee	220	7507	87	8	17	108	1.7 (1.4, 2.0)	3.1 (2.7, 3.6)	4.9 (4.1, 5.7)
Attune CR	Attune	816	37247	207	41	54	514	1.6 (1.4, 1.7)	2.6 (2.5, 2.8)	3.5 (3.2, 3.8)
Attune PS	Attune	419	17537	131	24	53	211	1.6 (1.4, 1.8)	2.7 (2.4, 2.9)	4.7 (4.1, 5.5)
BalanSys	BalanSys	155	5003	53	8	9	85	1.5 (1.2, 1.9)	2.5 (2.1, 3.0)	3.9 (3.3, 4.7)
Columbus	Columbus	276	8402	72	12	15	177	1.9 (1.7, 2.3)	3.8 (3.3, 4.3)	6.1 (5.2, 7.2)
E.Motion	E.Motion	77	1034	23	9	4	41	4.3 (3.2, 5.8)	6.5 (5.2, 8.3)	8.5 (6.8, 10.6)
Evolution	Evolution	375	13525	92	2	15	266	1.6 (1.4, 1.9)	2.9 (2.6, 3.2)	4.2 (3.7, 4.7)
GMK Primary	GMK Primary	149	3967	43	5	16	85	2.5 (2.0, 3.0)	3.8 (3.2, 4.5)	5.1 (4.3, 6.0)
GMK Sphere Primary	GMK Primary	653	26250	150	17	40	446	2.1 (1.9, 2.3)	3.2 (2.9, 3.5)	4.4 (3.9, 5.0)
GMK Sphere Primary	GMK Sphere Primary	111	4011	29	2	9	71	2.1 (1.7, 2.7)	3.6 (3.0, 4.4)	4.9 (3.9, 6.2)
Genesis II CR	Genesis II	1313	26672	283	79	57	894	2.0 (1.8, 2.1)	3.4 (3.2, 3.7)	5.0 (4.7, 5.3)
Genesis II Oxinium CR (ctd)	Genesis II	686	11473	140	37	28	481	1.9 (1.7, 2.2)	3.5 (3.1, 3.9)	5.9 (5.5, 6.5)
Genesis II Oxinium PS (ctd)	Genesis II	1581	22705	243	37	179	1122	2.7 (2.5, 3.0)	4.9 (4.6, 5.2)	7.0 (6.7, 7.4)
Genesis II PS	Genesis II	1013	21014	185	33	62	733	2.0 (1.8, 2.2)	3.6 (3.3, 3.8)	4.9 (4.6, 5.3)
Journey II Oxinium	Journey	34	3900	3	2	1	28	1.1 (0.7, 1.6)	4.5 (2.4, 8.2)	4.5 (2.4, 8.2)
LCS CR	LCS	638	8346	262	24	90	262	2.5 (2.1, 2.8)	4.5 (4.0, 4.9)	6.4 (5.9, 7.0)
Legion CR	Genesis II	370	10342	72	27	15	256	2.1 (1.8, 2.4)	3.8 (3.4, 4.2)	5.4 (4.7, 6.1)
Legion Oxinium CR	Genesis II	365	12774	86	28	12	239	1.7 (1.5, 2.0)	3.1 (2.8, 3.5)	4.3 (3.8, 4.9)
Legion Oxinium FS	Legion	33	360	2	2	0	29	6.7 (4.5, 10.0)	8.9 (6.2, 12.8)	11.9 (8.2, 16.9)
Legion Oxinium PS	Genesis II	822	19458	126	23	69	604	2.1 (1.9, 2.3)	3.8 (3.5, 4.1)	5.2 (4.8, 5.5)
Legion PS	Genesis II	234	6434	60	5	11	158	2.0 (1.7, 2.4)	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)
MRK	MRK	35	855	9	1	0	25	1.9 (1.2, 3.1)	3.1 (2.1, 4.5)	4.6 (3.2, 6.6)
Nexgen LCCK	Nexgen	57	983	10	3	1	43	3.0 (2.1, 4.3)	4.6 (3.4, 6.1)	5.9 (4.4, 7.8)
Nexgen LPS Flex	Nexgen	1536	31636	441	65	216	814	1.9 (1.7, 2.0)	3.2 (3.0, 3.4)	4.9 (4.7, 5.2)
Nexgen RH	Nexgen	44	832	4	5	4	31	2.9 (1.9, 4.4)	5.2 (3.7, 7.3)	8.8 (6.4, 12.1)
Persona CR	Persona	1195	76213	227	56	111	801	1.5 (1.4, 1.6)	2.4 (2.3, 2.6)	2.8 (2.5, 3.1)
Persona PS	Persona	154	6546	30	10	4	110	1.8 (1.5, 2.2)	2.8 (2.4, 3.3)	3.4 (2.8, 4.0)
SAIPH	SAIPH	120	6711	30	4	0	86	1.1 (0.9, 1.4)	2.1 (1.7, 2.5)	2.8 (2.1, 3.6)
Score	Score	454	6400	188	23	12	231	3.0 (2.6, 3.5)	5.6 (5.1, 6.3)	9.0 (8.1, 9.9)
Trekking	Trekking	75	1287	34	7	3	31	3.1 (2.3, 4.3)	4.8 (3.7, 6.1)	6.1 (4.9, 7.7)
Triathlon CR	Triathlon	4360	187428	819	173	214	3154	1.4 (1.4, 1.5)	2.3 (2.3, 2.4)	3.5 (3.4, 3.6)
Triathlon FS	Triathlon	27	494	7	2	1	17	4.2 (2.7, 6.6)	6.4 (4.4, 9.3)	6.4 (4.4, 9.3)
Triathlon PS	Triathlon	704	15654	138	38	86	442	2.2 (2.0, 2.5)	3.7 (3.4, 4.0)	5.2 (4.8, 5.6)
Vanguard CR	Vanguard	1224	27180	311	45	72	796	1.7 (1.5, 1.9)	2.9 (2.7, 3.1)	4.6 (4.4, 4.9)
TOTAL		21807	661803	5024	930	1561	14292			

Note: Only prostheses with >350 procedures have been listed.
CR 'cruciate retaining' refers to minimally stabilised.
Green: prosthesis combination qualifies for a superiority benchmark.
Blue: prosthesis combination qualifies for non-inferiority benchmark.
Restricted to modern prostheses.

Ten, Fifteen and Twenty Year Prosthesis Outcomes

SHOULDER REPLACEMENT

The Registry is reporting 10 year outcomes for primary total shoulder replacements. Individual humeral and glenoid prosthesis combinations are reported. A combination is included if >50 procedures have been reported to the Registry and the follow-up is ≥10 years.

As with hips and knees, to ensure that the data reflects contemporary practice only procedures using modern prostheses are included in the analyses. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prosthesis combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Total Stemmed Anatomic Shoulder Replacement

There are 5 total stemmed anatomic shoulder replacement combinations with a primary diagnosis of osteoarthritis with 10 year outcomes. These prosthesis combinations were used in 73.7% of all primary total stemmed anatomic shoulder replacement procedures performed for osteoarthritis.

The 10 year cumulative percent revision ranges from 4.9% to 24.2%. The cumulative percent revision benchmark at 10 years, calculated this year is based on the aggregate performance of modern prostheses where cemented polyethylene glenoid components are used for a primary diagnosis of osteoarthritis, which is 7.4%.

Using the benchmark of 7.4% at 10 years, then one total stemmed anatomic shoulder prosthesis combination qualifies for the superiority benchmark.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard which is 8.9% or less. No additional total stemmed anatomic shoulder prosthesis combination qualify for a non-inferiority benchmark (Table BM3).

Primary Total Stemmed Reverse Shoulder Replacement

There are 6 total stemmed reverse shoulder replacement combinations undertaken for all diagnoses with 10 year outcomes.

These prosthesis combinations were used in 67.7% of primary total stemmed reverse shoulder replacement procedures performed for any diagnosis reported to the Registry.

The 10 year cumulative percent revision ranges from 3.4% to 6.7%. The cumulative percent revision benchmark at 10 years, calculated this year based on the aggregate performance of modern prostheses with cementless fixation is 5.4%.

Applying a benchmark of 5.4% at 10 years then one total stemmed reverse shoulder prosthesis combination qualifies for the superiority benchmark.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard which is 6.5% or less. Using this approach, an additional 2 total stemmed reverse shoulder replacement combinations can be benchmarked, i.e. 3 (50%) prosthesis combinations would receive either a superiority or a non-inferiority benchmark. The additional 2 devices with a non-inferiority benchmark are highlighted in blue (Table BM4).

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, it is clear that those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

Table BM3 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Combinations with 10 Year Data (Primary Diagnosis OA)

Humeral Component	Glenoid Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				TSR	Humeral	Glenoid	Other			
Affinis	Affinis	21	198	7	1	7	6	1.1 (0.3, 4.3)	5.0 (2.7, 9.5)	8.9 (5.4, 14.3)
Ascend Flex	Perform	40	1385	37	1	0	2	1.6 (1.0, 2.4)	2.7 (1.9, 3.9)	4.9 (3.3, 7.0)
Comprehensive	Comprehensive	55	930	41	3	1	10	4.7 (3.5, 6.3)	5.7 (4.3, 7.5)	7.5 (5.6, 10.0)
Equinoxe	Equinoxe	80	726	55	6	4	15	5.1 (3.7, 7.0)	9.6 (7.4, 12.3)	24.2 (18.1, 32.0)
SMR	SMR	36	533	29	1	1	5	4.5 (3.0, 6.7)	5.6 (3.9, 8.0)	7.0 (5.0, 9.7)
TOTAL		232	3772	169	12	13	38			

Note: Only prostheses with >50 procedures have been listed.
Green: prosthesis combination qualifies for a superiority benchmark.
Blue: prosthesis combination qualifies for non-inferiority benchmark.
Restricted to modern prostheses.

Table BM4 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement Combinations with 10 Year Data (All Diagnoses)

Humeral Component	Glenoid Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				TSR	Humeral	Glenoid	Other			
Aequalis	Aequalis	219	4555	13	38	17	151	2.9 (2.4, 3.4)	4.4 (3.8, 5.1)	6.7 (5.8, 7.7)
Ascend Flex	Aequalis	157	4084	33	94	2	28	3.4 (2.9, 4.1)	4.9 (4.2, 5.8)	5.7 (4.6, 7.2)
Comprehensive	Comprehensive Reverse	159	8747	62	66	4	27	1.8 (1.5, 2.1)	2.5 (2.1, 3.0)	3.4 (2.2, 5.2)
Delta Xtend	Delta Xtend	490	12331	28	72	29	361	2.8 (2.5, 3.1)	3.7 (3.4, 4.1)	5.0 (4.5, 5.5)
SMR	SMR L1	504	11869	36	110	40	318	3.6 (3.3, 4.0)	4.3 (3.9, 4.7)	5.3 (4.8, 5.8)
Trabecular Metal	Trabecular Metal	105	1988	2	8	35	60	3.5 (2.8, 4.5)	5.1 (4.2, 6.3)	6.4 (5.2, 7.9)
TOTAL		**1634**	**43574**	**174**	**388**	**127**	**945**			

Note: Only prostheses with >50 procedures have been listed.
Green: prosthesis combination qualifies for a superiority benchmark.
Blue: prosthesis combination qualifies for non-inferiority benchmark.
Restricted to modern prostheses.

Fifteen Year Outcomes

This year, the Registry is reporting 15 year outcomes for 27 hip and 19 knee prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry, and the follow-up period is 15 or more years.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

HIP REPLACEMENT

The 27 listed prosthesis combinations were used in 59.6% of all primary total conventional hip replacement procedures performed for osteoarthritis.

The 15 year cumulative percent revision ranges from 4.1% to 17.3%. The benchmark used to assess superiority and non-inferiority performance at 15 years was calculated based on modern prostheses. This year, the 15 year benchmark is 6.0%. There are 5 (18.5%) hip prosthesis combinations that qualify for a superiority benchmark and these are highlighted in green (Table BM5).

An additional 4 prosthesis combinations qualify for a non-inferiority benchmark, i.e., 9 (33.3%) qualify for either a superiority or non-inferiority benchmark. Those prosthesis combinations that qualify for a non-inferiority benchmark are highlighted in blue (Table BM5).

KNEE REPLACEMENT

The listed 19 prosthesis combinations were used in 64.8% of all primary total knee replacement procedures performed for osteoarthritis.

The 15 year cumulative percent revision ranges from 4.7% to 11.1%. This year, the benchmark used to assess superiority and non-inferiority at 15 years is 6.3%. There is 1 (5.3%) knee prosthesis combination that qualifies for a superiority benchmark and this is highlighted in green (Table BM6).

There are an additional 7 prosthesis combinations that qualify for a non-inferiority benchmark, i.e., 8 (42.1%) qualify for either a superiority or non-inferiority benchmark. Those prostheses that qualify for a non-inferiority benchmark are highlighted in blue (Table BM6).

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Table BM5 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 15 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				5 Yrs	10 Yrs	15 Yrs
				THR	Femoral	Acetabular	Other			
Anthology	R3	285	8388	27	83	58	117	2.9 (2.5, 3.3)	3.7 (3.3, 4.2)	4.3 (3.8, 5.0)
C-Stem AMT	PINNACLE	159	5347	15	67	15	62	2.7 (2.3, 3.2)	4.2 (3.5, 5.0)	6.7 (4.5, 9.9)
CORAIL	PINNACLE	2488	63139	226	955	366	941	3.0 (2.8, 3.1)	4.5 (4.3, 4.7)	7.0 (6.6, 7.4)
CPCS	R3	282	8054	27	86	56	113	3.3 (2.9, 3.8)	4.6 (4.0, 5.2)	5.3 (4.5, 6.2)
CPCS	Reflection (Cup)	88	863	28	6	41	13	2.8 (1.9, 4.2)	7.9 (6.0, 10.4)	17.3 (13.8, 21.6)
CPCS	Reflection (Shell)	115	2845	17	49	14	35	1.6 (1.2, 2.2)	3.2 (2.6, 4.0)	5.3 (4.3, 6.5)
CPT	Allofit	62	1747	8	30	6	18	3.0 (2.3, 4.0)	4.5 (3.5, 5.9)	5.7 (4.1, 7.9)
CPT	Trabecular Metal (Shell)	121	2110	11	54	18	38	4.0 (3.2, 5.0)	6.4 (5.2, 7.7)	8.9 (7.2, 11.0)
CPT	Trilogy	435	7895	48	172	46	169	3.5 (3.2, 4.0)	5.5 (5.0, 6.1)	7.0 (6.3, 7.7)
CPT	ZCA	43	868	16	10	10	7	2.4 (1.6, 3.7)	4.5 (3.2, 6.3)	6.1 (4.3, 8.5)
Exeter V40	Exeter	138	1635	32	17	67	22	2.9 (2.1, 3.9)	4.6 (3.6, 5.8)	9.7 (8.0, 11.6)
Exeter V40	Exeter Contemporary	183	2978	59	37	62	25	3.0 (2.4, 3.7)	4.5 (3.8, 5.4)	7.7 (6.6, 9.1)
Exeter V40	Trabecular Metal (Shell)	21	496	2	3	2	14	3.7 (2.3, 5.8)	4.6 (3.0, 7.2)	5.1 (3.3, 7.8)
Exeter V40	Trident (Shell)	2509	82676	344	824	306	1035	2.3 (2.2, 2.4)	3.5 (3.3, 3.6)	4.9 (4.7, 5.2)
MS 30	Fitmore	19	620	0	2	8	9	2.6 (1.6, 4.4)	3.9 (2.4, 6.2)	4.9 (2.8, 8.4)
MS 30	Low Profile Cup	16	412	6	1	7	2	1.3 (0.6, 3.2)	2.8 (1.4, 5.4)	5.9 (3.2, 10.8)
Polarstem	R3	612	22165	35	204	89	284	2.9 (2.6, 3.1)	3.8 (3.5, 4.2)	4.6 (3.9, 5.5)
Quadra-H	Versafitcup CC	422	11091	49	197	76	100	3.0 (2.7, 3.4)	4.7 (4.3, 5.3)	7.7 (6.3, 9.3)
S-Rom	PINNACLE	162	2668	16	91	16	39	4.4 (3.7, 5.3)	5.7 (4.8, 6.7)	6.8 (5.8, 8.0)
SL-Plus	EP-Fit Plus	48	1124	3	20	9	16	2.9 (2.1, 4.1)	4.1 (3.0, 5.5)	4.6 (3.5, 6.1)
SL-Plus	R3	104	1695	7	28	24	45	4.2 (3.3, 5.3)	6.0 (4.9, 7.3)	7.6 (6.2, 9.3)
Secur-Fit	Trident (Shell)	546	9895	40	243	99	164	3.6 (3.2, 4.0)	4.8 (4.4, 5.2)	6.4 (5.9, 7.0)
Secur-Fit Plus	Trident (Shell)	92	2956	9	32	22	29	2.2 (1.7, 2.8)	3.1 (2.5, 3.9)	4.1 (3.3, 5.1)
Spectron EF	R3	105	2169	18	22	21	44	3.8 (3.1, 4.8)	5.1 (4.2, 6.2)	6.9 (5.5, 8.7)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	2.9 (2.1, 4.0)	7.2 (5.8, 8.9)	12.9 (10.8, 15.5)
Synergy	R3	196	5403	6	55	48	87	2.8 (2.4, 3.3)	3.5 (3.0, 4.1)	5.0 (4.2, 5.8)
Synergy	Trident (Shell)	22	439	0	4	9	9	1.9 (0.9, 3.7)	3.8 (2.3, 6.2)	6.1 (4.0, 9.5)
TOTAL		**9401**	**251084**	**1099**	**3304**	**1552**	**3446**			

Note: Only prostheses with >350 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses

Table BM6 Cumulative Percent Revision of Primary Total Knee Replacement Prosthesis Combinations with 15 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	Type of Revision				5 Yrs	10 Yrs	15 Yrs
				TKR	Femoral	Tibial	Other			
Active Knee	Active Knee	934	11106	282	30	43	579	4.6 (4.2, 5.0)	7.8 (7.2, 8.4)	11.1 (10.4, 11.9)
BalanSys	BalanSys	155	5003	53	8	9	85	2.5 (2.1, 3.0)	3.9 (3.3, 4.7)	5.2 (4.0, 6.8)
Columbus	Columbus	276	8402	72	12	15	177	3.8 (3.3, 4.3)	6.1 (5.2, 7.2)	8.6 (6.9, 10.6)
Genesis II CR	Genesis II	1313	26672	283	79	57	894	3.4 (3.2, 3.7)	5.0 (4.7, 5.3)	6.1 (5.8, 6.5)
Genesis II Oxinium CR (ctd)	Genesis II	686	11473	140	37	28	481	3.5 (3.1, 3.9)	5.9 (5.5, 6.5)	8.4 (7.7, 9.1)
Genesis II Oxinium PS (ctd)	Genesis II	1581	22705	243	37	179	1122	4.9 (4.6, 5.2)	7.0 (6.7, 7.4)	9.3 (8.8, 9.9)
Genesis II PS	Genesis II	1013	21014	185	33	62	733	3.6 (3.3, 3.8)	4.9 (4.6, 5.3)	6.2 (5.8, 6.7)
LCS CR	LCS	638	8346	262	24	90	262	4.5 (4.0, 4.9)	6.4 (5.9, 7.0)	8.1 (7.5, 8.8)
Legion CR	Genesis II	370	10342	72	27	15	256	3.8 (3.4, 4.2)	5.4 (4.7, 6.1)	7.2 (5.9, 8.7)
Legion Oxinium CR	Genesis II	365	12774	86	28	12	239	3.1 (2.8, 3.5)	4.3 (3.8, 4.9)	5.7 (4.8, 6.8)
Legion Oxinium PS	Genesis II	822	19458	126	23	69	604	3.8 (3.5, 4.1)	5.2 (4.8, 5.5)	7.9 (6.9, 9.1)
Legion PS	Genesis II	234	6434	60	5	11	158	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)	6.3 (4.5, 8.7)
MRK	MRK	35	855	9	1	0	25	3.1 (2.1, 4.5)	4.6 (3.2, 6.6)	6.6 (4.4, 9.6)
Nexgen LCCK	Nexgen	57	983	10	3	1	43	4.6 (3.4, 6.1)	5.9 (4.4, 7.8)	9.2 (6.5, 13.1)
Nexgen LPS Flex	Nexgen	1536	31636	441	65	216	814	3.2 (3.0, 3.4)	4.9 (4.7, 5.2)	6.5 (6.1, 6.8)
Score	Score	454	6400	188	23	12	231	5.6 (5.1, 6.3)	9.0 (8.1, 9.9)	10.7 (9.6, 11.9)
Triathlon CR	Triathlon	4360	187428	819	173	214	3154	2.3 (2.3, 2.4)	3.5 (3.4, 3.6)	4.7 (4.5, 4.9)
Triathlon PS	Triathlon	704	15654	138	38	86	442	3.7 (3.4, 4.0)	5.2 (4.8, 5.6)	6.5 (5.9, 7.1)
Vanguard CR	Vanguard	1224	27180	311	45	72	796	2.9 (2.7, 3.1)	4.6 (4.4, 4.9)	6.9 (6.4, 7.5)
TOTAL		16757	433865	3780	691	1191	11095			

Note: Only prostheses with >350 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Twenty Year Outcomes

The Registry is able to report 20 year outcomes for 11 hip and 7 knee prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry, the follow-up period is ≥20 years, and the prosthesis is still used, with the exception of those eligible prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

HIP REPLACEMENT

The 11 listed prosthesis combinations have been used in 41.9% of all primary total conventional hip replacement procedures performed for osteoarthritis. The 20 year cumulative percent revision ranges from 6.3% to 26.3% (Table BM7).

KNEE REPLACEMENT

The 7 listed prosthesis combinations were used in 19.9% of all primary total knee replacement procedures performed for osteoarthritis. The 20 year cumulative percent revision ranges from 7.2% to 13.9% (Table BM8).

Table BM7 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 20 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				10 Yrs	15 Yrs	20 Yrs
				THR	Femoral	Acetabular	Other			
CORAIL	PINNACLE	2488	63139	226	955	366	941	4.5 (4.3, 4.7)	7.0 (6.6, 7.4)	8.7 (7.5, 10.1)
CPCS	Reflection (Cup)	88	863	28	6	41	13	7.9 (6.0, 10.4)	17.3 (13.8, 21.6)	26.3 (20.5, 33.2)
CPCS	Reflection (Shell)	115	2845	17	49	14	35	3.2 (2.6, 4.0)	5.3 (4.3, 6.5)	8.2 (6.4, 10.5)
CPT	Trilogy	435	7895	48	172	46	169	5.5 (5.0, 6.1)	7.0 (6.3, 7.7)	8.2 (7.2, 9.4)
CPT	ZCA	43	868	16	10	10	7	4.5 (3.2, 6.3)	6.1 (4.3, 8.5)	8.8 (6.0, 12.7)
Exeter V40	Exeter	138	1635	32	17	67	22	4.6 (3.6, 5.8)	9.7 (8.0, 11.6)	15.1 (12.6, 18.0)
Exeter V40	Exeter Contemporary	183	2978	59	37	62	25	4.5 (3.8, 5.4)	7.7 (6.6, 9.1)	11.5 (9.3, 14.1)
Exeter V40	Trident (Shell)	2509	82676	344	824	306	1035	3.5 (3.3, 3.6)	4.9 (4.7, 5.2)	6.3 (5.9, 6.7)
S-Rom	PINNACLE	162	2668	16	91	16	39	5.7 (4.8, 6.7)	6.8 (5.8, 8.0)	9.2 (6.8, 12.4)
Secur-Fit	Trident (Shell)	546	9895	40	243	99	164	4.8 (4.4, 5.2)	6.4 (5.9, 7.0)	8.1 (7.2, 9.0)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	7.2 (5.8, 8.9)	12.9 (10.8, 15.5)	15.8 (13.0, 19.2)
TOTAL		**6835**	**176868**	**876**	**2416**	**1084**	**2459**			

Note: Restricted to modern prostheses

Table BM8 Cumulative Percent Revision of Primary Total Knee Replacement Combinations with 20 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	Type of Revision				10 Yrs	15 Yrs	20 Yrs
				TKR	Femoral	Tibial	Other			
Active Knee	Active Knee	934	11106	282	30	43	579	7.8 (7.2, 8.4)	11.1 (10.4, 11.9)	13.9 (12.9, 15.0)
Genesis II CR	Genesis II	1313	26672	283	79	57	894	5.0 (4.7, 5.3)	6.1 (5.8, 6.5)	7.4 (6.9, 7.9)
Genesis II Oxinium CR (ctd)	Genesis II	686	11473	140	37	28	481	5.9 (5.5, 6.5)	8.4 (7.7, 9.1)	10.6 (9.7, 11.6)
Genesis II Oxinium PS (ctd)	Genesis II	1581	22705	243	37	179	1122	7.0 (6.7, 7.4)	9.3 (8.8, 9.9)	11.9 (10.8, 13.1)
Genesis II PS	Genesis II	1013	21014	185	33	62	733	4.9 (4.6, 5.3)	6.2 (5.8, 6.7)	7.2 (6.7, 7.9)
LCS CR	LCS	638	8346	262	24	90	262	6.4 (5.9, 7.0)	8.1 (7.5, 8.8)	9.3 (8.6, 10.0)
Nexgen LPS Flex	Nexgen	1536	31636	441	65	216	814	4.9 (4.7, 5.2)	6.5 (6.1, 6.8)	8.3 (7.4, 9.3)
TOTAL		**7701**	**132952**	**1836**	**305**	**675**	**4885**			

Note: Restricted to modern prostheses. CR 'cruciate retaining' refers to minimally stabilised



Revision Arthroplasty

Revision Arthroplasty

Introduction

This year, the Registry is providing an updated comprehensive analysis of the outcome of revision hip, knee and shoulder replacement surgery. The aim of this chapter is to expand on the previous chapters on revision arthroplasty, from 2015 and 2020, and to add analyses of revision shoulder surgery. For each joint, information is provided on revisions for specific reasons, and the outcomes of major total, partial and minor revisions. The Registry also examines mortality after the 1st revision.

A revision is defined as a re-operation of a previous joint replacement where one or more of the prosthetic components are replaced, removed, or one or more components are added. To fully understand the outcome of an initial revision procedure, it is necessary to know the details of the primary procedure. Without this information, it is not apparent if the revision is the 1st revision or a subsequent revision. The Registry has a linking process, which is run monthly and automatically links a primary procedure to any subsequent revisions on the same side. The key to determining the order of revisions is knowledge of the primary procedure.

TERMINOLOGY

Reporting the outcome of revision procedures has the potential to be confusing. This is in part related to a lack of agreed terminology.

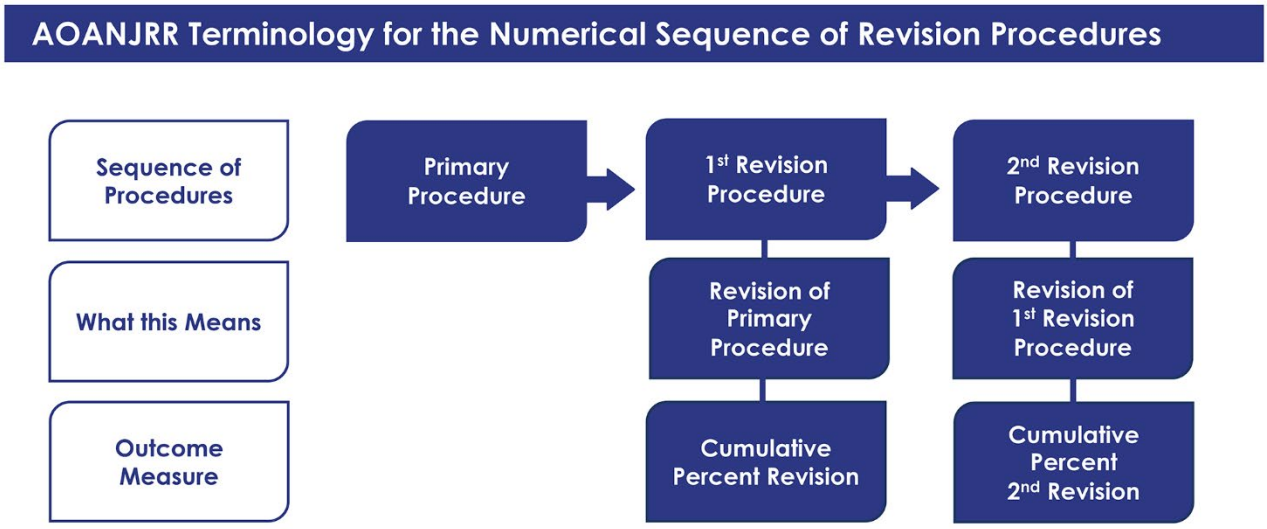
Using definitions from the 2020 Annual Report, the Registry has endeavoured to standardise the sequence of revisions and uses a numerical approach to describe revision procedures.

The 1st revision is the revision of a primary procedure. The 2nd revision is the revision of the 1st revision, and so on. Non-specific terminology such as 're-revision' has been avoided. This numerical sequence becomes increasingly important as registries have longer follow-up of known primary procedures that have multiple revisions.

When reporting the cumulative percent revision, the specific numerical terminology is used to correctly report the revision sequence. We have defined the term cumulative percent 2nd revision as the percent of 1st revision procedures revised up until time allowing for right censoring due to death and 'closure' of the database at the time of the analysis.

APPROACH TO ANALYSIS

The analyses for hip and knee replacement revisions are only performed for procedures with a primary diagnosis of osteoarthritis, whereas all primary diagnoses are included for the analyses for shoulder replacement revisions. Due to the complexities involved in the analysis of revisions for sepsis, 1st revision procedures undertaken for infection have been excluded from all analyses. However, 2nd revisions for infection are reported. The 2023 Annual Report provided a more comprehensive analysis of the outcomes of revision for infection.



Revision Total Conventional Hip Replacement

For the analysis of the 1st revision of primary total conventional hip replacement (THR), primary procedures involving metal/metal bearing surfaces and exchangeable necks have been excluded. Metal/metal bearing surfaces may have major issues associated with revisions, such as extensive soft tissue destruction, which are not seen with conventional bearings, making comparative analysis of the 1st revision more complicated. Metal/metal bearing surfaces also have not been used since 2017. Exchangeable necks are also seldom used in recent years, have an additional revision option (isolated head/neck exchange), and the reasons for revision vary from conventional THR.

There are 24,012 1st revision THR procedures recorded where the primary diagnosis was osteoarthritis. There are 4,998 1st revision procedures for infection that are excluded from this analysis. There are also a further 78 1st revision procedures excluded from the analysis where the diagnosis was not infection. These include 37 prostheses that were removed and not re-inserted, 1 cement only, 32 cement spacers, 7 total femur replacements and one saddle prosthesis. The following analysis is based on 18,936 aseptic 1st revision procedures.

DEMOGRAPHICS OF 1ST REVISION

The mean age at the 1st revision is 71.8 years. There is some variation depending on the reason for revision. For example, patients revised for fracture are on average slightly older (mean 76.5 years).

The median time from the primary procedure to the 1st revision is 3 years, ranging from 1 year for dislocation/instability to 4.2 years for loosening. There are more females (54.8%) undergoing a 1st revision, and this is most pronounced with 1st revision for dislocation/instability (females 62.2%). Most patients have an ASA score of 3 (51.1%) and are pre-obese (36.3%) at the time of 1st revision.

When an acetabular cup or femoral stem is revised at the 1st revision, cementless fixation is more likely to be used. The most common head size used in the 1st revision is >32mm (37.9%), and the most common bearing surface is metal/XLPE (46.6%), followed by ceramic/ XLPE (23.2%). Although primary conventional THR with metal/metal bearing surfaces were excluded from the analysis, it is to be noted that there were 76 procedures where metal/metal bearings were used in the 1st revision.

Table N1 provides demographic details of 1st revision procedures.

Table N1 Summary of 1st Revisions of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revisions for Infection)

Variable	Loosening (n=5,312)	Prosthesis Dislocation/ Instability (n=4,903)	Fracture (n=5,408)	Other (n=3,313)	TOTAL (n=18,936)
Follow-up Years (Primary to 1st Revision)					
Mean ± SD	5.7 ± 5.2	3.1 ± 4.4	5.3 ± 5.6	6.1 ± 5.7	5 ± 5.3
Median (IQR)	4.2 (1.2, 9.1)	1 (0.1, 4.4)	3.6 (0.1, 9.1)	4.3 (1.2, 10)	3 (0.4, 8.3)
Minimum	0	0	0	0	0
Maximum	24.3	24.2	24	23.5	24.3
Age at 1st Revision					
Mean ± SD	70.4 ± 10.7	71.3 ± 10.9	76.5 ± 10.5	67 ± 11.3	71.8 ± 11.3
Median (IQR)	71 (64, 78)	73 (65, 79)	78 (70, 84)	68 (60, 75)	73 (65, 80)
Age at 1st Revision in groups					
<55	433 (8.2%)	368 (7.5%)	172 (3.2%)	438 (13.2%)	1,411 (7.5%)
55-64	1,019 (19.2%)	812 (16.6%)	539 (10%)	816 (24.6%)	3,186 (16.8%)
65-74	1,834 (34.5%)	1,601 (32.7%)	1,349 (24.9%)	1,132 (34.2%)	5,916 (31.2%)
≥75	2,026 (38.1%)	2,122 (43.3%)	3,348 (61.9%)	927 (28%)	8,423 (44.5%)
Gender					
Male	2,630 (49.5%)	1,854 (37.8%)	2,527 (46.7%)	1,542 (46.5%)	8,553 (45.2%)
Female	2,682 (50.5%)	3,049 (62.2%)	2,881 (53.3%)	1,771 (53.5%)	10,383 (54.8%)
ASA at 1st Revision[1]					
ASA 1	213 (5.9%)	128 (3.9%)	90 (2.1%)	188 (7.5%)	619 (4.5%)
ASA 2	1,589 (43.9%)	1,283 (38.8%)	1,045 (24.5%)	1,170 (46.6%)	5,087 (37.1%)
ASA 3	1,675 (46.3%)	1,773 (53.6%)	2,479 (58.1%)	1,082 (43.1%)	7,009 (51.1%)
ASA 4	139 (3.8%)	125 (3.8%)	649 (15.2%)	71 (2.8%)	984 (7.2%)
ASA 5	1 (0%)	1 (0%)	7 (0.2%)		9 (0.1%)
BMI at 1st Revision[2]					
Underweight	18 (0.6%)	29 (1.1%)	52 (1.8%)	18 (0.9%)	117 (1.1%)
Normal	559 (19%)	600 (22.5%)	847 (29.3%)	376 (17.9%)	2,382 (22.5%)
Pre Obese	1,063 (36.2%)	964 (36.1%)	1,030 (35.6%)	788 (37.5%)	3,845 (36.3%)
Obese Class 1	792 (27%)	668 (25%)	571 (19.7%)	549 (26.2%)	2,580 (24.3%)
Obese Class 2	333 (11.3%)	270 (10.1%)	238 (8.2%)	252 (12%)	1,093 (10.3%)
Obese Class 3	170 (5.8%)	137 (5.1%)	156 (5.4%)	116 (5.5%)	579 (5.5%)
Fixation of Primary Procedure					
Cemented	787 (14.8%)	307 (6.3%)	260 (4.8%)	100 (3%)	1,454 (7.7%)
Cementless	3,297 (62.1%)	2,867 (58.5%)	3,611 (66.8%)	2,459 (74.2%)	12,234 (64.6%)
Hybrid	1,228 (23.1%)	1,729 (35.3%)	1,537 (28.4%)	754 (22.8%)	5,248 (27.7%)
Femoral Fixation in 1st Revision					
Femoral Cemented	1,329 (25%)	388 (7.9%)	1,211 (22.4%)	474 (14.3%)	3,402 (18%)
Femoral Cementless	1,966 (37%)	275 (5.6%)	3,469 (64.1%)	637 (19.2%)	6,347 (33.5%)
Femoral Component Not Revised	2,017 (38%)	4,240 (86.5%)	728 (13.5%)	2,202 (66.5%)	9,187 (48.5%)
Acetabular Fixation in 1st Revision					
Acetabular Cemented	476 (9%)	281 (5.7%)	180 (3.3%)	166 (5%)	1,103 (5.8%)
Acetabular Cementless	2,030 (38.2%)	1,682 (34.3%)	438 (8.1%)	1,240 (37.4%)	5,390 (28.5%)
Acetabular Component Not Revised	2,806 (52.8%)	2,940 (60%)	4,790 (88.6%)	1,907 (57.6%)	12,443 (65.7%)
Type of Acetabular Prosthesis in 1st Revision[3]					
Constrained Prosthesis	192 (3.7%)	1,297 (27.1%)	159 (3.2%)	85 (2.6%)	1,733 (9.5%)
Dual Mobility Prosthesis	648 (12.5%)	1,123 (23.4%)	561 (11.3%)	474 (14.6%)	2,806 (15.4%)

Variable	Loosening (n=5,312)	Prosthesis Dislocation/ Instability (n=4,903)	Fracture (n=5,408)	Other (n=3,313)	TOTAL (n=18,936)
Acetabular Insert Internal Diameter >32mm	2,268 (43.8%)	1,213 (25.3%)	1,993 (40%)	1,425 (43.9%)	6,899 (37.9%)
Acetabular Insert Internal Diameter 32mm	1,484 (28.7%)	811 (16.9%)	1,533 (30.8%)	965 (29.7%)	4,793 (26.3%)
Acetabular Insert Internal Diameter <32mm	581 (11.2%)	348 (7.3%)	733 (14.7%)	297 (9.1%)	1,959 (10.8%)
Bearing Surface of Primary[4]					
Ceramic/Ceramic	1,104 (20.8%)	667 (13.6%)	1,272 (23.5%)	1,094 (33.1%)	4,137 (21.9%)
Ceramic/Non XLPE	223 (4.2%)	118 (2.4%)	153 (2.8%)	155 (4.7%)	649 (3.4%)
Ceramic/XLPE	952 (17.9%)	1,137 (23.2%)	1,132 (21%)	594 (18%)	3,815 (20.2%)
Ceramic/Metal	7 (0.1%)	5 (0.1%)	7 (0.1%)	8 (0.2%)	27 (0.1%)
Metal/Non XLPE	1,262 (23.8%)	615 (12.5%)	468 (8.7%)	496 (15%)	2,841 (15%)
Metal/XLPE	1,550 (29.2%)	2,009 (41%)	2,073 (38.4%)	789 (23.8%)	6,421 (33.9%)
Ceramicised Metal/Non XLPE	22 (0.4%)	9 (0.2%)	3 (0.1%)	22 (0.7%)	56 (0.3%)
Ceramicised Metal/XLPE	190 (3.6%)	341 (7%)	294 (5.4%)	151 (4.6%)	976 (5.2%)
Bearing Surface of 1st Revision[5]					
Ceramic/Ceramic	184 (5.2%)	77 (1.8%)	52 (3.2%)	296 (11.8%)	609 (5.1%)
Ceramic/Non XLPE	79 (2.2%)	158 (3.7%)	51 (3.1%)	64 (2.6%)	352 (2.9%)
Ceramic/XLPE	810 (22.9%)	790 (18.5%)	328 (19.9%)	847 (33.8%)	2,775 (23.2%)
Ceramic/Metal	5 (0.1%)	6 (0.1%)		8 (0.3%)	19 (0.2%)
Metal/Metal	24 (0.7%)	28 (0.7%)	9 (0.5%)	15 (0.6%)	76 (0.6%)
Metal/Non XLPE	380 (10.7%)	1,027 (24%)	214 (13%)	130 (5.2%)	1,751 (14.6%)
Metal/XLPE	1,834 (51.9%)	1,864 (43.6%)	920 (55.8%)	964 (38.4%)	5,582 (46.6%)
Ceramicised Metal/Metal	2 (0.1%)				2 (0%)
Ceramicised Metal/Non XLPE	8 (0.2%)	62 (1.5%)	7 (0.4%)	9 (0.4%)	86 (0.7%)
Ceramicised Metal/XLPE	210 (5.9%)	262 (6.1%)	67 (4.1%)	176 (7%)	715 (6%)
Surgical Approach at 1st Revision[6]					
Anterior	291 (9.4%)	288 (9.9%)	179 (4.7%)	292 (13.3%)	1,050 (8.8%)
Lateral	594 (19.2%)	545 (18.8%)	1,019 (27%)	460 (21%)	2,618 (21.9%)
Posterior	2,213 (71.4%)	2,062 (71.2%)	2,573 (68.2%)	1,442 (65.7%)	8,290 (69.3%)

Abbreviations: SD - standard deviation, IQR - interquartile range, ASA - American Society of Anesthesiologists, BMI - Body Mass Index (kg/m2).

1. Excludes 5,228 procedures with unknown ASA at 1st revision.
2. Excludes 8,340 procedures with unknown BMI at 1st revision.
3. Excludes 746 procedures with unknown type of acetabular prosthesis in 1st revision.
4. Excludes 14 procedures with unknown bearing surface of primary.
5. Excludes 6,969 procedures with unknown bearing surface of 1st revision.
6. Excludes 6,978 procedures with unknown surgical approach at 1st revision.

Revision Arthroplasty

OUTCOME OF 1ST REVISION

Of the 18,936 1st revision procedures, 2,803 have had a 2nd revision. The cumulative percent 2nd revision at 20 years is 26.4% (Table N2 and Figure N1).

The most common reasons for 2nd revision are prosthesis dislocation/instability (33.1%), infection (23.3%), loosening (22.5%) and periprosthetic fracture (10.2%) (Table N3 and Figure N2).

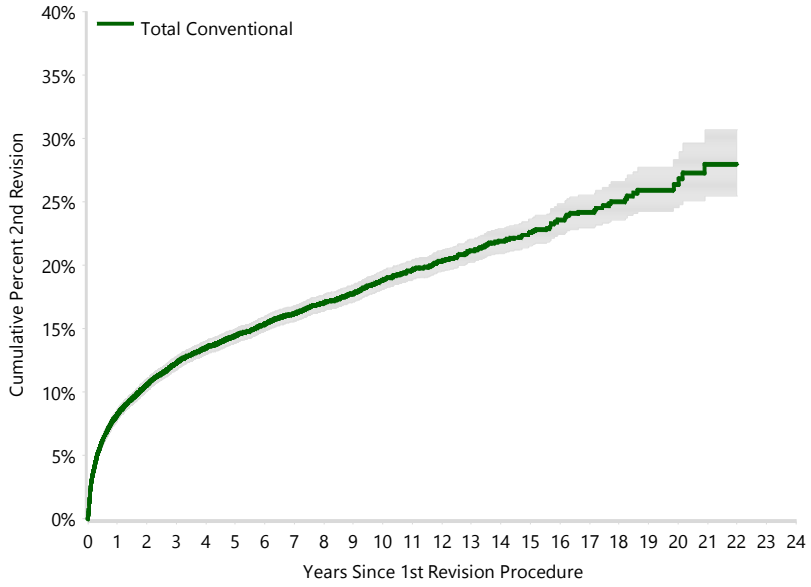
Revision of the head/insert is the most common type of 2nd revision (25.5%), followed by acetabular component (24.0%), femoral component (22.8%), THR (femoral/acetabular) (14.2%), and cement spacer (5.9%). All types of 2nd revisions are listed in Table N4.

Table N2 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Revision of Primary	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	2803	18936	8.3 (7.9, 8.7)	12.3 (11.8, 12.8)	14.4 (13.9, 15.0)	18.8 (18.1, 19.5)	22.6 (21.5, 23.6)	26.4 (24.5, 28.3)
TOTAL	2803	18936						

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N1 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	18936	15452	11802	8930	3396	943	164

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N3 Revision Diagnosis of 2nd Revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	Number	Percent
Prosthesis Dislocation/Instability	929	33.1
Infection	653	23.3
Loosening	631	22.5
Fracture	287	10.2
Pain	50	1.8
Implant Breakage Stem	46	1.6
Metal Related Pathology	29	1.0
Lysis	27	1.0
Implant Breakage Acetabular Insert	25	0.9
Implant Breakage Acetabular	25	0.9
Malposition	25	0.9
Leg Length Discrepancy	20	0.7
Incorrect Sizing	8	0.3
Wear Acetabular Insert	4	0.1
Heterotopic Bone	4	0.1
Tumour	3	0.1
Implant Breakage Head	2	0.1
Synovitis	1	0.0
Wear Acetabulum	1	0.0
Wear Head	1	0.0
Chondrolysis/Acetab. Erosion	1	0.0
Other	31	1.1
TOTAL	2803	100.0

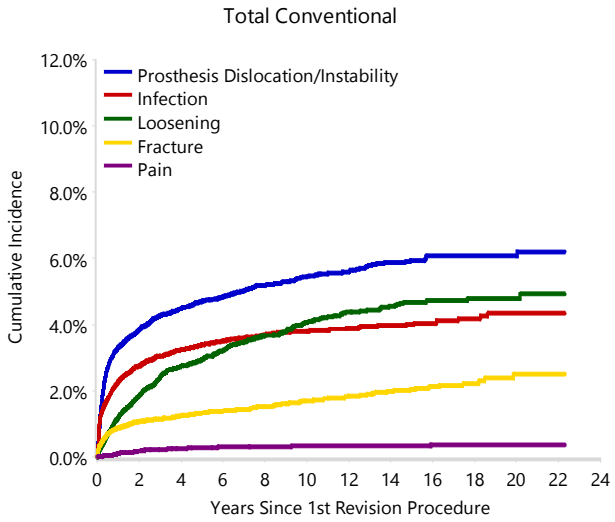
Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N4 Type of Revision of 2nd Revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Type of 2nd Revision	Number	Percent
Head/Insert	716	25.5
Acetabular Component	672	24.0
Femoral Component	638	22.8
THR (Femoral/Acetabular)	399	14.2
Cement Spacer	164	5.9
Head Only	105	3.7
Minor Components	50	1.8
Insert Only	28	1.0
Removal of Prostheses	25	0.9
Bipolar Only	2	0.1
Total Femoral	2	0.1
Reinsertion of Components	1	0.0
Bipolar Head and Femoral	1	0.0
TOTAL	2803	100.0

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N2 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

OUTCOME OF 1ST REVISION BY PATIENT CHARACTERISTICS

The outcome of the 1st revision varies by age and gender, with females aged <65 years having a higher rate of 2nd revision than females aged ≥65 years after 6 months.

Males aged <65 years have a higher rate of 2nd revision than males aged ≥65 years.

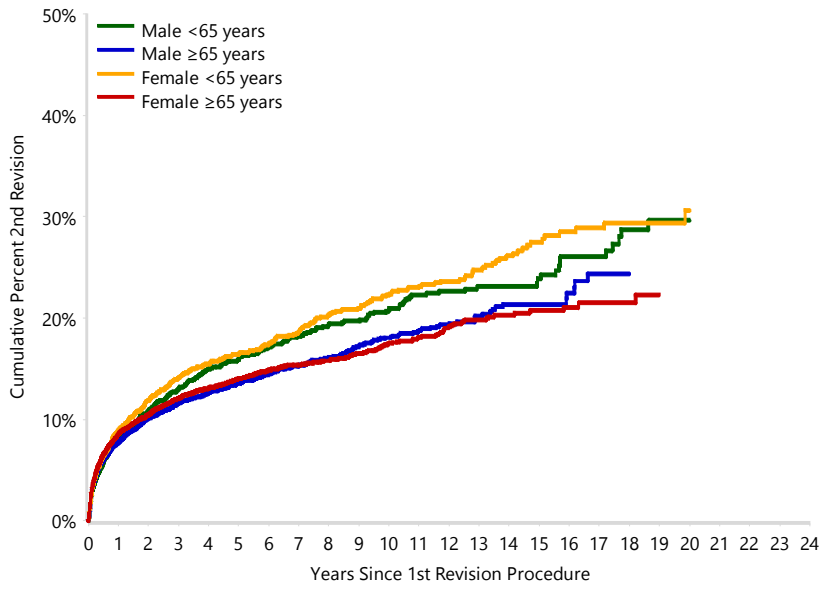
Males aged ≥65 years have a higher rate of revision compared to females of the same age group after 2 years, with no difference prior to this time (Table N5 and Figure N3).

Table N5 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Gender and Age at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Gender	Age at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<65 years	401	2245	8.0 (6.9, 9.2)	13.0 (11.6, 14.5)	15.9 (14.4, 17.6)	20.7 (18.8, 22.8)	23.9 (21.5, 26.5)	29.6 (25.6, 34.1)
	≥65 years	834	6308	7.7 (7.1, 8.4)	11.6 (10.8, 12.5)	13.6 (12.6, 14.5)	18.1 (16.8, 19.4)	21.4 (19.5, 23.4)	
Female	<65 years	457	2352	8.9 (7.8, 10.2)	14.1 (12.7, 15.6)	16.4 (14.9, 18.1)	22.3 (20.3, 24.3)	27.5 (24.9, 30.3)	30.6 (26.9, 34.7)
	≥65 years	1111	8031	8.5 (7.9, 9.2)	12.1 (11.3, 12.8)	14.0 (13.2, 14.9)	17.5 (16.4, 18.6)	20.7 (19.2, 22.4)	
TOTAL		2803	18936						

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N3 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Gender and Age at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Male <65 years vs Male ≥65 years
Entire Period: HR=1.16 (95% CI 1.03, 1.31), p=0.013

Male <65 years vs Female <65 years
Entire Period: HR=0.94 (95% CI 0.82, 1.07), p=0.340

Male ≥65 years vs Female ≥65 years
0 - 2Yr: HR=0.93 (95% CI 0.84, 1.03), p=0.145
2Yr+: HR=1.17 (95% CI 1.01, 1.35), p=0.034

Female <65 years vs Female ≥65 years
0 - 1Mth: HR=1.00 (95% CI 0.81, 1.23), p=0.996
1Mth - 3Mth: HR=1.06 (95% CI 0.86, 1.31), p=0.578
3Mth - 6Mth: HR=1.07 (95% CI 0.84, 1.35), p=0.591
6Mth+: HR=1.41 (95% CI 1.24, 1.60), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<65 years	2245	1925	1548	1242	551	203	55
	≥65 years	6308	4994	3668	2654	906	202	18
Female	<65 years	2352	2009	1629	1322	650	233	52
	≥65 years	8031	6524	4957	3712	1289	305	39

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

ASA SCORE AND BMI CATEGORY

ASA scores are available for 13,708 1st revision procedures. There are 9 patients with an ASA score of 5, and these were excluded from the comparative analysis.

Patients with ASA scores of 2 and 3 have a higher cumulative percent 2nd revision compared to patients with an ASA score of 1. Patients with an ASA score of 4 also have a higher rate of 2nd revision compared to patients with an ASA score of 1, but only for the first 3 months, with no difference after this time (Table N6 and Figure N4).

Considering ASA scores, patients with ASA 1 have the lowest rate of 2nd revision.

Prosthesis dislocation/instability is the most common reason for 2nd revision for patients with an ASA score of 2, 3 and 4 (Figure N5).

BMI is available for 10,596 1st revision procedures. There is no difference in cumulative percent 2nd revision comparing patients who are pre-obese or in obese class 1 to the normal BMI group. Patients in obese classes 2 and 3 have a higher cumulative percent 2nd revision compared to patients with a normal BMI (Table N7 and Figure N6).

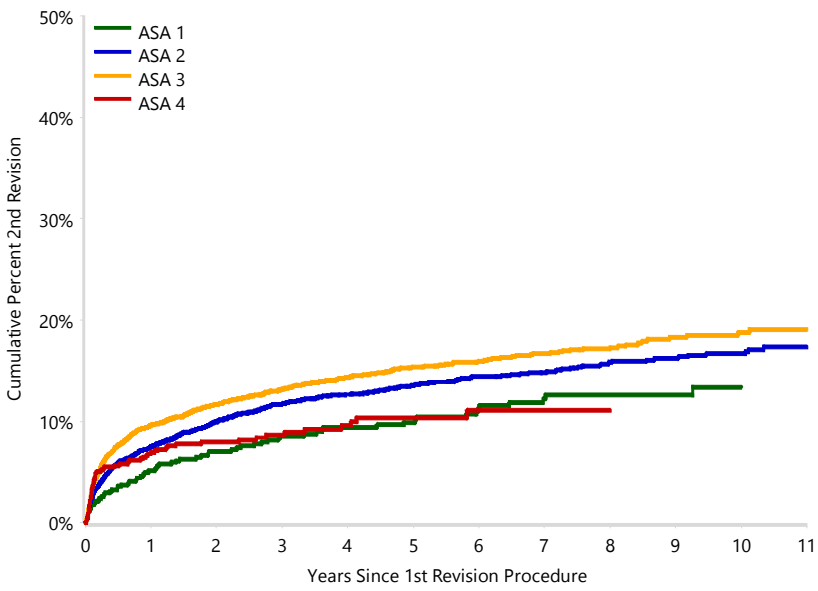
The most common reason for 2nd revision for patients in normal, pre-obese and obese class 1 groups is dislocation/instability, and for patients in obese classes 2 and 3, the most common reason for 2nd revision is infection (Figure N7).

Table N6 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by ASA (Primary Diagnosis OA, Excluding 1st Revision for Infection)

ASA Grade	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	67	619	5.1 (3.6, 7.2)	8.6 (6.6, 11.1)	9.9 (7.7, 12.7)	12.2 (9.6, 15.5)	13.4 (10.4, 17.2)
ASA 2	663	5087	7.5 (6.8, 8.3)	11.7 (10.8, 12.7)	13.6 (12.6, 14.6)	14.8 (13.7, 15.9)	16.6 (15.4, 18.0)
ASA 3	940	7009	9.6 (8.9, 10.4)	13.2 (12.3, 14.0)	15.3 (14.4, 16.3)	16.7 (15.7, 17.8)	18.8 (17.3, 20.3)
ASA 4	76	984	6.9 (5.4, 8.9)	8.6 (6.8, 10.9)	10.3 (8.1, 13.1)	11.1 (8.5, 14.3)	
ASA 5	1	9	11.1 (1.6, 56.7)	11.1 (1.6, 56.7)			
TOTAL	1747	13708					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted. Excludes 5,228 procedures with no ASA recorded.

Figure N4 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by ASA (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

ASA 2 vs ASA 1

Entire Period: HR=1.52 (95% CI 1.18, 1.96), p=0.001

ASA 3 vs ASA 1

Entire Period: HR=1.95 (95% CI 1.51, 2.52), p<0.001

ASA 4 vs ASA 1

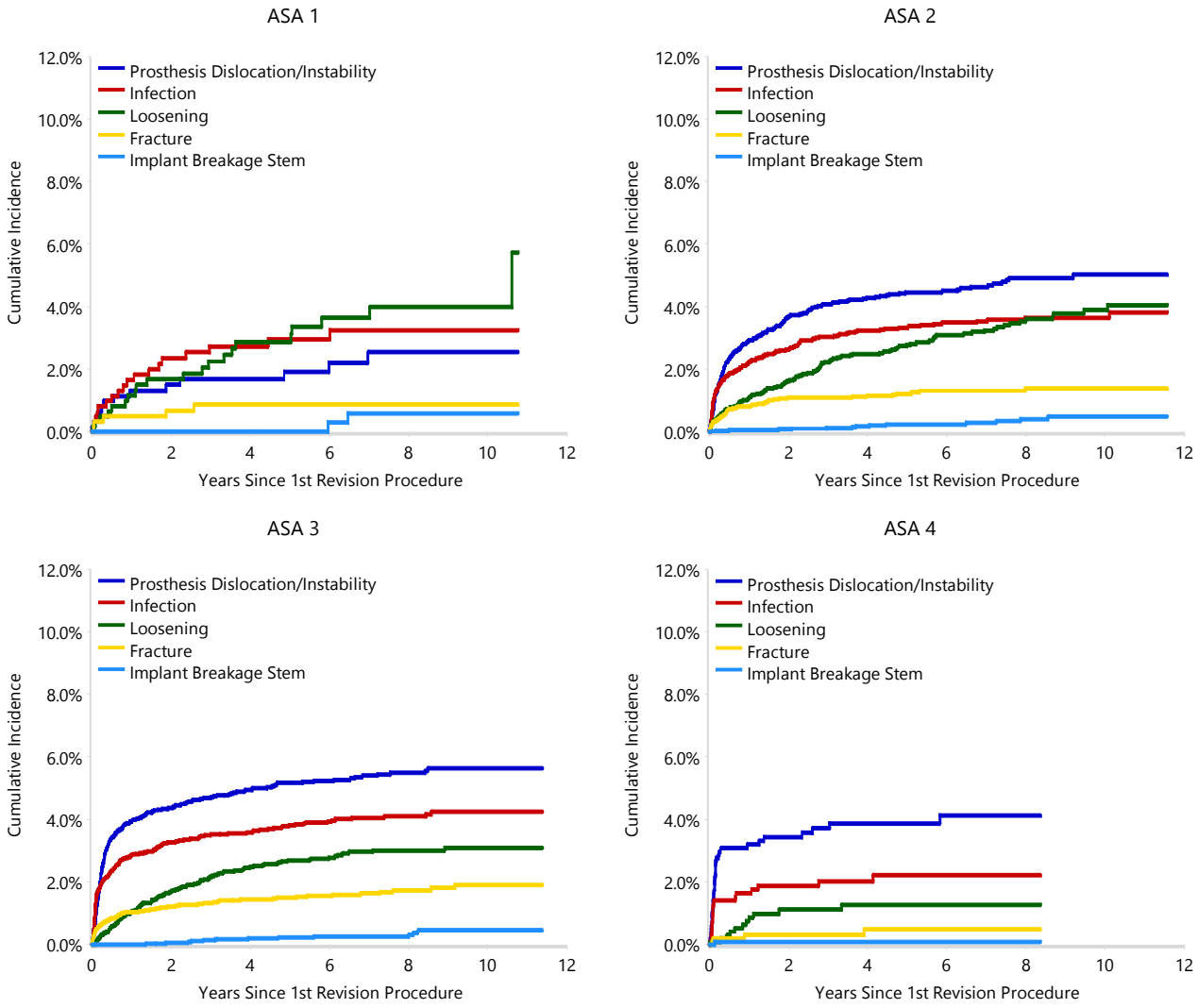
0 - 3Mth: HR=2.18 (95% CI 1.48, 3.22), p<0.001

3Mth+: HR=1.00 (95% CI 0.63, 1.56), p=0.987

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	619	561	461	358	252	69
ASA 2	5087	4262	3271	2410	1476	419
ASA 3	7009	5346	3568	2291	1219	272
ASA 4	984	611	340	172	75	16

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted. Excludes 5,228 procedures with no ASA recorded.

Figure N5 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Conventional Hip Replacement by ASA Grade (Primary Diagnosis OA, Excluding 1st Revision for Infection)



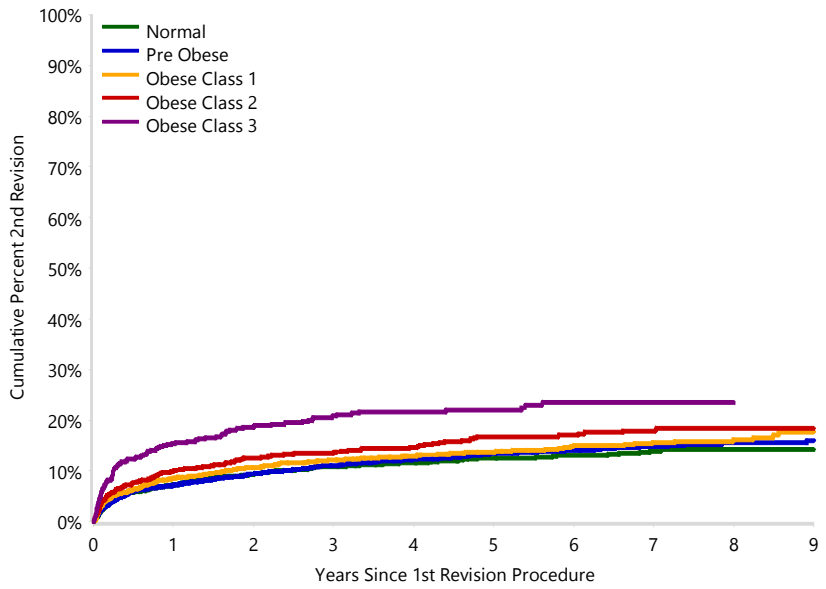
Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.
Excludes 5,228 procedures with no ASA recorded.

Table N7 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by BMI (Primary Diagnosis OA, Excluding 1st Revision for Infection)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Underweight	7	117	6.3 (3.1, 12.8)	6.3 (3.1, 12.8)		
Normal	251	2382	7.3 (6.3, 8.5)	10.8 (9.6, 12.3)	12.5 (11.0, 14.1)	13.9 (12.2, 15.8)
Pre Obese	440	3845	7.2 (6.4, 8.0)	11.1 (10.0, 12.2)	13.4 (12.2, 14.7)	14.8 (13.5, 16.3)
Obese Class 1	324	2580	8.5 (7.5, 9.7)	12.1 (10.8, 13.5)	13.7 (12.3, 15.2)	15.6 (14.0, 17.4)
Obese Class 2	158	1093	10.1 (8.4, 12.1)	13.6 (11.6, 16.0)	16.8 (14.4, 19.5)	17.9 (15.4, 20.9)
Obese Class 3	120	579	15.3 (12.6, 18.6)	20.8 (17.5, 24.6)	22.0 (18.6, 26.0)	23.4 (19.8, 27.7)
TOTAL	1300	10596				

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted
Excludes 8,340 procedures with no BMI recorded.
BMI has not been presented for patients aged ≤19 years.

Figure N6 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by BMI (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Pre Obese vs Normal
Entire Period: HR=1.04 (95% CI 0.89, 1.21), p=0.659

Obese Class 1 vs Normal
Entire Period: HR=1.11 (95% CI 0.94, 1.31), p=0.216

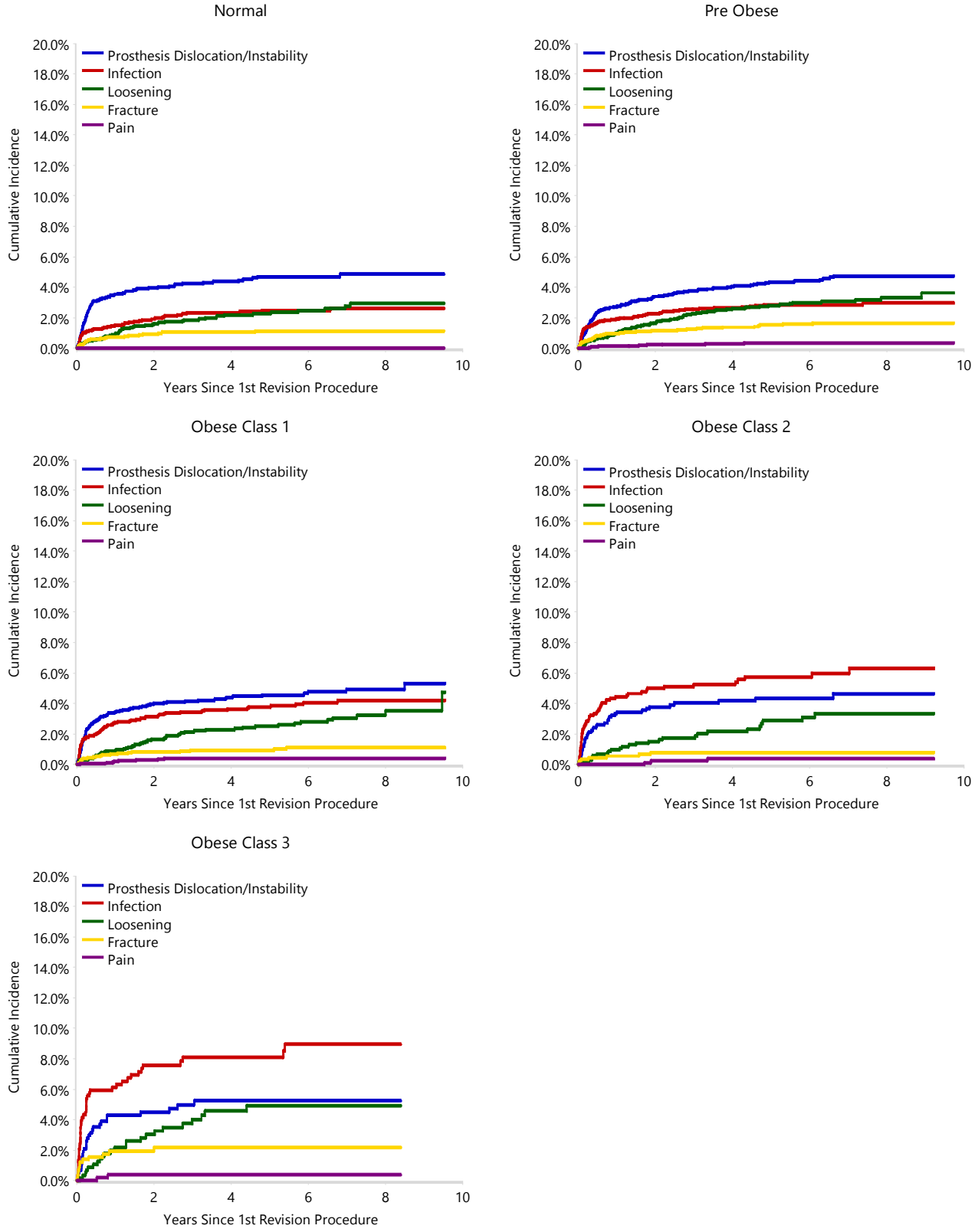
Obese Class 2 vs Normal
Entire Period: HR=1.26 (95% CI 1.03, 1.54), p=0.025

Obese Class 3 vs Normal
Entire Period: HR=1.83 (95% CI 1.46, 2.28), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
Normal	2382	1842	1211	738	347
Pre Obese	3845	3046	2090	1355	672
Obese Class 1	2580	2042	1432	937	438
Obese Class 2	1093	847	608	399	209
Obese Class 3	579	424	290	184	85

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted
Excludes 8,340 procedures with no BMI recorded.
BMI has not been presented for patients aged ≤19 years.

Figure N7 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.
Excludes 8,340 procedures with no BMI recorded.
BMI has not been presented for patients aged ≤19 years.

Revision Arthroplasty

CHANGES IN REVISION HIP REPLACEMENT OVER TIME

Since 2003, the annual number of 1st revision hip replacement procedures has increased more than 5 times. In 2003, there were 246 aseptic 1st revision procedures, while in 2024, there were 1341 recorded (Figure N8).

The yearly proportion of the 3 classes of 1st revision (minor, major partial and major total) is shown in Figure N9. There has been a small decrease in the proportion of minor 1st revisions.

There has been an increase in the proportion of 1st revisions for fracture over time, while there has been a decrease in 1st revisions for dislocation/instability (Figure N10).

The proportion of ceramic/XLPE bearings in the 1st revision procedure has increased, while there are fewer 1st revisions in which metal/non XLPE bearings are used. Changes in other bearing types have been less noticeable (Figure N11).

In 2024, acetabular inserts with an internal diameter >32mm are the most commonly used type of articulation in 1st revision procedures (36.3%). Since its introduction in 2007, the use of dual mobility acetabular components has increased to now be the 2nd most common (35.1%). In 2003, acetabular inserts used with head size <32mm were the most common type of articulation for 1st revision procedures, but their use has declined, and now these are rarely used (3.1%). There has also been a decline in the use of constrained inserts for 1st revision procedures from 18.6% in 2003 to 9.7% in 2024 (Figure N12).

When the femoral component is revised, the fixation used for the 1st revision procedure is shown in Figure N13. In 2024, 65.6% of procedures use cementless femoral fixation.

Figure N8 **1st Revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

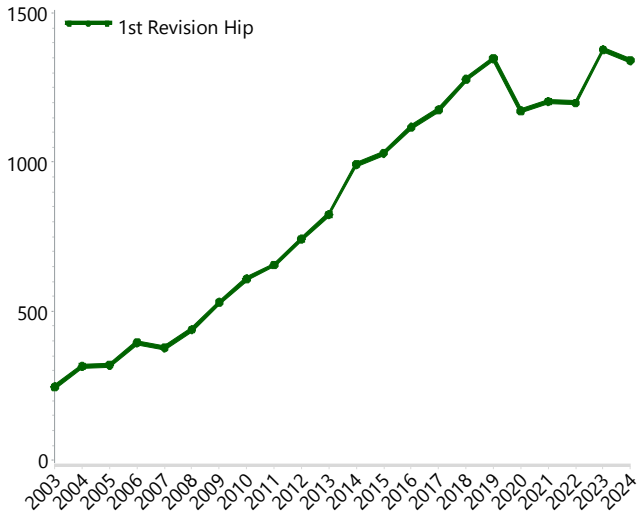


Figure N9 **Trends in 1st Revision Hip Replacement by Class Over Time (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

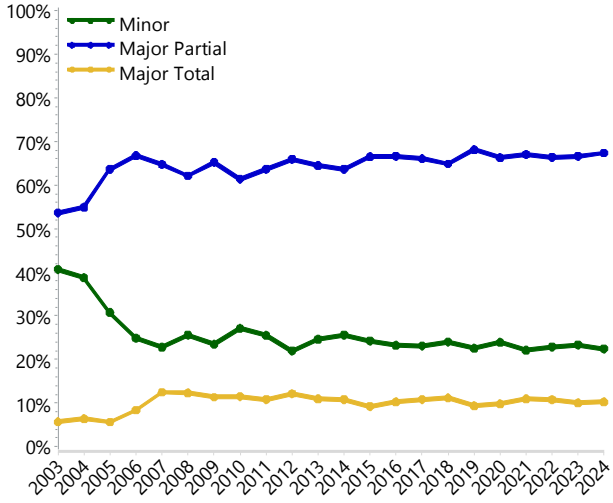


Figure N10 **Trends in 1st Revision Diagnosis of Known Primary Total Conventional Hip Replacement Over Time (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

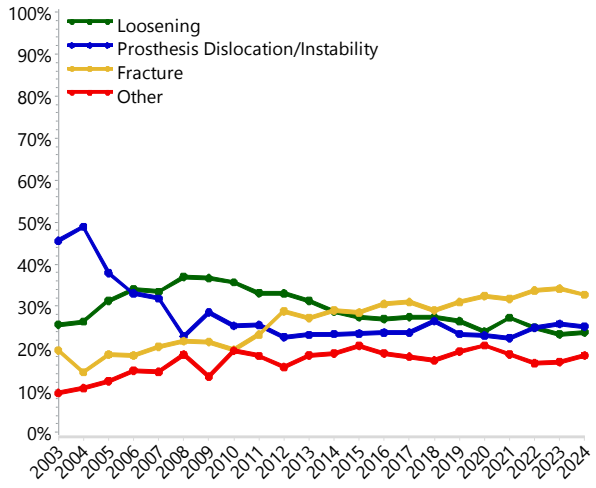


Figure N11 **Trends in Bearing Surface Used in 1st Revision of Known Primary Total Conventional Hip Replacement Over Time (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

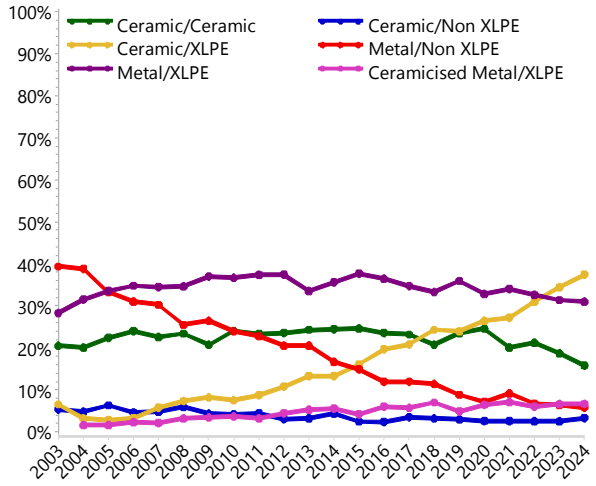


Figure N12 **Trends in Acetabular Components Used in 1st Revision of Known Primary Total Conventional Hip Replacement Over Time (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

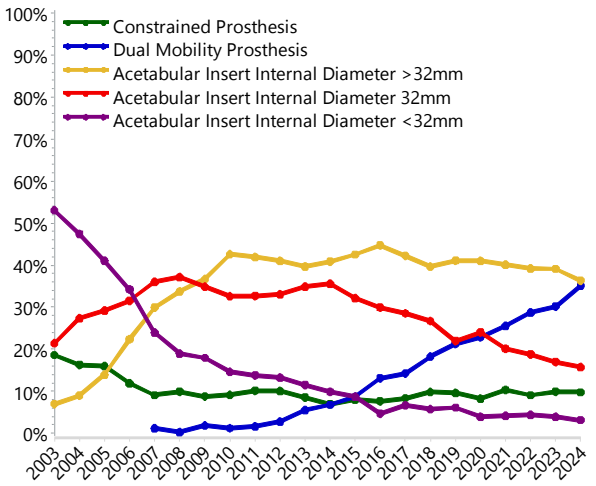
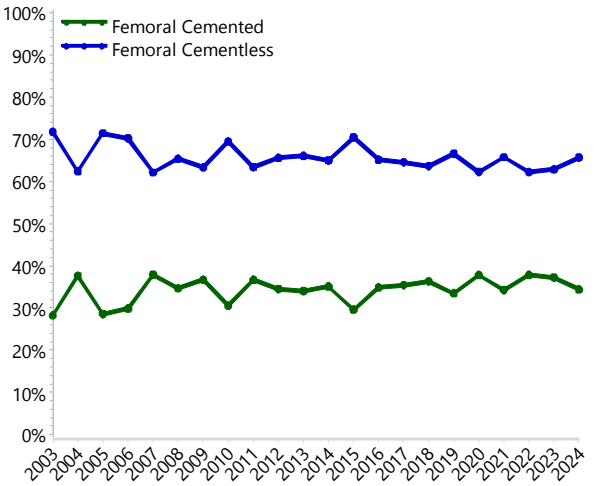


Figure N13 **Trends in Femoral Fixation Used in 1st Revision of Known Primary Total Conventional Hip Replacement Over Time (Primary Diagnosis OA, Excluding 1st Revision for Infection)**



OUTCOMES OF 1ST REVISION BY CLASS OF 1ST REVISION

Major partial revision is the most common class of 1st revision procedure (65.4%), followed by minor revision (24.4%) and major total revision (10.2%). The outcomes of the 1st revision by class of 1st revision are compared.

Minor revisions have a higher rate of 2nd revision compared to major total revisions for the entire period, and when compared to major partial revisions from 1 month onwards.

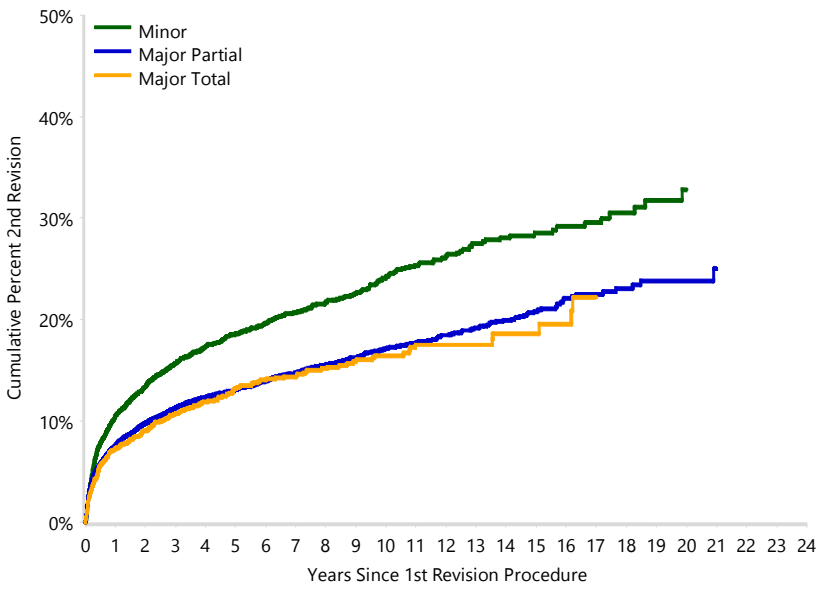
There is no difference in 2nd revision rate between major total and major partial 1st revisions (Table N8 and Figure N14).

Table N8 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Class of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	901	4618	10.5 (9.6, 11.4)	15.7 (14.6, 16.8)	18.6 (17.4, 19.8)	24.0 (22.5, 25.6)	28.5 (26.5, 30.7)	32.8 (29.2, 36.7)
Major Partial	1649	12382	7.6 (7.1, 8.1)	11.3 (10.7, 11.9)	13.0 (12.4, 13.7)	17.1 (16.3, 18.0)	20.8 (19.5, 22.1)	23.8 (21.8, 26.0)
Major Total	253	1936	7.2 (6.1, 8.4)	10.7 (9.3, 12.2)	13.2 (11.6, 15.0)	16.4 (14.5, 18.6)	18.6 (16.0, 21.5)	
TOTAL	2803	18936						

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N14 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Minor vs Major Partial

0 - 1Mth: HR=0.92 (95% CI 0.73, 1.16), p=0.498

1Mth - 3Mth: HR=1.49 (95% CI 1.21, 1.82), p<0.001

3Mth+: HR=1.54 (95% CI 1.40, 1.69), p<0.001

Minor vs Major Total

Entire Period: HR=1.49 (95% CI 1.29, 1.71), p<0.001

Major Partial vs Major Total

Entire Period: HR=1.04 (95% CI 0.91, 1.19), p=0.530

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	4618	3765	2885	2212	889	264	60
Major Partial	12382	10076	7681	5791	2133	592	97
Major Total	1936	1611	1236	927	374	87	7

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

OUTCOMES OF THE 1ST REVISION BY REASON FOR 1ST REVISION

Further analyses on the outcomes of the most common reasons for 1st revision have been performed. These include periprosthetic fracture, loosening, and prosthesis dislocation/instability.

When comparing the outcomes by reason for the 1st revision, prosthesis dislocation/instability has the highest rate of 2nd revision compared to other reasons for 1st revision. When the 1st revision is for loosening, there is a lower rate of 2nd revision for the first 3 months when compared to 1st revision for fracture. After 3 months this reverses, with revision for loosening then having a higher rate of 2nd revision (Table N9 and Figure N15).

When the reason for the 1st revision is loosening, the most common diagnosis for 2nd revision is also loosening (32.9%).

When the reason for the 1st revision is dislocation/instability, the most common diagnosis for 2nd revision is also dislocation/ instability (50.8%). When the reason for the 1st revision is fracture, the most common diagnosis for 2nd revision is infection (28.1%) (Table N10).

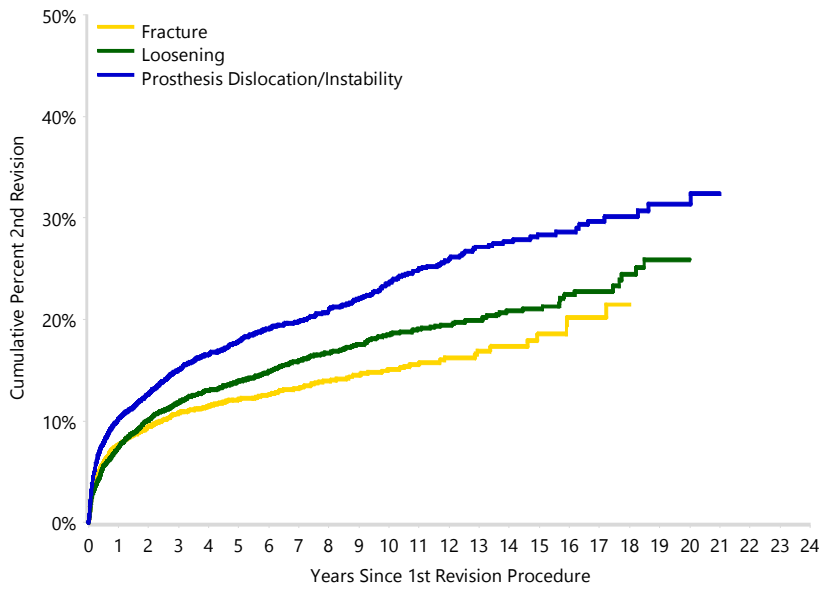
When the diagnosis for the 1st revision is loosening, the most common type of revision procedure is a femoral component only revision (25.8%). When the diagnosis for the 1st revision is dislocation/instability, the most common type of revision procedure is a head/insert revision (35.5%). When the revision diagnosis for the 1st revision is fracture, the most common type of revision procedure is a femoral component only revision (35.5%) (Table N11).

Table N9 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Reason for 1st Revision (Primary Diagnosis OA)

Reason for 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fracture	598	5408	7.7 (7.0, 8.5)	10.8 (10.0, 11.8)	12.1 (11.2, 13.2)	15.1 (13.8, 16.5)	18.5 (16.1, 21.3)	
Loosening	800	5312	7.4 (6.7, 8.1)	11.8 (10.9, 12.7)	13.9 (13.0, 15.0)	18.5 (17.2, 19.8)	21.0 (19.4, 22.7)	25.9 (22.7, 29.5)
Prosthesis Dislocation/ Instability	923	4903	10.2 (9.4, 11.1)	15.0 (14.0, 16.1)	17.9 (16.7, 19.1)	23.5 (22.0, 25.1)	28.3 (26.3, 30.5)	31.4 (28.4, 34.5)
TOTAL	2321	15623						

Note: Excluding revisions where no minor or major femoral/acetabular components have been inserted.

Figure N15 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Reason for 1st Revision (Primary Diagnosis OA)



HR - adjusted for age and gender

Loosening vs Fracture

0 - 3Mth: HR=0.80 (95% CI 0.66, 0.97), p=0.024

3Mth+: HR=1.21 (95% CI 1.06, 1.38), p=0.003

Prosthesis Dislocation/Instability vs Fracture

0 - 3Mth: HR=1.29 (95% CI 1.08, 1.54), p=0.004

3Mth - 3Yr: HR=1.37 (95% CI 1.19, 1.59), p<0.001

3Yr+: HR=1.76 (95% CI 1.46, 2.13), p<0.001

Prosthesis Dislocation/Instability vs Loosening

Entire Period: HR=1.33 (95% CI 1.21, 1.47), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fracture	5408	4117	2883	2030	597	125	26
Loosening	5312	4536	3609	2825	1169	342	43
Prosthesis Dislocation/ Instability	4903	3987	3049	2320	908	288	67

Note: Excluding revisions where no minor or major femoral/acetabular components have been inserted.

Table N10 Revision Diagnosis of 2nd Revision of Known Primary Total Conventional Hip Replacement by Reason for 1st Revision (Primary Diagnosis OA)

2nd Revision Diagnosis	Loosening		Prosthesis Dislocation/Instability		Fracture		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Prosthesis Dislocation/Instability	184	23.0	469	50.8	137	22.9	790	34.0
Infection	202	25.3	181	19.6	168	28.1	551	23.7
Loosening	263	32.9	121	13.1	148	24.7	532	22.9
Fracture	70	8.8	67	7.3	102	17.1	239	10.3
Implant Breakage Stem	17	2.1	7	0.8	10	1.7	34	1.5
Pain	14	1.8	9	1.0	10	1.7	33	1.4
Implant Breakage Acetabular	5	0.6	14	1.5	2	0.3	21	0.9
Implant Breakage Acetabular Insert	3	0.4	16	1.7	1	0.2	20	0.9
Lysis	8	1.0	7	0.8	4	0.7	19	0.8
Metal Related Pathology	5	0.6	9	1.0	3	0.5	17	0.7
Malposition	6	0.8	7	0.8	1	0.2	14	0.6
Leg Length Discrepancy	7	0.9	.	.	7	1.2	14	0.6
Incorrect Sizing	2	0.3	2	0.2	2	0.3	6	0.3
Wear Acetabular Insert	1	0.1	2	0.2	.	.	3	0.1
Heterotopic Bone	1	0.1	1	0.1	.	.	2	0.1
Synovitis	1	0.1	.	.	.	.	1	0.0
Implant Breakage Head	1	0.1	.	.	.	.	1	0.0
Wear Acetabulum	.	.	1	0.1	.	.	1	0.0
Chondrolysis/Acetab. Erosion	.	.	1	0.1	.	.	1	0.0
Other	10	1.3	9	1.0	3	0.5	22	0.9
TOTAL	**800**	**100.0**	**923**	**100.0**	**598**	**100.0**	**2321**	**100.0**

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N11 Type of 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA)

Type of 2nd Revision	Loosening		Prosthesis Dislocation/Instability		Fracture		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Head/Insert	170	21.3	328	35.5	112	18.7	610	26.3
Femoral Component	206	25.8	116	12.6	212	35.5	534	23.0
Acetabular Component	159	19.9	269	29.1	105	17.6	533	23.0
THR (Femoral/Acetabular)	132	16.5	112	12.1	84	14.0	328	14.1
Cement Spacer	67	8.4	39	4.2	31	5.2	137	5.9
Head Only	30	3.8	22	2.4	31	5.2	83	3.6
Minor Components	20	2.5	9	1.0	13	2.2	42	1.8
Insert Only	5	0.6	15	1.6	6	1.0	26	1.1
Removal of Prostheses	9	1.1	10	1.1	4	0.7	23	1.0
Bipolar Only	.	.	2	0.2	.	.	2	0.1
Reinsertion of Components	.	.	1	0.1	.	.	1	0.0
Bipolar Head and Femoral	1	0.1	.	.	.	.	1	0.0
Total Femoral	1	0.1	.	.	.	.	1	0.0
TOTAL	**800**	**100.0**	**923**	**100.0**	**598**	**100.0**	**2321**	**100.0**

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

LOOSENING

There are 5,312 1st revision procedures for loosening, and 800 of these have had a 2nd revision. The median time from primary procedure to 1st revision for loosening is 4.2 years, the mean patient age is 70.4 years, with a slight female predominance (50.5%).

Of the 1st revisions performed for loosening, the majority of the primary procedures are cementless (n=3,297, 62.1%), followed by hybrid (n=1,228, 23.1%) and cemented (n=787, 14.8%). The most common primary bearing surface of those revised for loosening is metal/XLPE (29.2%), metal/non XLPE (23.8%), ceramic/ceramic (20.8%), and ceramic/XLPE (17.9%) (Table N1).

The cumulative percent 2nd revision at 15 years is 21% (Table N9 and Figure N15). The most common reasons for 2nd revision are further loosening (32.9%), followed by infection (25.3%), prosthesis dislocation/instability (23.0%), and fracture (8.8%) (Table N10).

After a 1st revision for loosening, the more common 2nd revision procedures are femoral component only revisions (25.8%), minor revisions that involve both head/insert exchange (21.3%), and acetabular only revisions (19.9%) (Table N11).

It is unclear why a minor revision is performed for loosening, but it could reflect surgeons revising with a longer femoral neck for leg shortening as a result of stem subsidence.

When the 1st revision is for loosening, a minor revision has the highest cumulative percent revision 2nd revision. Conversely, when the 1st revision is for loosening a THR (femoral/acetabular) revision has a lower rate of 2nd revision compared to other 1st revision procedures (Table N12 and Figure N17).

When the femoral component is revised for loosening, revision procedures using cementless femoral fixation have a lower rate of all-cause 2nd revision (after 6 months) compared to revision procedures using cemented femoral fixation (Table N13 and Figure N18).

When the femoral component is revised for loosening, there is also a lower rate of 2nd revision for recurrent loosening using cementless femoral fixation compared to when cemented femoral fixation is used (Table N14 and Figure N19).

When a femoral component is revised for loosening, cementless femoral fixation has a lower 2nd revision rate than cement fixation.

When the bearing surfaces used for the 1st revision for loosening are compared, there is no difference in rate of 2nd revision between procedures using metal/XLPE and ceramic/XLPE, but there is a higher rate of 2nd revision when metal/non XLPE is compared to both alternatives with XLPE after 3 months (Table N15 and Figure N20).

Figure N16 Trends in Femoral Fixation in 1st Revision Total Hip Replacement Over Time (Primary Diagnosis OA, 1st Revision for Loosening)

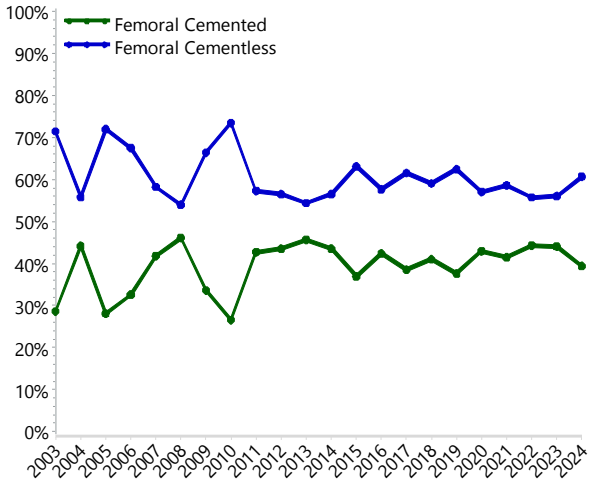
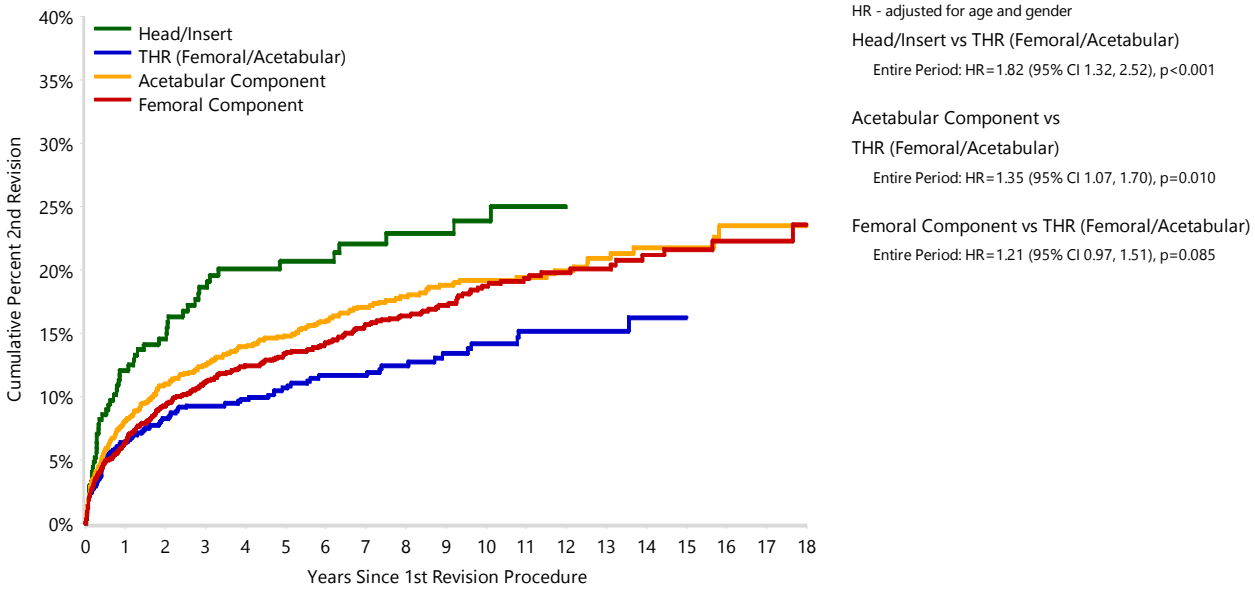


Table N12 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Head/Insert	57	273	12.1 (8.7, 16.7)	18.6 (14.3, 24.0)	20.7 (16.1, 26.3)	23.9 (18.6, 30.3)	
THR (Femoral/Acetabular)	104	895	6.4 (4.9, 8.2)	9.3 (7.5, 11.5)	10.7 (8.7, 13.1)	14.2 (11.6, 17.3)	16.2 (12.9, 20.4)
Acetabular Component	265	1611	8.1 (6.8, 9.5)	12.5 (10.9, 14.3)	14.8 (13.1, 16.8)	19.2 (17.0, 21.5)	21.8 (19.1, 24.8)
Femoral Component	345	2400	6.4 (5.5, 7.5)	11.1 (9.9, 12.5)	13.4 (12.0, 15.0)	18.8 (16.8, 20.9)	21.6 (19.1, 24.5)
TOTAL	771	5179					

Note: Excludes 133 1st revisions for loosening with other minor types of revisions.

Figure N17 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Head/Insert	273	220	174	129	70	18
THR (Femoral/Acetabular)	895	755	604	483	208	48
Acetabular Component	1611	1395	1137	903	398	117
Femoral Component	2400	2060	1606	1241	464	149

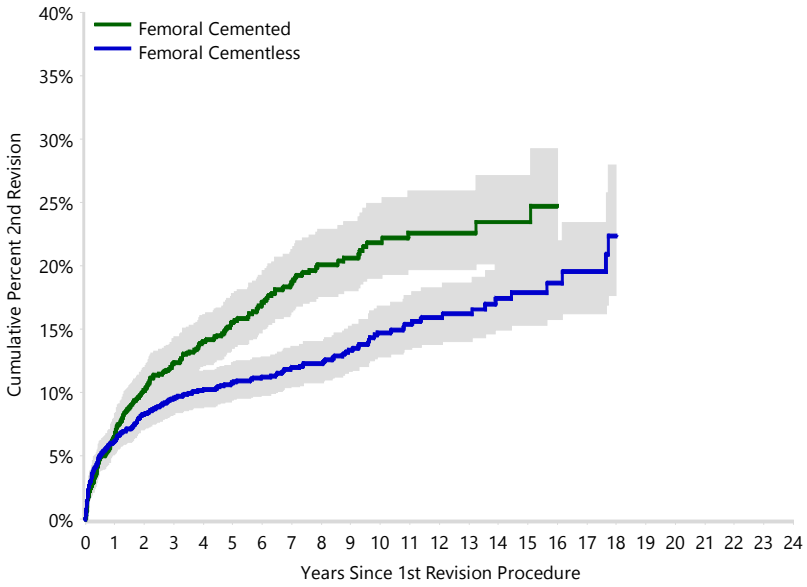
Note: Excludes 133 1st revisions for loosening with other minor types of revisions.

Table N13 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Femoral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Femoral Cemented	213	1329	6.8 (5.5, 8.3)	12.3 (10.5, 14.3)	15.5 (13.5, 17.8)	21.8 (19.1, 24.9)	23.5 (20.2, 27.2)
Femoral Cementless	236	1966	6.2 (5.2, 7.3)	9.5 (8.3, 11.0)	10.8 (9.4, 12.3)	14.7 (12.9, 16.9)	17.9 (15.3, 20.9)
TOTAL	449	3295					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N18 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender

Femoral Cemented vs Femoral Cementless

0 - 3Mth: HR=0.82 (95% CI 0.55, 1.21), p=0.309

3Mth - 6Mth: HR=1.55 (95% CI 0.90, 2.67), p=0.113

6Mth+: HR=1.86 (95% CI 1.47, 2.35), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Femoral Cemented	1329	1131	854	635	230	61
Femoral Cementless	1966	1684	1356	1089	442	136

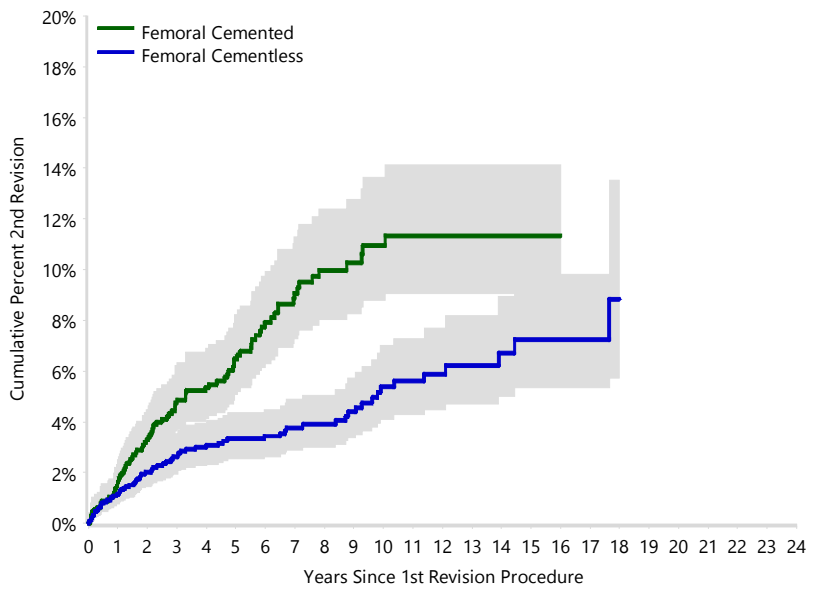
Note: Excluding 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N14 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening, 2nd Revision for Loosening)

Femoral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Femoral Cemented	88	1329	1.6 (1.1, 2.5)	4.8 (3.6, 6.2)	6.5 (5.1, 8.2)	11.0 (8.8, 13.6)	11.3 (9.1, 14.1)
Femoral Cementless	72	1966	1.1 (0.7, 1.8)	2.6 (2.0, 3.5)	3.3 (2.5, 4.4)	5.4 (4.1, 7.0)	7.2 (5.3, 9.8)
TOTAL	160	3295					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.
Excludes 1st revision with no femoral component inserted.

Figure N19 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening, 2nd Revision for Loosening)



HR - adjusted for age and gender
Femoral Cemented vs Femoral Cementless
Entire Period: HR=2.11 (95% CI 1.54, 2.89), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Femoral Cemented	1329	1131	854	635	230	61
Femoral Cementless	1966	1684	1356	1089	442	136

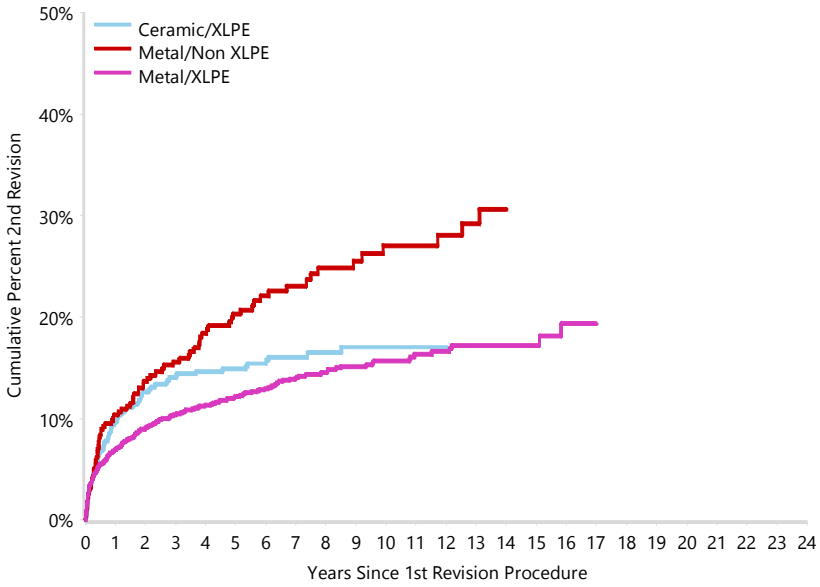
Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.
Excludes 1st revision with no femoral component inserted.

Table N15 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Bearing Surface of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Bearing Surface of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Ceramic/XLPE	115	810	9.7 (7.8, 12.0)	14.1 (11.7, 16.8)	14.9 (12.4, 17.7)	17.0 (14.1, 20.4)	
Metal/Non XLPE	85	380	10.3 (7.6, 13.9)	15.5 (12.2, 19.8)	20.3 (16.3, 25.1)	27.0 (22.0, 33.0)	
Metal/XLPE	242	1834	6.9 (5.8, 8.2)	10.3 (9.0, 11.9)	12.1 (10.6, 13.8)	15.6 (13.8, 17.7)	17.2 (15.0, 19.6)
TOTAL	442	3024					

Note: XLPE includes XLPE and XLPE+antioxidant.

Figure N20 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Bearing Surface of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender

Ceramic/XLPE vs Metal/XLPE

Entire Period: HR=1.12 (95% CI 0.89, 1.41), p=0.328

Metal/Non XLPE vs Ceramic/XLPE

0 - 3Mth: HR=0.99 (95% CI 0.57, 1.71), p=0.957

3Mth - 6Mth: HR=2.35 (95% CI 1.28, 4.31), p=0.006

6Mth+: HR=1.72 (95% CI 1.21, 2.43), p=0.002

Metal/Non XLPE vs Metal/XLPE

0 - 3Mth: HR=1.10 (95% CI 0.65, 1.88), p=0.714

3Mth - 6Mth: HR=2.63 (95% CI 1.46, 4.75), p=0.001

6Mth+: HR=1.93 (95% CI 1.41, 2.62), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Ceramic/XLPE	810	653	473	348	94	17
Metal/Non XLPE	380	308	255	197	90	38
Metal/XLPE	1834	1590	1291	1029	452	96

Note: XLPE includes XLPE and XLPE+antioxidant.

DISLOCATION/INSTABILITY

There are 4,903 1st revision procedures for dislocation/instability, and 923 of these have had a 2nd revision. The median time from primary procedure to revision for dislocation is 1 year, and the mean age of patients is 71.3 years, with more females undergoing revision (62.2%) (Table N1).

The cumulative percent 2nd revision at 15 years is 28.3% (Table N9 and Figure N15). The most common reason for 2nd revision is for further dislocation/instability (50.8%) followed by infection (19.6%), loosening (13.1%), and fracture (7.3%) (Table N10).

The most common 1st revision procedure for dislocation/instability is a minor revision that involves both head and insert exchange (35.5%), followed by acetabular component only revision (29.1%), femoral component only revision (12.6%) and THR (femoral/acetabular) revision (12.1%) (Table N11).

The outcomes of 1st revision procedures performed for dislocation/instability are compared. Revision of the acetabular component only has a lower rate of 2nd revision compared to THR and femoral only revision for the entire period, and when compared to a minor revision involving head/insert exchange after 1 month (Table N16 and Figure N22).

The use of insert types in the 1st revision procedures for dislocation/instability over time is shown in Figure N21.

There has been a decline in the use of head sizes <32mm and 32mm with time and an increase in the use of dual mobility bearings.

Femoral head size and use of constrained or dual mobility prostheses for the 1st revision procedures for dislocation/instability are also assessed. Acetabular inserts used with femoral heads <32mm are used in 348 (7.3%) procedures, head size 32mm in 811 procedures (16.9%), and head size >32mm in 1,213 procedures (25.3%), while constrained liners are used in 1,297 procedures (27.1%), and dual mobility constructs in 1,123 procedures (23.4%).

Dual mobility prostheses have a lower all-cause 2nd revision rate compared to acetabular inserts used with head sizes <32mm, 32mm and >32mm, and constrained prostheses after 3 months.

There is no difference in the rate of overall 2nd revision between head sizes. Dual mobility prostheses have a lower rate of all-cause 2nd revision compared to acetabular inserts used with head sizes <32mm, 32mm and >32mm, and when compared to constrained prostheses after 3 months (Table N17 and Figure N23).

The effectiveness of these acetabular insert types for preventing a 2nd revision for dislocation/instability is also assessed. Dual mobility prostheses have a lower rate of 2nd revision for dislocation/instability compared to all femoral head size groups (<32mm, 32mm and >32mm) and also when compared to constrained prostheses after 6 months (Table N18 and Figure N24).

Figure N21 Trends in Acetabular Prosthesis Use in 1st Revision Total Hip Replacement Over Time (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)

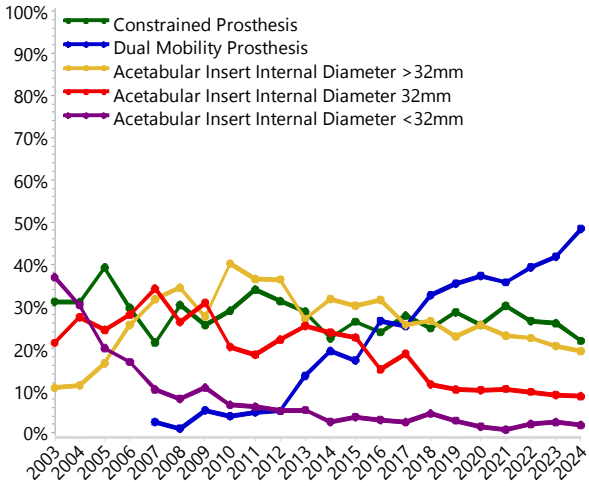
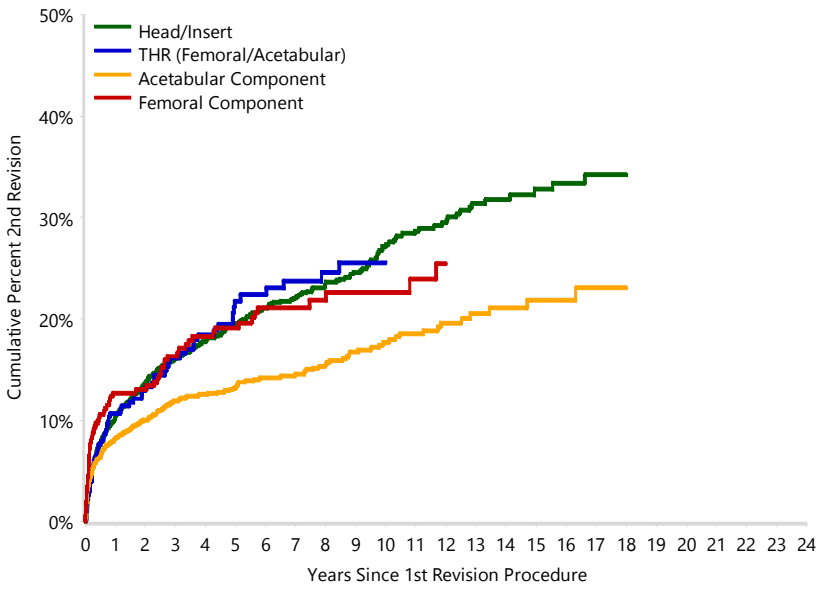


Table N16 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Head/Insert	451	2180	10.4 (9.1, 11.7)	16.1 (14.5, 17.8)	19.5 (17.8, 21.4)	27.1 (24.7, 29.8)	32.7 (29.4, 36.4)
THR (Femoral/Acetabular)	64	307	10.6 (7.6, 14.7)	16.1 (12.3, 21.0)	21.7 (17.1, 27.4)	25.5 (20.2, 32.0)	
Acetabular Component	234	1656	8.2 (6.9, 9.6)	11.9 (10.3, 13.6)	13.2 (11.5, 15.0)	17.6 (15.4, 20.2)	21.8 (18.5, 25.6)
Femoral Component	70	356	12.6 (9.6, 16.6)	16.3 (12.7, 20.7)	19.1 (15.1, 23.9)	22.6 (18.0, 28.1)	
TOTAL	819	4499					

Note: Excludes 404 1st revision for prosthesis dislocation/Instability procedures with other minor type of revisions.

Figure N22 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)



HR - adjusted for age and gender

Head/Insert vs Acetabular Component

0 - 1Mth: HR=0.79 (95% CI 0.54, 1.14), p=0.208

1Mth - 3Mth: HR=1.45 (95% CI 1.02, 2.07), p=0.038

3Mth+: HR=1.82 (95% CI 1.51, 2.19), p<0.001

THR (Femoral/Acetabular) vs Acetabular Component

Entire Period: HR=1.50 (95% CI 1.13, 1.97), p=0.004

Femoral Component vs Acetabular Component

Entire Period: HR=1.40 (95% CI 1.07, 1.83), p=0.013

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Head/Insert	2180	1765	1305	980	372	122
THR (Femoral/Acetabular)	307	255	195	133	51	17
Acetabular Component	1656	1368	1073	831	313	91
Femoral Component	356	280	220	171	70	21

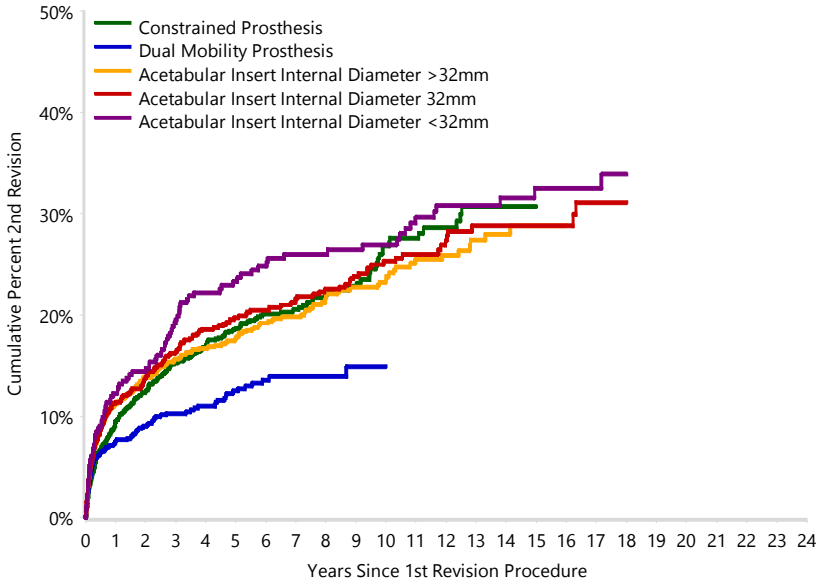
Note: Excludes 404 1st revision for prosthesis dislocation/Instability procedures with other minor type of revisions.

Table N17 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Prosthesis Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)

Prosthesis Used in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Constrained Prosthesis	247	1297	9.5 (8.0, 11.2)	15.3 (13.3, 17.5)	18.7 (16.5, 21.2)	26.8 (23.4, 30.5)	30.7 (26.5, 35.4)
Dual Mobility Prosthesis	120	1123	7.5 (6.1, 9.2)	10.3 (8.5, 12.4)	12.5 (10.4, 14.9)	14.9 (12.0, 18.4)	
Acetabular Insert Internal Diameter >32mm	243	1213	11.2 (9.5, 13.1)	15.6 (13.7, 17.9)	17.7 (15.6, 20.1)	23.2 (20.5, 26.2)	28.8 (25.0, 33.1)
Acetabular Insert Internal Diameter 32mm	184	811	11.4 (9.4, 13.8)	16.4 (13.9, 19.2)	19.7 (17.0, 22.8)	25.3 (22.0, 28.9)	28.8 (24.9, 33.1)
Acetabular Insert Internal Diameter <32mm	97	348	12.3 (9.2, 16.2)	19.5 (15.7, 24.2)	23.3 (19.0, 28.3)	26.9 (22.3, 32.3)	32.5 (27.0, 38.7)
TOTAL	891	4792					

Note: Excluding 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N23 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Prosthesis Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)



HR - adjusted for age and gender

Constrained Prosthesis vs Dual Mobility Prosthesis

0 - 3Mth: HR=1.10 (95% CI 0.79, 1.53), p=0.572

3Mth+: HR=1.94 (95% CI 1.53, 2.46), p<0.001

Acetabular Insert Internal Diameter >32mm vs Dual Mobility Prosthesis

Entire Period: HR=1.48 (95% CI 1.19, 1.85), p<0.001

Acetabular Insert Internal Diameter 32mm vs Dual Mobility Prosthesis

Entire Period: HR=1.57 (95% CI 1.24, 1.98), p<0.001

Acetabular Insert Internal Diameter <32mm vs Dual Mobility Prosthesis

Entire Period: HR=1.83 (95% CI 1.40, 2.40), p<0.001

Acetabular Insert Internal Diameter >32mm vs Acetabular Insert Internal Diameter 32mm

Entire Period: HR=0.94 (95% CI 0.78, 1.14), p=0.546

Acetabular Insert Internal Diameter <32mm vs Acetabular Insert Internal Diameter 32mm

Entire Period: HR=1.17 (95% CI 0.91, 1.49), p=0.217

Acetabular Insert Internal Diameter <32mm vs Acetabular Insert Internal Diameter >32mm

Entire Period: HR=1.24 (95% CI 0.98, 1.57), p=0.079

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Constrained Prosthesis	1297	1053	780	574	186	47
Dual Mobility Prosthesis	1123	868	570	362	41	2
Acetabular Insert Internal Diameter >32mm	1213	1010	806	642	265	63
Acetabular Insert Internal Diameter 32mm	811	684	577	476	241	89
Acetabular Insert Internal Diameter <32mm	348	290	245	208	141	72

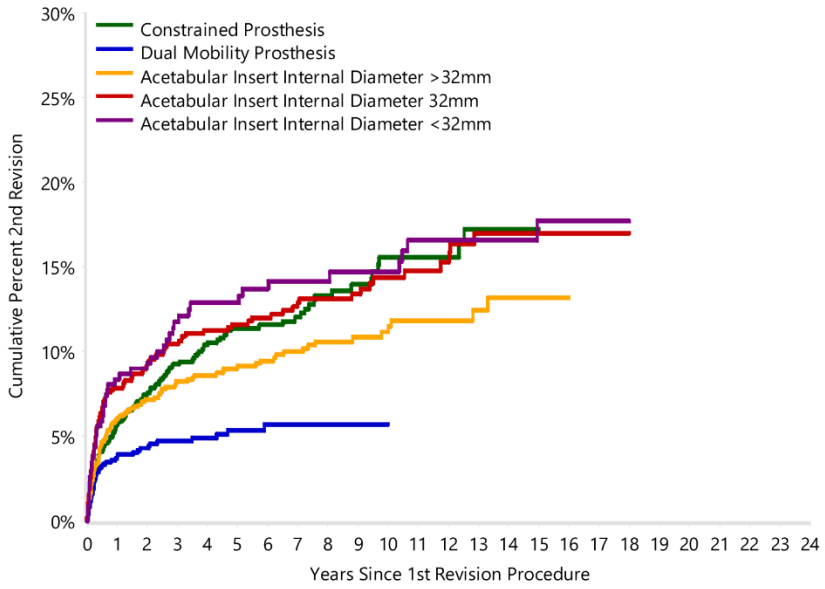
Note: Excluding 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N18 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Prosthesis Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability, 2nd Revision for Prosthesis Dislocation/Instability)

Prosthesis Used in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Constrained Prosthesis	137	1297	5.7 (4.6, 7.2)	9.3 (7.7, 11.1)	11.4 (9.6, 13.5)	15.6 (12.9, 18.7)	17.2 (13.9, 21.2)
Dual Mobility Prosthesis	51	1123	3.8 (2.8, 5.2)	4.7 (3.6, 6.3)	5.4 (4.0, 7.1)	5.7 (4.3, 7.6)	
Acetabular Insert Internal Diameter >32mm	112	1213	6.0 (4.8, 7.5)	8.3 (6.8, 10.1)	9.2 (7.6, 11.1)	11.2 (9.2, 13.5)	13.2 (10.5, 16.4)
Acetabular Insert Internal Diameter 32mm	104	811	7.9 (6.2, 10.0)	10.5 (8.5, 12.9)	11.6 (9.5, 14.2)	14.4 (11.8, 17.4)	17.0 (13.8, 20.9)
Acetabular Insert Internal Diameter <32mm	49	348	8.4 (5.9, 11.9)	11.8 (8.7, 15.8)	12.9 (9.6, 17.1)	14.7 (11.1, 19.3)	17.7 (13.4, 23.3)
TOTAL	453	4792					

Note: Excluding 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N24 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Prosthesis Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability, 2nd Revision for Prosthesis Dislocation/Instability)



HR - adjusted for age and gender

Constrained Prosthesis vs Dual Mobility Prosthesis
0 - 6Mth: HR=1.49 (95% CI 1.00, 2.22), p=0.052
6Mth+: HR=2.93 (95% CI 2.02, 4.25), p<0.001

Acetabular Insert Internal Diameter >32mm vs Dual Mobility Prosthesis
Entire Period: HR=1.76 (95% CI 1.26, 2.46), p<0.001

Acetabular Insert Internal Diameter 32mm vs Dual Mobility Prosthesis
Entire Period: HR=2.24 (95% CI 1.60, 3.14), p<0.001

Acetabular Insert Internal Diameter <32mm vs Dual Mobility Prosthesis
Entire Period: HR=2.40 (95% CI 1.62, 3.57), p<0.001

Acetabular Insert Internal Diameter >32mm vs Acetabular Insert Internal Diameter <32mm
Entire Period: HR=0.73 (95% CI 0.52, 1.02), p=0.068

Acetabular Insert Internal Diameter 32mm vs Acetabular Insert Internal Diameter <32mm
Entire Period: HR=0.93 (95% CI 0.66, 1.31), p=0.676

Acetabular Insert Internal Diameter >32mm vs Acetabular Insert Internal Diameter 32mm
Entire Period: HR=0.79 (95% CI 0.60, 1.03), p=0.078

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	1297	1053	780	574	186	47	11
Dual Mobility Prosthesis	1123	868	570	362	41	2	0
Acetabular Insert Internal Diameter >32mm	1213	1010	806	642	265	63	4
Acetabular Insert Internal Diameter 32mm	811	684	577	476	241	89	18
Acetabular Insert Internal Diameter <32mm	348	290	245	208	141	72	30

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

PERIPROSTHETIC FRACTURE

There are 5,408 1st revision procedures for fracture, and 598 of these procedures have had a 2nd revision. The median time from primary procedure to revision for fracture is 3.6 years, and the mean age of patients is slightly older than for other reasons for revision at 76.5 years, with more females undergoing revision for fracture (53.3%) (Table N1).

Of those who had a 1st revision for fracture, the fixation used for the primary total hip replacement is cementless (66.8%), hybrid (28.4%) and cemented (4.8%) (Table N1).

The cumulative percent 2nd revision at 15 years is 18.5% (Table N9 and Figure N15). The most common reason for 2nd revision is infection (28.1%), followed by loosening (24.7%), prosthesis dislocation/instability (22.9%), and further fracture (17.1%) (Table N10).

After 1st revision for fracture, the most common reason for 2nd revision is infection.

A revision of the femoral component (35.5%) is the most common type of 2nd revision, followed by minor revisions that involve both head/insert exchange (18.7%) and acetabular only revisions (17.6%) (Table N11). Minor 1st revisions for fracture are likely to be combined with fracture fixation procedures.

The outcomes of the type of 1st revision procedure for fractures are compared. Revision of the acetabular component only has a higher rate of 2nd revision compared to THR (femoral/acetabular). There are no other differences between procedure types (Table N19 and Figure N25).

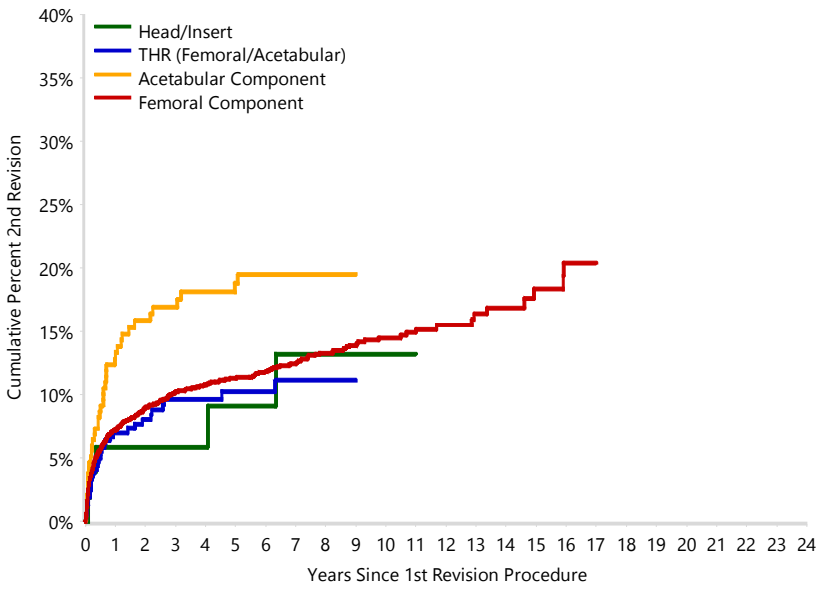
When the 1st revision is for fracture, cemented fixation used for revision of the femoral component has a higher rate of 2nd revision compared to cementless femoral fixation after 3 months (Table N20 and Figure N26).

Table N19 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Head/Insert	5	53	5.8 (1.9, 17.0)	5.8 (1.9, 17.0)	9.1 (3.4, 23.1)	13.2 (5.4, 30.4)	
THR (Femoral/Acetabular)	34	380	7.0 (4.8, 10.2)	9.6 (6.9, 13.4)	10.3 (7.3, 14.3)		
Acetabular Component	43	238	13.3 (9.5, 18.5)	16.9 (12.5, 22.6)	18.8 (14.1, 24.8)		
Femoral Component	450	4300	7.2 (6.5, 8.1)	10.2 (9.3, 11.3)	11.3 (10.3, 12.4)	14.5 (13.1, 16.1)	18.3 (15.5, 21.6)
TOTAL	532	4971					

Note: Excludes 437 1st revision procedures for fracture procedures with other minor types of revision.

Figure N25 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



HR - adjusted for age and gender

Head/Insert vs THR (Femoral/Acetabular)

Entire Period: HR=0.88 (95% CI 0.34, 2.24), p=0.782

Acetabular Component vs THR (Femoral/Acetabular)

Entire Period: HR=1.85 (95% CI 1.17, 2.90), p=0.007

Femoral Component vs THR (Femoral/Acetabular)

Entire Period: HR=1.21 (95% CI 0.86, 1.72), p=0.275

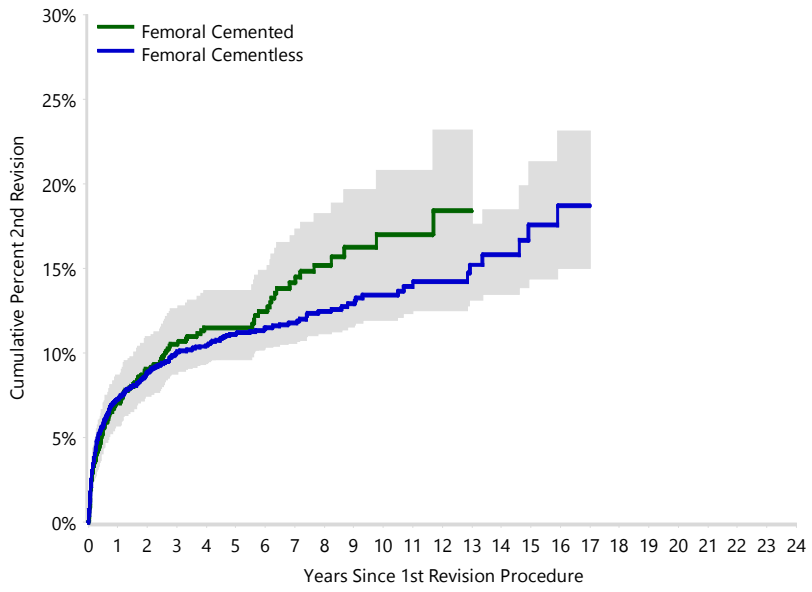
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Head/Insert	53	43	35	24	8	0	0
THR (Femoral/Acetabular)	380	298	202	133	36	7	2
Acetabular Component	238	182	142	117	39	3	0
Femoral Component	4300	3255	2277	1584	461	104	18

Note: Excludes 437 1st revision procedures for fracture procedures with other minor types of revision.

Table N20 **Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation in 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture, when the Femoral Component is Revised)**

Femoral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Femoral Cemented	131	1211	7.0 (5.7, 8.7)	10.5 (8.8, 12.6)	11.5 (9.6, 13.7)	14.2 (11.8, 16.9)	17.0 (13.9, 20.8)	
Femoral Cementless	353	3469	7.3 (6.5, 8.2)	10.1 (9.0, 11.2)	11.1 (10.0, 12.3)	11.8 (10.6, 13.1)	13.4 (11.9, 15.0)	17.6 (14.4, 21.3)
TOTAL	484	4680						

Figure N26 **Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Femoral Fixation in 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture, when the Femoral Component is Revised)**



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Femoral Cemented	1211	902	606	413	265	100	21
Femoral Cementless	3469	2651	1873	1304	848	397	90

Revision Arthroplasty

TIMING OF 1ST REVISION

The timing of the 1st revision was classified as early if it occurred within 2 years of the primary procedure (<2 years) or late if it occurred 2 years or more (≥2 years) after the primary procedure. There are 8,216 early 1st revisions (43.4%). When performed within 2 years, 1st revisions have a higher rate of 2nd revision in the first month and again from 3 months onwards when compared to late 1st revisions (Table N21 and Figure N27).

The reasons for 1st revision vary with time from the primary procedure. The three most common early 1st revision diagnoses are dislocation/instability, fracture and loosening, but while remaining the most common, the order of these reverses for late 1st revision. Most revisions for leg length discrepancy and incorrect sizing occur early, while lysis and wear or breakage-related revisions mostly occur late (Table N22 and Figure N28).

The most common reasons for a 2nd revision after an early 1st revision are dislocation/instability, infection and loosening, while after a late 1st revision, these are dislocation/instability, loosening and infection.

Of the 1st revisions for loosening, 34.5% (n=1,832) occur early. Early loosening most likely represents a failure of initial fixation. 1st revisions for loosening performed within 2 years have a higher rate of 2nd revision compared to late revisions for loosening (Table N23 and Figure N29).

Most of the 1st revisions for dislocation/instability occur early (60.7%, n=2975). Early 1st revisions for dislocation/instability have a higher rate of 2nd revision than late 1st revisions for dislocation/instability for the first 2 weeks only, and after this time, there is no difference (Table N24 and Figure N30).

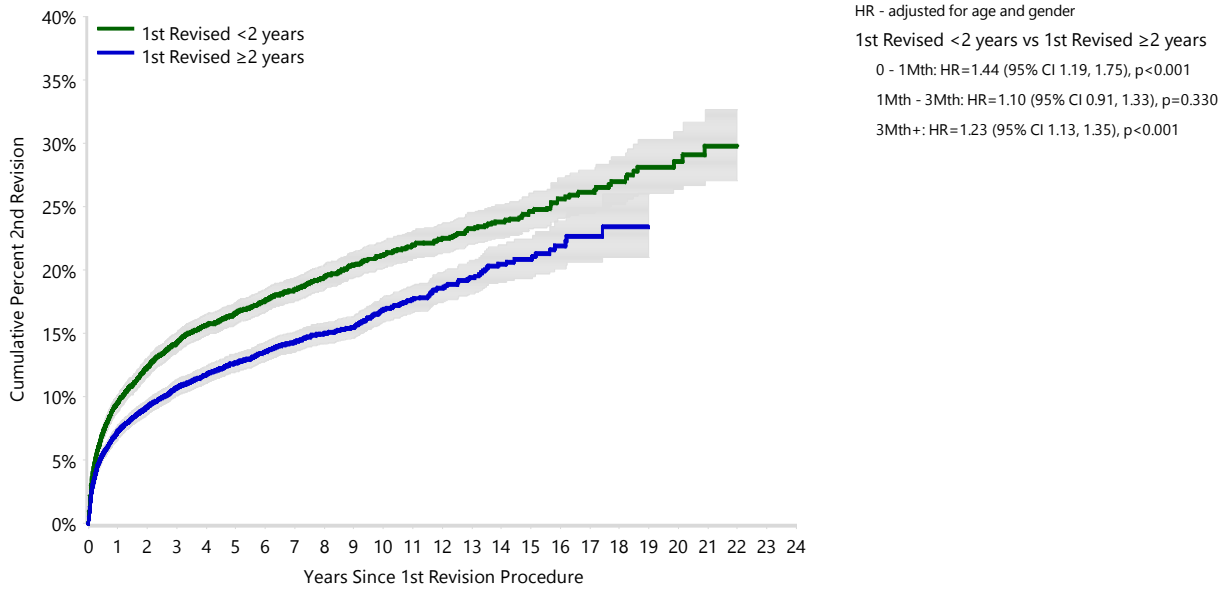
There are 42.8% of 1st revisions for fracture that occur within 2 years of the primary procedure (n=2,314). Early 1st revisions for fracture have a higher rate of 2nd revision than 1st revisions for fracture occurring late (Table N25 and Figure N31).

Table N21 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised <2 years	1472	8216	9.5 (8.9, 10.2)	14.3 (13.5, 15.1)	16.6 (15.7, 17.5)	21.1 (20.1, 22.2)	24.6 (23.2, 26.1)
1st Revised ≥2 years	1331	10720	7.3 (6.8, 7.8)	10.7 (10.1, 11.4)	12.7 (12.0, 13.4)	16.8 (15.9, 17.8)	20.8 (19.3, 22.4)
TOTAL	2803	18936					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N27 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised <2 years	8216	6860	5477	4332	1827	602
1st Revised ≥2 years	10720	8592	6325	4598	1569	341

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N22 Reasons for 1st Revision Total Conventional Hip Replacement by Timing of 1st Revision

1st Revision Diagnosis	1st Revised <2 years			1st Revised ≥2 years			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Fracture	2314	42.8	28.2	3094	57.2	28.9	5408	100.0	28.6
Heterotopic Bone	13	36.1	0.2	23	63.9	0.2	36	100.0	0.2
Implant Breakage Acetabular	32	25.2	0.4	95	74.8	0.9	127	100.0	0.7
Implant Breakage Acetabular Insert	67	34.7	0.8	126	65.3	1.2	193	100.0	1.0
Implant Breakage Head	13	25.5	0.2	38	74.5	0.4	51	100.0	0.3
Implant Breakage Stem	37	12.8	0.5	253	87.2	2.4	290	100.0	1.5
Incorrect Sizing	107	82.9	1.3	22	17.1	0.2	129	100.0	0.7
Leg Length Discrepancy	270	75.4	3.3	88	24.6	0.8	358	100.0	1.9
Loosening	1832	34.5	22.3	3480	65.5	32.5	5312	100.0	28.1
Lysis	34	7.0	0.4	452	93.0	4.2	486	100.0	2.6
Malposition	184	51.5	2.2	173	48.5	1.6	357	100.0	1.9
Metal Related Pathology	7	5.2	0.1	128	94.8	1.2	135	100.0	0.7
Pain	164	38.5	2.0	262	61.5	2.4	426	100.0	2.2
Prosthesis Dislocation/Instability	2975	60.7	36.2	1928	39.3	18.0	4903	100.0	25.9
Synovitis	1	50.0	0.0	1	50.0	0.0	2	100.0	0.0
Tumour	8	23.5	0.1	26	76.5	0.2	34	100.0	0.2
Wear Acetabular Insert	7	3.1	0.1	218	96.9	2.0	225	100.0	1.2
Wear Acetabulum	.	.	.	20	100.0	0.2	20	100.0	0.1
Wear Head	10	11.1	0.1	80	88.9	0.7	90	100.0	0.5
Other	141	39.8	1.7	213	60.2	2.0	354	100.0	1.9
TOTAL	**8216**	**43.4**	**100.0**	**10720**	**56.6**	**100.0**	**18936**	**100.0**	**100.0**

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N28 Cumulative Incidence 2nd Revision Diagnosis of Total Conventional Hip Replacement by Timing of 1st Revision

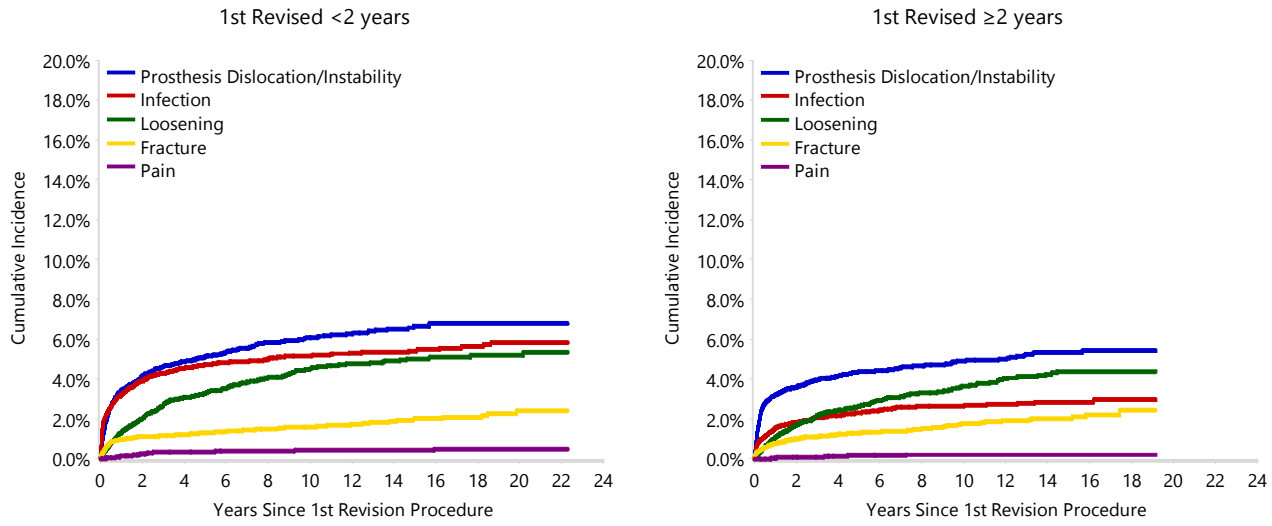
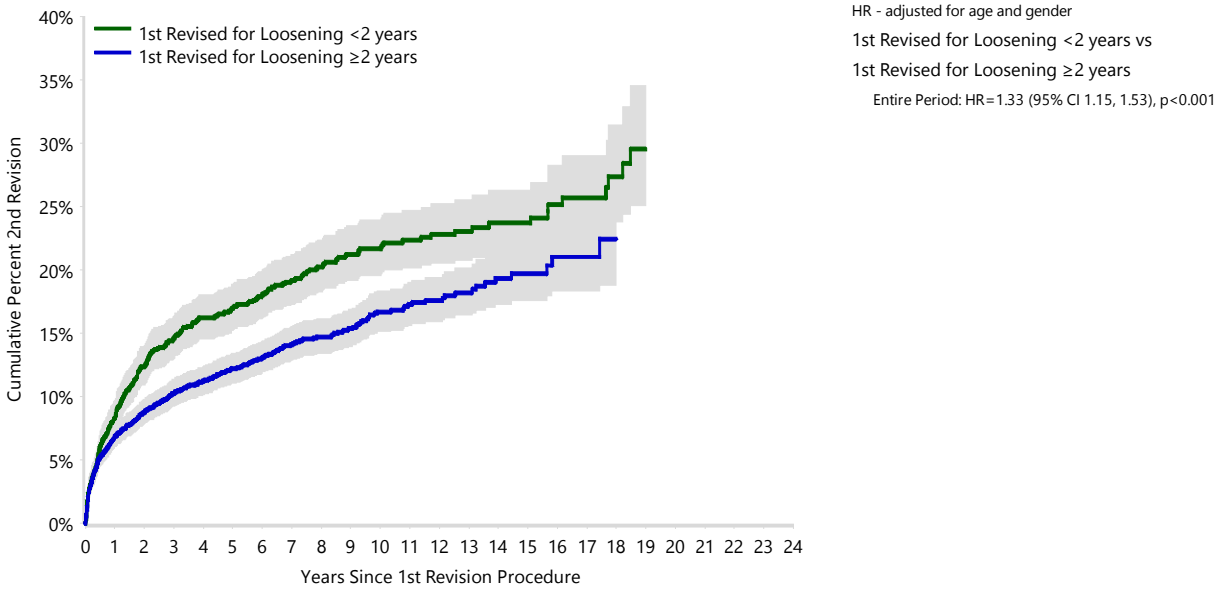


Table N23 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Loosening <2 years	348	1832	8.3 (7.1, 9.7)	14.6 (13.0, 16.3)	17.0 (15.3, 18.9)	21.7 (19.6, 23.9)	23.7 (21.3, 26.3)
1st Revised for Loosening ≥2 years	452	3480	6.9 (6.1, 7.8)	10.3 (9.3, 11.4)	12.2 (11.1, 13.5)	16.7 (15.2, 18.4)	19.7 (17.6, 22.1)
TOTAL	800	5312					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N29 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Loosening <2 years	1832	1579	1290	1041	485	177
1st Revised for Loosening ≥2 years	3480	2957	2319	1784	684	165

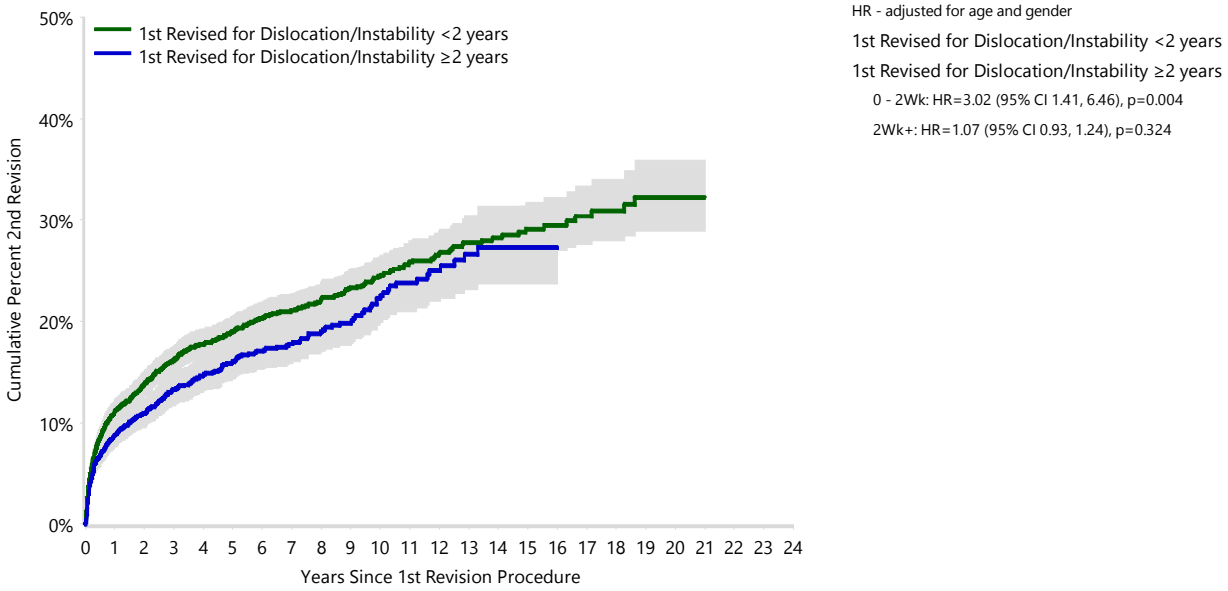
Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N24 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Dislocation/Instability <2 years	613	2975	11.1 (10.0, 12.3)	16.2 (14.9, 17.6)	19.0 (17.5, 20.5)	24.4 (22.6, 26.4)	29.1 (26.7, 31.7)
1st Revised for Dislocation/Instability ≥2 years	310	1928	8.8 (7.6, 10.1)	13.2 (11.7, 14.9)	16.1 (14.3, 18.0)	22.2 (19.7, 25.1)	27.3 (23.6, 31.3)
TOTAL	923	4903					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N30 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Dislocation/Instability <2 years	2975	2434	1921	1517	644	222
1st Revised for Dislocation/Instability ≥2 years	1928	1553	1128	803	264	66

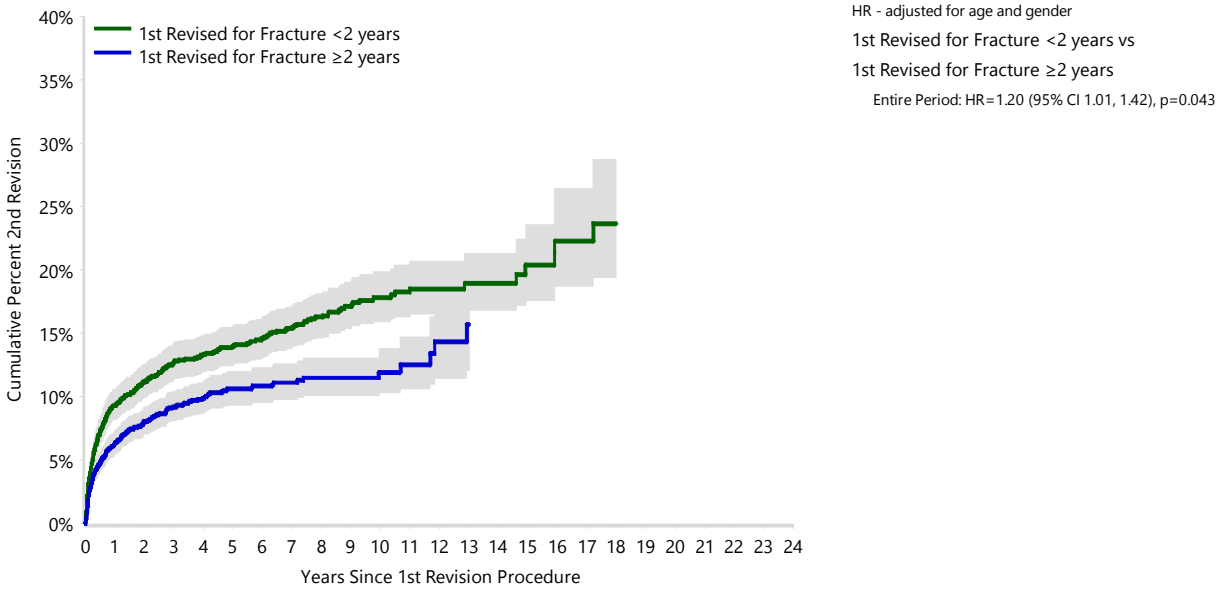
Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N25 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Fracture <2 years	336	2314	9.3 (8.2, 10.6)	12.8 (11.4, 14.3)	14.0 (12.5, 15.6)	17.8 (16.0, 19.8)	20.4 (17.6, 23.6)
1st Revised for Fracture ≥2 years	262	3094	6.4 (5.5, 7.4)	9.2 (8.1, 10.4)	10.6 (9.4, 12.0)	11.9 (10.3, 13.8)	
TOTAL	598	5408					

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N31 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
1st Revised for Fracture <2 years	2314	1908	1488	1154	401	104
1st Revised for Fracture ≥2 years	3094	2209	1395	876	196	21

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Revision Arthroplasty

SURGICAL APPROACH USED IN 1ST REVISION

Surgical approach data has been collected since 2015 and has been recorded for 11,958 1st revision hip replacement procedures. For revision hip replacement, the posterior approach is the most frequently used surgical approach (69.3%), while the lateral approach is used in 21.9% of procedures and the anterior approach in 8.8%. This contrasts with primary procedures for osteoarthritis, where the posterior approach is also the most common (used in 56.5%), the anterior approach second most common (30.5%), while the lateral approach is used for 13.0% of procedures (Table N26).

The posterior approach is used for 69.3%, lateral approach for 21.9% and anterior approach for 8.8% of 1st revision hip procedures.

Surgical approach use varies with class of 1st revision. For minor revisions, the posterior approach is used for 65.3% of procedures, the lateral approach for 22.1% and the anterior approach for 12.6%. For major partial revisions, the posterior approach is used for 69.7%, the lateral for 22.2% and the anterior for 8.2% of procedures. When a major total revision is performed, the posterior approach is used for 76.3% of these procedures, the lateral approach for 19.5% and the anterior approach for 4.2% (Table N26).

Surgical approach also varies with the reason for 1st revision. When the 1st revision is for loosening, the posterior approach is used for 71.4% of procedures, while the lateral approach is used for 19.2% and the anterior approach for 9.4%. Similarly, when the 1st revision is for dislocation/instability, the posterior approach is used for 71.2%, the lateral for 18.8% and the anterior for 9.9% (Table N27). Only a small percentage of revisions for fracture use the anterior approach (4.7%), where proportionately more use either the lateral (27.0%) or posterior approaches (68.2%).

When the outcomes of the surgical approaches used for the 1st revision are compared, procedures using the anterior approach have a higher rate of 2nd revision compared to those using the posterior approach, and also for the first 9 months when compared to the lateral approach. The lateral approach has a higher rate of 2nd revision compared to the posterior approach (after 9 months) (Table N28 and Figure N32).

When the surgical approaches used for the 1st revision are compared for the class of revision, there are no differences in the rate of 2nd revision for minor revisions or major total revision procedures (Table N29, Figure N33, Table N30 and Figure N34). Major partial revisions have a higher rate of 2nd revision when the anterior approach is used compared to the other two approaches, with no difference between the lateral and posterior approaches (Table N31 and Figure N35).

After using the anterior approach for the 1st revision, the most common reasons for 2nd revision are infection (31.8%), loosening (26.7%), dislocation/instability (22.2%) and fracture (8.5%). For 1st revisions using the lateral and posterior approaches, the most common reasons for 2nd revision are dislocation/instability (33.5% and 38.0% for lateral and posterior approaches, respectively), followed by infection (23.5% and 26.8%), loosening (22.9% and 16.0%) and fracture (10.1% and 10.0%) (Table N32).

Table N26 Revision Hip Replacement by 1st Revision Class and Surgical Approach (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Revision Class	Anterior			Lateral			Posterior			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Minor	348	12.6	33.1	612	22.1	23.4	1806	65.3	21.8	2766	100.0	23.1
Major Partial	650	8.2	61.9	1767	22.2	67.5	5549	69.7	66.9	7966	100.0	66.6
Major Total	52	4.2	5.0	239	19.5	9.1	935	76.3	11.3	1226	100.0	10.3
TOTAL	**1050**	**8.8**	**100.0**	**2618**	**21.9**	**100.0**	**8290**	**69.3**	**100.0**	**11958**	**100.0**	**100.0**

Note: Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N27 Revision Hip Replacement by Surgical Approach and Reason for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Reason for 1st Revision	Anterior			Lateral			Posterior			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Fracture	179	4.7	17.0	1019	27.0	38.9	2573	68.2	31.0	3771	100.0	31.5
Heterotopic Bone	1	4.3	0.1	3	13.0	0.1	19	82.6	0.2	23	100.0	0.2
Implant Breakage Acetabular	11	14.9	1.0	20	27.0	0.8	43	58.1	0.5	74	100.0	0.6
Implant Breakage Acetabular Insert	20	16.4	1.9	21	17.2	0.8	81	66.4	1.0	122	100.0	1.0
Implant Breakage Head	2	9.5	0.2	7	33.3	0.3	12	57.1	0.1	21	100.0	0.2
Implant Breakage Stem	5	2.3	0.5	51	23.4	1.9	162	74.3	2.0	218	100.0	1.8
Incorrect Sizing	18	25.7	1.7	18	25.7	0.7	34	48.6	0.4	70	100.0	0.6
Leg Length Discrepancy	68	31.2	6.5	27	12.4	1.0	123	56.4	1.5	218	100.0	1.8
Loosening	291	9.4	27.7	594	19.2	22.7	2213	71.4	26.7	3098	100.0	25.9
Lysis	12	3.9	1.1	67	21.8	2.6	229	74.4	2.8	308	100.0	2.6
Malposition	43	17.2	4.1	48	19.2	1.8	159	63.6	1.9	250	100.0	2.1
Metal Related Pathology	5	4.3	0.5	23	19.8	0.9	88	75.9	1.1	116	100.0	1.0
Pain	43	15.8	4.1	47	17.2	1.8	183	67.0	2.2	273	100.0	2.3
Prosthesis Dislocation/Instability	288	9.9	27.4	545	18.8	20.8	2062	71.2	24.9	2895	100.0	24.2
Synovitis	.	.	.	1	100.0	0.0	.	.	.	1	100.0	0.0
Tumour	.	.	.	13	56.5	0.5	10	43.5	0.1	23	100.0	0.2
Wear Acetabular Insert	10	6.8	1.0	39	26.5	1.5	98	66.7	1.2	147	100.0	1.2
Wear Acetabulum	2	22.2	0.2	4	44.4	0.2	3	33.3	0.0	9	100.0	0.1
Wear Head	8	11.9	0.8	16	23.9	0.6	43	64.2	0.5	67	100.0	0.6
Other	44	17.3	4.2	55	21.7	2.1	155	61.0	1.9	254	100.0	2.1
TOTAL	**1050**	**8.8**	**100.0**	**2618**	**21.9**	**100.0**	**8290**	**69.3**	**100.0**	**11958**	**100.0**	**100.0**

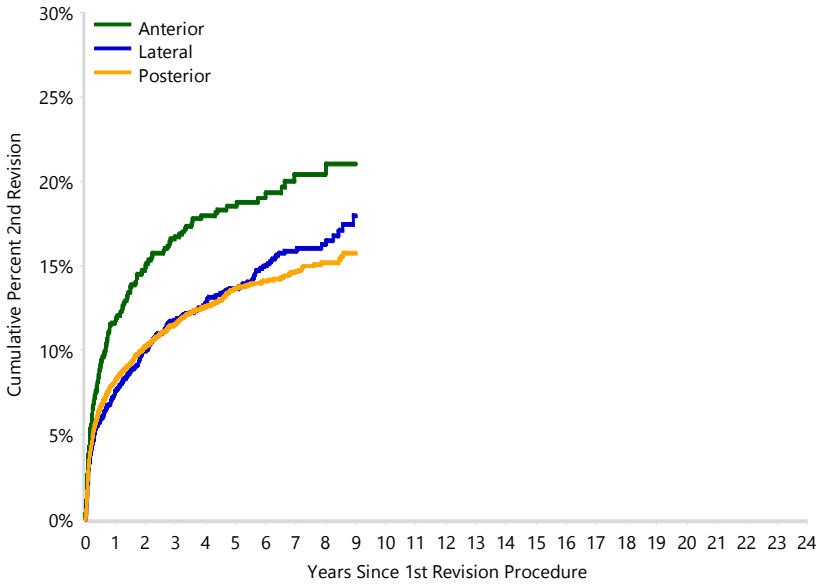
Note: Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N28 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	176	1050	11.8 (10.0, 14.0)	16.7 (14.5, 19.3)	18.5 (16.1, 21.3)	20.4 (17.6, 23.5)	21.0 (18.1, 24.4)
Lateral	328	2618	7.6 (6.6, 8.7)	11.8 (10.5, 13.2)	13.7 (12.3, 15.2)	15.9 (14.2, 17.7)	17.9 (15.7, 20.4)
Posterior	958	8290	8.2 (7.6, 8.9)	11.6 (10.8, 12.3)	13.6 (12.8, 14.5)	14.7 (13.7, 15.7)	15.7 (14.6, 17.0)
TOTAL	1462	11958					

Note: Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N32 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Anterior vs Lateral

0 - 3Mth: HR=1.36 (95% CI 1.02, 1.82), p=0.035

3Mth - 6Mth: HR=1.65 (95% CI 1.05, 2.61), p=0.031

6Mth - 9Mth: HR=2.28 (95% CI 1.34, 3.87), p=0.002

9Mth+: HR=1.02 (95% CI 0.77, 1.36), p=0.884

Anterior vs Posterior

Entire Period: HR=1.34 (95% CI 1.14, 1.58), p<0.001

Lateral vs Posterior

0 - 1Mth: HR=0.90 (95% CI 0.67, 1.21), p=0.481

1Mth - 9Mth: HR=0.90 (95% CI 0.73, 1.11), p=0.325

9Mth+: HR=1.27 (95% CI 1.06, 1.53), p=0.010

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	1050	797	584	378	201	50
Lateral	2618	2088	1451	1017	543	152
Posterior	8290	6371	4263	2629	1220	277

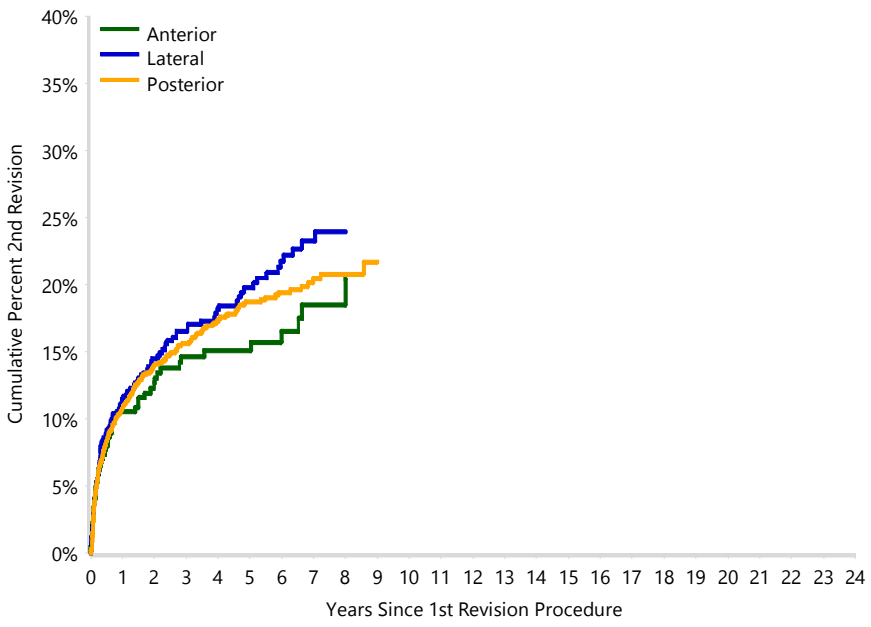
Note: Excluding 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N29 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Minor Revisions Only)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	52	348	10.5 (7.7, 14.3)	14.6 (11.1, 19.1)	15.1 (11.5, 19.7)	18.5 (14.0, 24.2)	
Lateral	113	612	11.5 (9.2, 14.4)	16.5 (13.6, 19.9)	19.8 (16.5, 23.6)	23.2 (19.4, 27.7)	
Posterior	290	1806	10.9 (9.5, 12.4)	15.6 (13.9, 17.5)	18.7 (16.8, 20.9)	20.5 (18.2, 22.9)	21.7 (18.9, 24.9)
TOTAL	455	2766					

Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N33 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Minor Revisions Only)



HR - adjusted for age and gender

Lateral vs Anterior

Entire Period: HR=1.31 (95% CI 0.94, 1.83), p=0.107

Lateral vs Posterior

Entire Period: HR=1.13 (95% CI 0.91, 1.40), p=0.286

Posterior vs Anterior

Entire Period: HR=1.17 (95% CI 0.87, 1.57), p=0.311

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	348	270	203	137	74	14
Lateral	612	473	329	224	112	26
Posterior	1806	1391	918	580	267	49

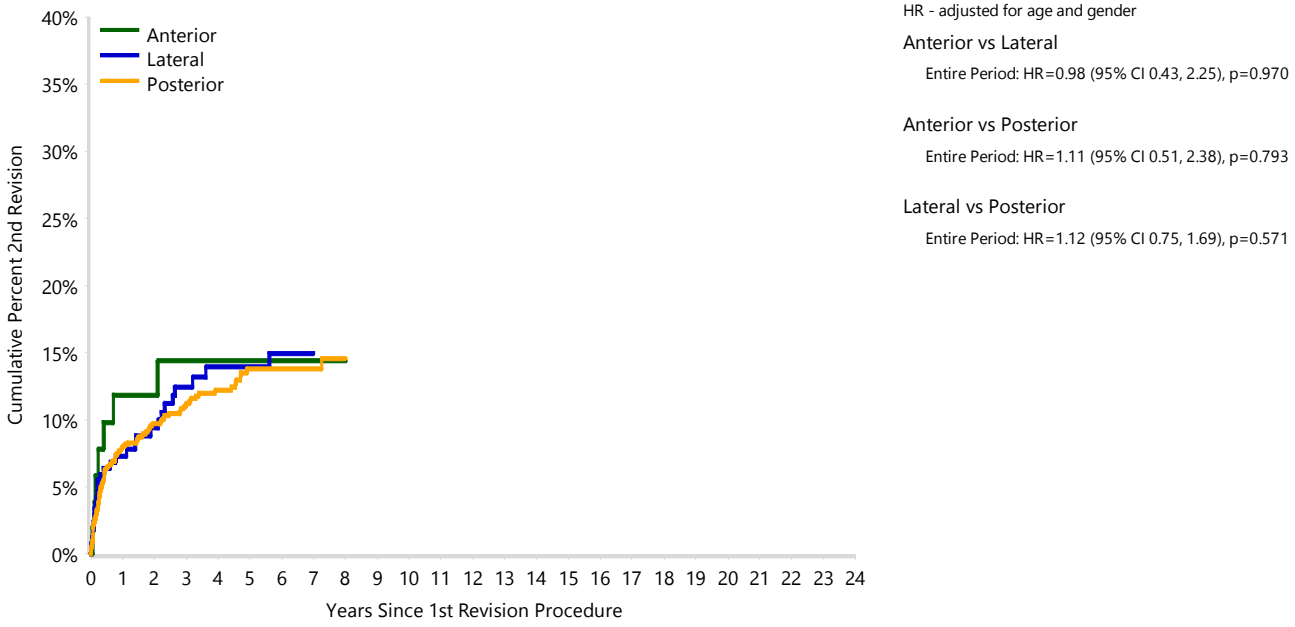
Note: Excluding 6978 procedures with unknown approach. Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N30 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Major Total Revisions Only)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Anterior	7	52	11.9 (5.5, 24.5)	14.4 (7.1, 28.0)	14.4 (7.1, 28.0)	14.4 (7.1, 28.0)
Lateral	30	239	7.3 (4.6, 11.5)	12.5 (8.6, 17.9)	13.9 (9.7, 19.7)	15.0 (10.5, 21.1)
Posterior	104	935	7.9 (6.3, 9.9)	11.2 (9.2, 13.6)	13.8 (11.4, 16.7)	13.8 (11.4, 16.7)
TOTAL	141	1226				

Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N34 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Major Total Revisions Only)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	52	40	30	19	11	3
Lateral	239	194	130	88	57	17
Posterior	935	731	489	291	131	31

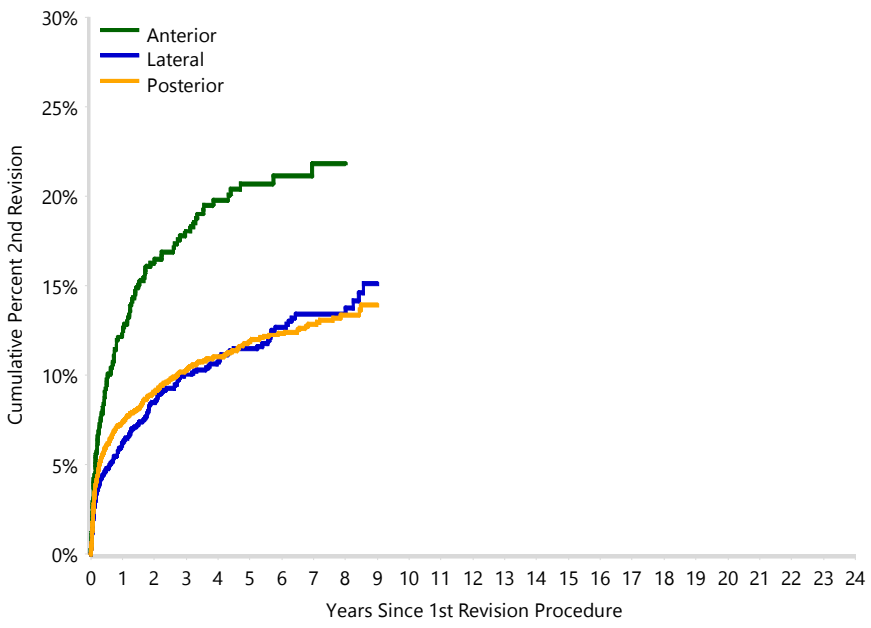
Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N31 Cumulative Percent 2nd Revision of Known Primary 1st Revision Hip Replacement by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Major Partial Revisions Only)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	117	650	12.5 (10.1, 15.4)	18.0 (15.1, 21.5)	20.7 (17.5, 24.4)	21.8 (18.3, 25.9)	
Lateral	185	1767	6.2 (5.2, 7.5)	10.0 (8.6, 11.7)	11.5 (9.9, 13.3)	13.4 (11.6, 15.5)	15.1 (12.7, 17.9)
Posterior	564	5549	7.4 (6.7, 8.2)	10.3 (9.4, 11.2)	11.9 (10.9, 12.9)	12.8 (11.8, 14.0)	13.9 (12.6, 15.4)
TOTAL	866	7966					

Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N35 Cumulative Percent 2nd Revision of Known Primary 1st Revision by Surgical Approach used for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection, 1st Major Partial Revisions Only)



HR - adjusted for age and gender

Anterior vs Lateral

Entire Period: HR=1.68 (95% CI 1.33, 2.13), p<0.001

Anterior vs Posterior

Entire Period: HR=1.66 (95% CI 1.36, 2.03), p<0.001

Posterior vs Lateral

0 - 9Mth: HR=1.18 (95% CI 0.96, 1.45), p=0.117

9Mth+: HR=0.81 (95% CI 0.64, 1.03), p=0.080

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Anterior	650	487	351	222	116	33
Lateral	1767	1421	992	705	374	109
Posterior	5549	4249	2856	1758	822	197

Note: Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Table N32 Revision Diagnosis of 2nd Revision of Total Conventional Hip Replacement by Surgical Approach Used for 1st Revision (Primary Diagnosis OA)

2nd Revision Diagnosis	Anterior		Lateral		Posterior		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Prosthesis Dislocation/Instability	39	22.2	110	33.5	364	38.0	513	35.1
Infection	56	31.8	77	23.5	257	26.8	390	26.7
Loosening	47	26.7	75	22.9	153	16.0	275	18.8
Fracture	15	8.5	33	10.1	96	10.0	144	9.8
Implant Breakage Stem	1	0.6	8	2.4	18	1.9	27	1.8
Pain	7	4.0	4	1.2	14	1.5	25	1.7
Malposition	1	0.6	3	0.9	10	1.0	14	1.0
Leg Length Discrepancy	3	1.7	1	0.3	9	0.9	13	0.9
Metal Related Pathology	1	0.6	6	1.8	5	0.5	12	0.8
Implant Breakage Acetabular Insert	.	.	5	1.5	6	0.6	11	0.8
Incorrect Sizing	2	1.1	1	0.3	4	0.4	7	0.5
Implant Breakage Acetabular	.	.	1	0.3	4	0.4	5	0.3
Lysis	1	0.6	1	0.3	3	0.3	5	0.3
Chondrolysis/Acetab. Erosion	.	.	1	0.3	.	.	1	0.1
Other	3	1.7	2	0.6	15	1.6	20	1.4
TOTAL	**176**	**100.0**	**328**	**100.0**	**958**	**100.0**	**1462**	**100.0**

Note: Excludes 6,978 procedures with unknown approach. Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

OUTCOMES OF 1ST REVISION OVER TIME

This analysis compares the outcomes of 1st revisions over four successive time periods: 1999-2005, 2006-2012, 2013-2019 and 2020-2024. There has been a reduction in the rate of 2nd revision comparing the most recent period to 1999-2005 and 2006-2012, but no difference is shown with 2013-2019 (Table N33 and Figure N36).

In all four time periods, dislocation/instability is the most common reason for a 2nd revision procedure (Table N34 and Figure N37).

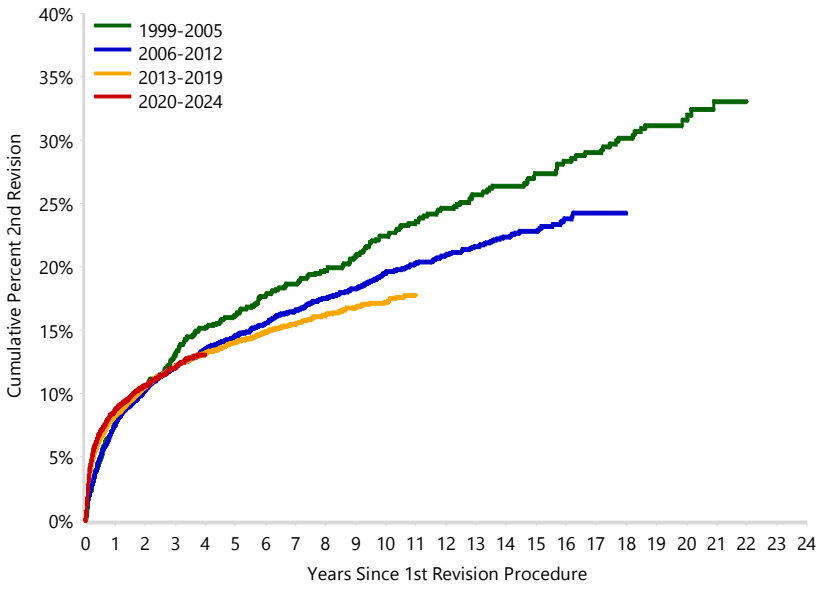
When the individual reasons for 1st revision are analysed over time, there is a decrease in the rate of 2nd revision when the 1st revision is for dislocation/instability (after 6 months) (Table N35 and Figure N38), for loosening (after 3 months) (Table N36 and Figure N39), or for fracture (after 1 year) (Table N37 and Figure N40) when the most recent period (2020-2024) is compared to 1999-2005, but there is no or minimal change compared to the other periods.

Table N33 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Time Period of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	281	1141	7.6 (6.2, 9.3)	13.2 (11.4, 15.4)	16.2 (14.1, 18.5)	22.4 (19.9, 25.2)	27.3 (24.5, 30.4)	31.6 (28.3, 35.1)
2006-2012	719	3743	7.6 (6.8, 8.5)	12.2 (11.1, 13.3)	14.6 (13.4, 15.8)	19.5 (18.1, 20.9)	22.8 (21.2, 24.4)	
2013-2019	1162	7762	8.3 (7.7, 8.9)	12.2 (11.4, 12.9)	14.1 (13.3, 14.9)	17.2 (16.3, 18.2)		
2020-2024	641	6290	8.8 (8.1, 9.5)	12.1 (11.2, 13.0)				
TOTAL	2803	18936						

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Figure N36 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Time Period of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 3Mth: HR=0.55 (95% CI 0.39, 0.79), p<0.001

3Mth - 6Mth: HR=1.06 (95% CI 0.68, 1.66), p=0.792

6Mth+: HR=1.60 (95% CI 1.35, 1.90), p<0.001

2006-2012 vs 2020-2024

0 - 3Mth: HR=0.57 (95% CI 0.46, 0.70), p<0.001

3Mth+: HR=1.26 (95% CI 1.11, 1.42), p<0.001

2013-2019 vs 2020-2024

Entire Period: HR=0.97 (95% CI 0.88, 1.07), p=0.519

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	1141	1022	907	803	570	382	164
2006-2012	3743	3346	2987	2662	1893	561	0
2013-2019	7762	6823	6108	5465	933	0	0
2020-2024	6290	4261	1800	0	0	0	0

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Table N34 2nd Revision Diagnosis of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	1999-2005			2006-2012		
	Number	% 1st Revisions Revised	% 2nd Revisions	Number	% 1st Revisions Revised	% 2nd Revisions
Prosthesis Dislocation/Instability	96	8.4	34.2	208	5.6	28.9
Infection	50	4.4	17.8	137	3.7	19.1
Loosening	80	7.0	28.5	196	5.2	27.3
Fracture	20	1.8	7.1	86	2.3	12.0
Implant Breakage Stem	3	0.3	1.1	10	0.3	1.4
Pain	8	0.7	2.8	9	0.2	1.3
Metal Related Pathology	1	0.1	0.4	13	0.3	1.8
Implant Breakage Acetabular	5	0.4	1.8	11	0.3	1.5
Leg Length Discrepancy				4	0.1	0.6
Lysis	10	0.9	3.6	11	0.3	1.5
Malposition	1	0.1	0.4	7	0.2	1.0
Implant Breakage Acetabular Insert	2	0.2	0.7	10	0.3	1.4
Incorrect Sizing						
Heterotopic Bone	1	0.1	0.4	3	0.1	0.4
Tumour				1	0.0	0.1
Wear Acetabular Insert	1	0.1	0.4	2	0.1	0.3
Chondrolysis/Acetab. Erosion						
Implant Breakage Head	1	0.1	0.4	1	0.0	0.1
Synovitis				1	0.0	0.1
Wear Acetabulum	1	0.1	0.4			
Wear Head				1	0.0	0.1
Other	1	0.1	0.4	8	0.2	1.1
N 2nd Revision	**281**	**24.6**	**100.0**	**719**	**19.2**	**100.0**
N 1st Revision	**1141**			**3743**		

2nd Revision Diagnosis	2013-2019			2020-2024		
	Number	% 1st Revisions Revised	% 2nd Revisions	Number	% 1st Revisions Revised	% 2nd Revisions
Prosthesis Dislocation/Instability	376	4.8	32.4	249	4.0	38.8
Infection	284	3.7	24.4	182	2.9	28.4
Loosening	272	3.5	23.4	83	1.3	12.9
Fracture	104	1.3	9.0	77	1.2	12.0
Implant Breakage Stem	28	0.4	2.4	5	0.1	0.8
Pain	21	0.3	1.8	12	0.2	1.9
Metal Related Pathology	12	0.2	1.0	3	0.0	0.5
Implant Breakage Acetabular	8	0.1	0.7	1	0.0	0.2
Leg Length Discrepancy	11	0.1	0.9	5	0.1	0.8
Lysis	3	0.0	0.3	3	0.0	0.5
Malposition	11	0.1	0.9	6	0.1	0.9
Implant Breakage Acetabular Insert	9	0.1	0.8	4	0.1	0.6

Revision Arthroplasty

2nd Revision Diagnosis	2013-2019 Number	2013-2019 % 1st Revisions Revised	2013-2019 % 2nd Revisions	2020-2024 Number	2020-2024 % 1st Revisions Revised	2020-2024 % 2nd Revisions
Incorrect Sizing	5	0.1	0.4	3	0.0	0.5
Heterotopic Bone						
Tumour	2	0.0	0.2			
Wear Acetabular Insert	1	0.0	0.1			
Chondrolysis/Acetab. Erosion	1	0.0	0.1			
Implant Breakage Head						
Synovitis						
Wear Acetabulum						
Wear Head						
Other	14	0.2	1.2	8	0.1	1.2
N 2nd Revision	**1162**	**15.0**	**100.0**	**641**	**10.2**	**100.0**
N 1st Revision	**7762**			**6290**		

Figure N37 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Conventional Hip Replacement by Time Period of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

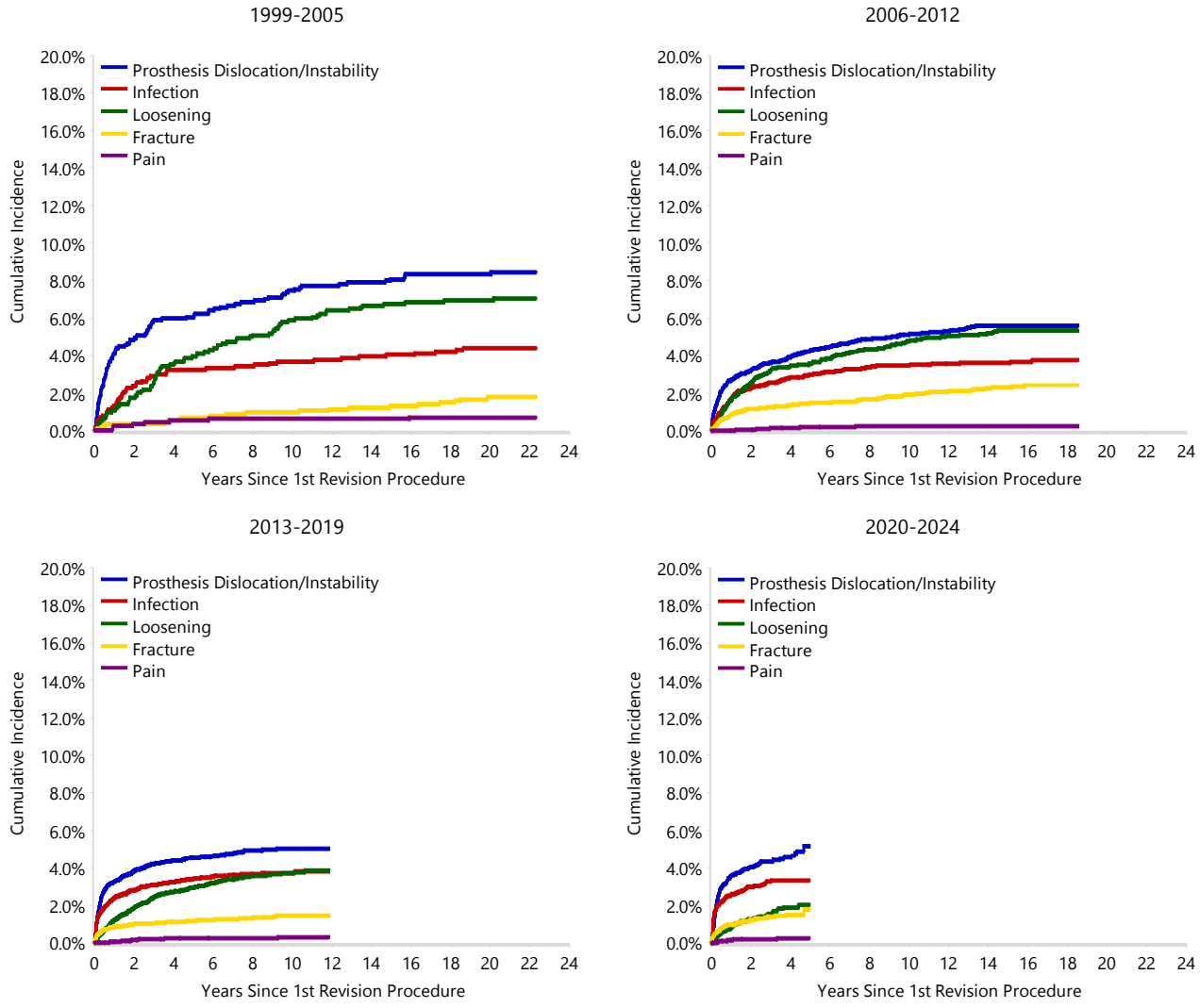
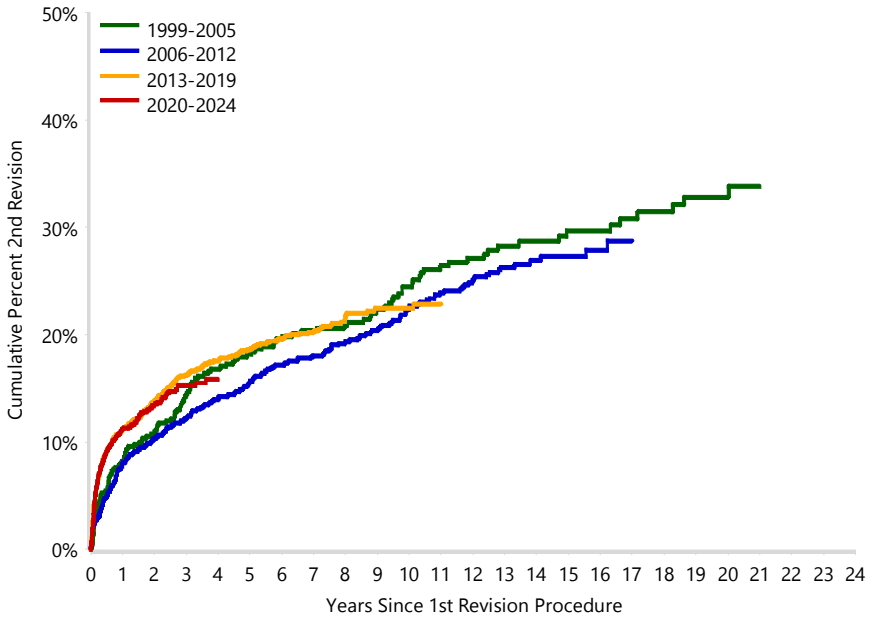


Table N35 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	133	522	8.2 (6.1, 10.9)	14.5 (11.7, 17.8)	18.2 (15.0, 21.9)	24.4 (20.7, 28.7)	29.6 (25.3, 34.5)	32.8 (27.9, 38.3)
2006-2012	221	990	8.0 (6.5, 9.9)	12.3 (10.4, 14.5)	15.6 (13.5, 18.1)	22.3 (19.7, 25.3)	27.3 (24.1, 30.7)	
2013-2019	372	1861	11.1 (9.8, 12.7)	16.2 (14.6, 18.0)	18.6 (16.9, 20.5)	22.4 (20.3, 24.7)		
2020-2024	197	1530	11.2 (9.6, 12.9)	15.3 (13.3, 17.5)				
TOTAL	923	4903						

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Figure N38 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Prosthesis Dislocation/Instability)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 6Mth: HR=0.61 (95% CI 0.41, 0.92), p=0.016

6Mth+: HR=1.36 (95% CI 1.04, 1.79), p=0.024

2006-2012 vs 2020-2024

0 - 1Mth: HR=0.72 (95% CI 0.45, 1.16), p=0.177

1Mth - 3Mth: HR=0.21 (95% CI 0.10, 0.44), p<0.001

3Mth+: HR=1.17 (95% CI 0.93, 1.47), p=0.173

2013-2019 vs 2020-2024

Entire Period: HR=1.03 (95% CI 0.86, 1.23), p=0.724

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	522	464	406	353	239	145	67
2006-2012	990	894	796	692	468	143	0
2013-2019	1861	1612	1440	1275	201	0	0
2020-2024	1530	1017	407	0	0	0	0

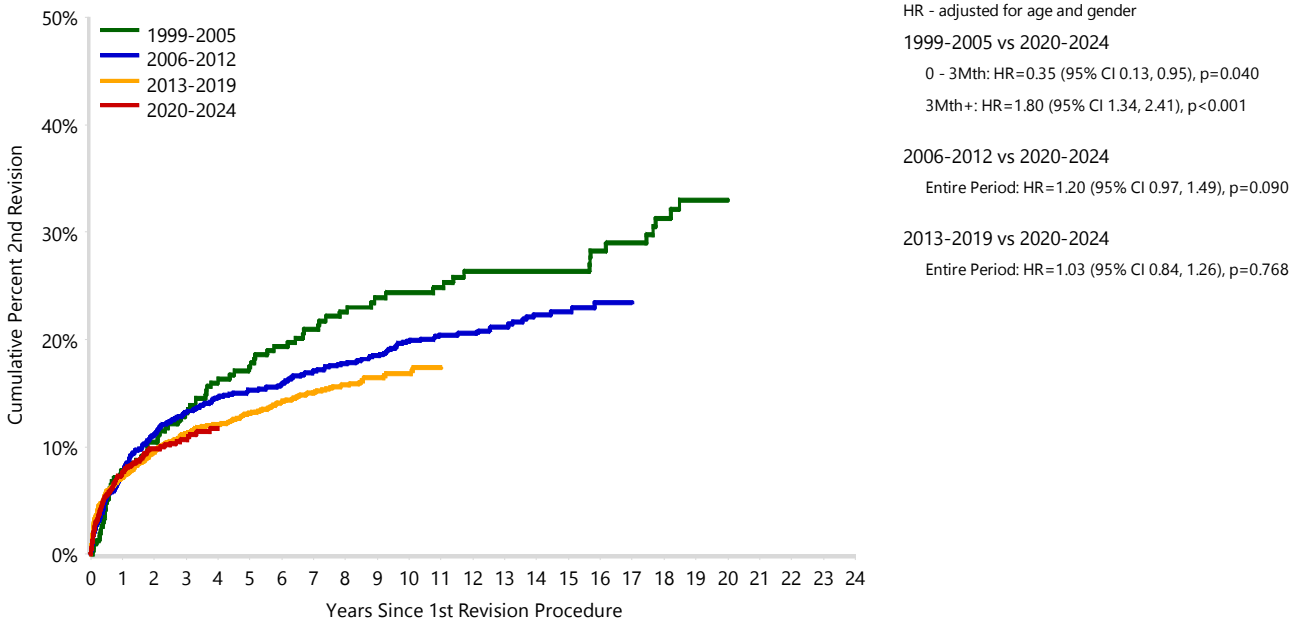
Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Table N36 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	82	314	7.8 (5.3, 11.4)	13.1 (9.8, 17.5)	17.4 (13.6, 22.3)	24.3 (19.7, 29.8)	26.3 (21.4, 32.0)	32.9 (27.0, 39.8)
2006-2012	256	1295	7.5 (6.2, 9.0)	13.2 (11.4, 15.1)	15.3 (13.4, 17.4)	19.8 (17.6, 22.2)	22.6 (20.1, 25.3)	
2013-2019	320	2156	7.1 (6.1, 8.3)	11.2 (10.0, 12.6)	13.1 (11.7, 14.6)	16.8 (15.0, 18.6)		
2020-2024	142	1547	7.6 (6.3, 9.1)	10.6 (9.0, 12.4)				
TOTAL	800	5312						

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Figure N39 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	314	280	252	220	161	116	43
2006-2012	1295	1178	1049	959	701	226	0
2013-2019	2156	1963	1801	1646	307	0	0
2020-2024	1547	1115	507	0	0	0	0

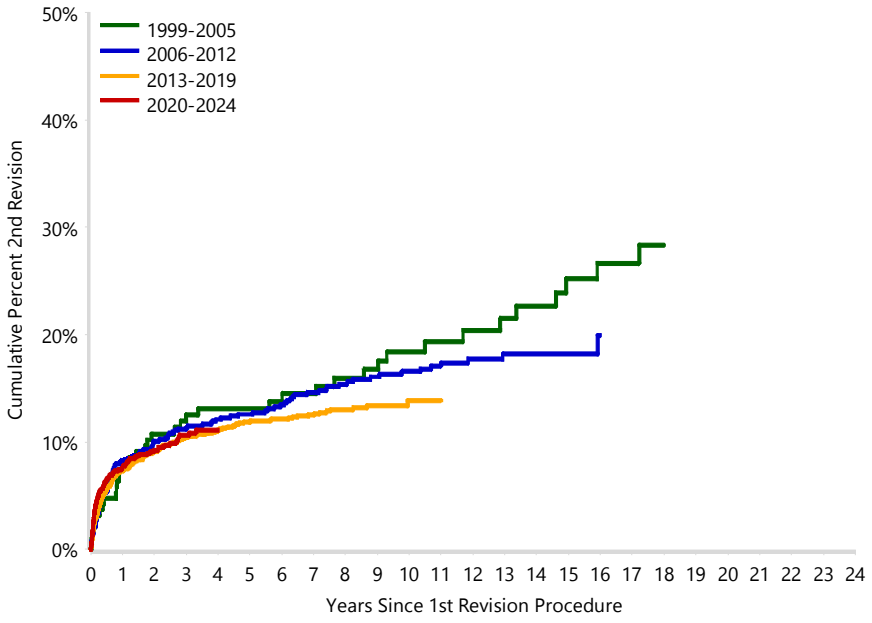
Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Table N37 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	39	192	7.4 (4.5, 12.3)	12.5 (8.5, 18.2)	13.1 (9.0, 18.9)	18.4 (13.2, 25.3)	25.2 (18.5, 33.7)	
2006-2012	123	843	8.2 (6.5, 10.3)	11.3 (9.3, 13.8)	12.6 (10.4, 15.1)	16.6 (13.9, 19.6)	18.2 (15.3, 21.6)	
2013-2019	260	2298	7.4 (6.3, 8.5)	10.5 (9.2, 11.8)	11.9 (10.6, 13.4)	13.8 (12.1, 15.8)		
2020-2024	176	2075	7.7 (6.6, 9.1)	10.7 (9.1, 12.4)				
TOTAL	598	5408						

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

Figure N40 Cumulative Percent 2nd Revision of Known Primary Total Conventional Hip Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 3Mth: HR=0.63 (95% CI 0.28, 1.42), p=0.264

3Mth - 1Yr: HR=1.09 (95% CI 0.53, 2.24), p=0.817

1Yr+: HR=1.70 (95% CI 1.06, 2.73), p=0.028

2006-2012 vs 2020-2024

0 - 6Mth: HR=0.85 (95% CI 0.60, 1.19), p=0.334

6Mth+: HR=1.27 (95% CI 0.93, 1.72), p=0.126

2013-2019 vs 2020-2024

Entire Period: HR=0.94 (95% CI 0.77, 1.14), p=0.503

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	192	171	151	133	90	58	26
2006-2012	843	709	618	529	319	67	0
2013-2019	2298	1920	1625	1368	188	0	0
2020-2024	2075	1317	489	0	0	0	0

Note: Excludes revisions where no minor or major femoral/acetabular components have been inserted.

MORTALITY FOLLOWING THE 1ST REVISION

Mortality following the 1st revision of primary conventional THR has been assessed. The overall mortality of a 1st revision procedure is 0.9% at 30 days, 1.9% at 90 days, 4.4% at 1 year and 37.5% at 10 years (Table N38 and Figure N41).

The 10-year survival of 1st revision hip replacements is 62.3%, while the 10-year survival of unrevised primary hip replacements is 81.1% (Table N39 and Figure N42).

Major partial 1st revisions have a higher mortality compared to minor revisions for the first 4 years, and when compared to major total revisions until 2.5 years, with no difference after these times (Table N40 and Figure N43).

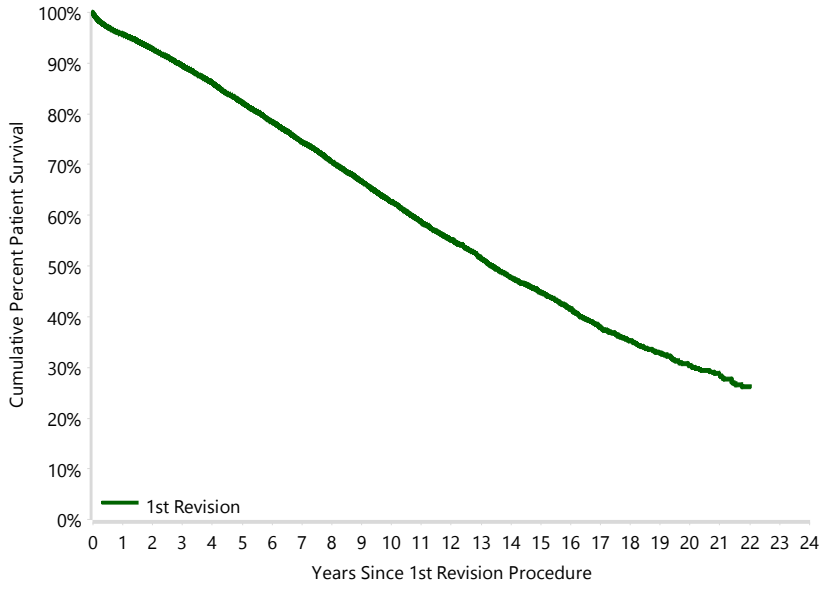
Mortality after 1st revision has also been assessed by common revision diagnoses. In this analysis, 1st revision for infection is included. Compared to other reasons for revision, 1st revision for loosening has the lowest mortality, both early at 30 days, 90 days and 1 year, and later at 10 years. By 10 years, 69.3% of patients have survived if revised for loosening. 1st revision for fracture has the highest mortality at all time points (Table N41 and Figure N44).

Compared to other diagnoses, revision for fracture has the highest mortality.

Table N38 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Replacement since 1st Revised (Excluding 1st Revision for Infection)

Class	N Deceased	N Total	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1st Revision	5715	18482	99.1 (98.9, 99.2)	98.1 (97.9, 98.3)	95.6 (95.3, 95.9)	82.1 (81.5, 82.7)	62.5 (61.6, 63.4)	44.7 (43.4, 45.9)	30.1 (28.3, 31.9)
TOTAL	**5715**	**18482**							

Figure N41 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Replacement since 1st Revised (Excluding 1st Revision for Infection)



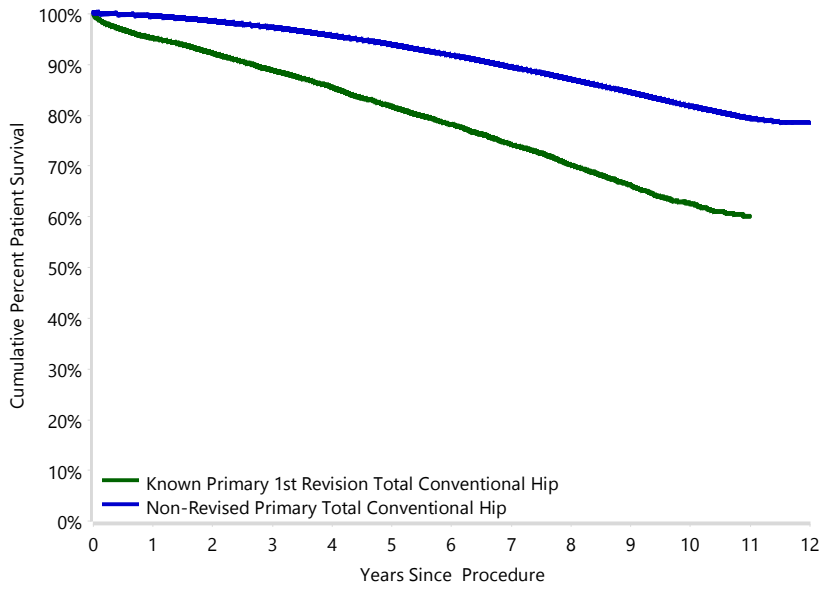
Number at Risk	0 Yr	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1st Revision	18482	18228	17815	16434	10223	4159	1257	241

Table N39 Cumulative Percent Survival of Patients with Non-Revised Primary Total Conventional Hip Replacement and Known Primary 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Procedure Type	N Deceased	N Total	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Conventional Hip	2737	13315	95.2 (94.8, 95.6)	81.6 (80.8, 82.3)	62.3 (60.9, 63.7)	
Non-Revised Primary Total Conventional Hip	32783	389697	99.3 (99.3, 99.3)	93.5 (93.4, 93.6)	81.1 (80.9, 81.3)	
TOTAL	35520	403012				

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Figure N42 Cumulative Percent Survival of Patients with Non-Revised Primary Total Conventional Hip Replacement and Known Primary 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age, gender and ASA score at procedure

Known Primary 1st Revision Total Conventional Hip
VS Non-Revised Primary Total Conventional Hip

0Mth - 9Mth: HR=4.82 (95% CI: 4.37, 5.30), p<0.0001

9Mth - 2Yrs: HR=2.04 (95% CI: 1.85, 2.26), p<0.0001

2Yrs - 4.5Yr: HR=1.69 (95% CI: 1.58, 1.82), p<0.0001

4.5Yrs+: HR=1.43 (95% CI: 1.34, 1.52), p<0.0001

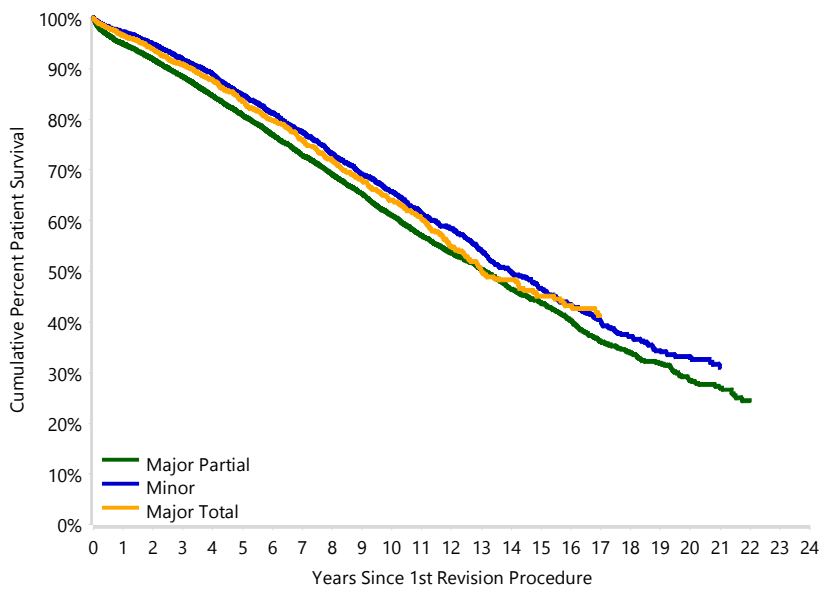
Number at Risk	0 Yr	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Conventional Hip	13315	11439	5933	915	0
Non-Revised Primary Total Conventional Hip	389697	345216	187544	34799	0

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Table N40 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Procedures since 1st Revised by Class of 1st Revision (Excluding 1st Revision for Infection)

Type of 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Major Partial	3826	12092	98.8 (98.6, 99.0)	97.7 (97.4, 97.9)	94.9 (94.5, 95.3)	80.9 (80.1, 81.6)	61.0 (59.9, 62.2)	43.9 (42.3, 45.4)	28.5 (26.2, 30.8)
Minor	1346	4523	99.5 (99.2, 99.6)	98.9 (98.6, 99.2)	97.3 (96.7, 97.7)	84.8 (83.6, 86.0)	65.7 (63.9, 67.5)	46.7 (44.1, 49.2)	32.9 (29.7, 36.2)
Major Total	543	1867	99.4 (98.9, 99.6)	98.8 (98.2, 99.2)	96.5 (95.6, 97.3)	83.5 (81.5, 85.3)	64.0 (61.0, 66.8)	45.0 (40.9, 49.1)	
TOTAL	**5715**	**18482**							

Figure N43 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Procedures since 1st Revised by Class of 1st Revision (Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Major Partial vs Minor

0 - 3Mth: HR=1.88 (95% CI 1.45, 2.45), p<0.001

3Mth - 4Yr: HR=1.20 (95% CI 1.08, 1.33), p<0.001

4Yr+: HR=1.02 (95% CI 0.94, 1.10), p=0.652

Major Partial vs Major Total

0 - 3Mth: HR=1.86 (95% CI 1.42, 2.43), p<0.001

3Mth - 2.5Yr: HR=1.17 (95% CI 1.02, 1.36), p=0.028

2.5Yr+: HR=1.03 (95% CI 0.94, 1.14), p=0.516

Major Total vs Minor

Entire Period: HR=1.02 (95% CI 0.92, 1.12), p=0.769

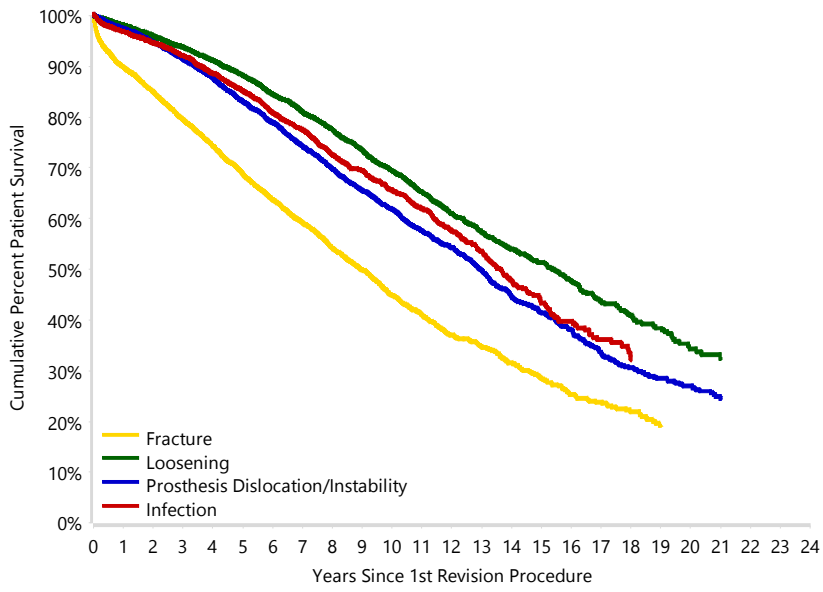
Number at Risk	0 Yr	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Major Partial	12092	11902	11606	10644	6533	2582	785	137
Minor	4523	4479	4396	4115	2651	1142	367	94
Major Total	1867	1847	1813	1675	1039	435	105	10

Table N41 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Replacement since 1st Revised by Reason for 1st Revision

Reason for 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fracture	2170	5303	97.4 (96.9, 97.8)	94.8 (94.2, 95.4)	89.9 (89.0, 90.7)	68.8 (67.4, 70.2)	44.8 (42.9, 46.7)	28.4 (26.0, 30.9)	
Loosening	1413	5177	99.7 (99.6, 99.9)	99.4 (99.1, 99.6)	98.0 (97.6, 98.4)	88.1 (87.1, 89.0)	69.3 (67.6, 70.9)	51.1 (48.8, 53.3)	34.2 (30.5, 37.9)
Prosthesis Dislocation/ Instability	1625	4795	99.7 (99.5, 99.8)	99.3 (99.0, 99.5)	97.2 (96.7, 97.7)	82.9 (81.7, 84.1)	61.6 (59.8, 63.4)	41.2 (38.9, 43.6)	26.8 (24.1, 29.6)
Infection	947	4108	99.4 (99.1, 99.6)	98.4 (97.9, 98.7)	96.6 (95.9, 97.1)	84.9 (83.5, 86.1)	65.3 (63.0, 67.5)	43.0 (39.4, 46.6)	
TOTAL	6155	19383							

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Figure N44 Cumulative Percent Survival of Patients with Known Primary Total Conventional Hip Replacement since 1st Revised by Reason for 1st Revision



HR - adjusted for age and gender

Fracture vs Loosening

0 - 3Mth: HR=5.54 (95% CI 4.22, 7.27), p<0.001

3Mth - 3Yr: HR=1.90 (95% CI 1.70, 2.13), p<0.001

3Yr+: HR=1.41 (95% CI 1.30, 1.52), p<0.001

Prosthesis Dislocation/Instability vs Loosening

Entire Period: HR=1.32 (95% CI 1.23, 1.41), p<0.001

Infection vs Loosening

0 - 3Mth: HR=3.20 (95% CI 2.27, 4.51), p<0.001

3Mth - 7Yr: HR=1.28 (95% CI 1.16, 1.42), p<0.001

7Yr+: HR=1.37 (95% CI 1.21, 1.55), p<0.001

Number at Risk	0 Yr	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fracture	5303	5142	4932	4374	2289	716	169	32
Loosening	5177	5141	5063	4771	3230	1447	453	68
Prosthesis Dislocation/Instability	4795	4762	4684	4348	2752	1159	399	101
Infection	4108	4059	3938	3545	1911	665	140	18

Note: Excludes 1st revisions where no minor or major femoral/acetabular components have been inserted.

Revision Arthroplasty

Revision Total Knee Replacement

The Registry has collected data for 41,026 1st revision total knee replacement (TKR) procedures where the primary diagnosis was osteoarthritis. In the following analysis, there are 10,283 procedures excluded where the 1st revision was undertaken for infection.

There are also 283 procedures excluded where minor or major TKR prostheses were not inserted, and the diagnosis was not infection. This group includes procedures where the prosthesis is removed and not replaced for indications such as patella fracture, patella component breakage or loosening (n=143), procedures where a cement spacer is inserted and the diagnosis is not recorded as infection (n=106), procedures that are cement only (n=10), or procedures where a total femoral replacement is used (n=24). This analysis includes 30,460 1st revision TKR procedures.

DEMOGRAPHICS OF 1ST REVISION

The mean age at 1st revision is 68.7 years. There is some variation in mean age with revision diagnosis, with patients revised for arthrofibrosis being younger (66.1 years) and those revised for fracture being older (74.3 years). 1st revision TKR is more common in females (56.9%) and the highest proportion of patients have an ASA score 2 (45.1%) or 3 (48.9%) and have a BMI in the obese class 1 category (31.5%). Demographic details for 1st revision TKR procedures are shown in Table N42.

Table N42 Summary of 1st Revisions of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Variable	Loosening (n=9,590)	Patella Reasons (n=5,924)	Instability (n=3,755)	Pain (n=2,992)	Arthrofibrosis (n=1,502)	Fracture (n=1,510)	Other (n=5,187)	TOTAL (n=30,460)
Follow-up Years (Primary to 1st Revision)								
Mean ± SD	5.1 ± 4.6	4.6 ± 4.2	4 ± 3.9	4 ± 3.6	2.5 ± 2.5	5.9 ± 5.5	6.1 ± 5.3	4.8 ± 4.5
Median (IQR)	3.4 (1.5, 7.5)	2.9 (1.4, 6.8)	2.4 (1.2, 5.6)	2.5 (1.4, 5.3)	1.6 (0.9, 3.1)	4.3 (0.8, 9.8)	4.5 (1.4, 10)	3 (1.3, 7.2)
Minimum	0	0	0	0	0	0	0	0
Maximum	24.2	22	23.2	20.8	19	21.8	24.1	24.2
Age at 1st Revision								
Mean ± SD	68.3 ± 9.1	69.3 ± 9.3	67.4 ± 9.5	68.5 ± 9	66.1 ± 8.8	74.3 ± 10.2	69 ± 9.2	68.7 ± 9.3
Median (IQR)	69 (62, 75)	70 (63, 76)	68 (61, 74)	69 (62, 75)	67 (60, 72)	75 (68, 82)	69 (63, 76)	69 (62, 75)
Age at 1st Revision in groups								
<55	654 (6.8%)	377 (6.4%)	354 (9.4%)	197 (6.6%)	147 (9.8%)	48 (3.2%)	317 (6.1%)	2,094 (6.9%)
55-64	2,580 (26.9%)	1,372 (23.2%)	1,074 (28.6%)	770 (25.7%)	472 (31.4%)	214 (14.2%)	1,269 (24.5%)	7,751 (25.4%)
65-74	3,840 (40%)	2,369 (40%)	1,427 (38%)	1,212 (40.5%)	627 (41.7%)	480 (31.8%)	2,080 (40.1%)	12,035 (39.5%)
≥75	2,516 (26.2%)	1,806 (30.5%)	900 (24%)	813 (27.2%)	256 (17%)	768 (50.9%)	1,521 (29.3%)	8,580 (28.2%)
Gender								
Male	4,154 (43.3%)	2,593 (43.8%)	1,502 (40%)	1,343 (44.9%)	811 (54%)	351 (23.2%)	2,363 (45.6%)	13,117 (43.1%)
Female	5,436 (56.7%)	3,331 (56.2%)	2,253 (60%)	1,649 (55.1%)	691 (46%)	1,159 (76.8%)	2,824 (54.4%)	17,343 (56.9%)
ASA at 1st Revision[1]								
ASA 1	197 (3.2%)	165 (4.2%)	105 (3.5%)	68 (3.7%)	63 (6%)	12 (1%)	127 (3.5%)	737 (3.5%)
ASA 2	2,771 (44.5%)	1,917 (48.7%)	1,350 (44.8%)	935 (50.4%)	545 (52.1%)	329 (27.4%)	1,567 (43.5%)	9,414 (45.1%)
ASA 3	3,156 (50.7%)	1,810 (46%)	1,486 (49.4%)	827 (44.6%)	428 (40.9%)	707 (58.8%)	1,803 (50.1%)	10,217 (48.9%)
ASA 4	106 (1.7%)	46 (1.2%)	70 (2.3%)	24 (1.3%)	10 (1%)	153 (12.7%)	101 (2.8%)	510 (2.4%)

Variable	Loosening (n=9,590)	Patella Reasons (n=5,924)	Instability (n=3,755)	Pain (n=2,992)	Arthrofibrosis (n=1,502)	Fracture (n=1,510)	Other (n=5,187)	TOTAL (n=30,460)
ASA 5						1 (0.1%)	1 (0%)	2 (0%)
BMI at 1st Revision[2]								
Underweight (<18.5)	12 (0.2%)	4 (0.1%)	6 (0.2%)	1 (0.1%)	5 (0.5%)	6 (0.7%)	8 (0.3%)	42 (0.2%)
Normal (18.5-24.9)	432 (8.3%)	286 (9%)	265 (10%)	141 (9.1%)	121 (13.2%)	163 (17.7%)	299 (10%)	1,707 (9.8%)
Pre Obese (25.0-29.9)	1,461 (27.9%)	946 (29.8%)	751 (28.2%)	439 (28.5%)	297 (32.5%)	247 (26.9%)	914 (30.4%)	5,055 (29%)
Obese Class 1 (30.0-34.9)	1,640 (31.4%)	1,014 (31.9%)	856 (32.2%)	540 (35%)	285 (31.2%)	255 (27.7%)	913 (30.4%)	5,503 (31.5%)
Obese Class 2 (35.0-39.9)	986 (18.8%)	577 (18.2%)	515 (19.4%)	281 (18.2%)	142 (15.5%)	114 (12.4%)	516 (17.2%)	3,131 (17.9%)
Obese Class 3 (≥40.0)	700 (13.4%)	352 (11.1%)	266 (10%)	140 (9.1%)	64 (7%)	134 (14.6%)	354 (11.8%)	2,010 (11.5%)
Fixation at Primary								
Cemented	5,225 (54.5%)	2,858 (48.2%)	2,103 (56%)	1,622 (54.2%)	873 (58.1%)	812 (53.8%)	2,524 (48.7%)	16,017 (52.6%)
Cementless	2,249 (23.5%)	1,656 (28%)	775 (20.6%)	663 (22.2%)	352 (23.4%)	351 (23.2%)	1,575 (30.4%)	7,621 (25%)
Hybrid (Tibial Cemented)	1,935 (20.2%)	1,313 (22.2%)	841 (22.4%)	662 (22.1%)	263 (17.5%)	324 (21.5%)	1,042 (20.1%)	6,380 (20.9%)
Hybrid (Tibial Cementless)	181 (1.9%)	97 (1.6%)	36 (1%)	45 (1.5%)	14 (0.9%)	23 (1.5%)	46 (0.9%)	442 (1.5%)
Femoral Fixation in 1st Revision								
Femoral Cemented	5,363 (55.9%)	37 (0.6%)	1,616 (43%)	561 (18.8%)	612 (40.7%)	962 (63.7%)	2,193 (42.3%)	11,344 (37.2%)
Femoral Cementless	117 (1.2%)		21 (0.6%)	10 (0.3%)	10 (0.7%)	65 (4.3%)	72 (1.4%)	295 (1%)
Femoral Component Not Revised	4,110 (42.9%)	5,887 (99.4%)	2,118 (56.4%)	2,421 (80.9%)	880 (58.6%)	483 (32%)	2,922 (56.3%)	18,821 (61.8%)
Tibial Fixation in 1st Revision								
Tibia Cemented	6,679 (69.6%)	28 (0.5%)	1,429 (38.1%)	593 (19.8%)	551 (36.7%)	1,083 (71.7%)	2,235 (43.1%)	12,598 (41.4%)
Tibia Cementless	169 (1.8%)		31 (0.8%)	14 (0.5%)	13 (0.9%)	35 (2.3%)	64 (1.2%)	326 (1.1%)
Tibial Component Not Revised	2,742 (28.6%)	5,896 (99.5%)	2,295 (61.1%)	2,385 (79.7%)	938 (62.5%)	392 (26%)	2,888 (55.7%)	17,536 (57.6%)
Patella Usage in Primary and 1st Revision								
Patella in Primary / Patella in 1st Revision	1,650 (17.2%)	145 (2.4%)	225 (6%)	428 (14.3%)	184 (12.3%)	119 (7.9%)	969 (18.7%)	3,720 (12.2%)
Patella in Primary / No Patella in 1st Revision	3,854 (40.2%)	15 (0.3%)	2,028 (54%)	517 (17.3%)	717 (47.7%)	764 (50.6%)	2,057 (39.7%)	9,952 (32.7%)
No Patella in Primary / Patella in 1st Revision	2,513 (26.2%)	5,756 (97.2%)	960 (25.6%)	1,945 (65%)	461 (30.7%)	296 (19.6%)	1,321 (25.5%)	13,252 (43.5%)
No Patella in Primary / No Patella in 1st Revision	1,573 (16.4%)	8 (0.1%)	542 (14.4%)	102 (3.4%)	140 (9.3%)	331 (21.9%)	840 (16.2%)	3,536 (11.6%)
Stability of Primary Procedure								
Minimally Stabilised	6,225 (64.9%)	4,346 (73.4%)	2,581 (68.7%)	2,064 (69%)	1,019 (67.8%)	980 (64.9%)	3,624 (69.9%)	20,839 (68.4%)
Posterior Stabilised	3,033 (31.6%)	1,377 (23.2%)	910 (24.2%)	801 (26.8%)	407 (27.1%)	454 (30.1%)	1,378 (26.6%)	8,360 (27.4%)
Medial Pivot Design	264 (2.8%)	185 (3.1%)	234 (6.2%)	114 (3.8%)	73 (4.9%)	40 (2.6%)	135 (2.6%)	1,045 (3.4%)
Fully Stabilised	40 (0.4%)	7 (0.1%)	24 (0.6%)	5 (0.2%)	1 (0.1%)	13 (0.9%)	25 (0.5%)	115 (0.4%)
Hinged	25 (0.3%)	8 (0.1%)	4 (0.1%)	7 (0.2%)	1 (0.1%)	23 (1.5%)	21 (0.4%)	89 (0.3%)

Revision Arthroplasty

Variable	Loosening (n=9,590)	Patella Reasons (n=5,924)	Instability (n=3,755)	Pain (n=2,992)	Arthrofibrosis (n=1,502)	Fracture (n=1,510)	Other (n=5,187)	TOTAL (n=30,460)
Unknown	3 (0%)	1 (0%)	2 (0.1%)	1 (0%)	1 (0.1%)		4 (0.1%)	12 (0%)
Stability of 1st Revision[3]								
Minimally Stabilised	1,901 (25.9%)	16 (34.8%)	106 (6.3%)	161 (24%)	125 (17.7%)	214 (17.7%)	556 (21.9%)	3,079 (21.7%)
Posterior Stabilised	2,644 (36%)	20 (43.5%)	394 (23.4%)	273 (40.6%)	303 (43%)	157 (13%)	891 (35.1%)	4,682 (33%)
Medial Pivot	86 (1.2%)	3 (6.5%)	22 (1.3%)	8 (1.2%)	11 (1.6%)	14 (1.2%)	25 (1%)	169 (1.2%)
Fully Stabilised	2,078 (28.3%)	7 (15.2%)	606 (36%)	192 (28.6%)	191 (27.1%)	106 (8.8%)	761 (30%)	3,941 (27.7%)
Hinged	640 (8.7%)		556 (33%)	38 (5.7%)	75 (10.6%)	720 (59.5%)	305 (12%)	2,334 (16.4%)
Metaphyseal Fixation in 1st Revision4								
No Metaphyseal Fixation	5,806 (77.4%)	44 (95.7%)	1,213 (71.2%)	567 (83%)	568 (79.7%)	829 (66.7%)	1,953 (75.4%)	10,980 (75.8%)
Metaphyseal Fixation	1,699 (22.6%)	2 (4.3%)	490 (28.8%)	116 (17%)	145 (20.3%)	414 (33.3%)	638 (24.6%)	3,504 (24.2%)
Augments in 1st Revision[6]								
Femoral and Tibial	160 (9.3%)	1 (10%)	22 (5.2%)	4 (3%)	6 (5.7%)	6 (4.5%)	60 (8.8%)	259 (8.1%)
Femoral Only	1,231 (71.9%)	8 (80%)	328 (76.8%)	109 (82.6%)	81 (76.4%)	50 (37.9%)	531 (78%)	2,338 (73.1%)
Tibial Only	321 (18.8%)	1 (10%)	77 (18%)	19 (14.4%)	19 (17.9%)	76 (57.6%)	90 (13.2%)	603 (18.8%)
No Augments	5,793 (77.2%)	36 (78.3%)	1,276 (74.9%)	551 (80.7%)	607 (85.1%)	1,111 (89.4%)	1,910 (73.7%)	11,284 (77.9%)
Stem Extensions in 1st Revision[7]								
Femoral and Tibial	3,422 (45.6%)	12 (26.1%)	1,070 (62.8%)	318 (46.6%)	335 (47%)	593 (47.7%)	1,411 (54.5%)	7,161 (49.4%)
Femoral Only	478 (6.4%)	8 (17.4%)	244 (14.3%)	49 (7.2%)	87 (12.2%)	296 (23.8%)	247 (9.5%)	1,409 (9.7%)
Tibial Only	2,062 (27.5%)	10 (21.7%)	132 (7.8%)	132 (19.3%)	89 (12.5%)	276 (22.2%)	403 (15.6%)	3,104 (21.4%)
Location Not Specified	58 (0.8%)		1 (0.1%)	2 (0.3%)	3 (0.4%)	10 (0.8%)	6 (0.2%)	80 (0.6%)
No Stem Extension Used	1,485 (19.8%)	16 (34.8%)	256 (15%)	182 (26.6%)	199 (27.9%)	68 (5.5%)	524 (20.2%)	2,730 (18.8%)

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Abbreviations: SD - standard deviation, IQR - interquartile range, ASA - American Society of Anesthesiologists, BMI - Body Mass Index (kg/m^2).

1. Excludes 9,580 procedures with unknown ASA at 1st Revision
2. Excludes 13,012 procedures with unknown BMI at 1st Revision
3. Stability of 1st revision only presented for major partial (incl. reinsertion of components) and major total 1st revision procedures.
4. Excludes 16,255 procedures with unknown Stability of 1st Revision
5. Metaphyseal fixation in 1st revision only presented for major partial (incl. reinsertion of components) and major total 1st revision procedures. (A metaphyseal fixation is defined as an attachment to a major component (and often the stem) that is designed to substitute for a central metaphyseal bone defect and aid fixation of the major component).
6. Excludes 15,976 procedures with unknown Metaphyseal Fixation in 1st Revision
7. Augments in 1st revision only presented when augments have been used in major partial (incl. reinsertion of components) and major total 1st revision procedures. (An augment is defined as an attachment to the non-articular surface of a major component that is used to substitute for bone deficiency at the articular surface level).
8. Excludes 15,976 procedures with unknown Augments in 1st Revision
9. Stem extension in 1st revision only presented for major partial (incl. reinsertion of components) and major total 1st revision procedures. (A stem extension is defined as an attachment to the major component used to aid fixation that is at least 15mm in length)
10. Excludes 15,976 procedures with unknown Stem Extension in 1st Revision

OUTCOME OF 1ST REVISION

Of the 30,460 1st revision procedures, 4,825 have had a 2nd revision. The cumulative percent 2nd revision at 20 years is 25.6% (Table N43 and Figure N45).

The most common reasons for 2nd revision are loosening (31.9%), infection (25.8%), instability (12.5%) and pain (6.7%) (Table N44 and Figure N46).

Loosening is the most common reason for 1st and 2nd revision.

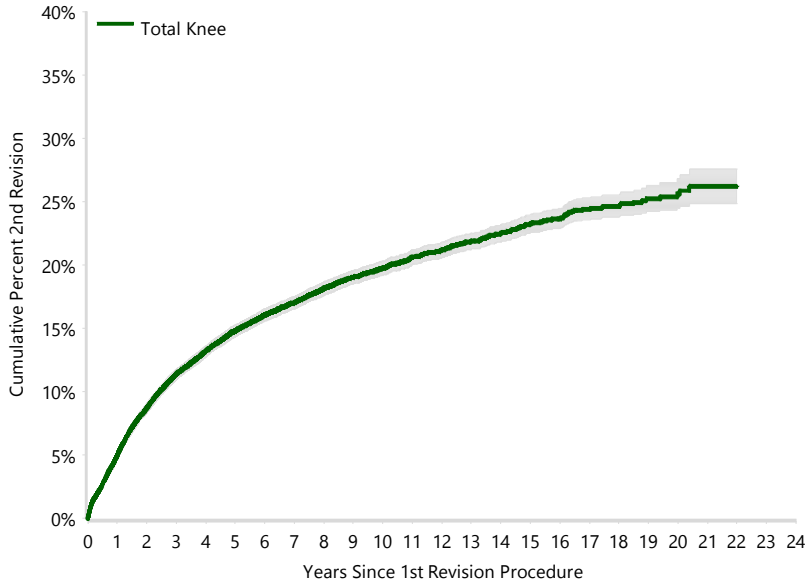
Revision of both the tibial and femoral components is the most common 2nd revision procedure (44.4%), followed by insert only (22.4%), femoral component only (8.2%), patella only (7.2%), cement spacer (6.5%), and tibial component only (6.3%) (Table N45).

Table N43 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Revision of Primary	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	4825	30460	5.0 (4.8, 5.3)	11.4 (11.0, 11.8)	14.8 (14.4, 15.2)	19.8 (19.2, 20.3)	23.3 (22.5, 24.0)	25.6 (24.5, 26.8)
TOTAL	4825	30460						

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N45 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	30460	26737	21021	16420	7323	2146	316

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N44 **2nd Revision Diagnosis of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

2nd Revision Diagnosis	Number	Percent
Loosening	1537	31.9
Infection	1243	25.8
Instability	604	12.5
Pain	321	6.7
Arthrofibrosis	213	4.4
Malalignment	153	3.2
Fracture	114	2.4
Lysis	88	1.8
Wear Tibial Insert	69	1.4
Patellofemoral Pain	58	1.2
Metal Related Pathology	51	1.1
Patella Maltracking	42	0.9
Patella Erosion	42	0.9
Prosthesis Dislocation	38	0.8
Incorrect Sizing	38	0.8
Bearing Dislocation	38	0.8
Other	176	3.6
TOTAL	4825	100.0

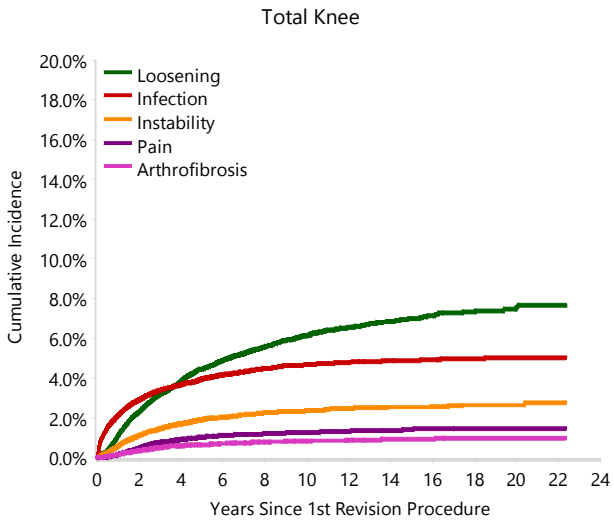
Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N45 **Type of 2nd Revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

Type of 2nd Revision	Number	Percent
TKR (Tibial/Femoral)	2144	44.4
Insert Only	1082	22.4
Femoral Component	394	8.2
Patella Only	346	7.2
Cement Spacer	316	6.5
Tibial Component	306	6.3
Insert/Patella	157	3.3
Removal of Prostheses	44	0.9
Minor Components	22	0.5
Total Femoral	9	0.2
Cement Only	4	0.1
Reinsertion of Components	1	0.0
TOTAL	4825	100.0

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N46 **Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Knee Replacement (Primary Diagnosis OA, Excluding 1st Revision for Infection)**



OUTCOME OF 1ST REVISION BY PATIENT CHARACTERISTICS

The outcome of the 1st revision varies by age and gender. Males aged <65 years have a higher rate of 2nd revision than females aged <65 years, at all time points, and males aged ≥65 years, except for the periods <3 months and from 6 to 7 years.

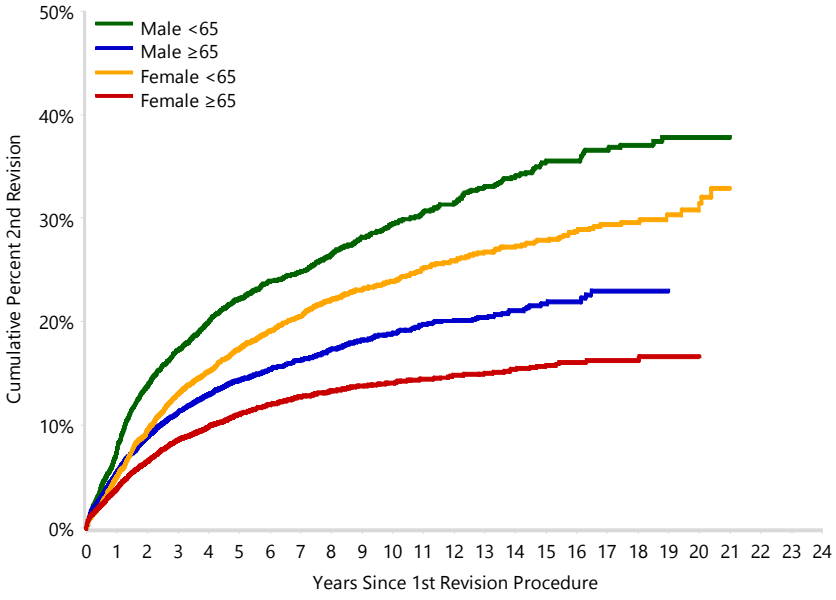
Females aged <65 years have a lower rate of revision than females aged ≥65 years for the first 2 weeks only, and after 1 month, there is a higher rate of revision. Males aged ≥65 years have a higher rate of revision than females aged ≥65 years (Table N46 and Figure N47).

Table N46 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Gender	Age at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<65	1112	4332	7.5 (6.8, 8.4)	17.2 (16.1, 18.4)	22.2 (20.9, 23.6)	29.5 (27.9, 31.1)	35.5 (33.5, 37.6)	37.8 (35.4, 40.3)
	≥65	1258	8785	5.4 (4.9, 5.9)	11.2 (10.5, 11.9)	14.3 (13.5, 15.1)	18.8 (17.8, 19.9)	21.7 (20.3, 23.2)	
Female	<65	1150	5513	4.9 (4.4, 5.5)	13.0 (12.1, 13.9)	17.4 (16.3, 18.5)	23.9 (22.6, 25.2)	27.8 (26.3, 29.4)	31.4 (28.9, 34.0)
	≥65	1305	11830	3.8 (3.5, 4.2)	8.5 (8.0, 9.1)	11.0 (10.4, 11.6)	14.0 (13.3, 14.8)	15.7 (14.8, 16.8)	16.6 (15.3, 18.0)
TOTAL		4825	30460						

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N47 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Male <65 vs Male ≥65
- 0 - 3Mth: HR=1.12 (95% CI 0.89, 1.41), p=0.331
- 3Mth - 1.5Yr: HR=1.80 (95% CI 1.59, 2.05), p<0.001
- 1.5Yr - 2Yr: HR=1.50 (95% CI 1.17, 1.92), p=0.001
- 2Yr - 2.5Yr: HR=1.55 (95% CI 1.20, 2.00), p<0.001
- 2.5Yr - 3.5Yr: HR=1.50 (95% CI 1.19, 1.88), p<0.001
- 3.5Yr - 4Yr: HR=2.05 (95% CI 1.49, 2.82), p<0.001
- 4Yr - 6Yr: HR=1.63 (95% CI 1.32, 2.01), p<0.001
- 6Yr - 7Yr: HR=1.04 (95% CI 0.67, 1.62), p=0.850
- 7Yr - 7.5Yr: HR=1.96 (95% CI 1.20, 3.20), p=0.007
- 7.5Yr+: HR=2.42 (95% CI 1.98, 2.96), p<0.001

Male <65 vs Female <65
- 0 - 1.5Yr: HR=1.55 (95% CI 1.36, 1.76), p<0.001
- 1.5Yr+: HR=1.17 (95% CI 1.05, 1.30), p=0.003

Male ≥65 vs Female ≥65
- Entire Period: HR=1.37 (95% CI 1.26, 1.48), p<0.001

Female <65 vs Female ≥65
- 0 - 2Wk: HR=0.49 (95% CI 0.32, 0.74), p<0.001
- 2Wk - 1Mth: HR=0.80 (95% CI 0.56, 1.15), p=0.230
- 1Mth - 6Mth: HR=1.45 (95% CI 1.18, 1.77), p<0.001
- 6Mth - 1Yr: HR=1.50 (95% CI 1.24, 1.83), p<0.001
- 1Yr - 2Yr: HR=1.85 (95% CI 1.59, 2.15), p<0.001
- 2Yr - 2.5Yr: HR=1.61 (95% CI 1.28, 2.02), p<0.001
- 2.5Yr - 4Yr: HR=1.86 (95% CI 1.56, 2.21), p<0.001
- 4Yr - 4.5Yr: HR=2.43 (95% CI 1.69, 3.51), p<0.001
- 4.5Yr - 7Yr: HR=1.66 (95% CI 1.37, 2.01), p<0.001
- 7Yr+: HR=3.12 (95% CI 2.48, 3.92), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<65	4332	3768	2975	2405	1202	445	94
	≥65	8785	7600	5773	4318	1653	371	34
Female	<65	5513	4967	4024	3289	1793	634	106
	≥65	11830	10402	8249	6408	2675	696	82

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

ASA SCORE AND BMI CATEGORY

ASA score is available for 20,878 1st revision TKR procedures. Patients with an ASA score of 3 have a higher rate of revision compared to patients with an ASA score of 1 in the first 6 months only, but there is no difference between patients with other ASA scores (Table N47and Figure N48).

The number of patients with an ASA score of 1 is small (n=737), as is the number with an ASA score of 4 (n=510). The incidence of 2nd revision for loosening is higher for patients with an ASA score of 1. As ASA score increases, the incidence of 2nd revision for early infection increases (Figure N49).

BMI is recorded for 17,448 1st revision procedures. Patients in obese class 3 have a higher rate of 2nd revision compared to patients with a normal BMI, in the first 6 months only (Table N48 and Figure N50).

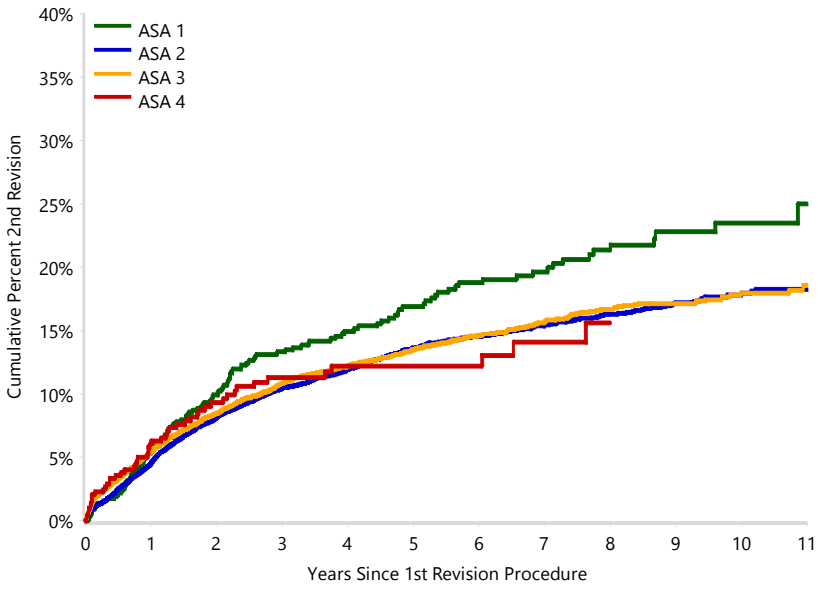
The incidence of 2nd revision for infection increases with increasing BMI (Figure N51).

Table N47 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA, Excluding 1st Revision for Infection)

ASA Score at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	11 Yrs
ASA 1	129	737	5.3 (3.9, 7.3)	13.3 (11.0, 16.1)	16.9 (14.2, 20.1)	23.5 (19.7, 27.8)	25.0 (20.5, 30.3)
ASA 2	1210	9414	4.6 (4.1, 5.0)	10.4 (9.8, 11.1)	13.6 (12.9, 14.4)	17.8 (16.8, 18.9)	18.2 (17.1, 19.4)
ASA 3	1222	10217	5.4 (5.0, 5.9)	10.8 (10.2, 11.5)	13.5 (12.7, 14.3)	17.9 (16.8, 19.1)	18.6 (17.2, 20.1)
ASA 4	50	510	6.0 (4.2, 8.7)	11.3 (8.5, 14.9)	12.2 (9.2, 16.0)		
TOTAL	2611	20878					

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 9,580 procedures with no ASA score, and 2 procedures with an ASA score of 5 at 1st revision.

Figure N48 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

ASA 2 vs ASA 1

Entire Period: HR=0.92 (95% CI 0.77, 1.11), p=0.398

ASA 3 vs ASA 1

0 - 6Mth: HR=1.39 (95% CI 1.10, 1.75), p=0.006

6Mth - 2.5Yr: HR=0.95 (95% CI 0.77, 1.16), p=0.593

2.5Yr+: HR=0.97 (95% CI 0.78, 1.20), p=0.770

ASA 4 vs ASA 1

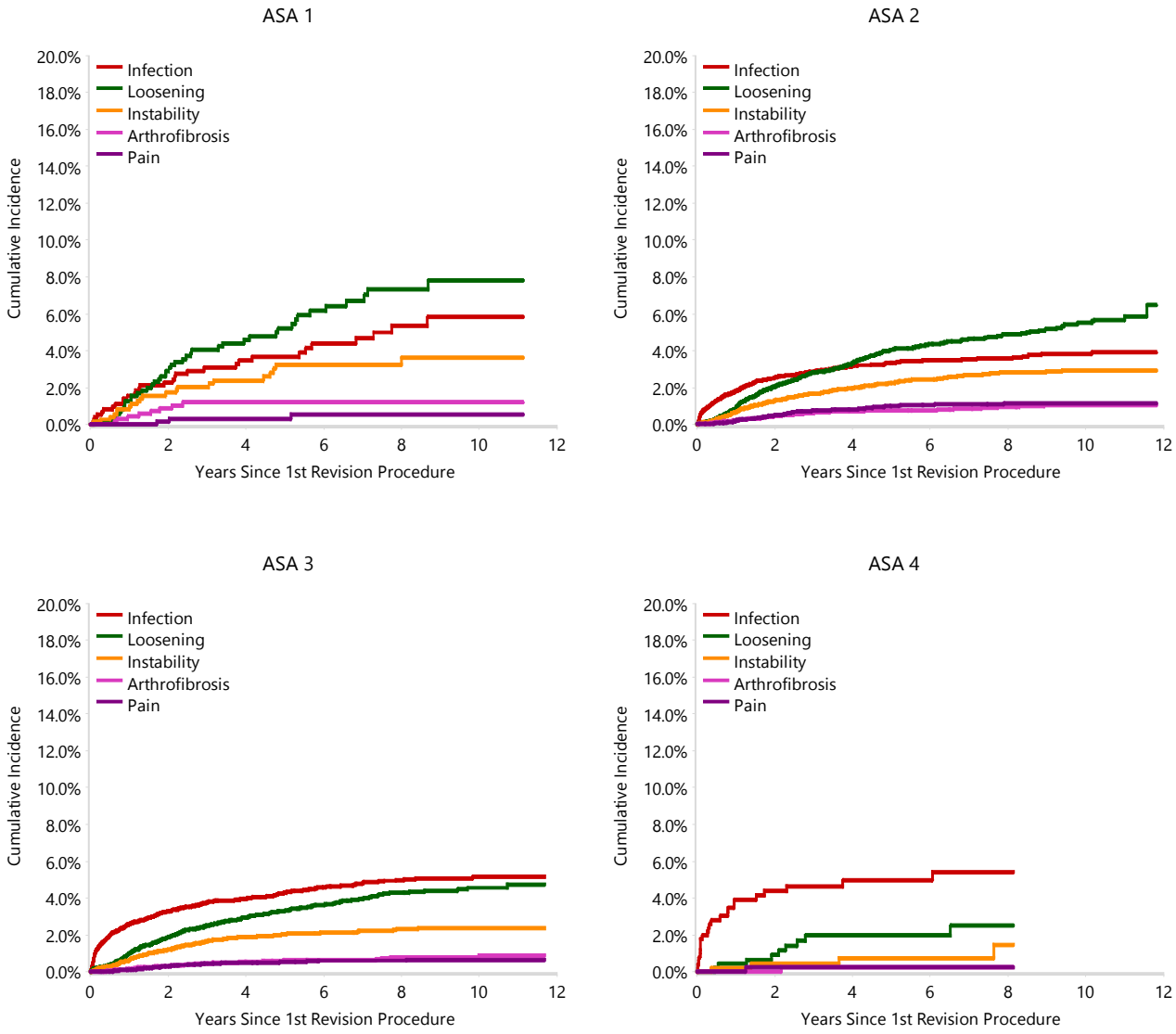
0 - 2.5Yr: HR=1.38 (95% CI 0.97, 1.96), p=0.071

2.5Yr+: HR=0.61 (95% CI 0.28, 1.30), p=0.199

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	11 Yrs
ASA 1	737	662	496	367	89	48
ASA 2	9414	8183	6229	4541	891	356
ASA 3	10217	8494	5960	3981	597	196
ASA 4	510	374	229	142	13	4

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 9,580 procedures with no ASA score, and 2 procedures with an ASA score of 5 at 1st revision.

Figure N49 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Knee Replacement by ASA Score at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



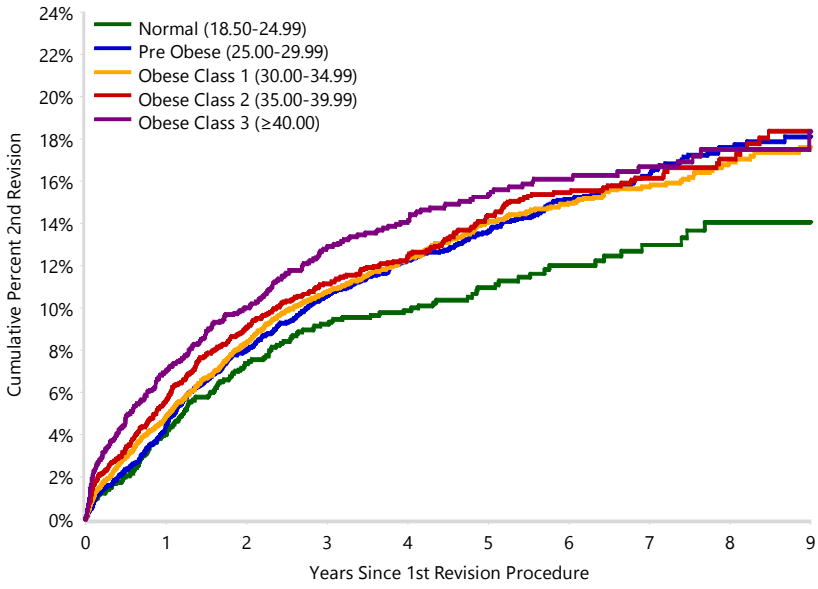
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 9,580 procedures with no ASA score, and 2 procedures with an ASA score of 5 at 1st revision.

Table N48 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by BMI Category at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

BMI Category at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	11 Yrs
Underweight	3	42	8.4 (2.8, 23.9)	8.4 (2.8, 23.9)	8.4 (2.8, 23.9)		
Normal	159	1707	4.0 (3.2, 5.1)	9.2 (7.8, 10.9)	11.0 (9.3, 12.8)		
Pre Obese	600	5055	4.4 (3.9, 5.0)	10.6 (9.7, 11.5)	13.6 (12.5, 14.8)		
Obese Class 1	651	5503	4.9 (4.3, 5.5)	10.8 (9.9, 11.7)	14.1 (13.0, 15.2)		
Obese Class 2	387	3131	5.6 (4.8, 6.5)	11.1 (10.0, 12.4)	14.4 (13.0, 15.9)		
Obese Class 3	265	2010	7.0 (6.0, 8.3)	12.9 (11.4, 14.6)	15.4 (13.7, 17.3)		
TOTAL	2065	17448					

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 13,012 procedures with no BMI data at 1st revision.
BMI has not been presented for patients aged ≤19 years.

Figure N50 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by BMI Category at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=1.14 (95% CI 0.96, 1.36), p=0.145

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
Entire Period: HR=1.10 (95% CI 0.93, 1.31), p=0.272

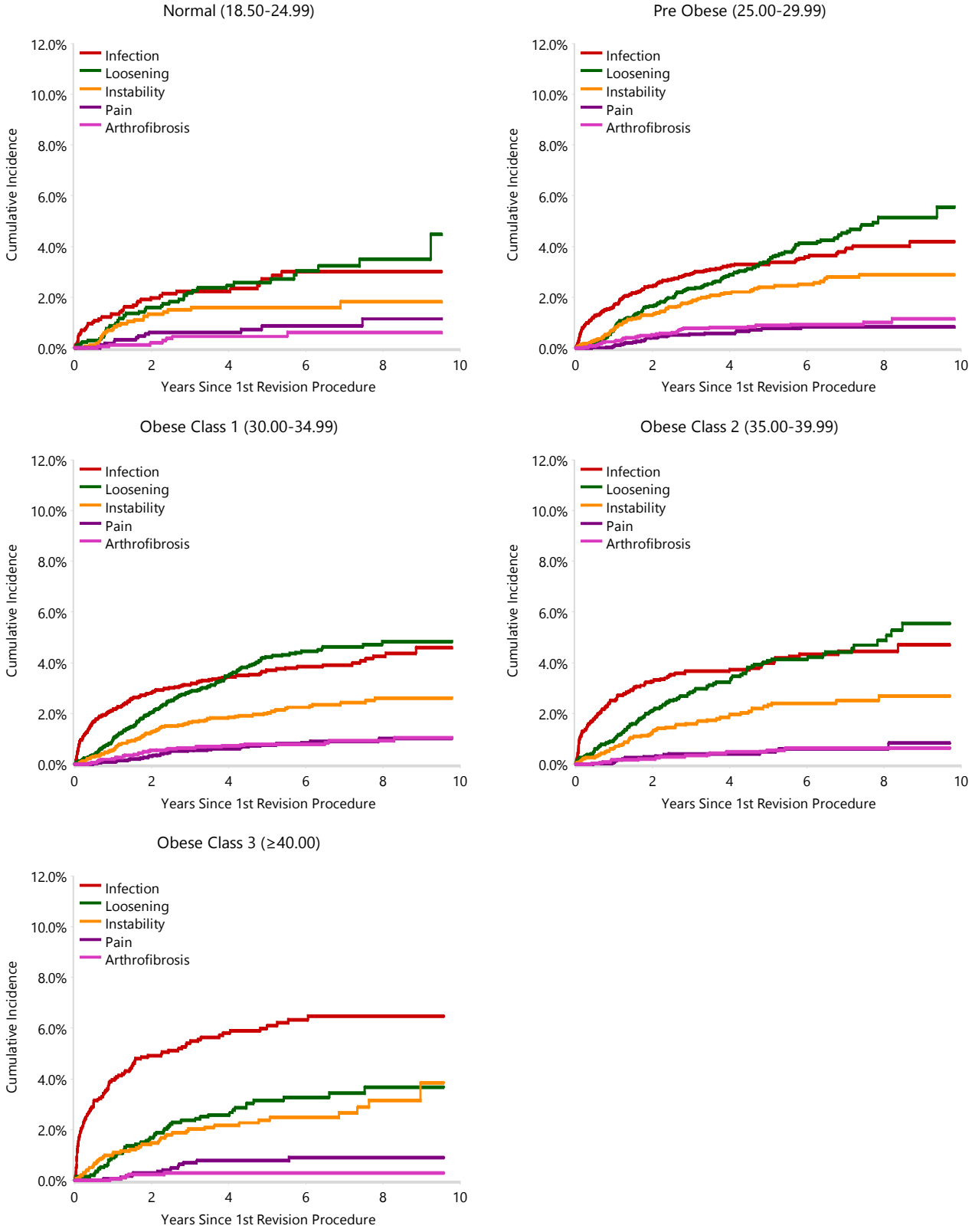
Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
Entire Period: HR=1.14 (95% CI 0.94, 1.37), p=0.180

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
0 - 6Mth: HR=1.88 (95% CI 1.43, 2.46), p<0.001
6Mth+: HR=1.02 (95% CI 0.82, 1.27), p=0.847

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs
Normal	1707	1416	1143	930	760	576	434	307	182	94	1	0
Pre Obese	5055	4274	3539	2955	2404	1903	1405	999	611	265	6	1
Obese Class 1	5503	4590	3845	3232	2612	2073	1523	1035	610	292	2	0
Obese Class 2	3131	2606	2169	1806	1492	1194	882	602	367	170	0	0
Obese Class 3	2010	1637	1370	1153	924	747	555	378	231	96	1	0

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 13,012 procedures with no BMI data at 1st revision.
BMI has not been presented for patients aged ≤19 years.

Figure N51 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Knee Replacement by BMI Category at 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.
Excludes 13,012 procedures with no BMI data at 1st revision.
BMI has not been presented for patients aged ≤19 years.

CHANGES IN REVISION KNEE SURGERY OVER TIME

Since 2003, the annual number of 1st revision knee replacement procedures has increased more than 6 times. In 2003, there were 334 aseptic 1st revision procedures, while in 2024, there were 2,034 recorded (Figure N52).

The yearly proportion of the 3 classes of 1st revision (minor, major partial and major total) is shown in Figure N53. There has been an increase in major total revisions and a decrease in major partial revisions.

With regard to the reason for 1st revision, there has been a decrease in proportion of 1st revisions for loosening (Figure N54).

Over time, there has been an increase in the proportions of fully stabilised and hinge prostheses used for 1st revision, and a decrease in minimally stabilised with time (Figure N55).

When the femoral component is revised, the fixation used for the 1st revision procedure is shown in Figure N56. Over 90% of 1st revision procedures use cemented femoral fixation, and this has slightly increased with time.

The proportion of tibial components using cemented fixation when revised remains comparable, with a slight increase (Figure N57).

Over time, there has been a decrease in use of non XLPE for the 1st revision and an increase in use of XLPE and, more recently, XLPE with antioxidant (Figure N58).

Reflecting the increased use of patella components in primary procedures over time, there have been an increase in 1st revision procedures where the patella component was used in the primary and no patella component was needed in the revision. Correspondingly, there has been a decrease in proportion of 1st revisions where the patella was initially unresurfaced and left further unresurfaced at revision (Figure N59).

While the use of stem extensions in the 1st revision is more common for tibial than for femoral components, the use of these for both components is the most common practice and has increased with time (Figure N60).

Figure N52 Known Primary Total Knee Replacement by 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

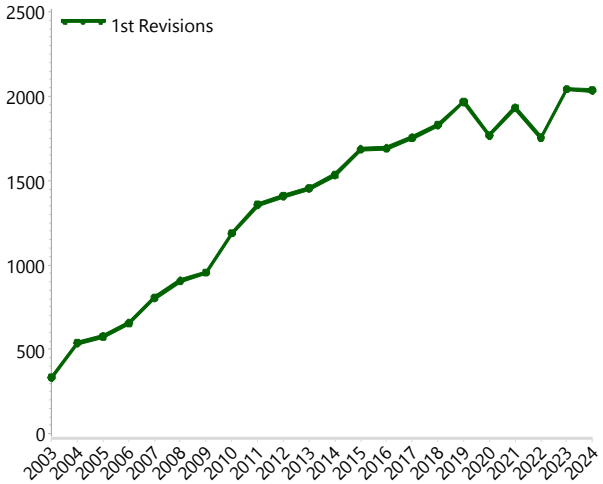


Figure N53 Known Primary Total Knee Replacement by 1st Revision Class (Primary Diagnosis OA, Excluding 1st Revision for Infection)

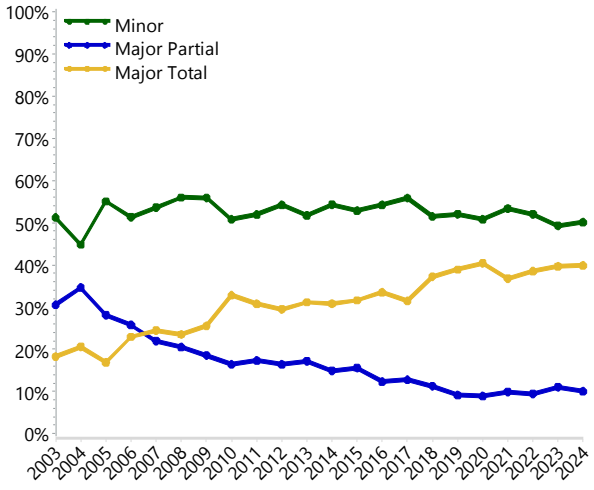


Figure N54 **Known Primary Total Knee Replacement by 1st Revision Diagnoses (Primary Diagnosis OA, Excluding 1st Revision for Infection, Restricted to Top Six 1st Revision Diagnoses)**

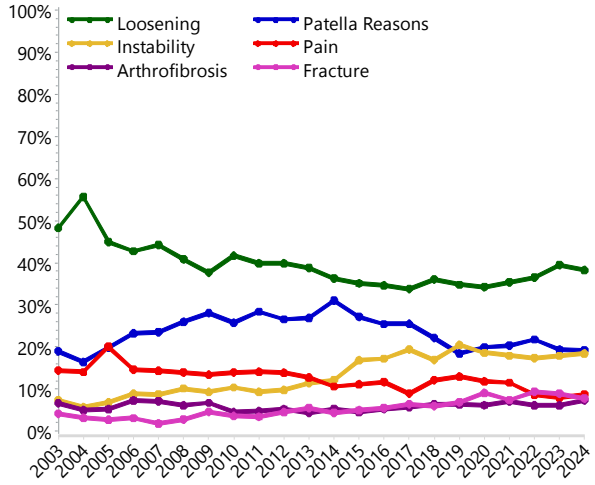


Figure N55 **Known Primary Total Knee Replacement by Stability of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

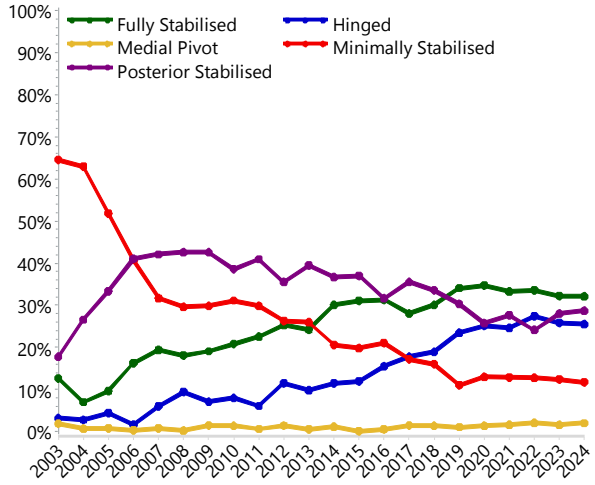


Figure N56 **Known Primary Total Knee Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

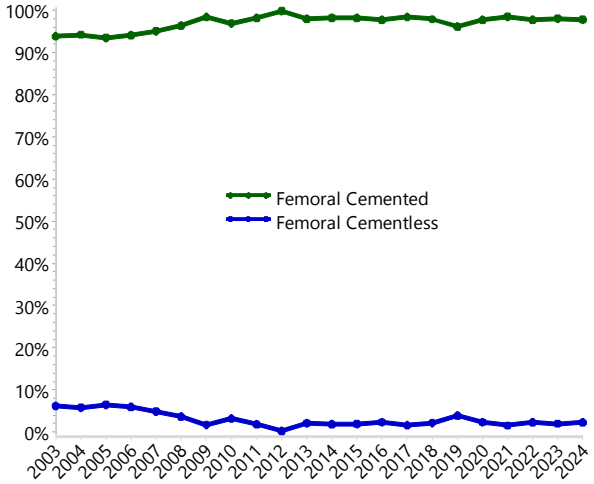


Figure N57 **Known Primary 1st Revision Total Knee Replacement by Tibial Fixation of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

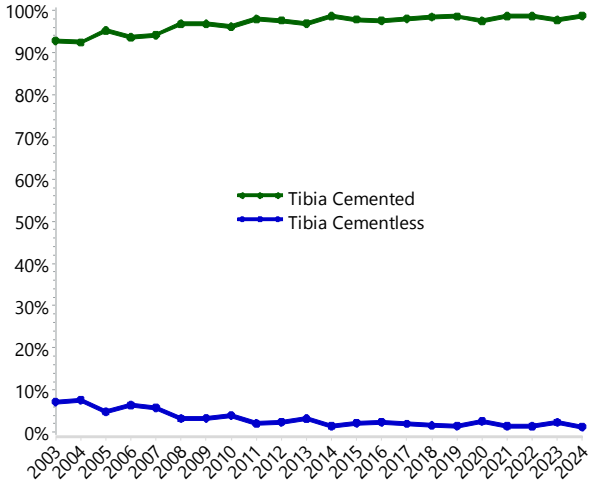


Figure N58 **Known Primary Total Knee Replacement by Polyethylene Type in 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

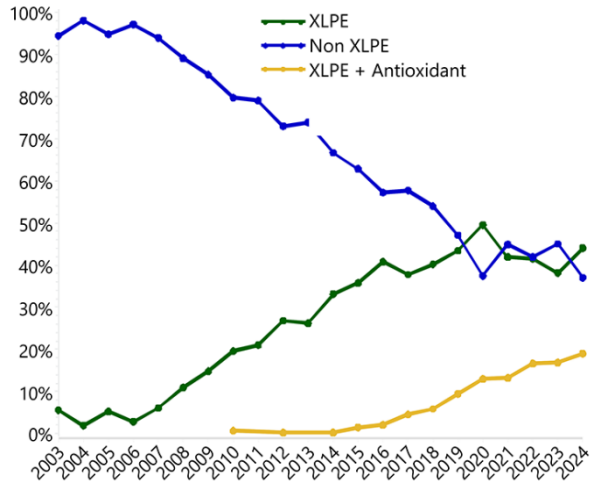


Figure N59 **Known Primary Total Knee Replacement by Patella Usage in Primary/1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**

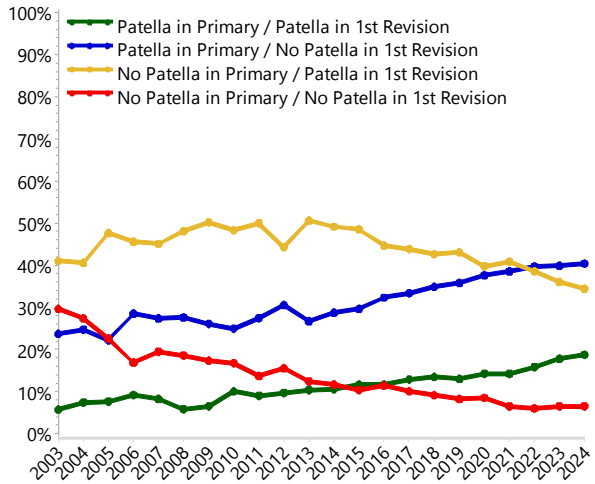
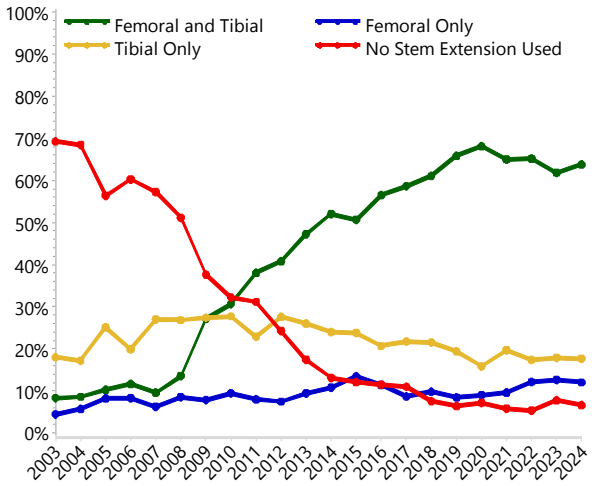


Figure N60 **Known Primary Total Knee Replacement by Stem Extension in 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)**



OUTCOME OF 1ST REVISION BY CLASS OF REVISION

Minor revisions are the most common class of 1st revision procedure (52.4%), with major total revisions second most common (33.1%) and then major partial revisions (14.4%). The outcome by class of the 1st revision is listed in Table N49.

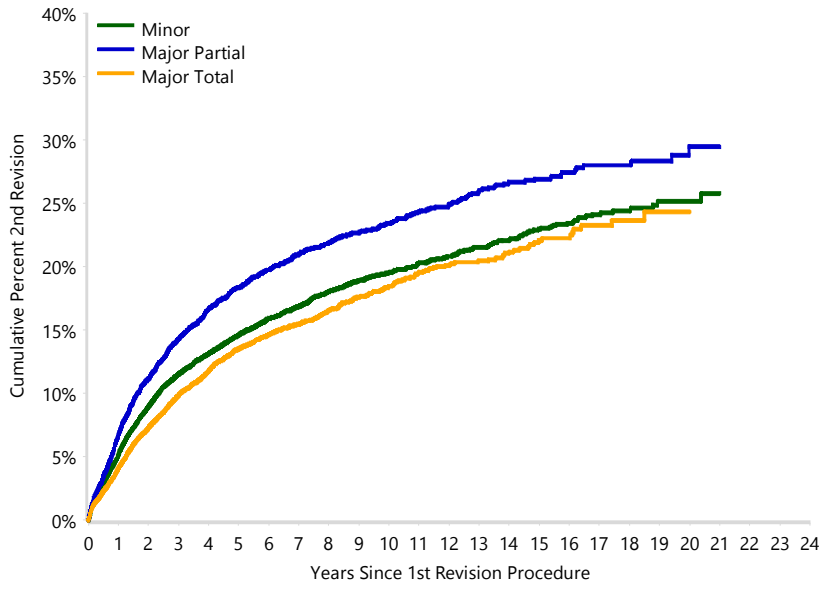
Major total revisions have a lower rate of 2nd revision compared to major partial revisions, and also compared to minor revisions, but only until 2.5 years, after which time there is no longer a difference. Minor revisions have a lower rate of 2nd revision compared to major partial revisions (Table N49 and Figure N61).

Table N49 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Class of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	2543	15976	5.1 (4.8, 5.5)	11.5 (11.0, 12.0)	14.6 (14.0, 15.2)	19.5 (18.8, 20.3)	23.0 (22.0, 24.0)	25.2 (23.7, 26.7)
Major Partial	916	4399	6.7 (6.0, 7.5)	14.3 (13.3, 15.4)	18.4 (17.2, 19.6)	23.4 (22.0, 24.8)	26.9 (25.3, 28.7)	29.5 (27.0, 32.0)
Major Total	1366	10085	4.1 (3.7, 4.5)	9.8 (9.2, 10.5)	13.5 (12.8, 14.3)	18.5 (17.5, 19.5)	22.1 (20.7, 23.6)	24.3 (22.1, 26.8)
TOTAL	4825	30460						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N61 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Minor vs Major Total

0 - 2.5Yr: HR=1.19 (95% CI 1.10, 1.30), p<0.001

2.5Yr+: HR=0.91 (95% CI 0.83, 1.01), p=0.076

Major Partial vs Minor

Entire Period: HR=1.21 (95% CI 1.12, 1.30), p<0.001

Major Partial vs Major Total

0 - 1Yr: HR=1.54 (95% CI 1.34, 1.77), p<0.001

1Yr - 1.5Yr: HR=1.42 (95% CI 1.15, 1.76), p=0.001

1.5Yr+: HR=1.14 (95% CI 1.03, 1.28), p=0.014

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	15976	14113	11196	8803	3942	1175	151
Major Partial	4399	3881	3155	2634	1437	508	110
Major Total	10085	8743	6670	4983	1944	463	55

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

OUTCOME OF 1ST REVISION BY REASON FOR 1ST REVISION

As the risk of 2nd revision varies depending on the reason for the 1st revision, more detailed analyses have been carried out for the 1st revision diagnoses of loosening, patella reasons, instability, pain, arthrofibrosis and fracture. 'Patella reasons' include patella erosion, patellofemoral pain and patella maltracking.

The lowest 15 year cumulative percent 2nd revision is 18.9% when the 1st revision was performed for patella reasons, and the highest is 29.3% for arthrofibrosis (Table N50 and Figure N62).

Loosening, infection, and a recurrence of the 1st revision diagnosis are the most common reasons for 2nd revision (apart from patella reasons).

When compared to the 1st revision for loosening, 1st revision for patella reasons, and 1st revision for pain have a lower rate of 2nd revision, as does the 1st revision for instability, but only after 1.5 years. 1st revision for instability and for fracture both have an initial higher rate of revision compared to 1st revision for loosening, but only for the first 1.5 years and 6 months, respectively. For each reason (apart from patella reasons) for 1st revision, loosening, infection, and a recurrence of the original revision diagnosis are the most common reasons for 2nd revision (Table N51).

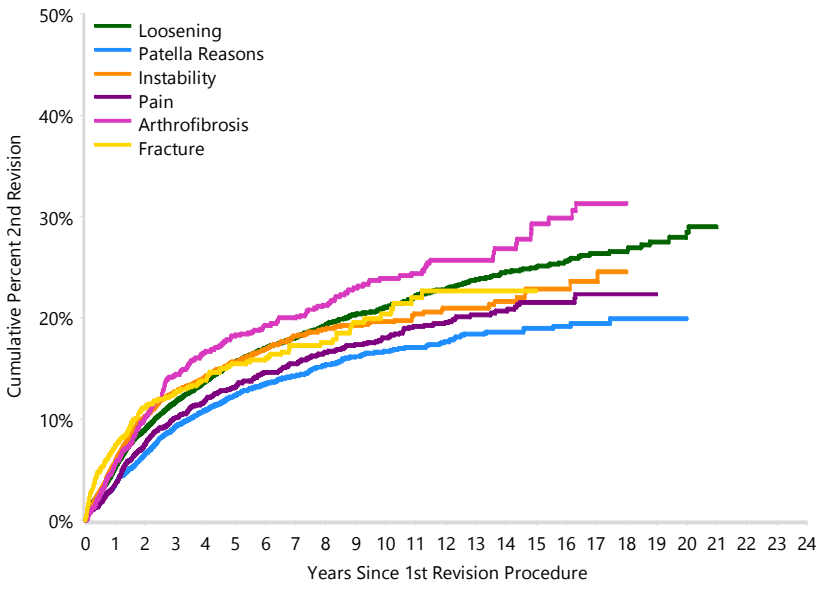
The most common type of 2nd revision procedure is revision of both tibial and femoral components (44.4%), insert only (22.4%), femoral component only (8.2%), patella only (7.2%), and cement spacer (6.5%) (Table N52).

Table N50 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Reason for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Reason for 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Loosening	1653	9590	5.2 (4.7, 5.6)	11.7 (11.0, 12.4)	15.6 (14.9, 16.4)	21.1 (20.1, 22.1)	25.0 (23.8, 26.3)	28.4 (26.3, 30.7)
Patella Reasons	809	5924	3.5 (3.1, 4.0)	9.2 (8.5, 10.0)	12.3 (11.5, 13.3)	16.7 (15.6, 17.9)	18.9 (17.6, 20.4)	19.9 (18.2, 21.8)
Instability	579	3755	5.9 (5.2, 6.7)	12.7 (11.6, 13.8)	15.6 (14.4, 17.0)	19.6 (18.1, 21.2)	22.9 (20.6, 25.4)	
Pain	457	2992	3.6 (3.0, 4.3)	10.1 (9.1, 11.3)	13.2 (11.9, 14.5)	18.0 (16.5, 19.7)	21.5 (19.5, 23.7)	
Arthrofibrosis	289	1502	5.6 (4.6, 7.0)	14.4 (12.6, 16.4)	18.3 (16.2, 20.5)	23.9 (21.4, 26.7)	29.3 (25.8, 33.2)	
Fracture	209	1510	7.4 (6.2, 8.9)	12.5 (10.8, 14.4)	15.5 (13.5, 17.7)	20.4 (17.5, 23.6)	22.7 (19.2, 26.6)	
TOTAL	3996	25273						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N62 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Reason for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Patella Reasons vs Loosening

Entire Period: HR=0.78 (95% CI 0.72, 0.85), p<0.001

Instability vs Loosening

0 - 1.5Yr: HR=1.14 (95% CI 1.00, 1.30), p=0.043

1.5Yr+: HR=0.81 (95% CI 0.71, 0.93), p=0.001

Pain vs Loosening

Entire Period: HR=0.84 (95% CI 0.76, 0.93), p<0.001

Arthrofibrosis vs Loosening

Entire Period: HR=1.05 (95% CI 0.93, 1.19), p=0.419

Fracture vs Loosening

0 - 6Mth: HR=2.55 (95% CI 1.99, 3.27), p<0.001

6Mth - 1.5Yr: HR=1.18 (95% CI 0.90, 1.56), p=0.233

1.5Yr+: HR=0.92 (95% CI 0.74, 1.15), p=0.464

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Loosening	9590	8443	6664	5272	2497	807	138
Patella Reasons	5924	5390	4401	3554	1638	433	47
Instability	3755	3228	2460	1825	601	158	20
Pain	2992	2726	2270	1808	866	284	35
Arthrofibrosis	1502	1297	999	772	365	138	18
Fracture	1510	1190	795	531	168	41	7

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N51 2nd Revision Diagnosis of Known Primary Total Knee Replacement by Reason for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	Loosening		Patella Reasons		Instability		Pain		Arthrofibrosis		Fracture		Other		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
Loosening	641	38.8	247	30.5	140	24.2	142	31.1	64	22.1	51	24.4	252	30.4	1537	31.9
Infection	478	28.9	184	22.7	132	22.8	97	21.2	61	21.1	76	36.4	215	25.9	1243	25.8
Instability	167	10.1	97	12.0	163	28.2	58	12.7	13	4.5	14	6.7	92	11.1	604	12.5
Pain	78	4.7	91	11.2	27	4.7	70	15.3	17	5.9	2	1.0	36	4.3	321	6.7
Arthrofibrosis	40	2.4	34	4.2	10	1.7	13	2.8	87	30.1	.	.	29	3.5	213	4.4
Malalignment	33	2.0	41	5.1	21	3.6	17	3.7	15	5.2	2	1.0	24	2.9	153	3.2
Fracture	27	1.6	13	1.6	16	2.8	8	1.8	5	1.7	30	14.4	15	1.8	114	2.4
Lysis	25	1.5	17	2.1	5	0.9	6	1.3	6	2.1	1	0.5	28	3.4	88	1.8
Wear Tibial Insert	15	0.9	23	2.8	3	0.5	6	1.3	3	1.0	1	0.5	18	2.2	69	1.4
Patellofemoral Pain	27	1.6	.	.	9	1.6	6	1.3	2	0.7	1	0.5	13	1.6	58	1.2
Metal Related Pathology	13	0.8	12	1.5	4	0.7	3	0.7	3	1.0	2	1.0	14	1.7	51	1.1
Patella Maltracking	8	0.5	7	0.9	8	1.4	8	1.8	1	0.3	2	1.0	8	1.0	42	0.9
Patella Erosion	22	1.3	.	.	7	1.2	.	.	3	1.0	5	2.4	5	0.6	42	0.9
Prosthesis Dislocation	9	0.5	3	0.4	8	1.4	.	.	.	.	.	.	18	2.2	38	0.8
Incorrect Sizing	9	0.5	11	1.4	.	.	4	0.9	1	0.3	2	1.0	11	1.3	38	0.8
Bearing Dislocation	18	1.1	.	.	1	0.2	1	0.2	1	0.3	5	2.4	12	1.4	38	0.8
Other	43	2.6	29	3.6	25	4.3	18	3.9	7	2.4	15	7.2	39	4.7	176	3.6
TOTAL	1653	100.0	809	100.0	579	100.0	457	100.0	289	100.0	209	100.0	829	100.0	4825	100.0

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N52 Type of 2nd Revision of Known Primary Total Knee Replacement by Reason for 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Type of 2nd Revision	Loosening		Patella Reasons		Instability		Pain		Arthrofibrosis		Fracture		Other		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
TKR (Tibial/Femoral)	679	41.1	385	47.6	280	48.4	227	49.7	144	49.8	45	21.5	384	46.3	2144	44.4
Insert Only	359	21.7	191	23.6	124	21.4	86	18.8	54	18.7	60	28.7	208	25.1	1082	22.4
Femoral Component	142	8.6	54	6.7	42	7.3	33	7.2	22	7.6	47	22.5	54	6.5	394	8.2
Patella Only	123	7.4	64	7.9	47	8.1	41	9.0	7	2.4	17	8.1	47	5.7	346	7.2
Cement Spacer	130	7.9	38	4.7	31	5.4	30	6.6	23	8.0	12	5.7	52	6.3	316	6.5
Tibial Component	140	8.5	42	5.2	22	3.8	23	5.0	21	7.3	11	5.3	47	5.7	306	6.3
Insert/Patella	50	3.0	30	3.7	25	4.3	14	3.1	11	3.8	4	1.9	23	2.8	157	3.3
Removal of Prostheses	18	1.1	4	0.5	5	0.9	3	0.7	5	1.7	2	1.0	7	0.8	44	0.9
Minor Components	7	0.4	.	.	3	0.5	.	.	1	0.3	5	2.4	6	0.7	22	0.5
Total Femoral	2	0.1	.	.	.	.	.	.	.	.	6	2.9	1	0.1	9	0.2
Cement Only	2	0.1	1	0.1	.	.	.	.	1	0.3	.	.	.	.	4	0.1
Reinsertion of Components	1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	1	0.0
TOTAL	1653	100.0	809	100.0	579	100.0	457	100.0	289	100.0	209	100.0	829	100.0	4825	100.0

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

LOOSENING

Loosening is the most common 1st revision diagnosis for total knee replacement, with a primary diagnosis of osteoarthritis (31.5% of aseptic revisions). There are 9,590 1st revision total knee procedures for loosening. There are more females revised for loosening (56.7%). The mean age at the time of 1st revision is 68.3 years, and the median time to 1st revision is 3.4 years (Table N42).

For loosening, revising both femoral and tibial components results in a lower rate of 2nd revision.

The most common type of 1st revision procedures for loosening are TKR (both tibial and femoral components revised) (50.3%), tibial only (21.1%), and femoral only (6.8%). Patella components are used in 13.0% of 1st revisions for loosening, either alone or with the addition of a polyethylene insert. Insert only revision is performed in 8.6% of 1st revisions for loosening. It is unclear why a minor revision is performed for loosening, but perhaps these are revisions for wear without actual component loosening, or misclassified revisions for instability.

Of the 9,590 primary total knee replacements revised for loosening, 1,653 have had a 2nd revision. The 15 year cumulative percent 2nd revision, where the 1st revision is for loosening, is 25.0% (Table N50 and Figure N62).

Where major components are revised in a 1st revision for loosening, cement fixation is used for 97.9% of the femoral components and 97.5% of the tibial components. Stem extensions are used in 80.2% of major revisions. Stems are added to both femoral and tibial components in 46.0% of procedures, 27.7% have only a tibial stem, 6.4% have only a femoral stem, and in 0.8% the location of the stem is unknown. The use of stem extensions for both femoral and tibial components has increased to 65.1% of 1st revisions for loosening, while revisions without stem extensions account for only 6.0% of procedures in 2024 (Figure N63).

Augment use is recorded for major component 1st revisions for loosening. Where these are used, 71.9% are added to the femoral component only, 18.8% to the tibial component only, and 9.3% have both femoral and tibial augments.

Metaphyseal fixation can be achieved by using sleeves or cones (Table N53). Metaphyseal sleeves or cones are used in 26.6% of major revisions for loosening (Table N42 and Figure N64).

The use of metaphyseal fixation in 1st revision for loosening has increased to 43.3% of major revisions for loosening in 2024 (Figure N63).

Where the 1st revision was for loosening, the most common reasons for the 2nd revision are further loosening (38.8%), infection (28.9%) and instability (10.1%) (Table N51). When a major revision is performed for loosening, revising both femoral and tibial components results in a lower rate of 2nd revision compared to revising only the femoral component, or compared to revising only the tibial component for the majority of the first 3.5 years. Tibial component only 1st revisions for loosening have a lower rate of 2nd revision compared to those where the femoral component only is revised (Table N54 and Figure N65).

There is a lower rate of 2nd revision when a stem extension is used in the 1st revision for loosening, compared to when a stem extension is not used (Table N55 and Figure N66). Use of stem extensions for both femoral and tibial components when revising for loosening has a lower rate of 2nd revision when compared to stem extensions on either femoral or tibial components alone or where no stem extension is used (Table N56 and Figure N67).

The use of metaphyseal fixation in the 1st revision for loosening has a lower rate of 2nd revision compared to when no metaphyseal fixation is used (Table N57 and Figure N68).

Figure N63 Trends in Stem Extension Use in Revision Total Knee Replacement Over Time (Primary Diagnosis OA, 1st Revision for Loosening)

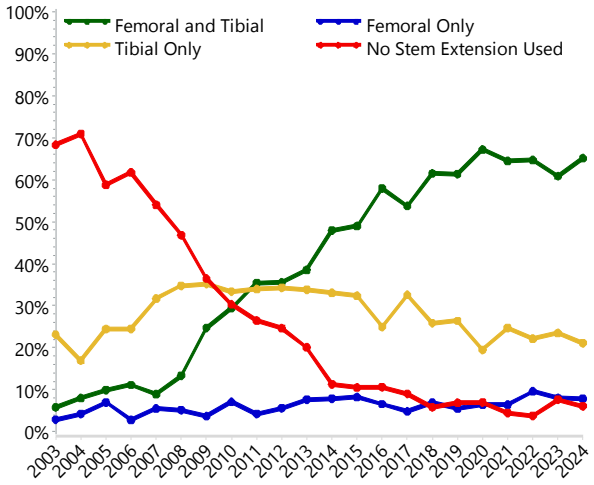
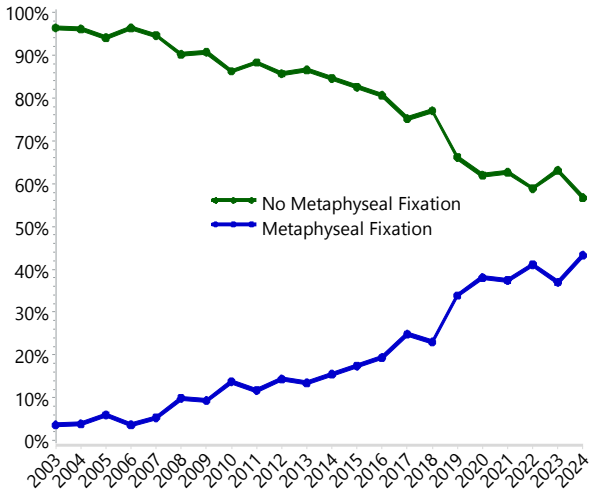


Table N53 **Known Primary 1st Revision Total Knee Replacement by Use of Metaphyseal fixation in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)**

Procedure Year	No Metaphyseal Fixation		Metaphyseal Fixation		TOTAL	
	N	Row%	N	Row%	N	Row%
≤2002	69	92.0	6	8.0	75	100.0
2003	106	96.4	4	3.6	110	100.0
2004	221	96.1	9	3.9	230	100.0
2005	173	94.0	11	6.0	184	100.0
2006	184	96.3	7	3.7	191	100.0
2007	229	94.6	13	5.4	242	100.0
2008	210	90.1	23	9.9	233	100.0
2009	224	90.7	23	9.3	247	100.0
2010	282	86.2	45	13.8	327	100.0
2011	294	88.3	39	11.7	333	100.0
2012	293	85.7	49	14.3	342	100.0
2013	296	86.5	46	13.5	342	100.0
2014	323	84.6	59	15.4	382	100.0
2015	322	82.6	68	17.4	390	100.0
2016	320	80.6	77	19.4	397	100.0
2017	284	75.1	94	24.9	378	100.0
2018	335	77.0	100	23.0	435	100.0
2019	291	66.1	149	33.9	440	100.0
2020	251	62.0	154	38.0	405	100.0
2021	266	62.6	159	37.4	425	100.0
2022	235	58.9	164	41.1	399	100.0
2023	314	63.1	184	36.9	498	100.0
2024	283	56.7	216	43.3	499	100.0
TOTAL	**5805**	**77.4**	**1699**	**22.6**	**7504**	**100.0**

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions

Figure N64 **Known Primary 1st Revision Total Knee Replacement by Use of Metaphyseal fixation in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)**



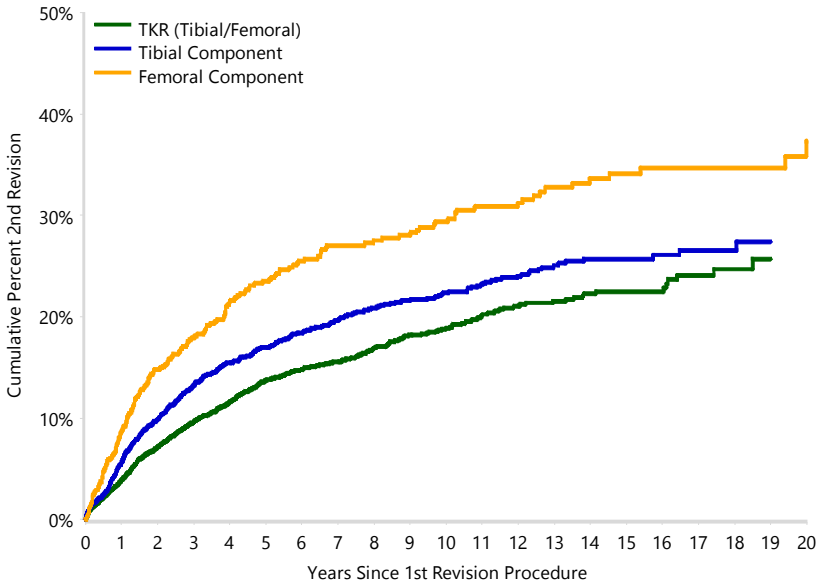
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions

Table N54 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	681	4824	3.9 (3.4, 4.5)	9.6 (8.7, 10.5)	13.7 (12.7, 14.9)	18.9 (17.5, 20.3)	22.5 (20.7, 24.5)	
Tibial Component	407	2024	5.6 (4.7, 6.8)	13.2 (11.7, 14.8)	16.9 (15.3, 18.7)	22.3 (20.4, 24.4)	25.7 (23.4, 28.2)	
Femoral Component	183	656	8.7 (6.8, 11.2)	17.9 (15.1, 21.2)	23.5 (20.3, 27.1)	29.4 (25.7, 33.4)	34.1 (29.9, 38.7)	37.3 (32.0, 43.2)
TOTAL	1271	7504						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Figure N65 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender

Tibial Component vs TKR (Tibial/Femoral)

0 - 2Wk: HR=3.49 (95% CI 1.50, 8.09), p=0.003

2Wk - 6Mth: HR=0.84 (95% CI 0.57, 1.22), p=0.348

6Mth - 1Yr: HR=1.78 (95% CI 1.29, 2.44), p<0.001

1Yr - 1.5Yr: HR=1.26 (95% CI 0.90, 1.76), p=0.186

1.3.5Yr - 3.5Yr: HR=1.31 (95% CI 1.04, 1.66), p=0.022

3.5Yr - 5Yr: HR=0.80 (95% CI 0.56, 1.14), p=0.217

5Yr+: HR=1.06 (95% CI 0.82, 1.37), p=0.637

Femoral Component vs TKR (Tibial/Femoral)

0 - 1.5Yr: HR=1.97 (95% CI 1.54, 2.54), p<0.001

1.5Yr+: HR=1.34 (95% CI 1.08, 1.67), p=0.007

Femoral Component vs Tibial Component

Entire Period: HR=1.33 (95% CI 1.12, 1.59), p=0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	4824	4223	3260	2452	990	279	38
Tibial Component	2024	1827	1510	1281	708	240	39
Femoral Component	656	576	463	387	249	123	42

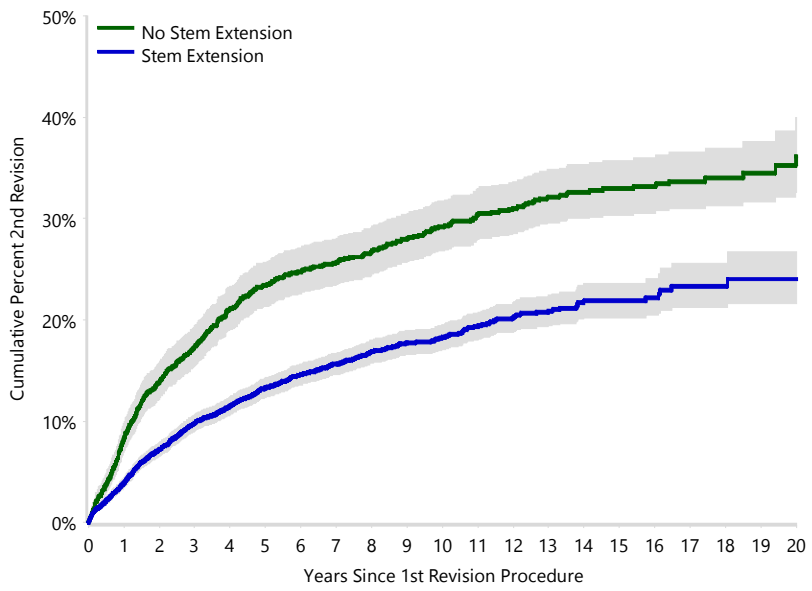
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Table N55 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stem Extension Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Stem Extension Used in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
No Stem Extension	433	1484	8.3 (7.0, 9.8)	17.3 (15.5, 19.4)	23.4 (21.3, 25.7)	29.2 (26.8, 31.7)	32.9 (30.3, 35.7)	36.1 (32.6, 39.9)
Stem Extension	838	6020	3.9 (3.4, 4.4)	9.8 (9.0, 10.6)	13.3 (12.4, 14.3)	18.2 (17.0, 19.5)	21.9 (20.2, 23.6)	24.0 (21.6, 26.7)
TOTAL	1271	7504						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N66 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stem Extension Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender

No Stem Extension vs Stem Extension

0 - 1Yr: HR=1.99 (95% CI 1.59, 2.48), p<0.001

1Yr+: HR=1.48 (95% CI 1.28, 1.69), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
No Stem Extension	1484	1334	1131	980	667	331	71
Stem Extension	6020	5292	4102	3140	1280	311	48

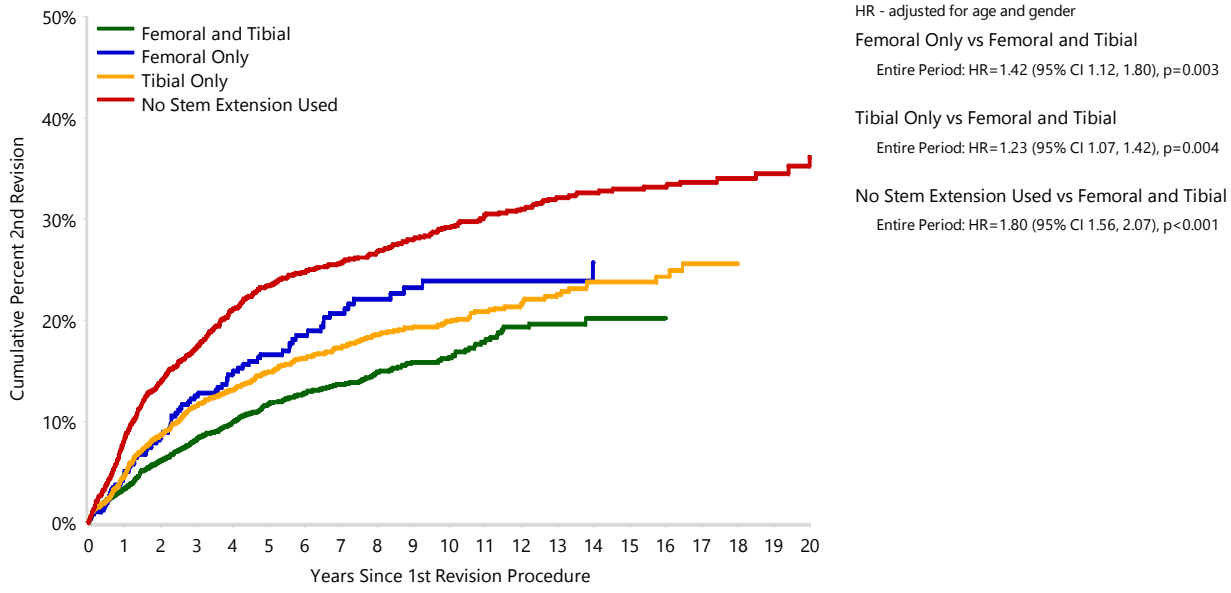
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N56 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stem Extension Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Stem Extension Used in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Femoral and Tibial	390	3422	3.4 (2.8, 4.0)	8.2 (7.2, 9.2)	11.7 (10.6, 13.0)	16.3 (14.7, 18.1)	20.2 (17.7, 22.9)	
Femoral Only	83	478	5.1 (3.4, 7.5)	12.5 (9.6, 16.1)	16.6 (13.2, 20.8)	23.9 (19.4, 29.2)		
Tibial Only	354	2062	4.6 (3.8, 5.6)	11.5 (10.2, 13.0)	14.9 (13.3, 16.6)	19.9 (18.0, 22.0)	23.7 (21.3, 26.4)	
No Stem Extension Used	433	1484	8.3 (7.0, 9.8)	17.3 (15.5, 19.4)	23.4 (21.3, 25.7)	29.2 (26.8, 31.7)	32.9 (30.3, 35.7)	36.1 (32.6, 39.9)
TOTAL	1260	7446						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions. Of these, excludes 58 procedures with a non-specified stem location.

Figure N67 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stem Extension Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
Femoral and Tibial	3422	2965	2245	1615	509	79	7	3
Femoral Only	478	414	308	236	108	28	3	2
Tibial Only	2062	1855	1500	1242	628	179	26	9
No Stem Extension Used	1484	1334	1131	980	667	331	71	19

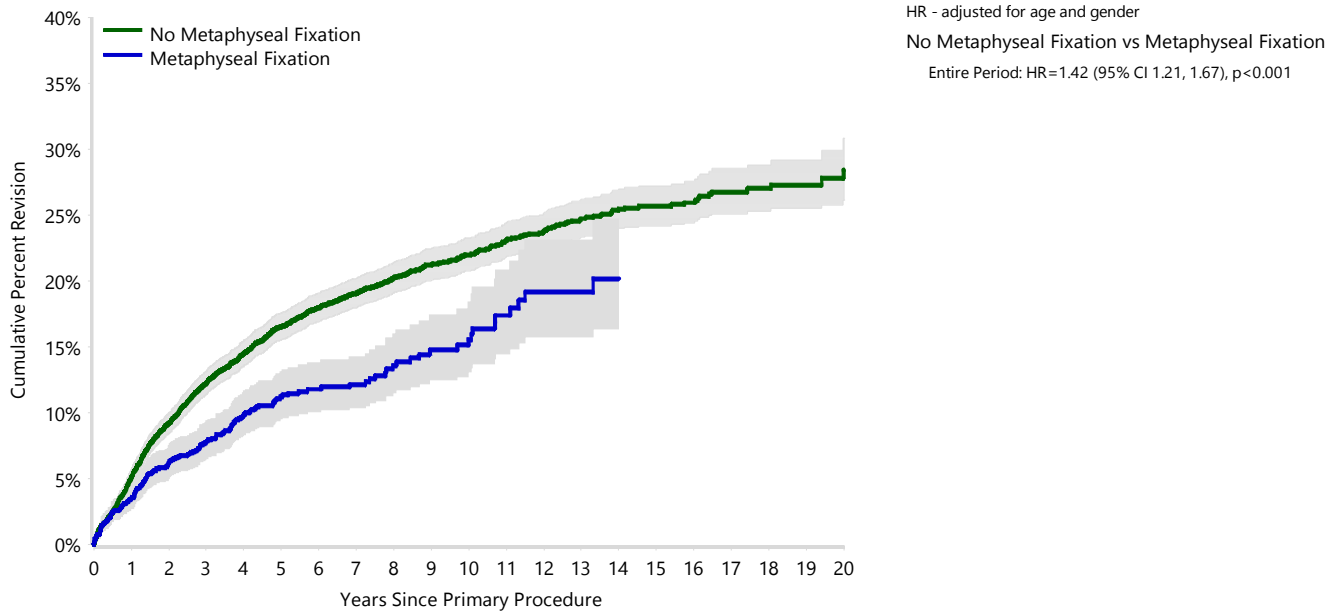
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions. Of these, excludes 58 procedures with a non-specified stem location.

Table N57 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Sleeve Used in 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Use of Metaphyseal fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
No Metaphyseal Fixation	1100	5805	5.1 (4.6, 5.8)	12.3 (11.4, 13.2)	16.6 (15.6, 17.6)	22.0 (20.8, 23.3)	25.7 (24.2, 27.2)	28.4 (26.1, 30.9)
Metaphyseal Fixation	171	1699	3.5 (2.7, 4.6)	7.8 (6.5, 9.3)	11.2 (9.6, 13.1)	15.6 (13.1, 18.4)		
TOTAL	**1271**	**7504**						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions

Figure N68 Cumulative Percent Revision of Known Primary 1st Revision Total Knee Replacement by Metaphyseal Fixation for 1st Revision Since the Primary Procedure (Primary Diagnosis OA, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
No Metaphyseal Fixation	5805	5208	4223	3448	1743	603	115
Metaphyseal Fixation	1699	1418	1010	672	204	39	4

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

PATELLA REASONS

After loosening, revision for patella reasons is the 2nd most common reason for 1st revision (19.4% of aseptic revisions). There are 5,924 primary TKRs that have been revised for patella reasons. Within this revision diagnosis category, there are 2,886 procedures for patella pain (48.7%), 2,762 for patella erosion (46.6%) and 276 for patella maltracking (4.7%). There are more females revised for patella reasons (56.2%). The mean age at revision is 69.3 years, and the median time to revision is 2.9 years (Table N42).

When the 1st revision is for patella reasons, 99.0% of revisions are patella revisions either alone (77.6%) or combined with a tibial insert revision (21.4%). There are very small numbers of TKR or femoral only revisions for these reasons. For knees revised for patella reasons, 97.2% did not have a patella component inserted in the primary procedure (Figure N69). Where the 1st revision is for patella reasons, the majority of procedures involve insertion of a patella component in a previously unresurfaced patella. There are 145 revisions for patella reasons where the initial procedure included a patella component, and that patella component was revised.

There are only 23 minor revision procedures for patella reasons that did not use a patella component in the revision procedure, and 15 of these had a prior patella prosthesis (Table N42).

Of the 5,924 1st revisions for patella reasons, 809 have had a 2nd revision. The 15 year cumulative percent 2nd revision is 18.9%. When a 1st revision for patella reasons is performed, the rate of 2nd revision is lower when an unresurfaced patella has a patella component inserted compared to when the patella component is revised (Table N58 and Figure N70).

Where the 1st revision was for patella reasons, the most common reasons for the 2nd revision are loosening (30.5%), infection (22.7%), instability (12.0%), and pain (11.2%). Further revision for any patella cause is uncommon (Table N51).

The most common types of 2nd revision are revision of both tibial and femoral components (47.6%), insert only (23.6%), patella only (7.9%), and femoral component only (6.7%) (Table N52).

Figure N69 Trends in Patella Usage in Primary and Revision Total Knee Replacement Over Time (Primary Diagnosis OA, 1st Revision for Patella Reasons)

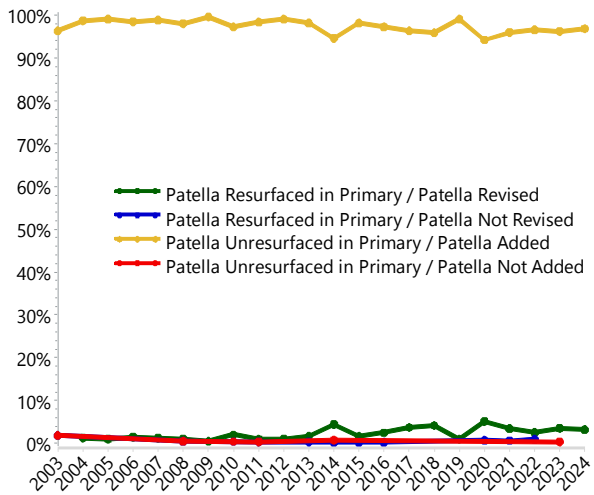
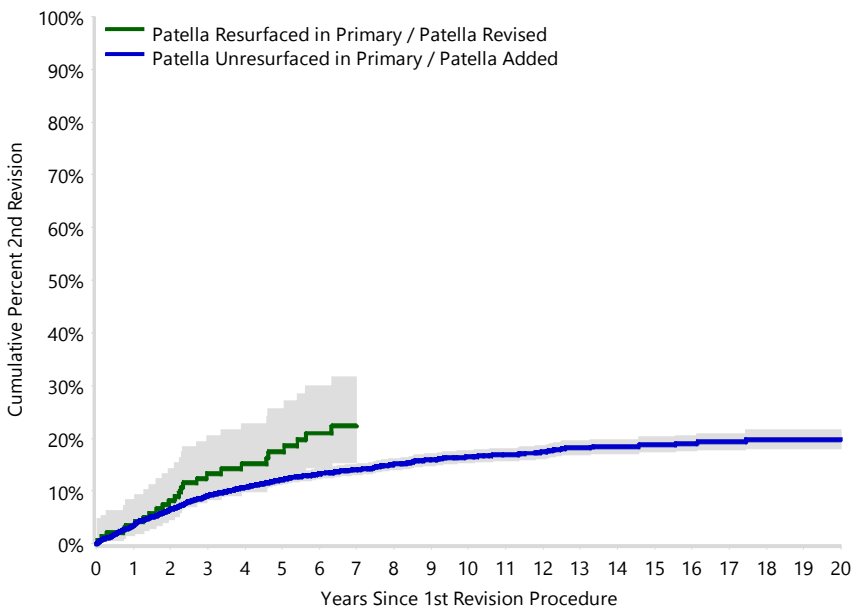


Table N58 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Patella Usage at Primary and 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)

Patella Usage in Primary and 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Resurfaced in Primary / Patella Revised	27	145	3.5 (1.5, 8.3)	13.2 (8.4, 20.5)	17.4 (11.6, 25.6)			
Patella Resurfaced in Primary / Patella Not Revised	4	15	6.7 (1.0, 38.7)	20.0 (6.9, 50.0)	20.0 (6.9, 50.0)	33.3 (12.9, 69.7)		
Patella Unresurfaced in Primary / Patella Added	777	5756	3.5 (3.1, 4.0)	9.1 (8.4, 9.9)	12.2 (11.3, 13.1)	16.5 (15.4, 17.7)	18.8 (17.4, 20.2)	19.8 (18.0, 21.7)
Patella Unresurfaced in Primary / Patella Not Added	1	8	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	16.7 (2.5, 72.7)	16.7 (2.5, 72.7)		
TOTAL	809	5924						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N70 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Patella Usage at Primary and 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)



HR - adjusted for age and gender
Patella Resurfaced in Primary / Patella Revised vs
Patella Unresurfaced in Primary / Patella Added
Entire Period: HR=1.53 (95% CI 1.04, 2.25), p=0.029

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Resurfaced in Primary / Patella Revised	145	130	98	69	26	4	1
Patella Unresurfaced in Primary / Patella Added	5756	5238	4288	3474	1603	428	46

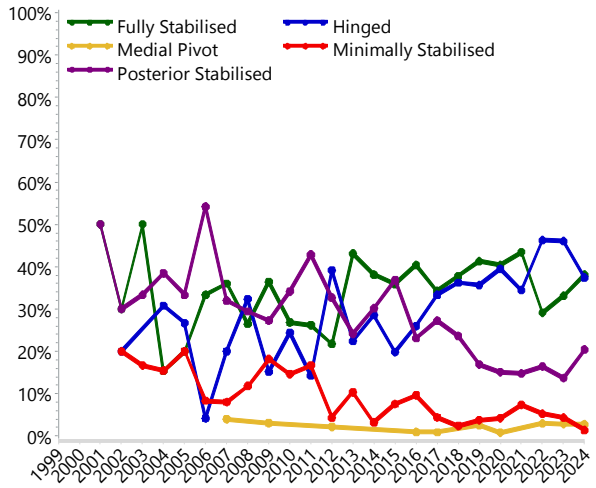
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

INSTABILITY

There are 3,755 primary TKRs that have been revised for instability, which is the 3rd most common reason for 1st aseptic revision (12.3%). More females are revised for instability (60.0%). The mean age at the time of revision for instability is 67.4 years, and the median time to revision is 2.4 years (Table N42).

The most common types of 1st revision procedures for instability are insert only (38.4%), TKR (both femoral and tibial components revised) (37.1%), insert/patella (14.5%), and femoral component only (6.5%). When a major revision is performed for instability, fully stabilised prostheses are used in 36.0%, hinged components in 33.0%, posterior stabilised in 23.4% and minimally stabilised prostheses in 6.3% of revision procedures (Table N42). Over time, the proportions of minimally stabilised and posterior stabilised components used in 1st revision for instability have declined (Figure N71).

Figure N71 Trends in Implant Stability Use in Revision Total Knee Replacement Over Time (Primary Diagnosis OA, 1st Revision for Instability)



Of the 3,755 primary TKR revised for instability, 579 have had a 2nd revision. The 15 year cumulative percent 2nd revision is 22.9% (Table N50 and Figure N62).

Where the 1st revision was for instability, the most common reasons for the 2nd revision are further instability (28.2%), loosening (24.2%), infection (22.8%), and pain (4.7%) (Table N51).

The most common types of 2nd revision are revision of both tibial and femoral components (48.4%), insert only (21.4%), patella only (8.1%), and femoral component only (7.3%) (Table N52).

When comparing major 1st revision procedures for instability, there is no difference in the rate of 2nd revision when one or both femoral and tibial components are revised (Table N59 and Figure N72).

There is a lower rate of 2nd revision when fully stabilised prostheses are used in the 1st revision for instability compared to posterior stabilised components. There is no difference in rate of 2nd revision when minimally stabilised or hinged prostheses are compared to fully stabilised designs (Table N60 and Figure N73).

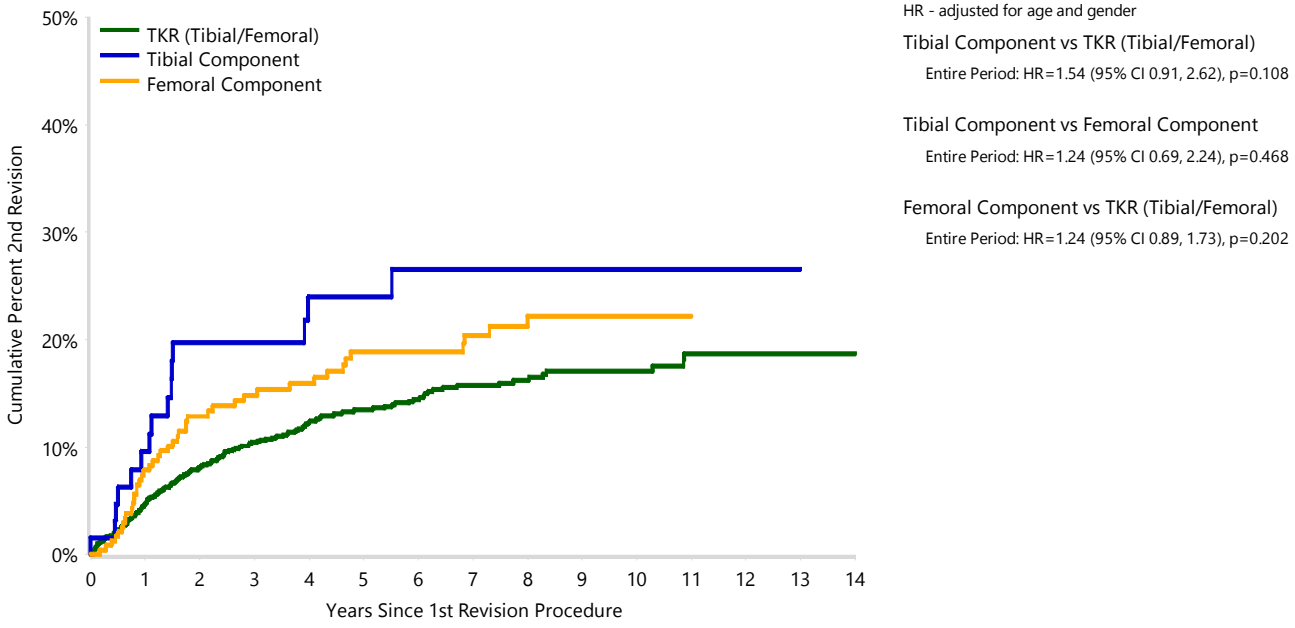
There is a lower rate of 2nd revision when a fully stabilised prosthesis is used for revision for instability, compared to PS components.

Table N59 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	176	1394	4.7 (3.7, 6.0)	10.4 (8.8, 12.3)	13.5 (11.6, 15.7)	17.0 (14.7, 19.8)		
Tibial Component	15	66	9.5 (4.4, 20.0)	19.7 (11.7, 32.2)	24.0 (14.9, 37.4)	26.5 (16.7, 40.5)		
Femoral Component	44	243	7.8 (5.0, 12.2)	14.8 (10.8, 20.2)	18.8 (14.1, 24.9)	22.2 (16.8, 28.9)		
TOTAL	235	1703						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Figure N72 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	1394	1192	887	633	169	39	5
Tibial Component	66	55	44	32	21	5	1
Femoral Component	243	206	165	133	52	15	3

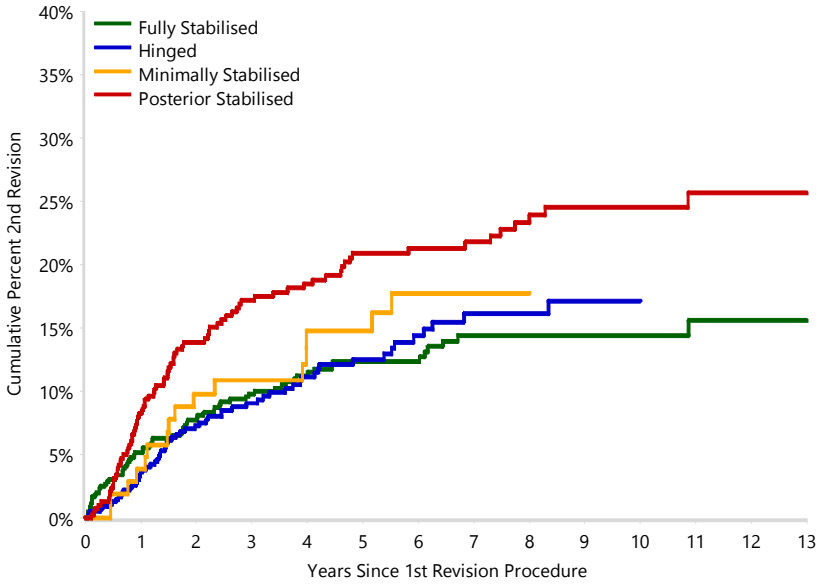
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Table N60 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stability of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)

Stability of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	17	106	3.9 (1.5, 9.9)	10.9 (6.2, 18.8)	14.8 (9.0, 23.8)			
Posterior Stabilised	82	394	8.3 (5.9, 11.6)	17.2 (13.7, 21.5)	20.9 (17.0, 25.6)	24.5 (20.0, 29.8)		
Medial Pivot	2	22	5.6 (0.8, 33.4)	11.1 (2.9, 37.6)	11.1 (2.9, 37.6)			
Fully Stabilised	69	606	5.2 (3.7, 7.3)	9.8 (7.6, 12.7)	12.4 (9.7, 15.6)	14.4 (11.4, 18.1)		
Hinged	63	556	3.6 (2.3, 5.6)	9.1 (6.8, 12.1)	12.5 (9.7, 16.2)	17.1 (13.2, 22.1)		
TOTAL	233	1684						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions. Of these, excludes 19 procedures with unknown stability in 1st revision.

Figure N73 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Stability of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)



HR - adjusted for age and gender

Hinged vs Fully Stabilised

0 - 1.5Yr: HR=0.99 (95% CI 0.63, 1.56), p=0.979

1.5Yr+: HR=1.33 (95% CI 0.85, 2.09), p=0.211

Minimally Stabilised vs Fully Stabilised

Entire Period: HR=1.21 (95% CI 0.71, 2.06), p=0.476

Posterior Stabilised vs Fully Stabilised

Entire Period: HR=1.58 (95% CI 1.14, 2.18), p=0.005

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fully Stabilised	606	512	402	286	82	26	5
Hinged	556	477	329	222	49	6	0
Minimally Stabilised	106	99	78	59	28	7	0
Posterior Stabilised	394	333	267	217	81	20	4

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions. Of these, excludes 19 procedures with unknown stability in 1st revision.

Revision Arthroplasty

PAIN

There are 2,992 primary TKR procedures revised with a 1st revision diagnosis of pain (9.8% of aseptic 1st revisions). Females are more commonly revised for pain (55.1%). The mean age at time of revision for pain is 68.5 years, and the median time to revision is 2.5 years (Table N42).

The most common types of 1st revision for pain are patella only (45.2%), insert/patella (23.1%), both femoral and tibial components (16.6%), and insert only (8.9%). Of those revised for pain, 68.4% did not have a patella component in the primary procedure and a patella component was inserted in 95.0% of these. Where major components were revised, 98.2% of femoral components and 97.7% of the tibial components used cement fixation in the 2nd revision (Table N42)

Of the 2,992 primary total knee replacements revised for pain, 457 have had a 2nd revision. The 15 year cumulative percent 2nd revision for pain is 21.5% (Table N50 and Figure N62).

Where the 1st revision was for pain, the most common reasons for the 2nd revision are loosening (31.1%), infection (21.2%), further pain (15.3%), and instability (12.7%) (Table N51).

The most common types of 2nd revision procedures are revision of both tibial and femoral components (49.2%), insert only (18.8%), patella only (9.0%), and femoral component only (7.2%) (Table N52).

When a major 1st revision is performed for pain, there is no difference in rate of 2nd revision with the class of 1st revision (Table N61 and Figure N74).

There is no difference in 2nd revision rate with 1st revision procedures for pain.

There is no difference in rate of 2nd revision when a major 1st revision for pain involves revision of the femoral or tibial component, or both (Table N62 and Figure N75).

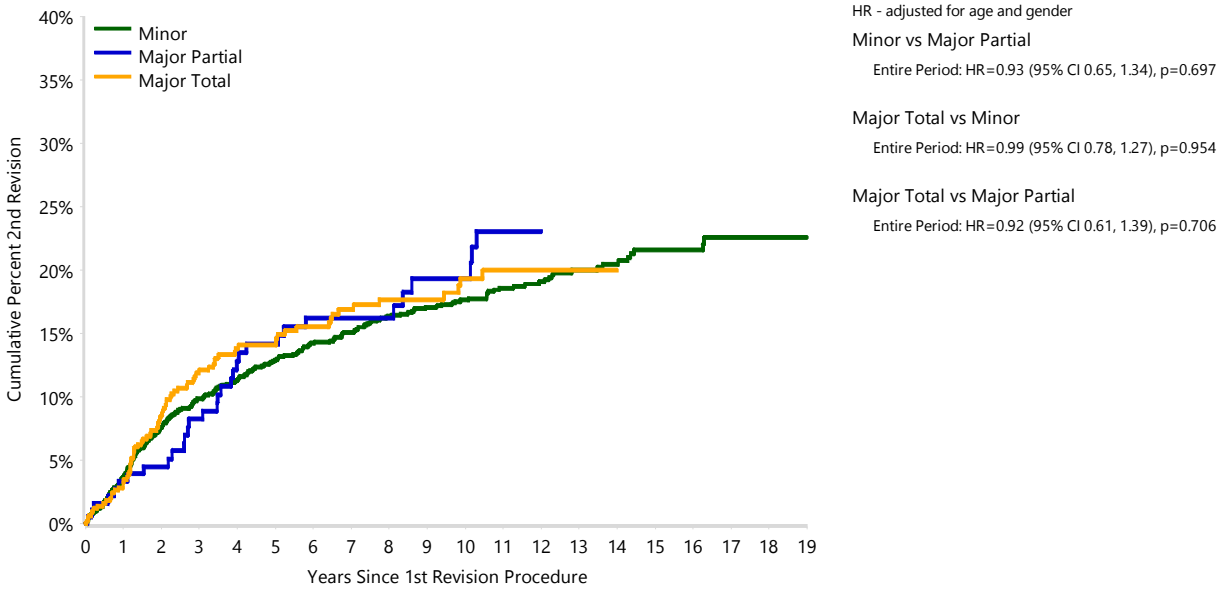
There is no difference in the 2nd revision rate when using a patella component in revision for pain compared to when no patella component is used (Table N63 and Figure N76).

Table N61 Cumulative Percent 2nd Revision of Known Primary 1st Revision Total Knee Replacement by Class of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)

Class of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	346	2309	3.7 (3.0, 4.6)	9.8 (8.7, 11.2)	12.9 (11.5, 14.4)	17.6 (15.9, 19.6)	21.6 (19.3, 24.2)	
Major Partial	32	185	3.3 (1.5, 7.3)	8.3 (5.0, 13.6)	14.1 (9.6, 20.6)	19.3 (13.7, 26.9)		
Major Total	79	498	3.3 (2.0, 5.3)	12.1 (9.4, 15.5)	14.1 (11.2, 17.6)	19.4 (15.6, 23.8)		
TOTAL	457	2992						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N74 Cumulative Percent 2nd Revision of Known Primary 1st Revision Total Knee Replacement by Class of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	2309	2095	1750	1378	662	229	28
Major Partial	185	168	145	124	65	21	3
Major Total	498	463	375	306	139	34	4

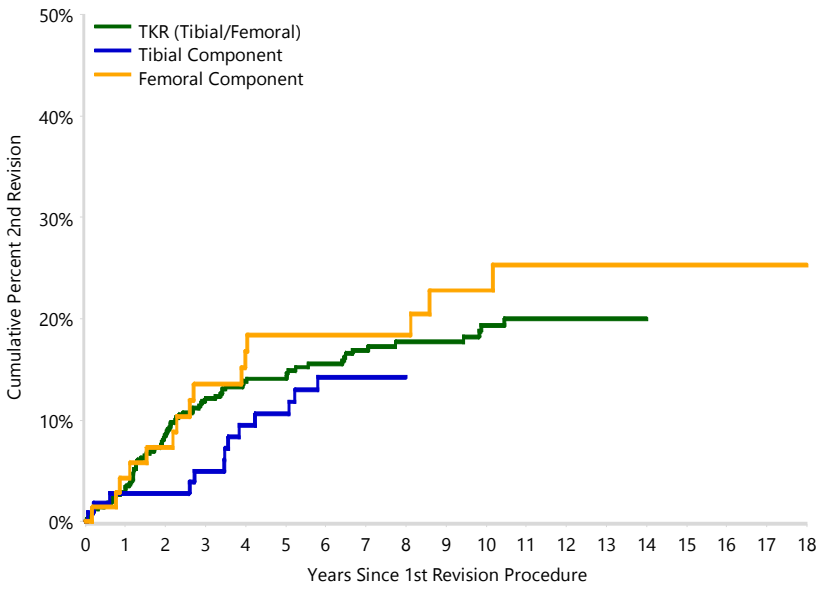
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N62 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	79	498	3.3 (2.0, 5.3)	12.1 (9.4, 15.5)	14.1 (11.2, 17.6)	19.4 (15.6, 23.8)		
Tibial Component	16	109	2.8 (0.9, 8.4)	5.0 (2.1, 11.6)	10.6 (5.8, 18.9)			
Femoral Component	15	73	4.3 (1.4, 12.8)	13.5 (7.3, 24.4)	18.4 (10.9, 30.2)	22.8 (14.0, 35.8)	25.3 (15.8, 38.9)	
TOTAL	110	680						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Figure N75 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)



HR - adjusted for age and gender

TKR (Tibial/Femoral) vs Tibial Component

Entire Period: HR=1.09 (95% CI 0.64, 1.88), p=0.742

Femoral Component vs TKR (Tibial/Femoral)

Entire Period: HR=1.28 (95% CI 0.73, 2.22), p=0.385

Femoral Component vs Tibial Component

Entire Period: HR=1.40 (95% CI 0.69, 2.83), p=0.350

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	498	463	375	306	139	34	4
Tibial Component	109	99	88	75	34	11	2
Femoral Component	73	66	54	49	31	10	1

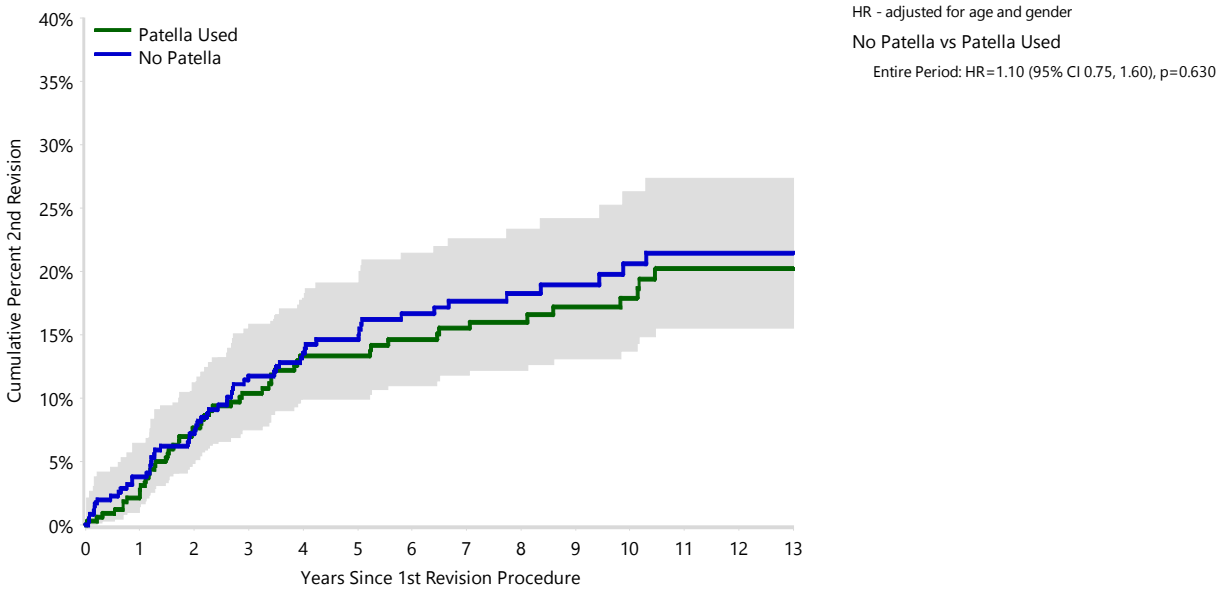
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Table N63 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Patella Usage in 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)

Patella Usage in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	52	330	2.8 (1.5, 5.3)	10.4 (7.5, 14.4)	13.4 (10.0, 17.8)	17.9 (13.7, 23.2)		
No Patella	58	350	3.8 (2.2, 6.5)	11.8 (8.7, 15.8)	14.6 (11.2, 19.1)	20.6 (16.0, 26.3)		
TOTAL	110	680						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Figure N76 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Patella Usage in 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	330	309	256	216	110	30	4
No Patella	350	319	261	214	94	25	3

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

ARTHROFIBROSIS

Arthrofibrosis is the reason for 4.9% of aseptic 1st revisions of primary TKR procedures for osteoarthritis. There are 1,502 primary TKR procedures revised for arthrofibrosis. There are more males than females revised for arthrofibrosis (54.0%). The mean age at the time of revision for arthrofibrosis is 66.1 years, and the median time to revision is 1.6 years (Table N42).

The most common types of 1st revision for arthrofibrosis are both femoral and tibial components (31.5%), insert only (31.2%), insert/patella (13.9%), femoral component only (9.9%), and patella only (7.4%).

Of the 1,502 primary TKR procedures revised for arthrofibrosis, 289 have had a 2nd revision. The 15 year cumulative percent 2nd revision for this reason is 29.3% (Table N50 and Figure N62).

Where the 1st revision was for arthrofibrosis, the most common reasons for the 2nd revision are further arthrofibrosis (30.1%), loosening (22.1%), infection (21.1%), and pain (5.9%).

When the reason for 1st revision is arthrofibrosis, the most common types of 2nd revision are revision of both tibial and femoral components (49.8%), insert only (18.7%), cement spacer (8.0%), femoral component only (7.6%), and tibial component only (7.3%) (Table N52).

When comparing the more common types of 1st revision procedures, insert only has a higher rate of 2nd revision compared to revision of both femoral and tibial components (Table N64 and Figure N77).

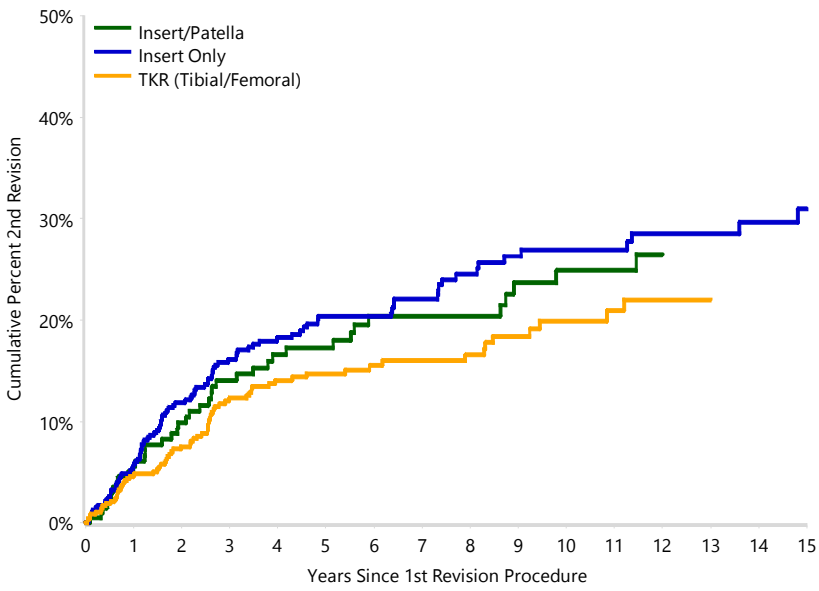
> Insert only 1st revisions for arthrofibrosis have a higher rate of 2nd revision than revision of femoral and tibial components.

When the stability of the prostheses used for 1st revisions for arthrofibrosis is compared, minimally stabilised components have a higher rate of 2nd revision compared to fully stabilised, but there is no difference when the other groups are compared (Table N65 and Figure N78).

Table N64 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Insert/Patella	41	209	5.6 (3.1, 9.8)	14.0 (9.8, 20.0)	17.3 (12.4, 23.7)	24.9 (18.5, 33.0)		
Insert Only	98	469	5.8 (4.0, 8.4)	16.2 (12.9, 20.1)	20.4 (16.6, 24.8)	26.9 (22.2, 32.4)	30.9 (25.2, 37.6)	
TKR (Tibial/Femoral)	73	473	4.6 (3.0, 7.0)	12.3 (9.5, 15.9)	14.7 (11.6, 18.6)	19.9 (15.7, 25.1)		
TOTAL	212	1151						

Figure N77 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)



HR - adjusted for age and gender

Insert/Patella vs TKR (Tibial/Femoral)

Entire Period: HR=1.22 (95% CI 0.83, 1.79), p=0.308

Insert Only vs Insert/Patella

Entire Period: HR=1.12 (95% CI 0.77, 1.61), p=0.558

Insert Only vs TKR (Tibial/Femoral)

Entire Period: HR=1.36 (95% CI 1.00, 1.85), p=0.047

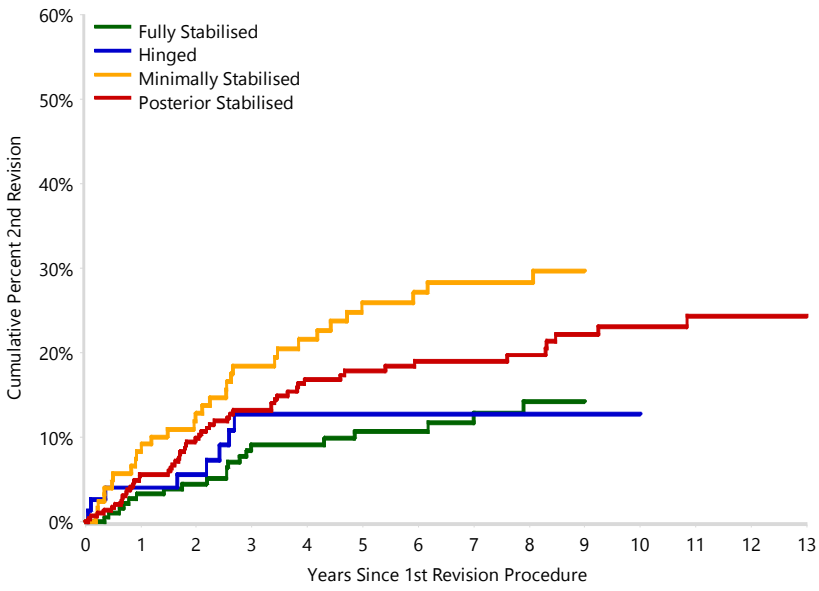
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Insert/Patella	209	180	140	115	59	18	4
Insert Only	469	400	294	218	105	53	9
TKR (Tibial/Femoral)	473	419	322	241	90	26	0

Table N65 Cumulative Percent 2nd Revision of Known Primary 1st Revision Total Knee Replacement by Stability of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)

Stability of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fully Stabilised	23	191	3.3 (1.5, 7.1)	9.1 (5.6, 14.7)	10.7 (6.7, 16.7)			
Hinged	9	75	4.1 (1.3, 12.1)	12.7 (6.5, 24.1)	12.7 (6.5, 24.1)	12.7 (6.5, 24.1)		
Medial Pivot	1	11	9.1 (1.3, 49.2)	9.1 (1.3, 49.2)	9.1 (1.3, 49.2)			
Minimally Stabilised	36	125	8.3 (4.6, 14.9)	18.5 (12.4, 27.0)	25.9 (18.6, 35.4)			
Posterior Stabilised	54	303	5.6 (3.5, 9.0)	13.2 (9.6, 17.9)	17.9 (13.6, 23.2)	23.1 (17.8, 29.7)		
TOTAL	123	705						

Note: Restricted to major total and major partial revisions. Of these, excludes 8 procedures with unknown stability.

Figure N78 Cumulative Percent 2nd Revision of Known Primary 1st Revision Total Knee Replacement by Stability of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)



HR - adjusted for age and gender

Hinged vs Fully Stabilised

Entire Period: HR=1.14 (95% CI 0.53, 2.46), p=0.745

Minimally Stabilised vs Fully Stabilised

Entire Period: HR=2.34 (95% CI 1.39, 3.96), p=0.001

Posterior Stabilised vs Fully Stabilised

Entire Period: HR=1.45 (95% CI 0.89, 2.37), p=0.135

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fully Stabilised	191	171	136	107	39	8	0
Hinged	75	67	44	29	9	2	0
Minimally Stabilised	125	105	84	66	38	14	2
Posterior Stabilised	303	259	205	156	71	27	1

Note: Restricted to major total and major partial revisions. Of these, excludes 8 procedures with unknown stability.

FRACTURE

Fracture is the reason for 5.0% of aseptic 1st revisions of primary TKR procedures for osteoarthritis. There are 1,510 primary TKR procedures revised for fracture. There are more females than males revised for fracture (76.8%). The mean age at the time of revision for fracture is 74.3 years, and the median time to revision is 4.3 years (Table N42).

The most common types of 1st revision for fracture are both femoral and tibial components (59.7%), tibial component only (14.3%), patella only (9.9%), femoral component only (8.3%) and insert only (4.0%). Minor revisions for fracture are most likely accompanying fracture fixation procedures.

There is no difference in 2nd revision rate with constraint of the revision procedure, including distal femoral replacement and hinged procedures.

Of the 1,510 primary TKR procedures revised for fracture, 209 have had a 2nd revision. The 10 year cumulative percent 2nd revision for this reason is 20.4% (Table N50 and Figure N62).

Where the 1st revision was for fracture, the most common reasons for the 2nd revision are infection (36.4%), loosening (24.4%), further fracture (14.4%) and instability (6.7%) (Table N51).

The most common types of 2nd revision are insert only (28.7%), femoral component only (22.5%), both femoral and tibial components (21.5%) and patella only (8.1%) (Table N52).

When comparing the more common types of 1st revision procedures, there is no difference in the rate of 2nd revision except for tibial component only revision, which has a higher rate of 2nd revision compared to a revision of both femoral and tibial components in the first month only (Table N66 and Figure N79).

Where the 1st revision is for fracture, there is a lower rate of 2nd revision where cement fixation is used for the revised femoral component (Table N67 and Figure N80). Similarly, when the 1st revision is for fracture, there is a lower rate of 2nd revision where cement is used for fixation of the revised tibial component (Table N68 and Figure N81).

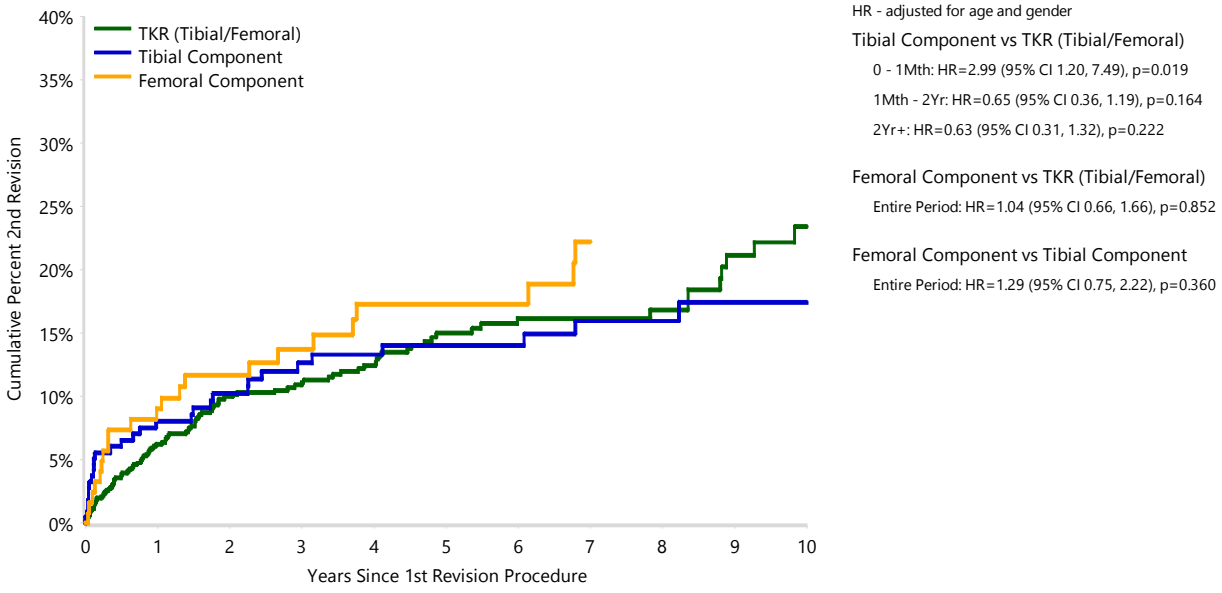
Where the 1st revision is for fracture, there is no difference in the rate of 2nd revision when comparing the use of articulations of varying levels of constraint (Table N69 and Figure N82).

Table N66 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	108	902	6.2 (4.8, 8.1)	10.9 (8.8, 13.4)	15.0 (12.3, 18.2)	23.4 (18.3, 29.7)		
Tibial Component	30	216	8.0 (5.1, 12.6)	12.6 (8.7, 18.2)	14.0 (9.8, 19.9)	17.4 (12.2, 24.6)		
Femoral Component	23	125	9.0 (5.1, 15.7)	13.8 (8.6, 21.5)	17.3 (11.3, 26.0)			
TOTAL	161	1243						

Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Figure N79 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Type of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
TKR (Tibial/Femoral)	902	682	434	256	58	12	0
Tibial Component	216	181	134	107	44	8	1
Femoral Component	125	108	78	60	24	10	2

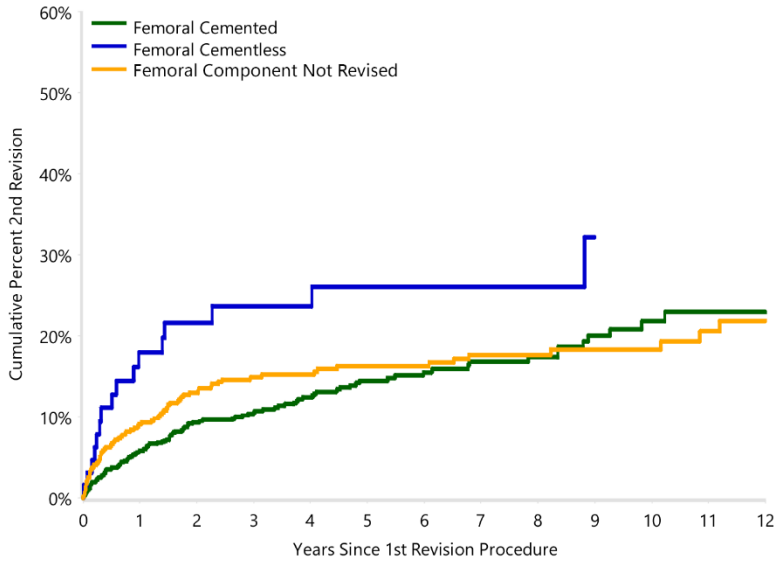
Note: Restricted to TKR (femoral/tibial), femoral only and tibial only 1st revisions.

Table N67 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Femoral Fixation of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Femoral Cemented	115	962	5.8 (4.4, 7.6)	10.4 (8.4, 12.8)	14.5 (11.9, 17.5)	21.8 (17.5, 27.1)		
Femoral Cementless	16	65	17.9 (10.3, 30.1)	23.7 (14.7, 36.9)	26.0 (16.4, 39.7)			
Femoral Component Not Revised	78	483	9.2 (6.9, 12.1)	14.9 (11.9, 18.6)	16.3 (13.0, 20.2)	18.3 (14.7, 22.8)		
TOTAL	209	1510						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N80 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Femoral Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



HR - adjusted for age and gender

Femoral Cementless vs Femoral Cemented

Entire Period: HR=2.02 (95% CI 1.20, 3.42), p=0.008

Femoral Cementless vs Femoral Component Not Revised

Entire Period: HR=2.01 (95% CI 1.17, 3.47), p=0.011

Femoral Component Not Revised vs Femoral Cemented

0 – 2Yr: HR=1.20 (95% CI 0.85, 1.68), p=0.304

2Yr+: HR=0.65 (95% CI 0.38, 1.13), p=0.129

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Femoral Cemented	962	743	478	289	75	21	2
Femoral Cementless	65	47	34	27	7	1	0
Femoral Component Not Revised	483	400	283	215	86	19	5

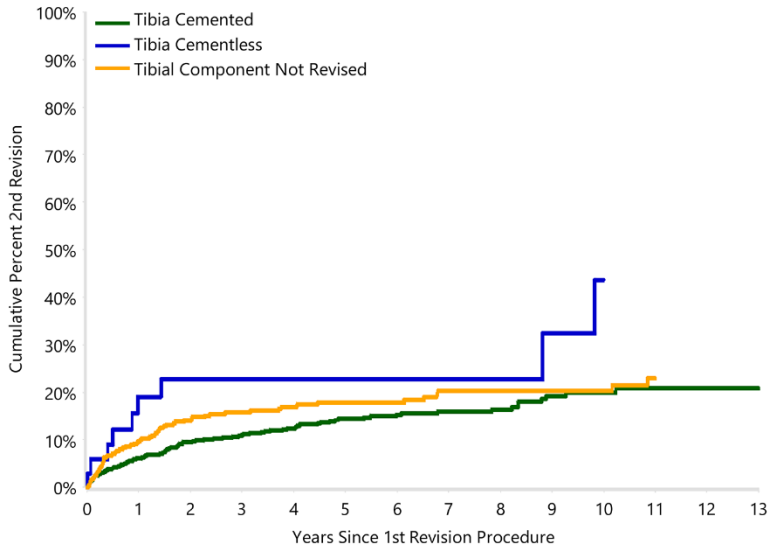
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N68 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Tibial Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Tibial Fixation of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Tibia Cemented	129	1083	6.2 (4.8, 7.9)	10.9 (9.0, 13.1)	14.4 (12.0, 17.1)	19.9 (16.2, 24.2)		
Tibia Cementless	9	35	19.1 (9.0, 37.7)	22.7 (11.5, 42.1)	22.7 (11.5, 42.1)	43.7 (21.9, 73.6)		
Tibial Component Not Revised	71	392	9.7 (7.1, 13.2)	15.8 (12.4, 20.0)	17.8 (14.1, 22.4)	20.2 (16.0, 25.3)		
TOTAL	209	1510						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N81 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Tibial Fixation of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



HR – adjusted for age and gender

Tibia Cementless vs Tibia Cemented
Entire period: HR=2.13 (95% CI 1.08, 4.19), p=0.028

Tibia Cementless vs Tibial Component Not Revised
Entire period: HR=1.84 (95% CI 0.92, 3.71), p=0.086

Tibial Component Not Revised vs Tibia Cemented
Entire period: HR=1.15 (95% CI 0.86, 1.56), p=0.343

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
Tibia Cemented	1083	840	552	349	97	17	1	0
Tibia Cementless	35	23	16	14	5	3	0	0
Tibial Component Not Revised	392	327	227	168	66	21	6	5

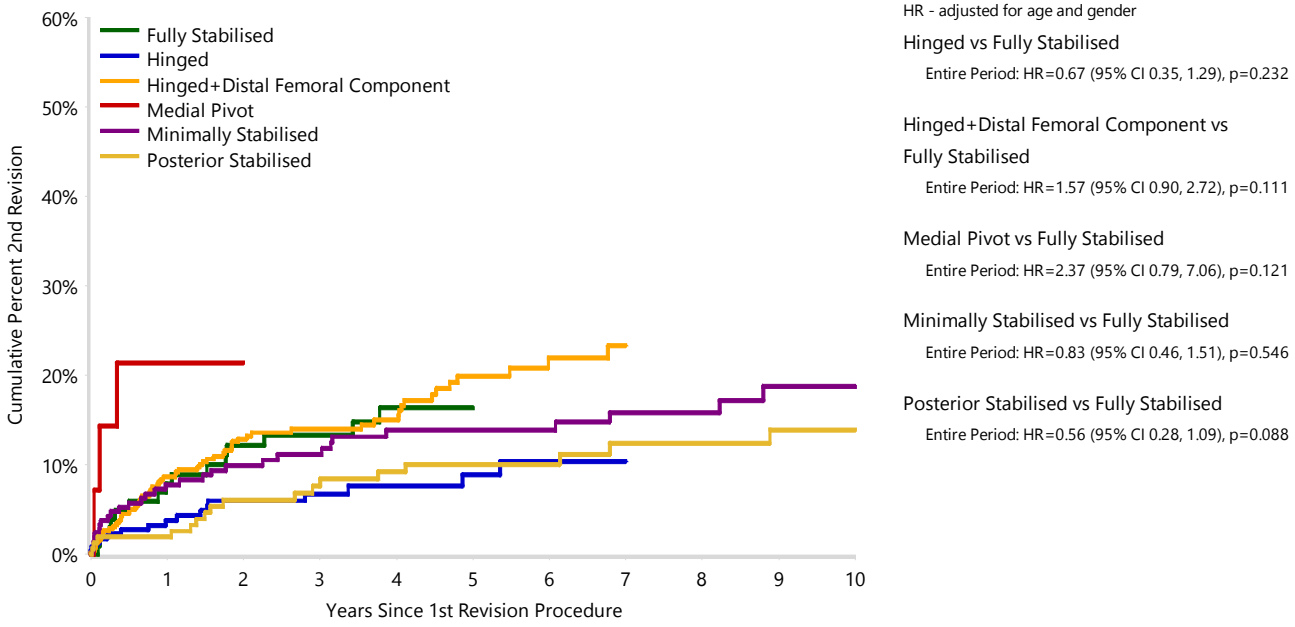
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N69 Cumulative Percent Revision of Known Primary 1st Revision Total Knee Replacement by Stability and Distal Femoral Replacement of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Stability and Distal Femoral Component of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Fully Stabilised	17	106	7.9 (4.0, 15.2)	13.4 (8.0, 21.9)	16.4 (10.1, 25.9)		
Hinged	19	232	3.8 (1.9, 7.4)	6.7 (3.9, 11.4)	8.9 (5.3, 14.8)		
Hinged + Distal Femoral Component	68	488	8.6 (6.3, 11.8)	14.0 (10.8, 18.0)	19.9 (15.5, 25.4)		
Medial Pivot	4	14	21.4 (7.5, 52.8)				
Minimally Stabilised	30	214	7.8 (4.8, 12.4)	11.1 (7.5, 16.5)	13.9 (9.6, 19.8)	18.7 (13.0, 26.5)	
Posterior Stabilised	17	157	1.9 (0.6, 5.8)	7.6 (4.3, 13.3)	10.1 (6.1, 16.5)	13.9 (8.7, 21.9)	
TOTAL	155	1211					

Note: Restricted to major total and major partial revisions. Of these, excludes 32 procedures with missing stability.

Figure N82 Cumulative Percent Revision of Known Primary 1st Revision Total Knee Replacement by Stability and Distal Femoral Replacement of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fully Stabilised	106	91	60	43	10	1	0
Hinged	232	183	118	68	17	3	0
Hinged+ Distal Femoral Component	488	339	197	103	10	0	0
Medial Pivot	14	9	2	2	0	0	0
Minimally Stabilised	214	177	135	106	41	13	3
Posterior Stabilised	157	148	118	92	42	10	0

Note: Restricted to major total and major partial revisions. Of these, excludes 32 procedures with missing stability.

TIMING OF 1ST REVISION

The timing of the 1st revision was classified as early if it occurred within 2 years of the primary procedure (<2 years) or late if it occurred 2 years or more (≥2 years) after the primary procedure. There are 11,249 early 1st revisions (36.9%). 1st revisions performed within 2 years have a higher rate of 2nd revision when compared to late 1st revisions after 3months and until 4.5 years, with no difference outside of this period (Table N70 and Figure N83).

The most common reasons for early revision are loosening, instability and patellofemoral pain, while the most common reasons for late revision are loosening, instability and patella erosion. Revisions for implant breakage or wear more often occur late (Table N71).

Loosening, infection and instability are the most common reasons for 2nd revision for both early and late 1st revisions (Figure N84).

There are 32.9% (n=3,156) of 1st revisions for loosening that occur early; 37.4% (n=2,215) of 1st revisions for patella reasons that occur early, 39.2% (n=1,173) of 1st revisions for pain that occur early; and 58.4% (n=873) of 1st revisions for arthrofibrosis that occur early (Table N71 and Figure N84). For all of these reasons for revision, early 1st revisions have a higher rate of revision compared to late 1st revisions (Table N72 to Table N75 and Figure N85 to Figure N88).

There are 1,621 early 1st revisions for instability (43.2% of 1st revisions for instability). 1st revisions performed within 2 years have a higher rate of 2nd revision for the first 1.5 years compared to late 1st revisions for instability (Table N76 and Figure N89).

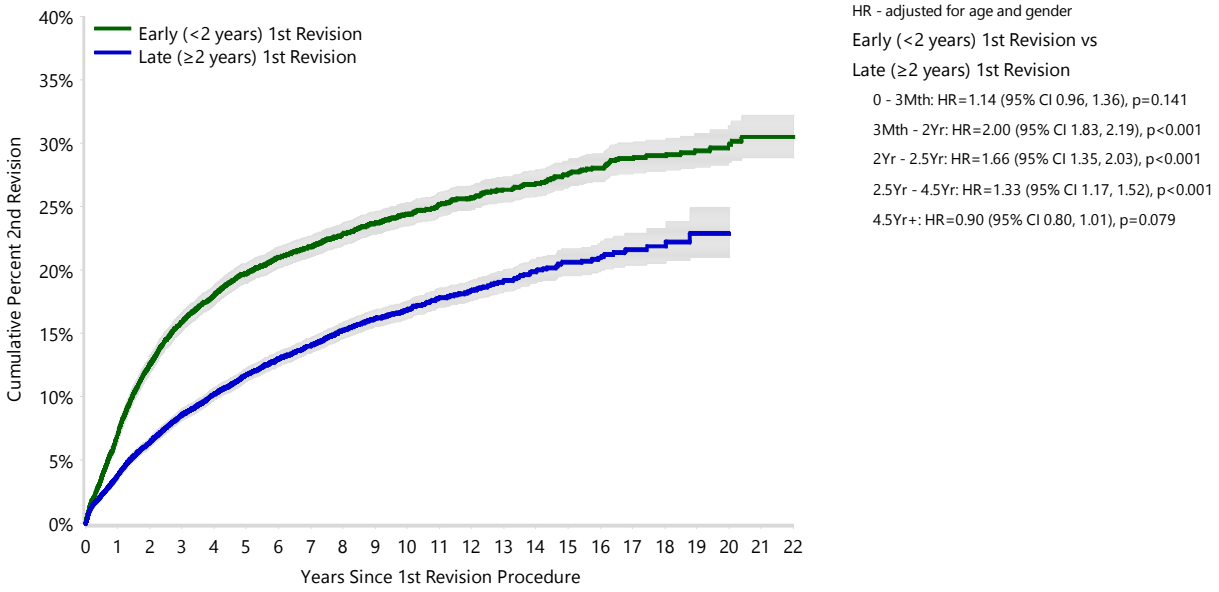
There are 547 early 1st revisions for fracture (36.4% of 1st revisions for fracture). There is no difference in rate of 2nd revision comparing early and late 1st revisions for fracture (Table N77 and Figure N90).

Table N70 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	2446	11249	7.0 (6.6, 7.5)	15.9 (15.2, 16.6)	19.7 (19.0, 20.5)	24.4 (23.5, 25.3)	27.6 (26.6, 28.7)	29.9 (28.5, 31.4)
Late (≥2 years) 1st Revision	2379	19211	3.8 (3.5, 4.1)	8.6 (8.2, 9.0)	11.7 (11.2, 12.2)	16.9 (16.2, 17.6)	20.6 (19.6, 21.6)	22.9 (21.0, 24.9)
TOTAL	4825	30460						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N83 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	11249	9915	7990	6540	3470	1306	270
Late (≥2 years) 1st Revision	19211	16822	13031	9880	3853	840	46

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N71 Reasons for 1st Revision Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

1st Revision Diagnosis	Early (<2 years) 1st Revision			Late (≥2 years) 1st Revision			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Arthrofibrosis	877	58.4	7.8	625	41.6	3.3	1502	100.0	4.9
Bearing Dislocation	159	71.9	1.4	62	28.1	0.3	221	100.0	0.7
Fracture	547	36.2	4.9	963	63.8	5.0	1510	100.0	5.0
Heterotopic Bone	7	36.8	0.1	12	63.2	0.1	19	100.0	0.1
Implant Breakage Femoral	12	22.6	0.1	41	77.4	0.2	53	100.0	0.2
Implant Breakage Patella	39	21.2	0.3	145	78.8	0.8	184	100.0	0.6
Implant Breakage Tibial	19	20.0	0.2	76	80.0	0.4	95	100.0	0.3
Implant Breakage Tibial Insert	55	13.1	0.5	364	86.9	1.9	419	100.0	1.4
Incorrect Side	2	100.0	0.0	.	.	.	2	100.0	0.0
Incorrect Sizing	250	69.4	2.2	110	30.6	0.6	360	100.0	1.2
Instability	1621	43.2	14.4	2134	56.8	11.1	3755	100.0	12.3
Loosening	3156	32.9	28.1	6434	67.1	33.5	9590	100.0	31.5
Lysis	105	12.0	0.9	770	88.0	4.0	875	100.0	2.9
Malalignment	397	49.4	3.5	406	50.6	2.1	803	100.0	2.6
Metal Related Pathology	84	19.7	0.7	342	80.3	1.8	426	100.0	1.4
Osteonecrosis	23	39.7	0.2	35	60.3	0.2	58	100.0	0.2
Pain	1173	39.2	10.4	1819	60.8	9.5	2992	100.0	9.8
Patella Dislocation	1	50.0	0.0	1	50.0	0.0	2	100.0	0.0
Patella Erosion	768	27.8	6.8	1994	72.2	10.4	2762	100.0	9.1
Patella Maltracking	166	60.1	1.5	110	39.9	0.6	276	100.0	0.9
Patellofemoral Pain	1281	44.4	11.4	1605	55.6	8.4	2886	100.0	9.5
Progression Of Disease	1	8.3	0.0	11	91.7	0.1	12	100.0	0.0
Prosthesis Dislocation	74	59.2	0.7	51	40.8	0.3	125	100.0	0.4
Synovitis	53	44.9	0.5	65	55.1	0.3	118	100.0	0.4
Tumour	9	27.3	0.1	24	72.7	0.1	33	100.0	0.1
Wear Femoral	.	.	.	3	100.0	0.0	3	100.0	0.0
Wear Patella	6	8.1	0.1	68	91.9	0.4	74	100.0	0.2
Wear Tibial	3	18.8	0.0	13	81.3	0.1	16	100.0	0.1
Wear Tibial Insert	75	8.4	0.7	819	91.6	4.3	894	100.0	2.9
Other	286	72.4	2.5	109	27.6	0.6	395	100.0	1.3
TOTAL	**11249**	**36.9**	**100.0**	**19211**	**63.1**	**100.0**	**30460**	**100.0**	**100.0**

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N84 Cumulative Incidence 2nd Revision Diagnosis of Known Primary 1st Revision Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

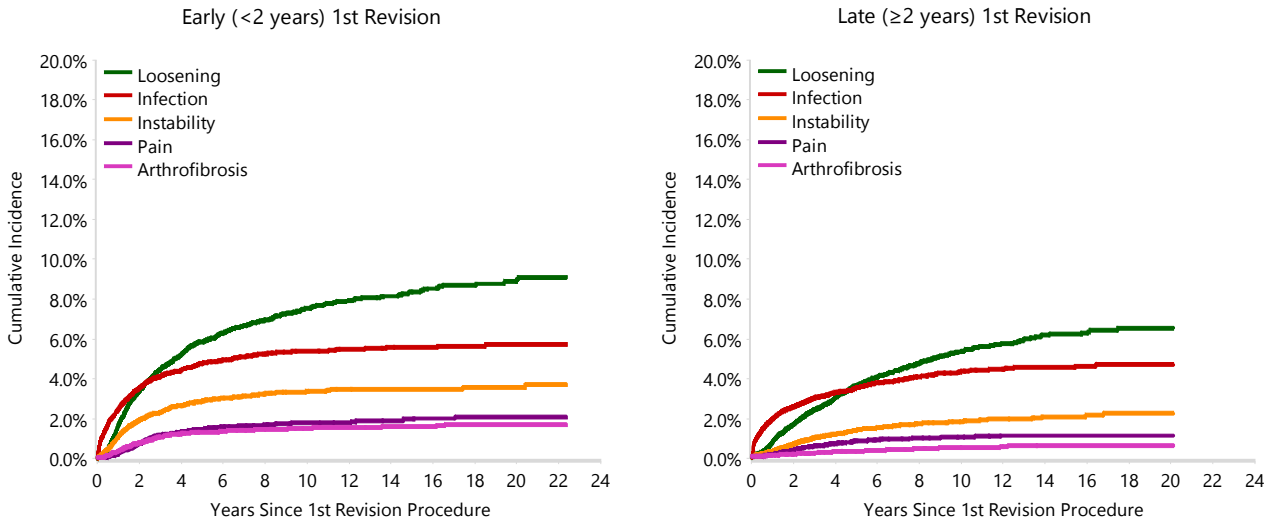
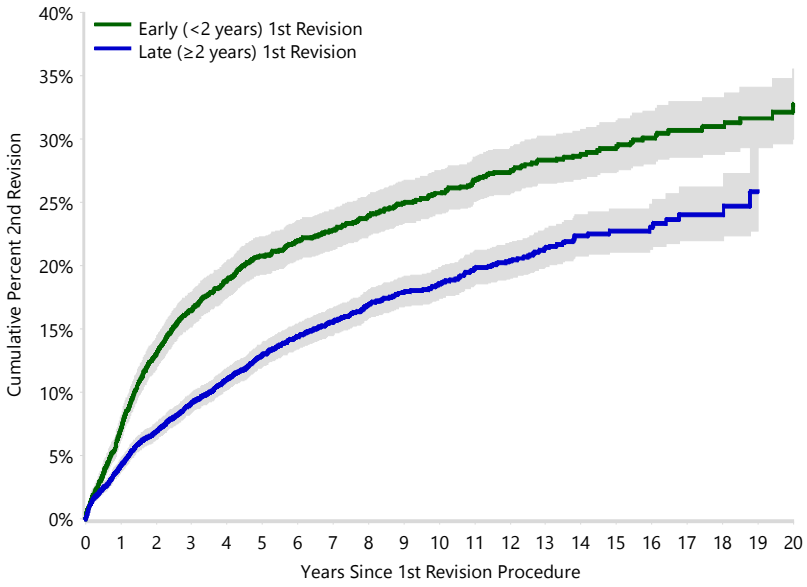


Table N72 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	751	3156	7.1 (6.2, 8.0)	16.5 (15.2, 17.9)	20.7 (19.3, 22.3)	25.7 (24.1, 27.5)	29.4 (27.5, 31.4)	32.7 (30.0, 35.6)
Late (≥2 years) 1st Revision	902	6434	4.2 (3.7, 4.7)	9.2 (8.4, 9.9)	12.9 (12.1, 13.9)	18.6 (17.4, 19.9)	22.7 (21.1, 24.5)	
TOTAL	1653	9590						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N85 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender
Early (<2 years) 1st Revision vs
Late (≥2 years) 1st Revision
0 - 1.5Yr: HR=1.65 (95% CI 1.42, 1.91), p<0.001
1.5Yr - 2.5Yr: HR=2.06 (95% CI 1.59, 2.66), p<0.001
2.5Yr+: HR=1.01 (95% CI 0.87, 1.17), p=0.934

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	3156	2814	2283	1901	1075	436	116
Late (≥2 years) 1st Revision	6434	5629	4381	3371	1422	371	22

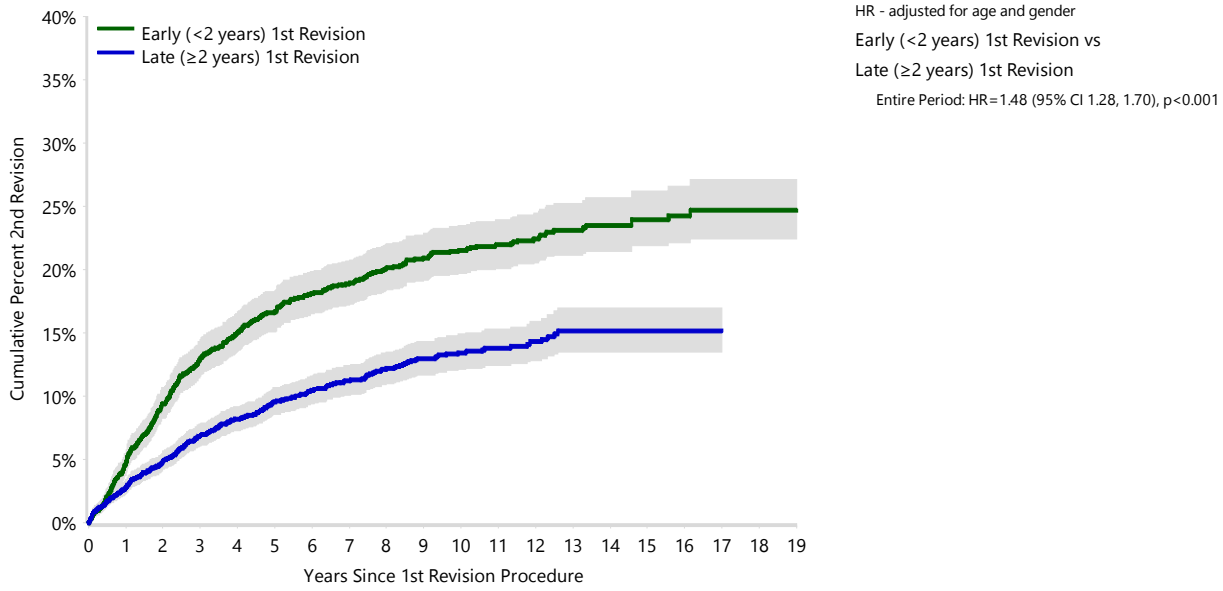
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N73 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	434	2215	4.6 (3.8, 5.6)	12.9 (11.6, 14.5)	16.7 (15.1, 18.4)	21.5 (19.7, 23.5)	24.0 (21.9, 26.2)	
Late (≥2 years) 1st Revision	375	3709	2.8 (2.3, 3.4)	6.9 (6.1, 7.8)	9.6 (8.6, 10.7)	13.4 (12.1, 14.9)	15.2 (13.5, 17.0)	
TOTAL	809	5924						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N86 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
Early (<2 years) 1st Revision	2215	2048	1699	1451	828	286	38	19
Late (≥2 years) 1st Revision	3709	3342	2702	2103	810	147	9	2

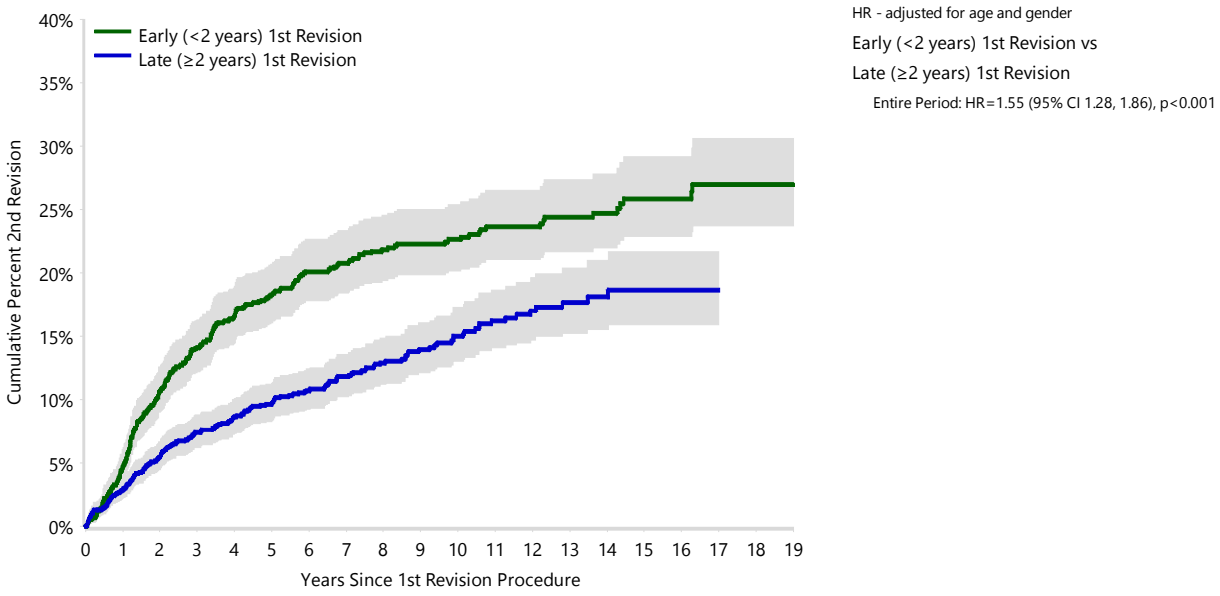
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N74 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	246	1173	4.7 (3.6, 6.1)	14.1 (12.2, 16.3)	18.3 (16.1, 20.7)	22.6 (20.1, 25.4)	25.9 (22.9, 29.1)	
Late (≥2 years) 1st Revision	211	1819	2.9 (2.2, 3.8)	7.4 (6.3, 8.8)	9.7 (8.3, 11.2)	15.0 (13.1, 17.3)	18.6 (15.9, 21.7)	
TOTAL	457	2992						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N87 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	1173	1072	892	746	416	173	30
Late (≥2 years) 1st Revision	1819	1654	1378	1062	450	111	5

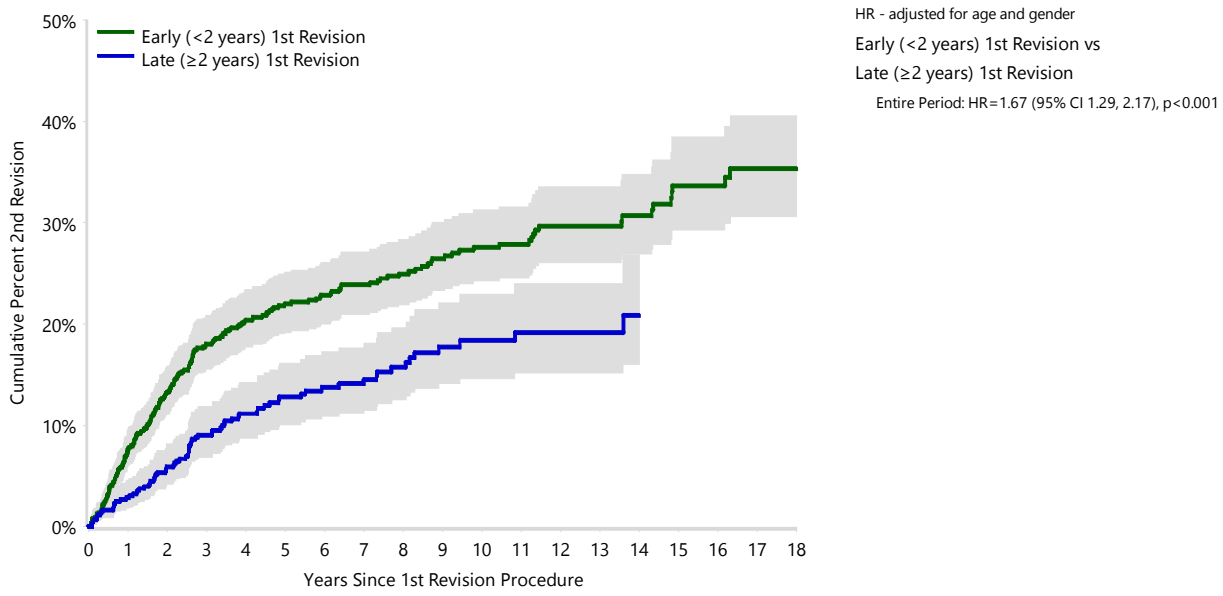
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N75 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	210	877	7.6 (6.0, 9.6)	18.0 (15.5, 20.9)	22.0 (19.2, 25.1)	27.6 (24.3, 31.2)	33.6 (29.3, 38.4)	
Late (≥2 years) 1st Revision	79	625	2.8 (1.8, 4.5)	9.0 (6.9, 11.8)	12.8 (10.1, 16.1)	18.3 (14.6, 22.9)		
TOTAL	289	1502						

Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N88 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
Early (<2 years) 1st Revision	877	754	583	464	246	106	17	11
Late (≥2 years) 1st Revision	625	543	416	308	119	32	1	0

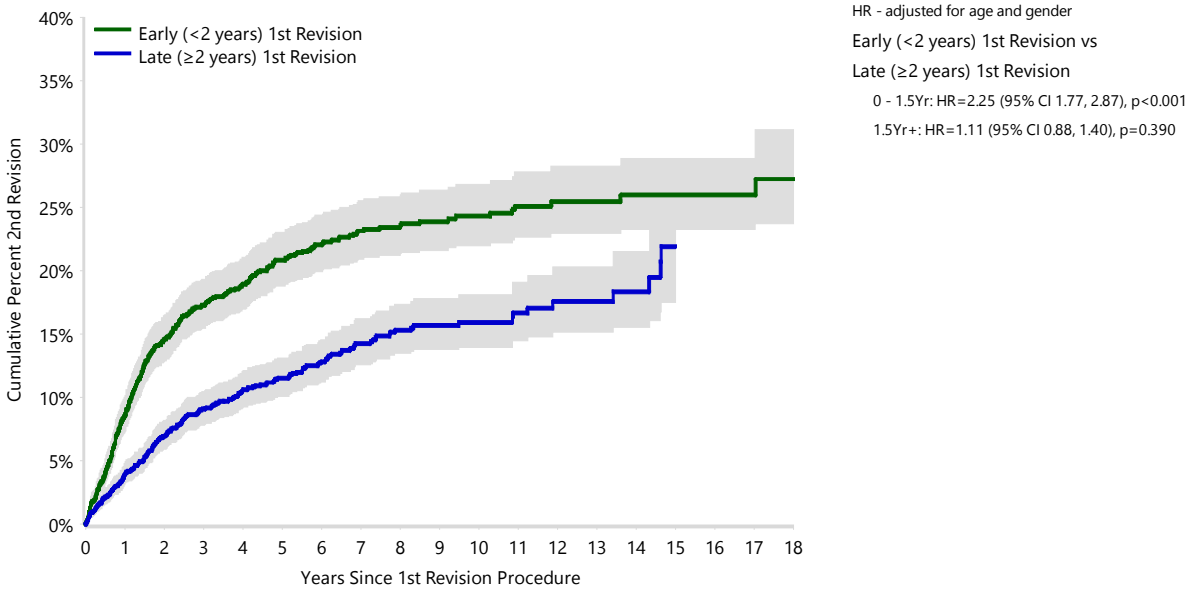
Note: Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N76 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	332	1621	8.5 (7.2, 10.0)	17.3 (15.5, 19.3)	20.8 (18.8, 23.1)	24.3 (22.0, 26.8)	26.0 (23.3, 28.9)	
Late (≥2 years) 1st Revision	247	2134	3.9 (3.2, 4.9)	9.1 (7.9, 10.5)	11.5 (10.1, 13.1)	15.9 (14.0, 18.1)	21.9 (17.5, 27.3)	
TOTAL	579	3755						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N89 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	1621	1367	1059	826	321	102	16
Late (≥2 years) 1st Revision	2134	1861	1401	999	280	56	4

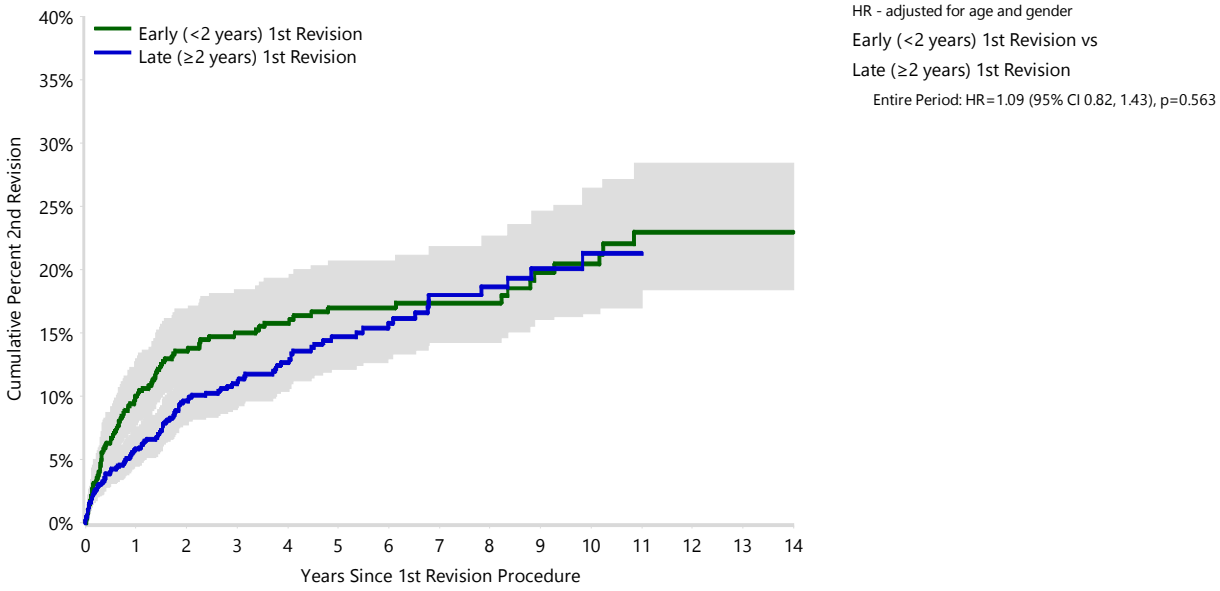
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N77 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	94	547	10.0 (7.8, 12.9)	15.0 (12.1, 18.4)	17.0 (13.9, 20.7)	20.4 (16.6, 25.1)		
Late (≥2 years) 1st Revision	115	963	5.8 (4.5, 7.6)	11.0 (8.9, 13.4)	14.7 (12.1, 17.7)	21.3 (17.0, 26.4)		
TOTAL	209	1510						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N90 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Timing of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Early (<2 years) 1st Revision	547	449	338	248	106	33	6
Late (≥2 years) 1st Revision	963	741	457	283	62	8	1

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

OUTCOMES OF 1ST REVISION OVER TIME

This analysis compares the outcomes of 1st revisions of total knee replacement over four successive time periods: 1999-2005, 2006-2012, 2013-2019 and 2020-2024. When all aseptic 1st revisions are included, there is a lower rate of 2nd revision comparing the most recent period to 1999-2005 and 2006-2012, but there is no difference compared to 2013-2019 (Table N78 and Figure N91).

There has been little change in 2nd revision rate for any reason since 2006-2012.

The numbers and proportions of the 2nd revision diagnoses for each time period are shown in (Table N79).
The proportion of 2nd revision for loosening has decreased over time, while revisions for infection and instability have increased.

Where the 1st revision is for loosening the rate of the 2nd revision , is lower for the period 2020-2024 compared to 1999-2005 after 9 months, but there is little difference when compared to the other time periods (Table N80 and Figure N93).

There is a lower rate of 2nd revision where the 1st revision is for instability comparing time periods 2020-2024 to 1999-2005, but there is no difference when compared to the other time periods (Table N81 and Figure N94).

Where the 1st revision is for patella reasons the rate of 2nd revision is again lower when comparing 2020-2025 to 1999-2005 after 1.5 years, but there is no difference when compared to other time periods (Table N82 and Figure N95).

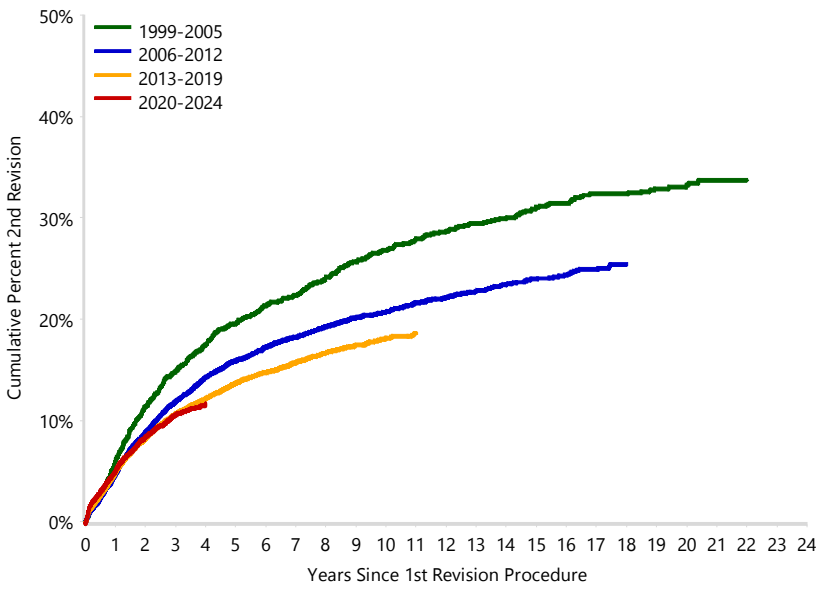
There has been no change in the rate of 2nd revision over time where the 1st revision is for arthrofibrosis, fracture or pain (Table N83, Figure N96, Table N84, Figure N97, Table N85, and Figure N98).

Table N78 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	510	1743	6.0 (5.0, 7.2)	14.8 (13.2, 16.6)	19.6 (17.7, 21.5)	26.8 (24.7, 29.0)	31.1 (28.8, 33.5)	33.3 (30.8, 35.8)
2006-2012	1599	7275	4.7 (4.2, 5.2)	11.9 (11.2, 12.7)	15.9 (15.1, 16.8)	20.8 (19.9, 21.8)	24.1 (23.0, 25.2)	
2013-2019	1916	11913	4.9 (4.6, 5.4)	10.8 (10.2, 11.4)	13.8 (13.2, 14.5)	18.3 (17.5, 19.1)		
2020-2024	800	9529	5.2 (4.7, 5.6)	10.7 (10.0, 11.5)				
TOTAL	4825	30460						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N91 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 3Mth: HR=0.56 (95% CI 0.36, 0.85), p=0.006

3Mth+: HR=1.58 (95% CI 1.39, 1.79), p<0.001

2006-2012 vs 2020-2024

0 - 3Mth: HR=0.55 (95% CI 0.43, 0.70), p<0.001

3Mth - 1.5Yr: HR=1.14 (95% CI 1.00, 1.30), p=0.042

1.5Yr+: HR=1.25 (95% CI 1.12, 1.40), p<0.001

2013-2019 vs 2020-2024

0 - 3Mth: HR=0.71 (95% CI 0.58, 0.86), p<0.001

3Mth+: HR=1.05 (95% CI 0.95, 1.16), p=0.324

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	1743	1617	1426	1280	980	696	316
2006-2012	7275	6882	6221	5700	4464	1450	0
2013-2019	11913	11214	10219	9440	1879	0	0
2020-2024	9529	7024	3155	0	0	0	0

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N79 2nd Revision Diagnosis of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	1999-2005			2006-2012		
	Number	% 1st Revisions Revised	% 2nd Revisions	Number	% 1st Revisions Revised	% 2nd Revisions
Loosening	211	12.1	41.4	570	7.8	35.6
Infection	106	6.1	20.8	349	4.8	21.8
Instability	30	1.7	5.9	156	2.1	9.8
Pain	38	2.2	7.5	149	2.0	9.3
Arthrofibrosis	23	1.3	4.5	53	0.7	3.3
Malalignment	12	0.7	2.4	52	0.7	3.3
Fracture	6	0.3	1.2	26	0.4	1.6
Lysis	10	0.6	2.0	44	0.6	2.8
Wear Tibial Insert	13	0.7	2.5	29	0.4	1.8
Metal Related Pathology	4	0.2	0.8	26	0.4	1.6
Patellofemoral Pain	14	0.8	2.7	25	0.3	1.6
Bearing Dislocation	2	0.1	0.4	8	0.1	0.5
Patella Erosion	2	0.1	0.4	13	0.2	0.8
Prosthesis Dislocation	6	0.3	1.2	15	0.2	0.9
Implant Breakage Tibial Insert	4	0.2	0.8	10	0.1	0.6
Incorrect Sizing	7	0.4	1.4	14	0.2	0.9
Patella Maltracking	6	0.3	1.2	14	0.2	0.9
Implant Breakage Patella	3	0.2	0.6	6	0.1	0.4
Implant Breakage Femoral	2	0.1	0.4	5	0.1	0.3
Implant Breakage Tibial	1	0.1	0.2	8	0.1	0.5
Wear Patella	3	0.2	0.6	6	0.1	0.4
Synovitis	2	0.1	0.4	5	0.1	0.3
Heterotopic Bone	1	0.1	0.2	3	0.0	0.2
Osteonecrosis				1	0.0	0.1
Implant Breakage Stem						
Progression Of Disease				1	0.0	0.1
Tumour	1	0.1	0.2			
Wear Femoral				1	0.0	0.1
Wear Tibial	1	0.1	0.2	1	0.0	0.1
Other	2	0.1	0.4	9	0.1	0.6
N 2nd Revision	**510**	**29.3**	**100.0**	**1599**	**22.0**	**100.0**
N 1st Revision	**1743**			**7275**		

Table N80 ***Continued***

2nd Revision Diagnosis	2013-2019			2020-2024		
	Number	% 1st Revisions Revised	% 2nd Revisions	Number	% 1st Revisions Revised	% 2nd Revisions
Loosening	573	4.8	29.9	183	1.9	22.9
Infection	495	4.2	25.8	293	3.1	36.6
Instability	302	2.5	15.8	116	1.2	14.5
Pain	105	0.9	5.5	29	0.3	3.6
Arthrofibrosis	90	0.8	4.7	47	0.5	5.9
Malalignment	70	0.6	3.7	19	0.2	2.4
Fracture	54	0.5	2.8	28	0.3	3.5
Lysis	22	0.2	1.1	12	0.1	1.5
Wear Tibial Insert	22	0.2	1.1	5	0.1	0.6
Metal Related Pathology	15	0.1	0.8	6	0.1	0.8
Patellofemoral Pain	18	0.2	0.9	1	0.0	0.1
Bearing Dislocation	20	0.2	1.0	8	0.1	1.0
Patella Erosion	19	0.2	1.0	8	0.1	1.0
Prosthesis Dislocation	11	0.1	0.6	6	0.1	0.8
Implant Breakage Tibial Insert	14	0.1	0.7	7	0.1	0.9
Incorrect Sizing	14	0.1	0.7	3	0.0	0.4
Patella Maltracking	14	0.1	0.7	8	0.1	1.0
Implant Breakage Patella	11	0.1	0.6	3	0.0	0.4
Implant Breakage Femoral	8	0.1	0.4			
Implant Breakage Tibial	7	0.1	0.4	2	0.0	0.3
Wear Patella	6	0.1	0.3	3	0.0	0.4
Synovitis	5	0.0	0.3	2	0.0	0.3
Heterotopic Bone	2	0.0	0.1	2	0.0	0.3
Osteonecrosis	2	0.0	0.1	1	0.0	0.1
Implant Breakage Stem	1	0.0	0.1			
Progression Of Disease						
Tumour	1	0.0	0.1	1	0.0	0.1
Wear Femoral						
Wear Tibial						
Other	15	0.1	0.8	7	0.1	0.9
N 2nd Revision	**1916**	**16.1**	**100.0**	**800**	**8.4**	**100.0**
N 1st Revision	**11913**			**9529**		

Figure N92 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Knee Replacement by Time Period of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

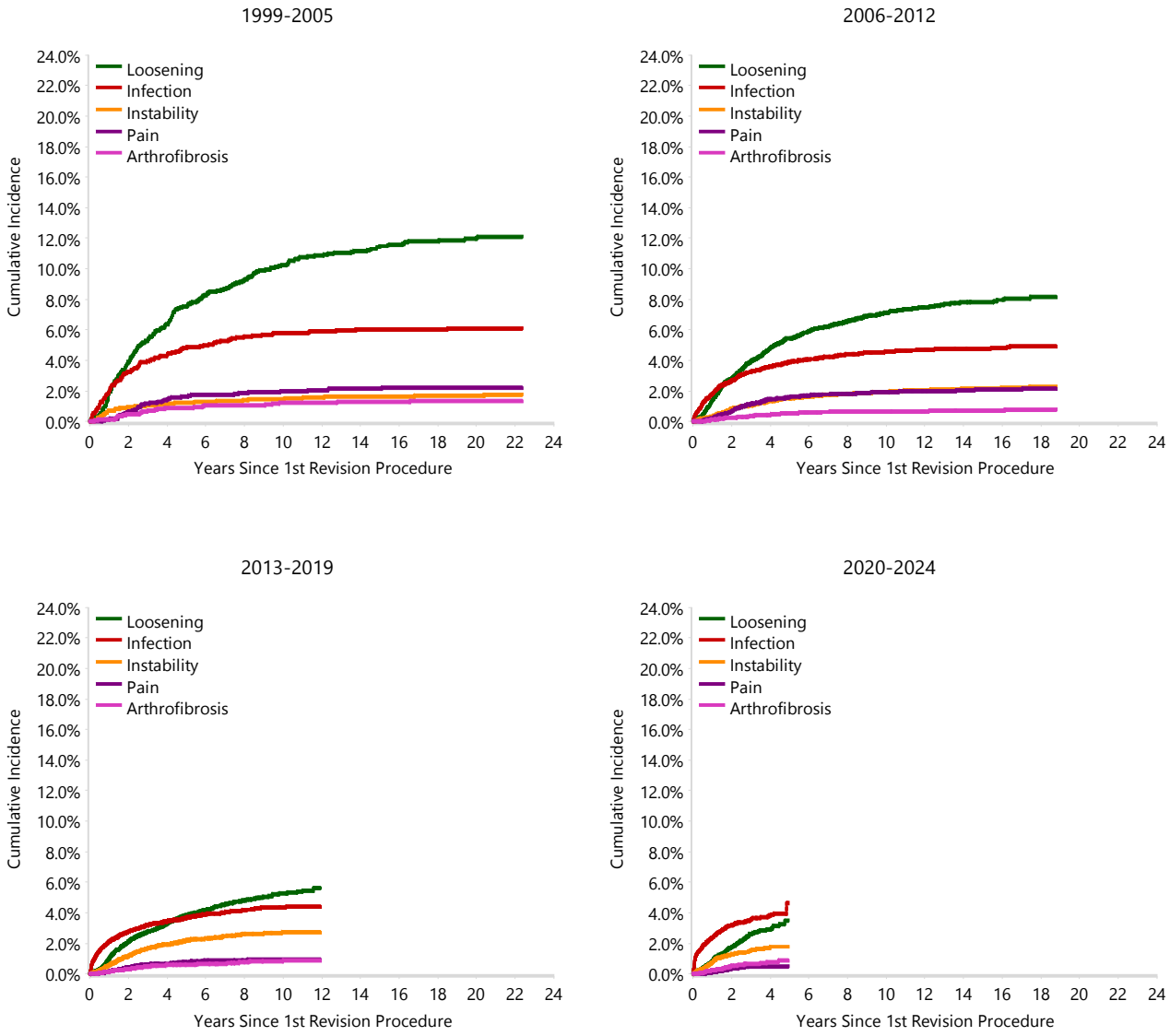
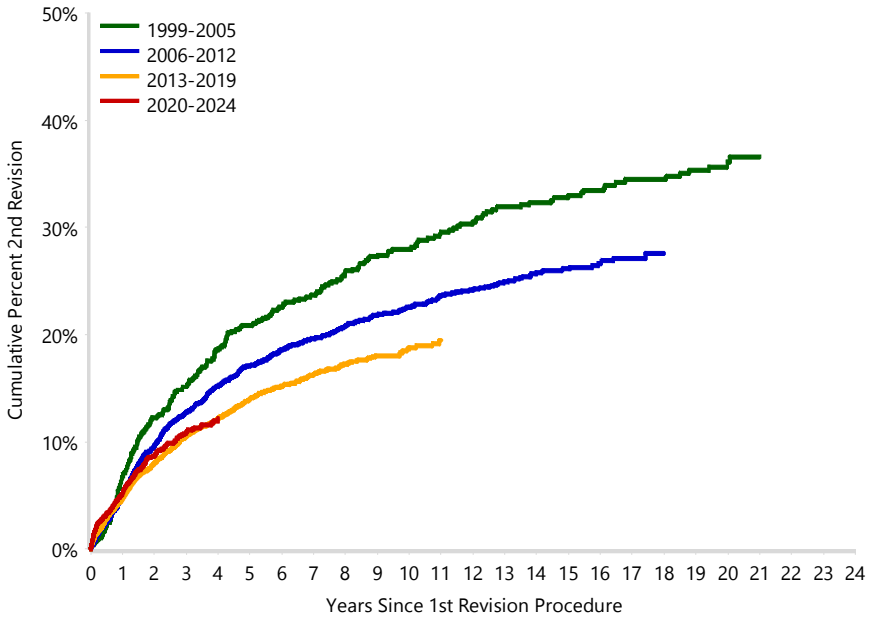


Table N81 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
1999-2005	230	723	6.8 (5.2, 8.9)	15.1 (12.7, 18.0)	20.9 (18.1, 24.1)	27.9 (24.7, 31.5)	33.0 (29.5, 36.8)	36.1 (32.3, 40.2)	36.6 (32.7, 40.8)
2006-2012	592	2464	5.2 (4.4, 6.1)	12.8 (11.5, 14.1)	17.1 (15.6, 18.7)	22.6 (20.9, 24.3)	26.1 (24.3, 28.1)		
2013-2019	586	3545	4.7 (4.1, 5.5)	10.5 (9.5, 11.6)	14.0 (12.9, 15.2)	18.8 (17.3, 20.4)			
2020-2024	245	2858	5.2 (4.5, 6.2)	10.8 (9.5, 12.3)					
TOTAL	1653	9590							

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N93 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Loosening)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 3Mth: HR=0.42 (95% CI 0.19, 0.90), p=0.025

3Mth - 9Mth: HR=1.46 (95% CI 0.92, 2.31), p=0.104

9Mth - 1Yr: HR=2.32 (95% CI 1.42, 3.81), p<0.001

1Yr+: HR=1.40 (95% CI 1.13, 1.75), p=0.002

2006-2012 vs 2020-2024

0 - 3Mth: HR=0.62 (95% CI 0.42, 0.91), p=0.015

3Mth - 2.5Yr: HR=1.22 (95% CI 1.01, 1.47), p=0.035

2.5Yr - 4Yr: HR=1.10 (95% CI 0.82, 1.47), p=0.538

4Yr+: HR=1.04 (95% CI 0.81, 1.32), p=0.761

2013-2019 vs 2020-2024

Entire Period: HR=0.92 (95% CI 0.79, 1.08), p=0.308

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs	21 Yrs
1999-2005	723	667	595	528	408	295	138	46
2006-2012	2464	2321	2088	1915	1501	512	0	0
2013-2019	3545	3354	3070	2829	588	0	0	0
2020-2024	2858	2101	911	0	0	0	0	0

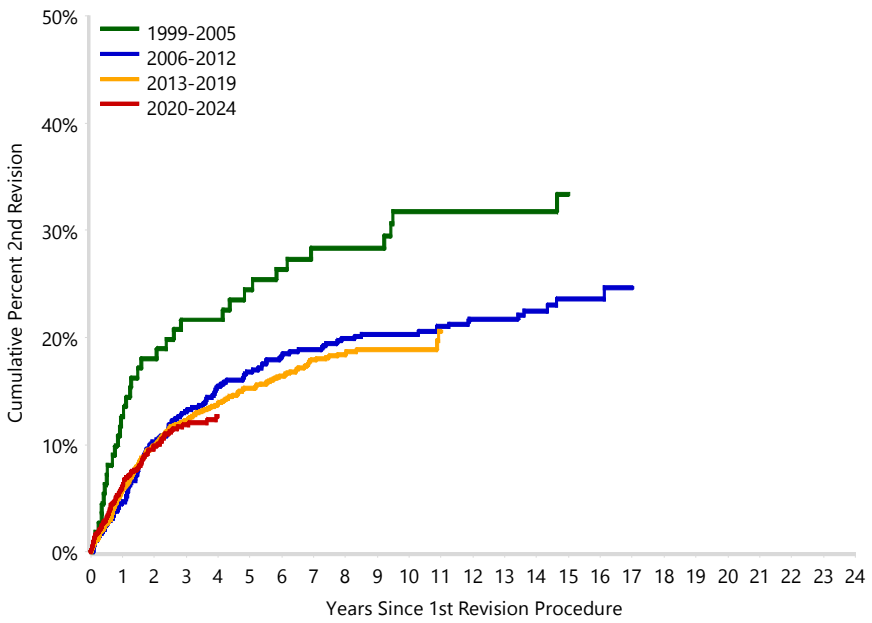
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N82 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	35	111	12.6 (7.7, 20.4)	21.7 (15.1, 30.5)	24.4 (17.5, 33.6)	31.8 (23.8, 41.6)	33.4 (25.1, 43.5)	
2006-2012	125	580	4.5 (3.1, 6.6)	13.1 (10.6, 16.2)	16.8 (13.9, 20.1)	20.3 (17.2, 23.9)	23.5 (20.0, 27.7)	
2013-2019	289	1662	5.7 (4.7, 7.0)	12.3 (10.8, 14.0)	15.2 (13.6, 17.1)	18.9 (16.9, 21.0)		
2020-2024	130	1402	6.2 (5.0, 7.7)	11.8 (10.0, 14.0)				
TOTAL	579	3755						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N94 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Instability)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

Entire Period: HR=1.73 (95% CI 1.17, 2.57), p=0.006

2006-2012 vs 2020-2024

0 - 1.5Yr: HR=0.90 (95% CI 0.64, 1.28), p=0.564

1.5Yr+: HR=1.45 (95% CI 0.98, 2.15), p=0.065

2013-2019 vs 2020-2024

0 - 1.5Yr: HR=0.95 (95% CI 0.74, 1.23), p=0.703

1.5Yr+: HR=1.26 (95% CI 0.88, 1.81), p=0.201

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	111	97	86	79	58	41	20
2006-2012	580	549	486	446	350	117	0
2013-2019	1662	1558	1413	1300	193	0	0
2020-2024	1402	1024	475	0	0	0	0

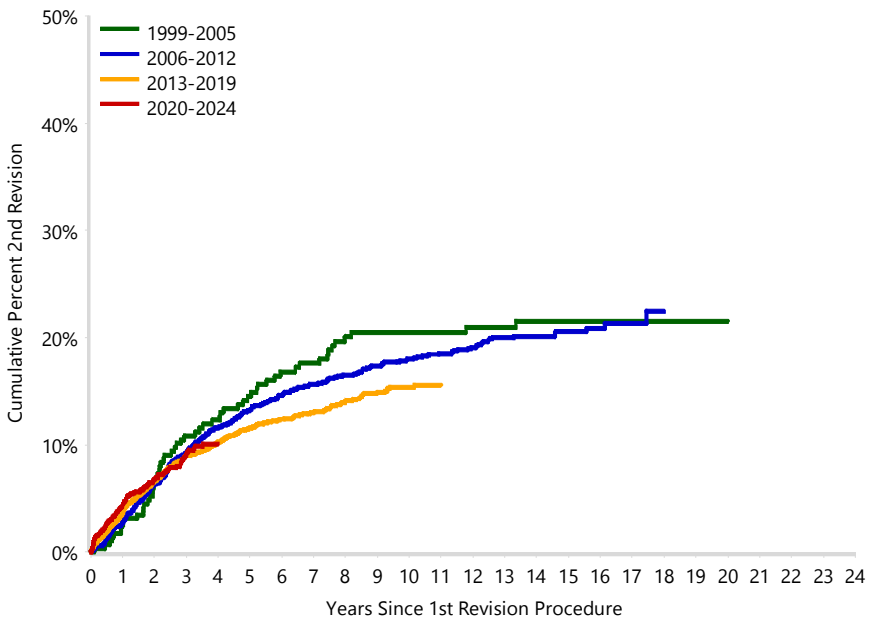
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N83 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	60	291	2.4 (1.2, 5.0)	10.8 (7.7, 15.0)	14.5 (10.9, 19.2)	20.5 (16.1, 25.8)	21.5 (17.0, 27.0)	21.5 (17.0, 27.0)
2006-2012	298	1585	2.7 (2.0, 3.7)	9.2 (7.9, 10.7)	13.3 (11.7, 15.1)	18.0 (16.2, 20.1)	20.5 (18.5, 22.8)	
2013-2019	339	2487	3.6 (3.0, 4.4)	9.0 (7.9, 10.2)	11.5 (10.3, 12.9)	15.4 (13.9, 17.1)		
2020-2024	112	1561	4.3 (3.4, 5.5)	9.1 (7.5, 11.1)				
TOTAL	809	5924						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N95 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Patella Reasons)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 1.5Yr: HR=0.54 (95% CI 0.28, 1.04), p=0.066

1.5Yr+: HR=1.46 (95% CI 1.01, 2.11), p=0.047

2006-2012 vs 2020-2024

0 - 6Mth: HR=0.54 (95% CI 0.33, 0.90), p=0.017

6Mth - 9Mth: HR=1.09 (95% CI 0.59, 2.00), p=0.790

9Mth - 1Yr: HR=0.43 (95% CI 0.19, 0.97), p=0.043

1Yr - 2.5Yr: HR=1.19 (95% CI 0.87, 1.62), p=0.278

2.5Yr - 3.5Yr: HR=1.48 (95% CI 0.94, 2.34), p=0.088

3.5Yr+: HR=1.33 (95% CI 0.95, 1.85), p=0.092

2013-2019 vs 2020-2024

Entire Period: HR=0.94 (95% CI 0.75, 1.18), p=0.591

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	291	282	250	228	179	127	47
2006-2012	1585	1531	1403	1284	994	306	0
2013-2019	2487	2384	2202	2042	465	0	0
2020-2024	1561	1193	546	0	0	0	0

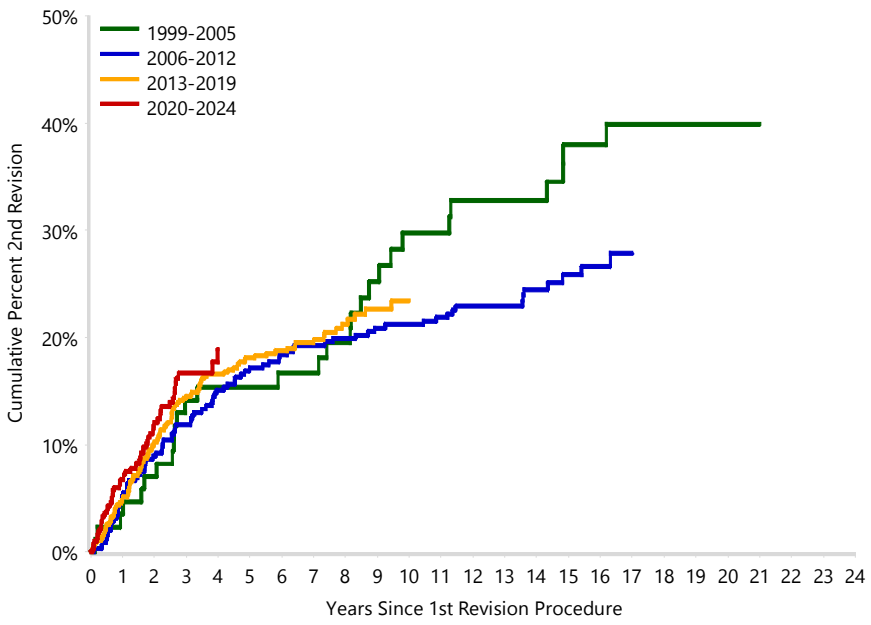
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N84 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	29	86	3.5 (1.1, 10.5)	14.1 (8.3, 23.6)	15.3 (9.2, 25.0)	29.7 (20.8, 41.5)	38.0 (27.8, 50.4)	39.9 (29.4, 52.5)
2006-2012	84	350	5.5 (3.5, 8.4)	11.9 (8.9, 15.8)	17.2 (13.6, 21.6)	21.2 (17.2, 25.9)	25.8 (21.2, 31.3)	
2013-2019	113	551	5.1 (3.5, 7.3)	14.5 (11.8, 17.7)	18.1 (15.1, 21.6)	23.4 (19.6, 27.9)		
2020-2024	63	515	6.7 (4.8, 9.4)	16.6 (13.0, 21.2)				
TOTAL	289	1502						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N96 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Arthrofibrosis)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 2.5Yr: HR=0.57 (95% CI 0.26, 1.25), p=0.163

2.5Yr+: HR=1.48 (95% CI 0.85, 2.56), p=0.163

2006-2012 vs 2020-2024

Entire Period: HR=0.78 (95% CI 0.55, 1.11), p=0.160

2013-2019 vs 2020-2024

Entire Period: HR=0.84 (95% CI 0.61, 1.16), p=0.291

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	86	82	72	68	46	35	18
2006-2012	350	328	302	278	239	103	0
2013-2019	551	519	460	426	80	0	0
2020-2024	515	368	165	0	0	0	0

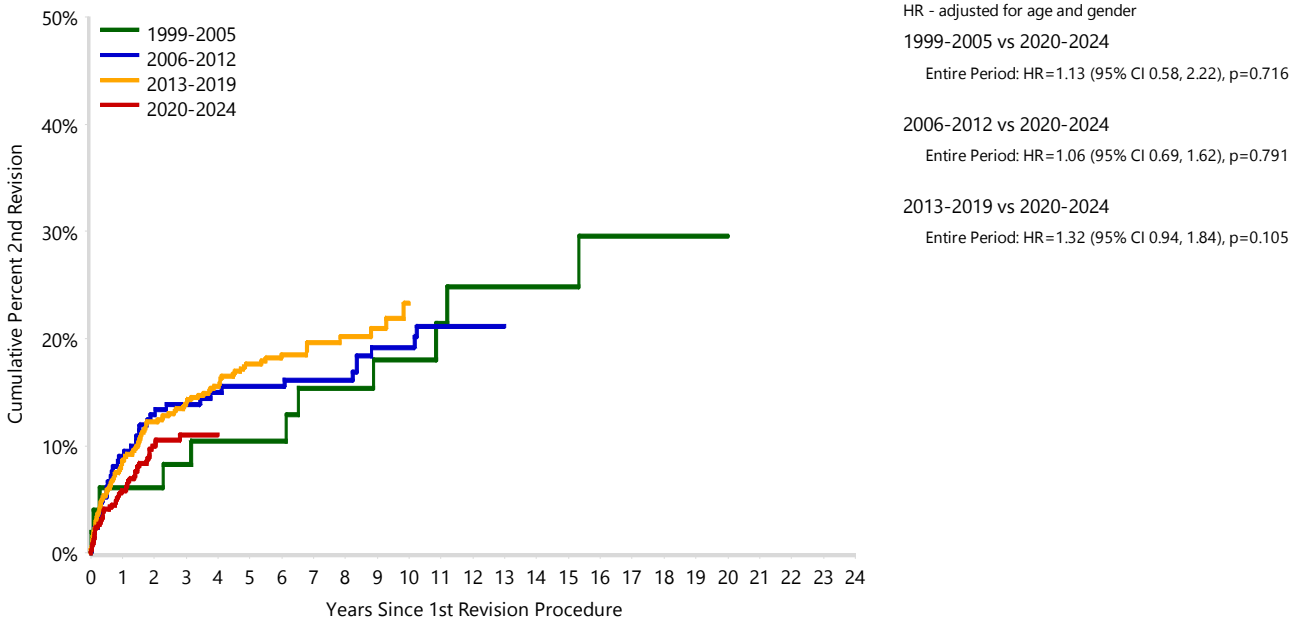
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N85 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	11	52	6.1 (2.0, 17.7)	8.2 (3.2, 20.5)	10.4 (4.5, 23.3)	18.0 (9.4, 33.0)	24.9 (13.9, 42.0)	29.6 (16.9, 48.5)
2006-2012	40	216	9.0 (5.8, 13.8)	13.9 (9.9, 19.4)	15.5 (11.2, 21.3)	19.2 (14.2, 25.6)		
2013-2019	102	579	8.6 (6.6, 11.3)	13.8 (11.2, 17.1)	17.6 (14.6, 21.2)	23.3 (18.7, 28.8)		
2020-2024	56	663	5.8 (4.2, 8.1)	11.0 (8.5, 14.3)				
TOTAL	209	1510						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N97 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	52	45	43	39	30	16	7
2006-2012	216	190	168	145	87	25	0
2013-2019	579	496	409	347	51	0	0
2020-2024	663	459	175	0	0	0	0

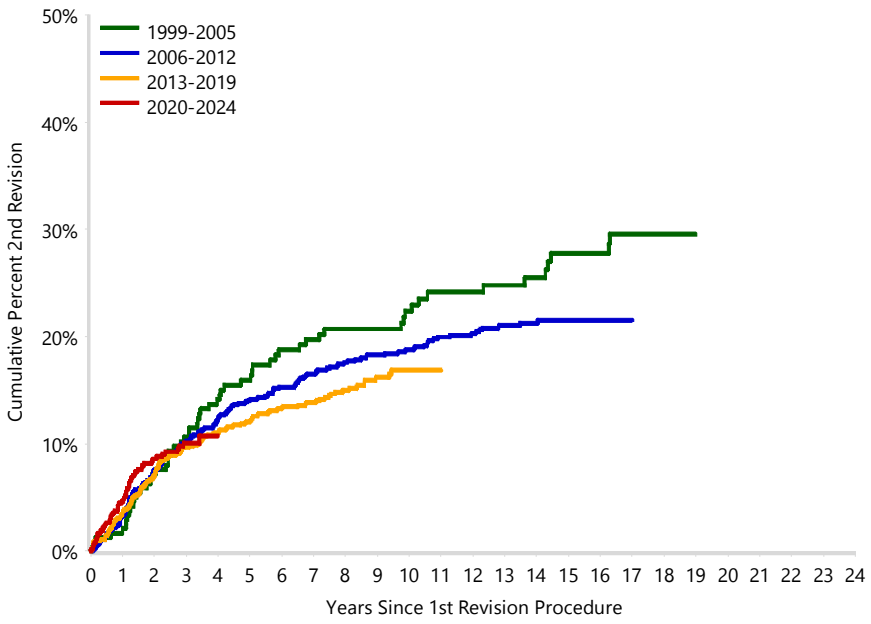
Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N86 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	60	241	2.1 (0.9, 4.9)	10.6 (7.3, 15.3)	15.9 (11.8, 21.3)	22.4 (17.4, 28.5)	27.7 (22.0, 34.6)	
2006-2012	168	848	3.2 (2.2, 4.6)	10.2 (8.4, 12.5)	14.0 (11.8, 16.6)	18.7 (16.2, 21.6)	21.5 (18.8, 24.7)	
2013-2019	167	1147	3.6 (2.7, 4.8)	9.7 (8.1, 11.6)	12.1 (10.3, 14.1)	16.8 (14.5, 19.6)		
2020-2024	62	756	4.7 (3.3, 6.5)	10.0 (7.8, 12.8)				
TOTAL	457	2992						

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N98 Cumulative Percent 2nd Revision of Known Primary Total Knee Replacement by Year of 1st Revision (Primary Diagnosis OA, 1st Revision for Pain)



HR - adjusted for age and gender

1999-2005 vs 2020-2024

0 - 1.5Yr: HR=0.83 (95% CI 0.45, 1.52), p=0.540

1.5Yr+: HR=1.68 (95% CI 1.10, 2.57), p=0.017

2006-2012 vs 2020-2024

0 - 1.5Yr: HR=0.89 (95% CI 0.60, 1.32), p=0.571

1.5Yr+: HR=1.22 (95% CI 0.85, 1.75), p=0.283

2013-2019 vs 2020-2024

Entire Period: HR=0.95 (95% CI 0.70, 1.28), p=0.735

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1999-2005	241	234	205	180	137	93	35
2006-2012	848	816	746	684	543	191	0
2013-2019	1147	1096	1001	944	186	0	0
2020-2024	756	580	318	0	0	0	0

Note: Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

MORTALITY FOLLOWING 1ST REVISION TOTAL KNEE REPLACEMENT

Mortality following revision total knee replacement has been calculated for all 1st revision procedures. The overall mortality is 0.2% at 30 days, 0.4% at 90 days, 1.0% at 1 year and 22.1% at 10 years (Table N86 and Figure N99).

The 10-year survival of 1st revision knee replacements is 78.4% while the 10-years survival of unrevised primary knee replacements is 82.9% (Table N87 and Figure N100).

Major total 1st revisions have a higher rate of mortality compared to minor revisions for the majority of the first 10 years, and when compared to major partial revisions until 3 months, with little difference after these times. Compared to minor 1st revisions, major partial revisions also have a higher early mortality (between 2 weeks and 3 months) (Table N88 and Figure N101).

Mortality following 1st revision has also been assessed by the revision diagnosis, and in this analysis, 1st revision for infection is included.

Compared to 1st revisions for loosening, 1st revisions for infection and fracture have a higher rate of mortality, while those revised for arthrofibrosis have a lower rate of mortality. 1st revisions for patella reasons, pain, instability and lysis have a similar mortality to 1st revisions for loosening (Table N89 and Figure N102).

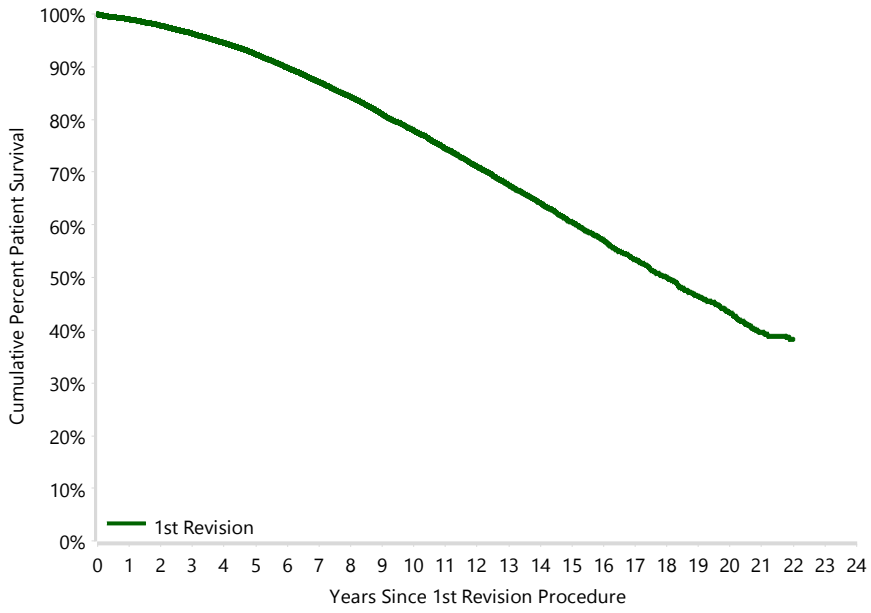
Revisions for fracture and infection have higher rates of mortality.

Table N87 Cumulative Percent Survival of Patients with Known Primary Total Knee Replacement Since 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Class	N Deceased	N Total	30 Day	90 Day	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1st Revisions	5953	28811	99.8 (99.8, 99.9)	99.6 (99.5, 99.7)	99.0 (98.9, 99.1)	92.4 (92.0, 92.7)	77.9 (77.2, 78.5)	60.5 (59.6, 61.5)	43.3 (41.7, 44.9)
TOTAL	5953	28811							

Note: Restricted to the first of the revision procedures for bilateral patients
Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N99 Cumulative Percent Survival of Patients with Known Primary Total Knee Replacement Since 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
1st Revisions	28811	26643	22526	18425	8989	2927	503

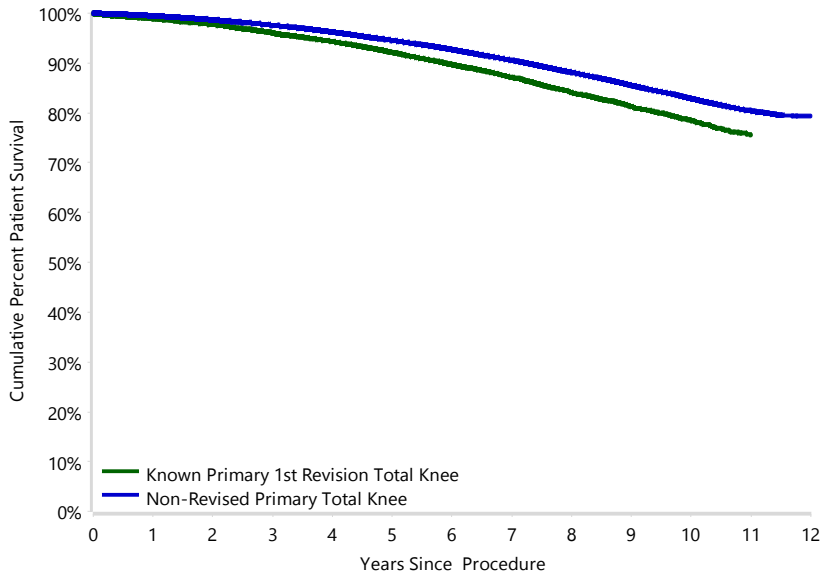
Note: Restricted to the first of the revision procedures for bilateral patients.
Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N88 Cumulative Percent Survival of Patients with Non-Revised Primary Total Knee Replacement and Known Primary 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Procedure Type	N Deceased	N Total	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Knee	2047	19557	98.9 (98.8, 99.1)	92.2 (91.7, 92.6)	78.4 (77.4, 79.4)	
Non-Revised Primary Total Knee	47003	629400	99.5 (99.5, 99.5)	94.6 (94.5, 94.6)	82.9 (82.7, 83.0)	
TOTAL	**49050**	**648957**				

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort.

Figure N100 Cumulative Percent Survival of Patients with Non-Revised Primary Total Knee Replacement and Known Primary 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age, gender and ASA score at procedure

Known Primary 1st Revision Total Conventional Hip VS Non-Revised Primary Total Conventional Hip

0Mth - 3Mth: HR=2.67 (95% CI: 2.12, 3.35), p<0.0001

3Mth – 1.5Yrs: HR=1.51 (95% CI: 1.32, 1.72), p<0.0001

1.5Yrs - 2.5Yr: HR=1.36 (95% CI: 1.19, 1.56), p<0.0001

2.5Yrs+: HR=1.20 (95% CI: 1.14, 1.26), p<0.0001

Number at Risk	0 Yr	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Knee	19557	17479	9867	1849	0
Non-Revised Primary Total Knee	629400	557917	309997	59077	0

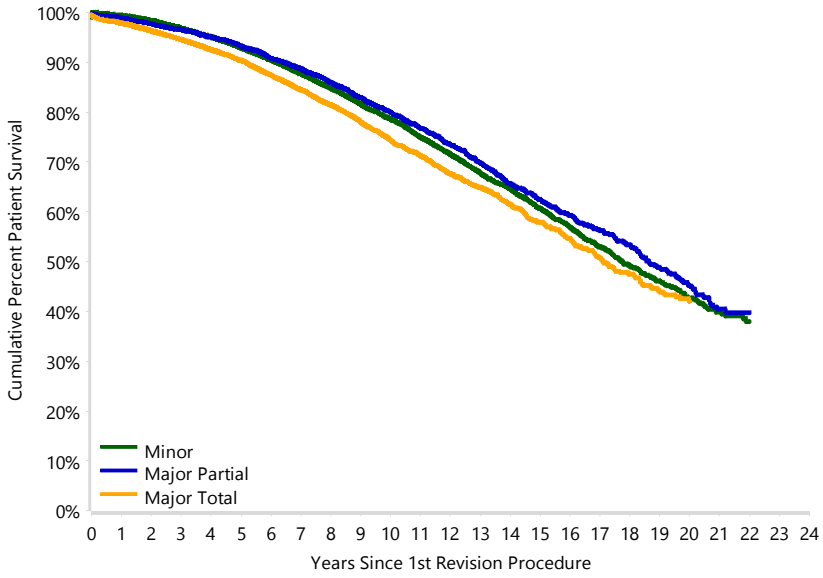
Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort.

Table N89 Cumulative Percent Survival of Patients with Known Primary 1st Revision Total Knee Replacement Since 1st Revision by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)

Type of 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	3048	15037	99.9 (99.9, 100.0)	99.9 (99.8, 99.9)	99.4 (99.3, 99.5)	93.0 (92.5, 93.4)	78.8 (77.9, 79.6)	60.9 (59.5, 62.3)	43.0 (40.6, 45.2)
Major Partial	1055	4262	99.9 (99.7, 100.0)	99.7 (99.5, 99.8)	99.2 (98.8, 99.4)	93.6 (92.8, 94.3)	80.3 (78.8, 81.7)	62.9 (60.7, 65.0)	45.7 (42.5, 48.8)
Major Total	1850	9512	99.6 (99.4, 99.7)	99.2 (99.0, 99.3)	98.2 (98.0, 98.5)	90.9 (90.2, 91.5)	74.8 (73.6, 76.0)	58.5 (56.6, 60.4)	42.7 (39.3, 46.0)
TOTAL	5953	28811							

Note: Restricted to the first of the revision procedures for bilateral patients.
Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N101 Cumulative Percent Survival of Patients with Known Primary 1st Revision Total Knee Replacement Since 1st Revision by Class of 1st Revision (Primary Diagnosis OA, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Major Partial vs Minor

0 - 2Wk: HR=1.19 (95% CI 0.25, 5.72), p=0.830
2Wk - 1Mth: HR=8.65 (95% CI 2.05, 36.52), p=0.003
1Mth - 3Mth: HR=3.40 (95% CI 1.29, 8.98), p=0.013
3Mth - 6Mth: HR=2.22 (95% CI 0.89, 5.57), p=0.088
6Mth - 9Mth: HR=0.71 (95% CI 0.28, 1.79), p=0.469
9Mth - 2.5Yr: HR=1.23 (95% CI 0.97, 1.57), p=0.093
2.5Yr - 3.5Yr: HR=0.80 (95% CI 0.58, 1.11), p=0.178
3.5Yr - 4Yr: HR=1.11 (95% CI 0.75, 1.64), p=0.611
4Yr - 5Yr: HR=0.99 (95% CI 0.75, 1.30), p=0.925
5Yr - 5.5Yr: HR=0.79 (95% CI 0.53, 1.17), p=0.243
5.5Yr - 6Yr: HR=1.50 (95% CI 1.10, 2.04), p=0.009
6Yr+: HR=1.02 (95% CI 0.94, 1.11), p=0.580

Major Total vs Minor

0 - 2Wk: HR=6.89 (95% CI 3.06, 15.55), p<0.001
2Wk - 3Mth: HR=6.50 (95% CI 3.27, 12.89), p<0.001
3Mth - 6Mth: HR=3.62 (95% CI 1.90, 6.89), p<0.001
6Mth - 2Yr: HR=1.35 (95% CI 1.10, 1.65), p=0.003
2Yr - 5Yr: HR=1.09 (95% CI 0.96, 1.23), p=0.174
5Yr - 10Yr: HR=1.20 (95% CI 1.10, 1.32), p<0.001
10Yr+: HR=1.02 (95% CI 0.91, 1.14), p=0.719

Major Total vs Major Partial

0 - 2Wk: HR=3.17 (95% CI 1.43, 6.99), p=0.004
2Wk - 3Mth: HR=1.92 (95% CI 1.05, 3.51), p=0.034
3Mth - 1.5Yr: HR=1.22 (95% CI 0.92, 1.61), p=0.173
1.5Yr - 2.5Yr: HR=1.01 (95% CI 0.76, 1.35), p=0.922
2.5Yr - 5Yr: HR=1.16 (95% CI 0.95, 1.42), p=0.145
5Yr - 5.5Yr: HR=1.56 (95% CI 1.02, 2.39), p=0.040
5.5Yr - 6Yr: HR=0.79 (95% CI 0.56, 1.12), p=0.187
6Yr+: HR=1.08 (95% CI 0.98, 1.19), p=0.116

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minor	15037	14013	11940	9781	4778	1564	232
Major Partial	4262	4032	3575	3136	1842	737	177
Major Total	9512	8598	7011	5508	2369	626	94

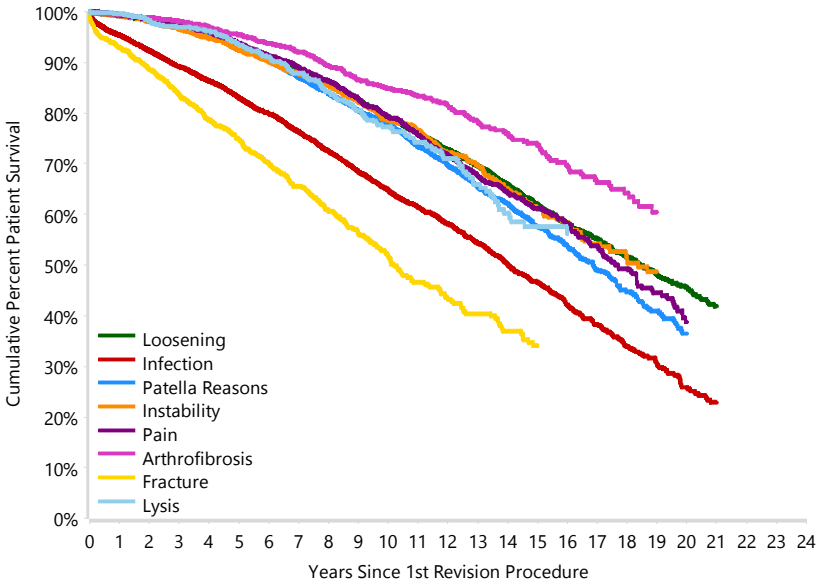
Note: Restricted to the first of the revision procedures for bilateral patients.
Excluding 1st revisions where no minor or major femoral/tibial components have been inserted.

Table N90 Cumulative Percent Survival of Patients with Known Primary Total Knee Replacement Since 1st Revision by Reason for 1st Revision (Primary Diagnosis OA)

Reason for 1st Revision	N Deceased	N Total	30 Day	90 Day	1 Yr	5 Yrs	10 Yrs	15 Yrs
Loosening	1902	9114	99.9 (99.8, 100.0)	99.8 (99.7, 99.9)	99.3 (99.1, 99.4)	93.4 (92.8, 93.9)	79.3 (78.2, 80.3)	61.9 (60.3, 63.6)
Infection	2235	8128	99.0 (98.7, 99.2)	97.7 (97.3, 98.0)	95.4 (94.9, 95.9)	83.0 (82.0, 83.9)	64.8 (63.4, 66.3)	46.5 (44.5, 48.6)
Patella Reasons	1263	5517	100.0 (99.9, 100.0)	100.0 (99.9, 100.0)	99.5 (99.3, 99.7)	93.2 (92.5, 93.9)	77.8 (76.4, 79.2)	57.7 (55.4, 59.9)
Instability	547	3559	99.9 (99.7, 100.0)	99.8 (99.6, 99.9)	99.3 (99.0, 99.5)	92.4 (91.4, 93.4)	78.7 (76.6, 80.6)	61.3 (57.6, 64.7)
Pain	645	2841	100.0 (99.8, 100.0)	99.9 (99.7, 100.0)	99.3 (99.0, 99.6)	93.8 (92.7, 94.7)	79.3 (77.3, 81.1)	61.2 (58.3, 64.0)
Arthrofibrosis	201	1470	99.9 (99.5, 100.0)	99.8 (99.4, 99.9)	99.5 (99.0, 99.8)	95.5 (94.1, 96.6)	84.9 (82.2, 87.2)	73.7 (69.6, 77.3)
Fracture	497	1458	97.7 (96.7, 98.3)	95.9 (94.7, 96.8)	93.0 (91.6, 94.2)	74.8 (72.1, 77.2)	51.6 (47.7, 55.3)	34.1 (29.1, 39.1)
Lysis	140	804	99.9 (99.1, 100.0)	99.8 (99.0, 99.9)	99.6 (98.8, 99.9)	93.5 (91.2, 95.2)	77.3 (73.0, 81.1)	57.5 (50.5, 63.9)
TOTAL	**7430**	**32891**						

Note: Restricted to the first of the revision procedures for bilateral patients
Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Figure N102 Cumulative Percent Survival of Patients with Known Primary Total Knee Replacement Since 1st Revision by Reason for 1st Revision (Primary Diagnosis OA)



HR - adjusted for age and gender

Infection vs Loosening
- 0 - 3Mth: HR=11.93 (95% CI 8.20, 17.36), p<0.001
- 3Mth - 6Mth: HR=4.29 (95% CI 2.93, 6.27), p<0.001
- 6Mth - 2Yr: HR=2.63 (95% CI 2.23, 3.10), p<0.001
- 2Yr - 3Yr: HR=2.21 (95% CI 1.83, 2.68), p<0.001
- 3Yr - 5.5Yr: HR=1.56 (95% CI 1.38, 1.76), p<0.001
- 5.5Yr+: HR=1.30 (95% CI 1.20, 1.41), p<0.001

Patella Reasons vs Loosening
- 0 - 2Yr: HR=0.67 (95% CI 0.51, 0.87), p=0.002
- 2Yr - 2.5Yr: HR=1.20 (95% CI 0.85, 1.70), p=0.293
- 2.5Yr - 6Yr: HR=0.99 (95% CI 0.87, 1.13), p=0.890
- 6Yr+: HR=1.08 (95% CI 0.99, 1.17), p=0.087

Instability vs Loosening
- Entire Period: HR=1.09 (95% CI 0.99, 1.20), p=0.081

Pain vs Loosening
- Entire Period: HR=0.98 (95% CI 0.89, 1.07), p=0.620

Arthrofibrosis vs Loosening
- Entire Period: HR=0.77 (95% CI 0.66, 0.89), p<0.001

Fracture vs Loosening
- 0 - 2Wk: HR=26.24 (95% CI 15.09, 45.62), p<0.001
- 2Wk - 3Mth: HR=10.94 (95% CI 6.66, 17.97), p<0.001
- 3Mth - 3Yr: HR=2.78 (95% CI 2.31, 3.36), p<0.001
- 3Yr+: HR=1.71 (95% CI 1.51, 1.94), p<0.001

Lysis vs Loosening
- Entire Period: HR=0.94 (95% CI 0.79, 1.12), p=0.482

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Loosening	9114	8473	7209	6008	3147	1125	235
Infection	8128	7051	5475	4166	1667	500	71
Patella Reasons	5517	5203	4525	3816	1906	548	63
Instability	3559	3255	2691	2079	736	211	28
Pain	2841	2695	2408	2006	1041	368	47
Arthrofibrosis	1470	1346	1144	924	468	202	33
Fracture	1458	1238	881	614	209	53	7
Lysis	804	720	586	474	218	54	7

Note: Restricted to the first of the revision procedures for bilateral patients
Excludes 1st revisions where no minor or major femoral/tibial components have been inserted.

Revision Arthroplasty

Revision Shoulder Replacement

The Registry has information on 5,347 1st revision shoulder replacement procedures for all primary diagnoses. There were 848 procedures excluded where the 1st revision was undertaken for infection.

There are also 27 1st revision procedures excluded where minor or major prostheses were not inserted, and the diagnosis was not infection.

All shoulder replacement classes other than partial resurfacing anatomic were revised predominately to total stemmed reverse at the 1st revision.

A hemi stemmed anatomic is amongst the most widely undertaken primary shoulder replacements, and this procedure is revised to a total stemmed reverse at the 1st revision in 94.8% of cases. Similarly, a total stemless anatomic is revised to a total stemmed reverse in 89.7% of cases, a total stemmed anatomic in 89.4% and a total stemmed reverse in 87.2% of cases, respectively. The primary diagnosis of 1st revision shoulder replacement classes is summarised in Table N90. Due to the number of 1st revisions available, the following analyses are limited to 1st revisions of primary total stemmed anatomic and total stemmed reverse shoulder replacements.

Table N91 1st Revision of Primary Shoulder Replacement by Primary Diagnosis and Type of Primary

Primary Diagnosis	Partial Resurfacing Anatomic			Hemi Resurfacing Anatomic			Hemi Stemmed Anatomic			Hemi Stemless Anatomic			Humeral Ball		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Fracture	.	.	.	2	0.3	0.7	325	48.6	60.3	1	0.1	6.3	.	.	.
Instability	2	3.3	11.1	2	3.3	0.7	5	8.3	0.9	.	.	.	.	.	.
Osteoarthritis	15	0.5	83.3	231	8.4	85.2	139	5.1	25.8	10	0.4	62.5	2	0.1	100.0
Osteonecrosis	.	.	.	5	6.0	1.8	19	22.6	3.5	3	3.6	18.8	.	.	.
Other Inflammatory Arthritis	.	.	.	1	3.8	0.4	5	19.2	0.9	.	.	.	.	.	.
Rheumatoid Arthritis	.	.	.	4	5.1	1.5	7	9.0	1.3	.	.	.	.	.	.
Rotator Cuff Arthropathy	1	0.1	5.6	26	3.4	9.6	20	2.6	3.7	2	0.3	12.5	.	.	.
Tumour	.	.	.	.	.	.	19	38.8	3.5	.	.	.	.	.	.
Other	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TOTAL	**18**	**0.4**	**100.0**	**271**	**6.1**	**100.0**	**539**	**12.1**	**100.0**	**16**	**0.4**	**100.0**	**2**	**0.0**	**100.0**

Primary Diagnosis	Total Resurfacing Anatomic			Total Stemmed Anatomic			Total Stemless Anatomic		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Fracture	1	0.1	4.0	19	2.8	1.2	1	0.1	0.6
Instability	.	.	.	13	21.7	0.8	1	1.7	0.6
Osteoarthritis	23	0.8	92.0	1469	53.7	92.9	158	5.8	94.6
Osteonecrosis	.	.	.	33	39.3	2.1	5	6.0	3.0
Other Inflammatory Arthritis	1	3.8	4.0	11	42.3	0.7	1	3.8	0.6
Rheumatoid Arthritis	.	.	.	22	28.2	1.4	.	.	.
Rotator Cuff Arthropathy	.	.	.	13	1.7	0.8	1	0.1	0.6
Tumour	.	.	.	.	.	.	.	.	.
Other	.	.	.	1	50.0	0.1	.	.	.
TOTAL	**25**	**0.6**	**100.0**	**1581**	**35.4**	**100.0**	**167**	**3.7**	**100.0**

Primary Diagnosis	Total Stemmed Reverse			Total Stemless Reverse			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Fracture	320	47.8	17.3	.	.	.	669	100.0	15.0
Instability	37	61.7	2.0	.	.	.	60	100.0	1.3
Osteoarthritis	689	25.2	37.2	2	0.1	100.0	2738	100.0	61.2
Osteonecrosis	19	22.6	1.0	.	.	.	84	100.0	1.9
Other Inflammatory Arthritis	7	26.9	0.4	.	.	.	26	100.0	0.6
Rheumatoid Arthritis	45	57.7	2.4	.	.	.	78	100.0	1.7
Rotator Cuff Arthropathy	703	91.8	38.0	.	.	.	766	100.0	17.1
Tumour	30	61.2	1.6	.	.	.	49	100.0	1.1
Other	1	50.0	0.1	.	.	.	2	100.0	0.0
TOTAL	**1851**	**41.4**	**100.0**	**2**	**0.0**	**100.0**	**4472**	**100.0**	**100.0**

Revision of Total Stemmed Anatomic Shoulder Replacement

The Registry has information on 1,705 1st revisions of total stemmed anatomic shoulder replacement procedures for all primary diagnoses. There are 119 procedures excluded where the 1st revision was undertaken for infection.

There are also 5 procedures excluded where minor or major prostheses were not inserted, and the diagnosis was not infection. Therefore, this analysis includes 1581 1st revisions of total stemmed anatomic replacements.

DEMOGRAPHICS OF 1ST REVISION

The mean age at 1st revision is 70.1 years. 1st revision of total stemmed anatomic is more common in females (58.4%) except for implant breakage of the glenoid insert (45.1%). The highest proportion of patients have an ASA score of 3 (50.9%) or 2 (44.0%) and are pre obese (31.3%) or have a BMI in the obese class 1 category (29.2%). Demographic details for revision of total stemmed anatomic shoulder replacement procedures are shown in Table N91.

Table N92 Summary of 1st Revision of Known Primary Total Stemmed Anatomic Replacement (All Diagnoses, Excluding 1st Revisions for Infection)

Variable	Rotator Cuff Insufficiency (n=426)	Instability/ Dislocation (n=367)	Loosening (n=365)	Implant Breakage Glenoid Insert (n=102)	Other (n=321)	TOTAL (n=1,581)
Follow-up Years (Primary to 1st Revision)						
Mean (SD)	3.5 ± 3.5	2.4 ± 3.1	5.8 ± 4.2	4.4 ± 3.4	4.2 ± 3.8	4 ± 3.8
Median (IQR)	2 (0.9, 5.8)	1 (0.4, 3.1)	5.4 (2, 8.7)	3.7 (1.8, 6.3)	2.8 (1, 6.6)	2.4 (0.9, 6.5)
Minimum	0	0	0	0.2	0	0
Maximum	16	15.6	16.9	15.1	17.7	17.7
Age at 1st Revision						
Mean (SD)	70.8 ± 8.8	69 ± 9.9	70.9 ± 8.2	71 ± 8.7	69.1 ± 9.5	70.1 ± 9.1
Median (IQR)	71 (66, 77)	70 (64, 76)	72 (66, 77)	71.5 (66, 77)	70 (64, 76)	71 (65, 76)
Age at 1st Revision in groups						
<55	18 (4.2%)	28 (7.6%)	12 (3.3%)	4 (3.9%)	21 (6.5%)	83 (5.2%)
55-64	72 (16.9%)	73 (19.9%)	65 (17.8%)	16 (15.7%)	67 (20.9%)	293 (18.5%)
65-74	188 (44.1%)	151 (41.1%)	160 (43.8%)	48 (47.1%)	136 (42.4%)	683 (43.2%)
≥75	148 (34.7%)	115 (31.3%)	128 (35.1%)	34 (33.3%)	97 (30.2%)	522 (33%)
Gender						
Male	151 (35.4%)	119 (32.4%)	167 (45.8%)	56 (54.9%)	164 (51.1%)	657 (41.6%)
Female	275 (64.6%)	248 (67.6%)	198 (54.2%)	46 (45.1%)	157 (48.9%)	924 (58.4%)
ASA at 1st Revision[1]						
ASA 1	6 (1.8%)	9 (3.5%)	9 (3%)		13 (5.3%)	37 (3.1%)
ASA 2	144 (43%)	103 (40.6%)	134 (44.2%)	33 (52.4%)	113 (46.3%)	527 (44%)
ASA 3	175 (52.2%)	139 (54.7%)	157 (51.8%)	29 (46%)	110 (45.1%)	610 (50.9%)
ASA 4	10 (3%)	3 (1.2%)	3 (1%)	1 (1.6%)	8 (3.3%)	25 (2.1%)
BMI at 1st Revision[2]						
Underweight	3 (1.1%)		2 (0.8%)		1 (0.5%)	6 (0.6%)
Normal	35 (12.4%)	41 (20.6%)	50 (19.4%)	7 (16.3%)	24 (13%)	157 (16.2%)
Pre Obese	93 (32.9%)	59 (29.6%)	74 (28.7%)	17 (39.5%)	60 (32.4%)	303 (31.3%)
Obese Class 1	76 (26.9%)	54 (27.1%)	83 (32.2%)	9 (20.9%)	61 (33%)	283 (29.2%)
Obese Class 2	50 (17.7%)	27 (13.6%)	34 (13.2%)	7 (16.3%)	23 (12.4%)	141 (14.6%)
Obese Class 3	26 (9.2%)	18 (9%)	15 (5.8%)	3 (7%)	16 (8.6%)	78 (8.1%)
Fixation of Primary Procedure						
Cemented	11 (2.6%)	24 (6.5%)	39 (10.7%)	1 (1%)	8 (2.5%)	83 (5.2%)
Cementless	276 (64.8%)	220 (59.9%)	69 (18.9%)	98 (96.1%)	196 (61.1%)	859 (54.3%)
Hybrid	139 (32.6%)	123 (33.5%)	257 (70.4%)	3 (2.9%)	117 (36.4%)	639 (40.4%)

Variable	Rotator Cuff Insufficiency (n=426)	Instability/ Dislocation (n=367)	Loosening (n=365)	Implant Breakage Glenoid Insert (n=102)	Other (n=321)	TOTAL (n=1,581)
Glenoid Fixation in 1st Revision						
Glenoid Cemented	3 (0.7%)	11 (3%)	47 (12.9%)	2 (2%)	14 (4.4%)	77 (4.9%)
Glenoid Cementless	142 (33.3%)	120 (32.7%)	214 (58.6%)	7 (6.9%)	65 (20.2%)	548 (34.7%)
No Glenoid inserted in 1st Revision	281 (66%)	236 (64.3%)	104 (28.5%)	93 (91.2%)	242 (75.4%)	956 (60.5%)
Humeral Fixation in 1st Revision						
Humeral Cemented	38 (8.9%)	35 (9.5%)	91 (24.9%)		33 (10.3%)	197 (12.5%)
Humeral Cementless	376 (88.3%)	282 (76.8%)	171 (46.8%)	83 (81.4%)	209 (65.1%)	1,121 (70.9%)
No Humeral component inserted in 1st Revision	12 (2.8%)	50 (13.6%)	103 (28.2%)	19 (18.6%)	79 (24.6%)	263 (16.6%)

Abbreviations: SD - standard deviation, IQR - interquartile range, ASA - American Society of Anesthesiologists, BMI - Body Mass Index (kg/m^2).

[1]Excludes 382 procedures with unknown ASA at 1st Revision.

[2]Excludes 613 procedures with unknown BMI at 1st Revision

BMI are not provided for patients aged ≤19 years.

Revision Arthroplasty

OUTCOME OF 1ST REVISION

There are 259 revisions of the 1,581 1st revision procedures. The cumulative percent 2nd revision at 10 years is 19.9% and at 14 years is 20.5% (Table N92 and Figure N103).

The most common reasons for 2nd revision are instability/ dislocation (31.7%), loosening (24.7%), infection (13.1%) and rotator cuff insufficiency (7.7%) (Table N93 and Figure N104).

At 10 years, the cumulative percent 2nd revision for known primary total stemmed anatomic replacement is 19.9%.

Revision of both the humeral and glenoid components is the most common 2nd revision procedure (32.8%) followed by humeral component only (32.0%), glenoid component only (8.5%), head only (8.1%), cement spacer (6.6%), and cup only (4.2%) (Table N94).

A total stemmed anatomic shoulder replacement has a lower rate of 2nd revision when revised to a total stemmed reverse replacement compared to a primary total stemmed reverse undergoing a 1st revision to another reverse replacement. (Table N95 and Figure N105).

A total stemmed anatomic shoulder replacement revised to a total stemmed reverse has a lower rate of 2nd revision than a primary total stemmed reverse revised to another reverse.

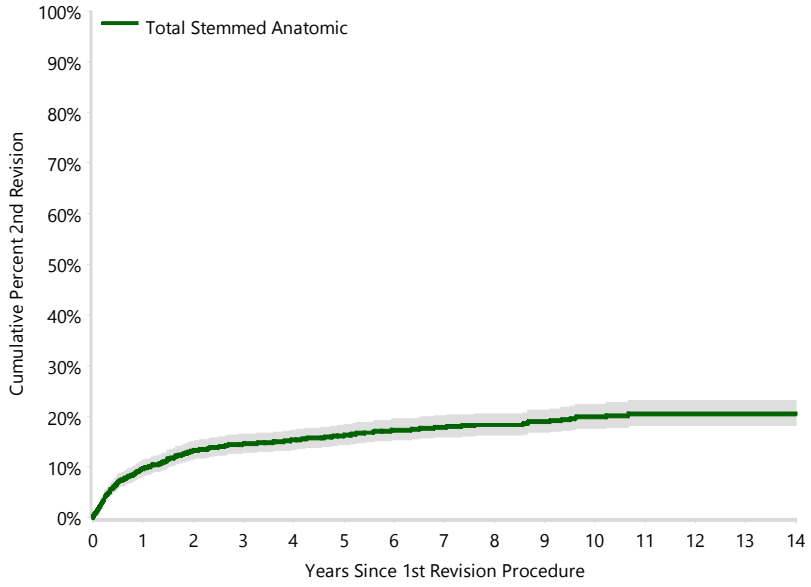
Primary total stemmed anatomic shoulder replacement implants may encompass a single design platform prosthesis (SDPP). These platform implant ranges include both anatomic and reverse shoulder replacement. They feature common design, composition metallurgy, coatings, and bearing surfaces. They allow polarity change of humeral or glenoid prostheses by modular exchange. In revision surgery the humeral stem may be retained if in the primary procedure a SDPP implant was used. The 2nd revision rate is not different regardless of whether or not the humeral stem is retained in 1st revision total stemmed anatomic replacements (Table N96 and Figure N106).

Table N93 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement (All Diagnoses, Excluding 1st Revision for Infection)

Revision of Primary	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Total Stemmed Anatomic	259	1581	9.8 (8.4, 11.4)	14.6 (12.9, 16.5)	16.2 (14.3, 18.2)	17.9 (15.9, 20.1)	19.9 (17.6, 22.4)	20.5 (18.1, 23.2)
TOTAL	259	1581						

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N103 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Total Stemmed Anatomic	1581	1302	1026	821	586	289	46

Table N94 2nd Revision Diagnosis of Known Primary Total Stemmed Anatomic Replacement (All Diagnoses, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	Number	Percent
Instability/Dislocation	82	31.7
Loosening	64	24.7
Infection	34	13.1
Rotator Cuff Insufficiency	20	7.7
Dissociation	11	4.2
Pain	8	3.1
Fracture	8	3.1
Implant Breakage Glenoid Insert	8	3.1
Metal Related Pathology	5	1.9
Implant Breakage Glenoid	4	1.5
Malposition	3	1.2
Wear Glenoid Insert	3	1.2
Wear Glenoid	2	0.8
Osteonecrosis	1	0.4
Implant Breakage Humeral	1	0.4
Lysis	1	0.4
Wear Humeral Cup	1	0.4
Heterotopic Bone	1	0.4
Glenoid Erosion	1	0.4
Other	1	0.4
TOTAL	259	100.0

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N95 Type of 2nd Revision of Known Primary Total Stemmed Anatomic Replacement (All Diagnoses, Excluding 1st Revision for Infection)

Type of 2nd Revision	Number	Percent
Humeral/Glenoid	85	32.8
Humeral Component	83	32.0
Glenoid Component	22	8.5
Head Only	21	8.1
Cement Spacer	17	6.6
Cup Only	11	4.2
Cup/Head	8	3.1
Removal of Prostheses	6	2.3
Head/Insert	3	1.2
Cement Only	2	0.8
Reinsertion of Components	1	0.4
TOTAL	259	100.0

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N104 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Stemmed Anatomic Replacement (All Diagnoses, Excluding 1st Revision for Infection)

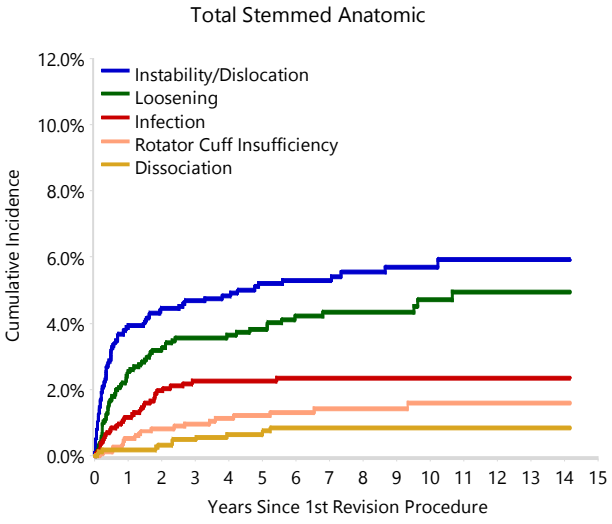
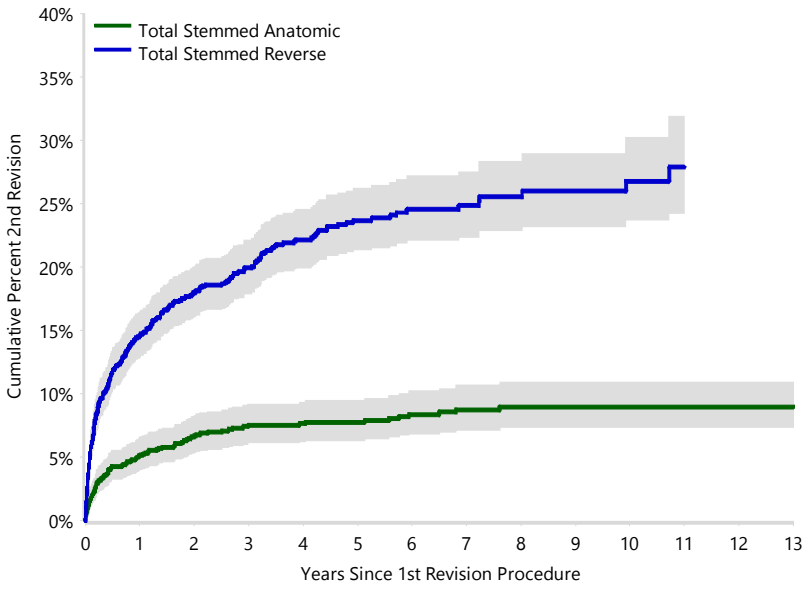


Table N96 Cumulative Percent 2nd Revision of 1st Revision of Known Primary Total Shoulder Replacement by Primary Shoulder Class (1st Revision to Total Stemmed Reverse Shoulder, Excluding 1st Revision for Infection)

Type of Primary	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Total Stemmed Anatomic	95	1234	5.2 (4.0, 6.6)	7.5 (6.1, 9.2)	7.8 (6.3, 9.5)	8.7 (7.2, 10.7)
Total Stemmed Reverse	326	1603	14.6 (12.9, 16.4)	19.9 (17.9, 22.1)	23.7 (21.4, 26.2)	24.8 (22.3, 27.5)
TOTAL	421	2837				

Figure N105 Cumulative Percent 2nd Revision of 1st Revision of Known Primary Total Shoulder Replacement by Primary Shoulder Class (1st Revision to Total Stemmed Reverse Shoulder, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Total Stemmed Anatomic vs Total Stemmed Reverse

Entire Period: HR=0.30 (95% CI 0.24, 0.38), p<0.001

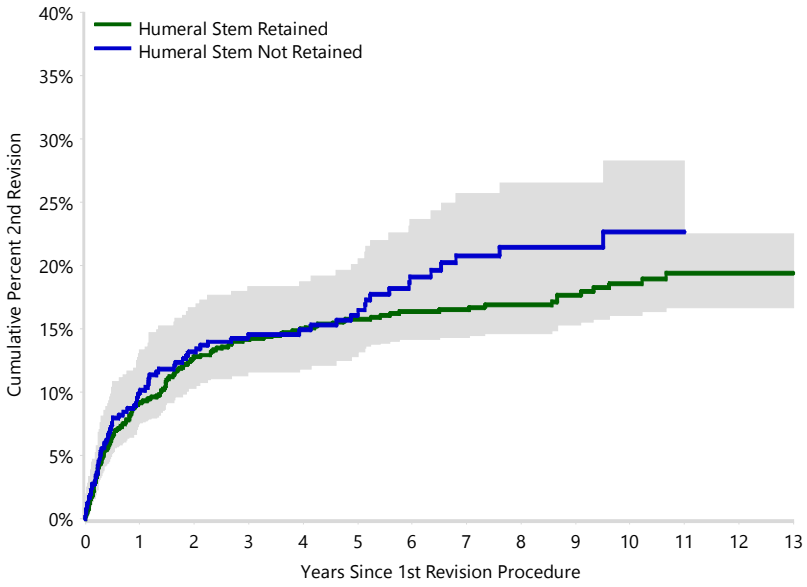
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
Total Stemmed Anatomic	1234	1053	837	662	455
Total Stemmed Reverse	1603	1141	733	432	237

Table N97 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Humeral Retention (All Diagnoses, Excluding 1st Revision for Infection and Removal of Prosthesis Only Revision)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Humeral Stem Retained	173	1092	9.2 (7.6, 11.1)	14.1 (12.1, 16.4)	15.8 (13.6, 18.2)	16.5 (14.3, 19.0)	18.6 (16.0, 21.4)
Humeral Stem Not Retained	79	472	10.1 (7.7, 13.3)	14.6 (11.6, 18.3)	16.1 (12.8, 20.1)	20.8 (16.7, 25.7)	22.6 (18.0, 28.2)
TOTAL	252	1564					

Note: Excludes 17 removal of prostheses only procedures.

Figure N106 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Humeral Retention (All Diagnoses, Excluding 1st Revision for Infection and Removal of Prosthesis Only Revision)



HR - adjusted for age and gender
Humeral Stem Not Retained vs
Humeral Stem Retained
Entire Period: HR=1.14 (95% CI 0.87, 1.49), p=0.335

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Humeral Stem Retained	1092	920	744	611	457	228
Humeral Stem Not Retained	472	372	276	207	127	59

Note: Excludes 17 removal of prostheses only procedures.

OUTCOME OF 1ST REVISION BY CLASS OF REVISION

In 2024, major total revision is the most common class of 1st revision procedure of a primary total stemmed anatomic total shoulder replacement. The yearly proportion of the 3 classes of 1st revision has changed over the past 20 years and is shown in Figure N107. There has been an ongoing increase in the proportion of major total 1st revisions.

The most common 2nd revision was to a minor class 1st revision, followed by 2nd revision to major partial class 1st revisions (Table N97).

The outcomes of the 1st revision by class of 1st revision are compared. Minor revisions have a higher rate of 2nd revision compared to major total and major partial revisions for the entire period. Major total revisions have a higher 2nd revision rate than major partial at all time periods (Table N97 and Figure N108). Both minor and major partial revisions undergo 2nd revision predominately for instability/dislocation, while major total revisions are more commonly revised for loosening (Figure N109).

Figure N107 Revision Shoulder Replacement by Class of 1st Revision (Primary Total Stemmed Anatomic Shoulder Replacement)

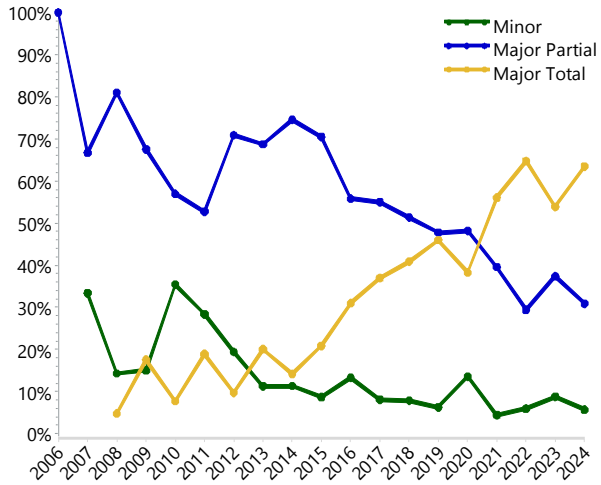
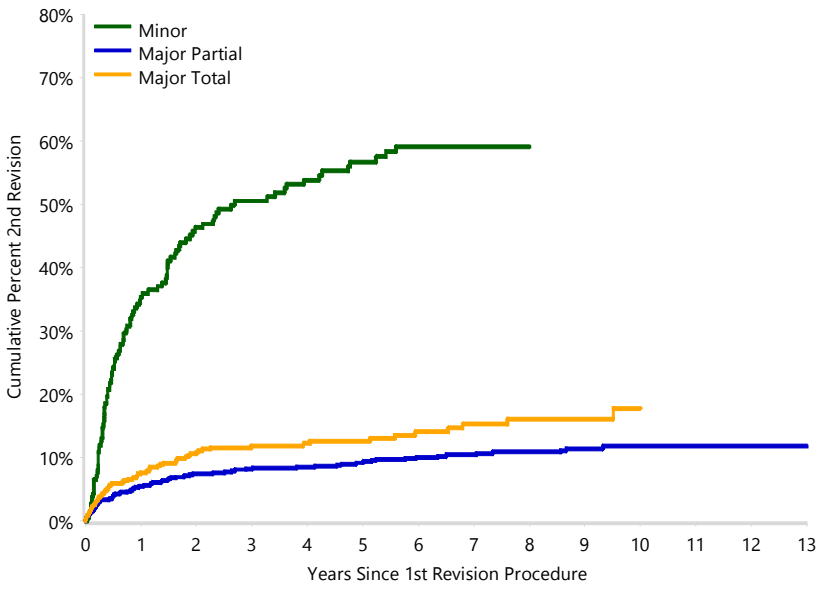


Table N98 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Class of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Minor	107	185	35.3 (28.9, 42.8)	50.5 (43.4, 58.1)	56.7 (49.4, 64.3)	59.1 (51.7, 66.7)	
Major Partial	85	848	5.5 (4.2, 7.3)	8.3 (6.6, 10.4)	9.2 (7.4, 11.4)	10.4 (8.4, 12.9)	11.8 (9.5, 14.5)
Major Total	67	548	7.6 (5.7, 10.3)	11.9 (9.3, 15.2)	12.6 (9.9, 16.0)	15.3 (11.9, 19.5)	17.8 (13.3, 23.6)
TOTAL	259	1581					

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N108 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Minor vs Major Partial

Entire Period: HR=7.63 (95% CI 5.72, 10.19), p<0.001

Minor vs Major Total

Entire Period: HR=5.05 (95% CI 3.71, 6.87), p<0.001

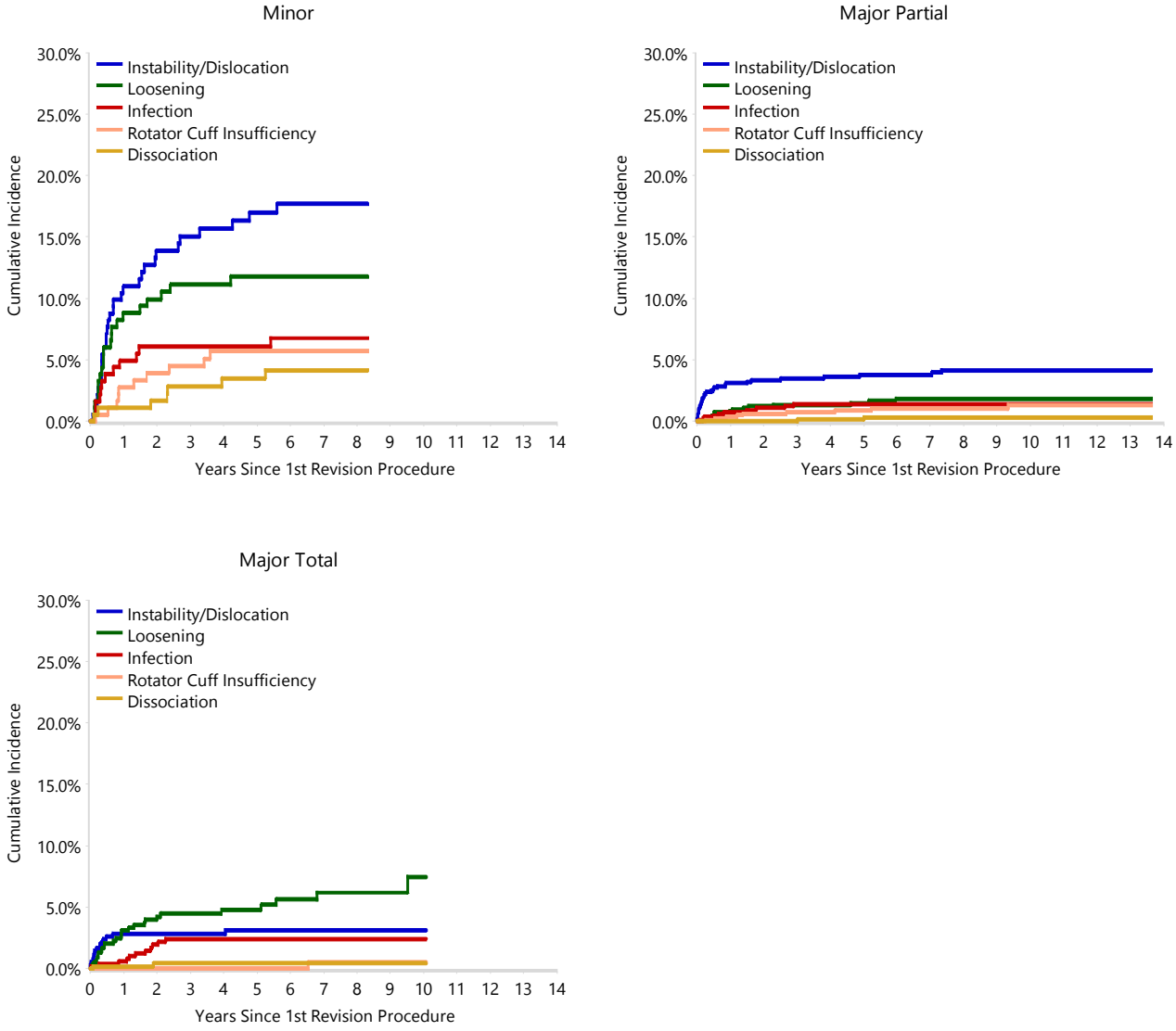
Major Total vs Major Partial

Entire Period: HR=1.51 (95% CI 1.09, 2.08), p=0.012

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Minor	185	113	76	57	46	26
Major Partial	848	758	653	552	421	221
Major Total	548	431	297	212	119	42

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N109 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Stemmed Anatomic Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Revision Arthroplasty

OUTCOME OF 1ST REVISION BY TYPE OF REVISION

The most common type of 1st revision for total stemmed anatomic shoulder replacements is a humeral component, followed by humeral/glenoid combination.

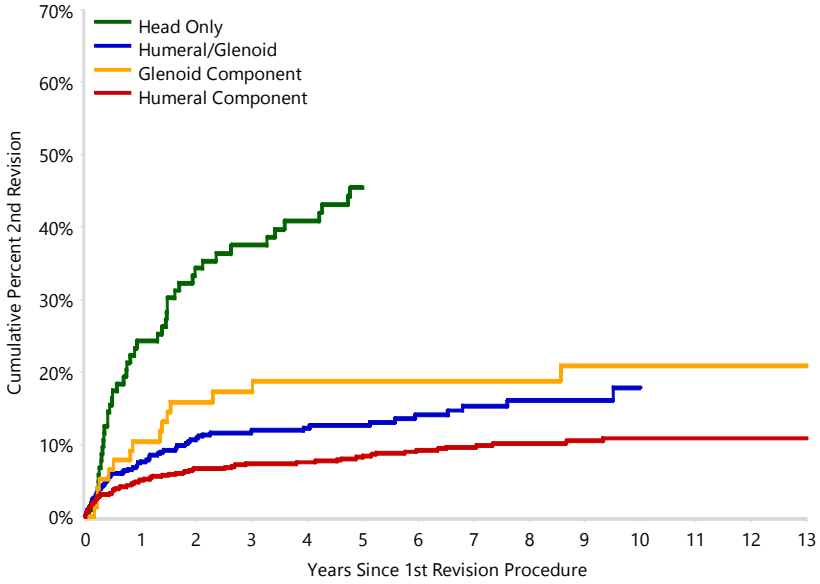
Isolated head revision, glenoid revision and glenoid/humeral revision have an increased risk of 2nd revision when compared to humeral revision.

Isolated head revision has an increased risk of 2nd revision when compared to the humeral revision. In addition, glenoid and glenoid/humeral revision have a higher rate of 2nd revision than humeral 1st revision (Table N98 and Figure N110).

Table N99 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Head Only	52	104	24.2 (17.1, 33.7)	37.5 (28.8, 47.7)	45.4 (36.1, 55.9)		
Humeral/Glenoid	67	548	7.6 (5.7, 10.3)	11.9 (9.3, 15.2)	12.6 (9.9, 16.0)	15.3 (11.9, 19.5)	17.8 (13.3, 23.6)
Glenoid Component	15	77	10.4 (5.4, 19.8)	17.2 (10.4, 27.9)	18.8 (11.6, 29.7)	18.8 (11.6, 29.7)	20.9 (13.0, 32.4)
Humeral Component	70	770	5.0 (3.7, 6.8)	7.4 (5.7, 9.5)	8.2 (6.4, 10.5)	9.6 (7.6, 12.1)	10.8 (8.6, 13.6)
TOTAL	204	1499					

Figure N110 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Head Only vs Humeral Component

0 - 3Mth: HR=2.51 (95% CI 1.11, 5.68), p=0.027

3Mth+: HR=7.84 (95% CI 5.31, 11.58), p<0.001

Humeral/Glenoid vs Humeral Component

Entire Period: HR=1.64 (95% CI 1.17, 2.30), p=0.004

Glenoid Component vs Humeral Component

Entire Period: HR=1.94 (95% CI 1.11, 3.40), p=0.019

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Head Only	104	76	56	45	35	19
Humeral/Glenoid	548	431	297	212	119	42
Glenoid Component	77	68	54	51	44	28
Humeral Component	770	689	598	500	376	193

HUMERAL FIXATION OUTCOME

At the time of the 1st revision, the most common fixation for an implanted humeral component is cementless, followed by no exchange of a humeral prosthesis, while the percentage of 2nd revision for no humeral exchanged 1st revision is higher than 1st revisions with cementless fixation. The method of humeral fixation at 1st revision does not change the rate of 2nd revision (Table N99).

Table N100 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Humeral Fixation of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Humeral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	24	197	5.7 (3.2, 10.1)	10.0 (6.4, 15.5)	11.7 (7.6, 17.6)	15.0 (10.0, 22.3)
Humeral Cementless	113	1121	6.2 (4.9, 7.8)	9.0 (7.4, 10.9)	9.7 (8.0, 11.7)	11.2 (9.3, 13.4)
No Humeral component inserted in 1st Revision	122	263	27.8 (22.8, 33.7)	40.5 (34.7, 46.8)	45.2 (39.2, 51.6)	46.7 (40.6, 53.2)
TOTAL	**259**	**1581**				

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

TIMING OF 1ST REVISION

The timing of the 1st revision was classified as early if it occurred within 2 years of the primary procedure (<2 years) or late if it occurred 2 years or more (≥2 years) after the primary procedure.

The reason for the 1st revision and the timing (early or late) are shown in Table N100.

There are 710 early 1st revisions (44.9%). In the first 3 months, the revision rate is lower for early 1st revisions compared to procedures performed later. However, from 3 months onwards, this reverses, and early 1st revisions have a higher rate of 2nd revision compared to procedures performed later (Table N101 and Figure N111).

There are 91 early 1st revisions for loosening (24.9%). There is no difference in the 2nd revision rate between early 1st revisions for loosening and those undertaken later (Table N102).

There are 248 early 1st revisions for instability/dislocation (67.6%). There is no difference in the 2nd revision rate between early 1st revisions for dislocation/instability and those performed later (Table N103).

There are 215 early 1st revisions for rotator cuff insufficiency (50.5%). Late 1st revisions have a higher rate of 2nd revision compared to early 1st revisions for rotator cuff insufficiency (Table N104 and Figure N112).

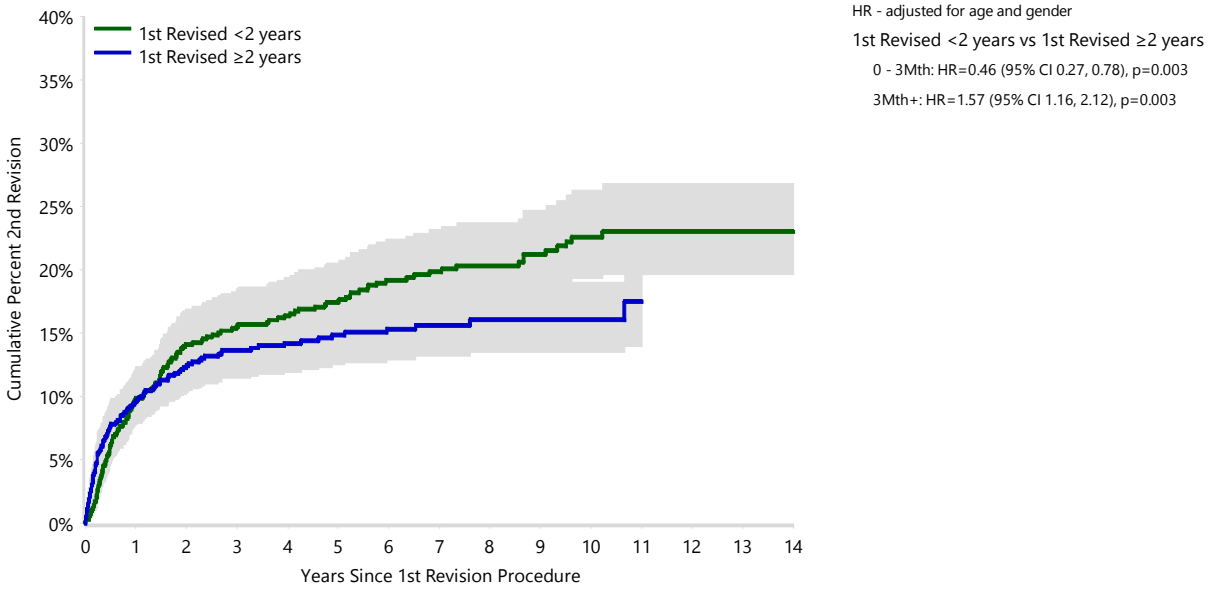
Table N101 Known Primary Total Stemmed Anatomic Shoulder by Timing and Reason of 1st Revision (Excluding 1st Revision for Infection)

Revision for 1st Revision	1st Revised <2 years			1st Revised ≥2 years			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Arthrofibrosis	15	71.4	2.1	6	28.6	0.7	21	100.0	1.3
Dissociation	17	28.3	2.4	43	71.7	4.9	60	100.0	3.8
Fracture	22	48.9	3.1	23	51.1	2.6	45	100.0	2.8
Glenoid Erosion	2	66.7	0.3	1	33.3	0.1	3	100.0	0.2
Implant Breakage Glenoid	6	16.2	0.8	31	83.8	3.6	37	100.0	2.3
Implant Breakage Glenoid Insert	32	31.4	4.5	70	68.6	8.0	102	100.0	6.5
Implant Breakage Head	1	50.0	0.1	1	50.0	0.1	2	100.0	0.1
Implant Breakage Humeral	.	.	.	2	100.0	0.2	2	100.0	0.1
Incorrect Sizing	17	89.5	2.4	2	10.5	0.2	19	100.0	1.2
Instability/Dislocation	248	67.6	34.9	119	32.4	13.7	367	100.0	23.2
Loosening	91	24.9	12.8	274	75.1	31.5	365	100.0	23.1
Lysis	2	7.7	0.3	24	92.3	2.8	26	100.0	1.6
Malposition	11	84.6	1.5	2	15.4	0.2	13	100.0	0.8
Metal Related Pathology	4	16.7	0.6	20	83.3	2.3	24	100.0	1.5
Pain	21	56.8	3.0	16	43.2	1.8	37	100.0	2.3
Progression Of Disease	.	.	.	3	100.0	0.3	3	100.0	0.2
Rotator Cuff Insufficiency	215	50.5	30.3	211	49.5	24.2	426	100.0	26.9
Wear Glenoid	.	.	.	1	100.0	0.1	1	100.0	0.1
Wear Glenoid Insert	2	10.0	0.3	18	90.0	2.1	20	100.0	1.3
Other	4	50.0	0.6	4	50.0	0.5	8	100.0	0.5
TOTAL	**710**	**44.9**	**100.0**	**871**	**55.1**	**100.0**	**1581**	**100.0**	**100.0**

Table N102 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	139	710	9.9 (7.9, 12.3)	15.5 (13.0, 18.5)	17.5 (14.8, 20.6)	19.8 (16.9, 23.2)	22.6 (19.3, 26.3)
1st Revised ≥2 years	120	871	9.6 (7.8, 11.9)	13.7 (11.4, 16.3)	14.8 (12.5, 17.6)	15.6 (13.2, 18.6)	16.0 (13.5, 19.1)
TOTAL	259	1581					

Figure N111 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	710	615	515	447	344	200
1st Revised ≥2 years	871	687	511	374	242	89

Table N103 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Time of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Time of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised for Loosening <2 years	20	91	15.6 (9.6, 24.9)	21.5 (14.3, 31.7)	21.5 (14.3, 31.7)	21.5 (14.3, 31.7)	24.2 (16.0, 35.7)
1st Revised for Loosening ≥2 years	44	274	11.2 (7.9, 15.8)	17.0 (12.8, 22.5)	18.6 (14.0, 24.4)	18.6 (14.0, 24.4)	
TOTAL	64	365					

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N104 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Time of 1st Revision (All Diagnoses, 1st Revision for Instability/Dislocation)

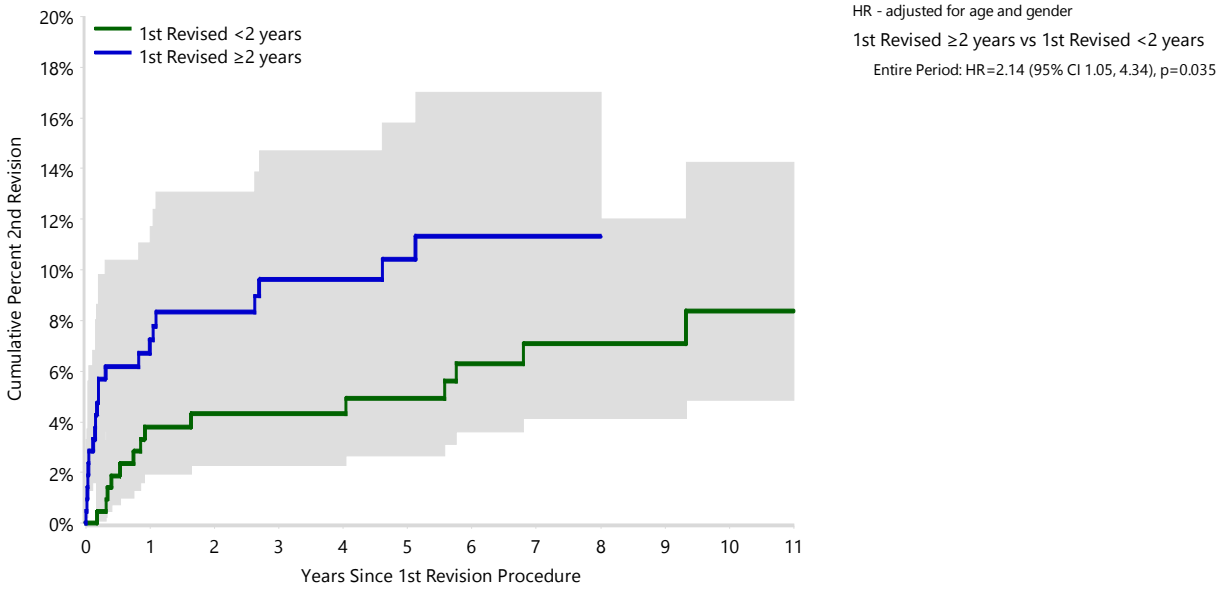
Time of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised for Dislocation/ Instability <2 years	43	248	9.9 (6.7, 14.3)	13.3 (9.6, 18.4)	15.4 (11.3, 20.8)	17.8 (13.3, 23.6)	20.5 (15.4, 27.0)
1st Revised for Dislocation/ Instability ≥2 years	16	119	9.5 (5.4, 16.6)	13.7 (8.4, 21.7)	15.4 (9.6, 24.2)		
TOTAL	59	367					

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N105 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Time of 1st Revision (All Diagnoses, 1st Revision for Rotator Cuff Insufficiency)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	14	215	3.8 (1.9, 7.5)	4.3 (2.3, 8.1)	4.9 (2.7, 9.0)	7.1 (4.1, 12.0)	8.4 (4.9, 14.2)
1st Revised ≥2 years	22	211	7.2 (4.4, 11.7)	9.6 (6.2, 14.7)	10.4 (6.8, 15.8)	11.3 (7.4, 17.0)	
TOTAL	36	426					

Figure N112 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Time of 1st Revision (All Diagnoses, 1st Revision for Rotator Cuff Insufficiency)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	215	197	170	149	111	61
1st Revised ≥2 years	211	172	137	101	59	11

OUTCOME OF 1ST REVISION BY PATIENT CHARACTERISTICS

The outcome of the 1st revision of primary total stemmed anatomic shoulder replacement varies by age and gender. Females aged <65 years have a higher rate of 2nd revision than females aged ≥65 years (Table N105 and Figure N113).

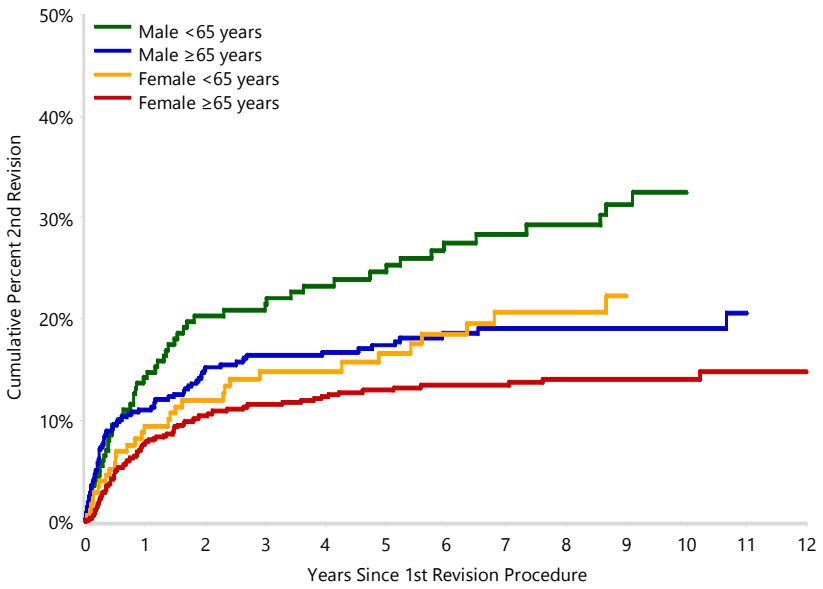
Males aged <65 years have a higher rate of 2nd revision than males aged ≥65 years from 3 months after the 1st revision. Males aged ≥65 years have a higher rate of revision compared to females of the same age group in the first 3 months, with no difference after this time.

Table N106 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Gender and Age (All Diagnoses, Excluding 1st Revision for Infection)

Gender	Age at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	<65 years	55	201	14.2 (10.0, 19.9)	21.4 (16.2, 28.0)	24.6 (19.0, 31.5)	28.3 (22.2, 35.7)	32.5 (25.6, 40.6)
	≥65 years	77	456	11.0 (8.5, 14.3)	16.4 (13.1, 20.3)	17.4 (14.0, 21.5)	19.0 (15.4, 23.4)	19.0 (15.4, 23.4)
Female	<65 years	34	175	9.4 (5.9, 14.9)	14.8 (10.2, 21.4)	16.6 (11.5, 23.5)	20.6 (14.7, 28.5)	
	≥65 years	93	749	7.9 (6.1, 10.1)	11.6 (9.4, 14.2)	13.0 (10.6, 15.7)	13.4 (11.0, 16.3)	14.1 (11.5, 17.1)
TOTAL		259	1581					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N113 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Gender and Age (All Diagnoses, Excluding 1st Revision for Infection)



Male <65 years vs Male ≥65 years
0 - 3Mth: HR=0.80 (95% CI 0.41, 1.57), p=0.518
3Mth+: HR=2.03 (95% CI 1.36, 3.05), p<0.001

Male <65 years vs Female <65 years
Entire Period: HR=1.43 (95% CI 0.93, 2.20), p=0.098

Male ≥65 years vs Female ≥65 years
0 - 3Mth: HR=3.06 (95% CI 1.72, 5.47), p<0.001
3Mth+: HR=1.09 (95% CI 0.76, 1.55), p=0.641

Female <65 years vs Female ≥65 years
Entire Period: HR=1.57 (95% CI 1.06, 2.32), p=0.024

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	<65 years	201	162	132	110	81	48
	≥65 years	456	358	279	224	153	74
Female	<65 years	175	145	110	93	68	39
	≥65 years	749	637	505	394	284	128

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

ASA SCORE AND BMI CATEGORY

ASA score is available for 1,199 1st revision of primary total stemmed anatomic shoulder replacements. There is no difference in the rate of 2nd revision between patients with ASA scores of 1-4 (Table N106). BMI is recorded for 968 1st revision procedures. The rate of 2nd revision did not differ between BMI classes (Table N107).

Table N107 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by ASA (All Diagnoses, Excluding 1st Revision for Infection)

ASA Grade	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	5	37	8.3 (2.8, 23.7)	14.6 (6.3, 31.6)	14.6 (6.3, 31.6)	14.6 (6.3, 31.6)	14.6 (6.3, 31.6)
ASA 2	68	527	7.5 (5.5, 10.2)	12.3 (9.6, 15.6)	13.6 (10.8, 17.1)	14.4 (11.5, 18.1)	16.2 (12.6, 20.7)
ASA 3	78	610	9.5 (7.4, 12.2)	12.0 (9.5, 15.0)	13.2 (10.6, 16.4)	15.9 (12.7, 19.8)	
ASA 4	4	25	16.0 (6.3, 37.2)	16.0 (6.3, 37.2)	16.0 (6.3, 37.2)	16.0 (6.3, 37.2)	
TOTAL	155	1199					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.
Excludes 382 procedures with no ASA score recorded.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N108 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by BMI (All Diagnoses, Excluding 1st Revision for Infection)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Underweight	0	6	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
Normal	18	157	7.9 (4.6, 13.5)	10.2 (6.3, 16.4)	13.0 (8.3, 19.9)	13.0 (8.3, 19.9)	
Pre Obese	39	303	7.5 (5.0, 11.2)	10.9 (7.7, 15.2)	12.2 (8.8, 16.8)	15.2 (11.2, 20.4)	16.3 (11.9, 22.2)
Obese Class 1	29	283	8.3 (5.5, 12.3)	10.4 (7.3, 14.8)	10.9 (7.7, 15.5)	11.6 (8.2, 16.4)	11.6 (8.2, 16.4)
Obese Class 2	16	141	9.0 (5.2, 15.3)	9.0 (5.2, 15.3)	10.0 (5.9, 16.7)	11.4 (6.8, 18.7)	
Obese Class 3	11	78	11.8 (6.3, 21.5)	13.3 (7.4, 23.3)	13.3 (7.4, 23.3)	13.3 (7.4, 23.3)	13.3 (7.4, 23.3)
TOTAL	113	968					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted
Excludes 613 procedures with no BMI recorded.
BMI has not been presented for patients aged ≤19 years.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

CHANGES IN REVISION SHOULDER SURGERY OVER TIME

The most common reason for 1st revision has changed over time. In 2008, the majority of 1st revision procedures were performed for loosening or instability/dislocation, but since 2022, loosening has been more common (Figure N114).

Up to 2020, the most common 1st revision of primary total stemmed anatomic shoulder arthroplasty was a partial major revision.

After that time, major total revision has predominated (Figure N107). In 2024, 63.4% of 1st revisions are major total, 30.9% major partial and 5.7% are minor.

The type of fixation of the humeral component at the 1st revision remains predominately cementless when the humeral component is exchanged (Figure N115).

The results of the 1st revision are stratified by the reason for the 1st revision in the following section.

Figure N114 Revision Shoulder Replacement by Class (Primary Total Stemmed Anatomic Shoulder Replacement) by Reason for 1st Revision

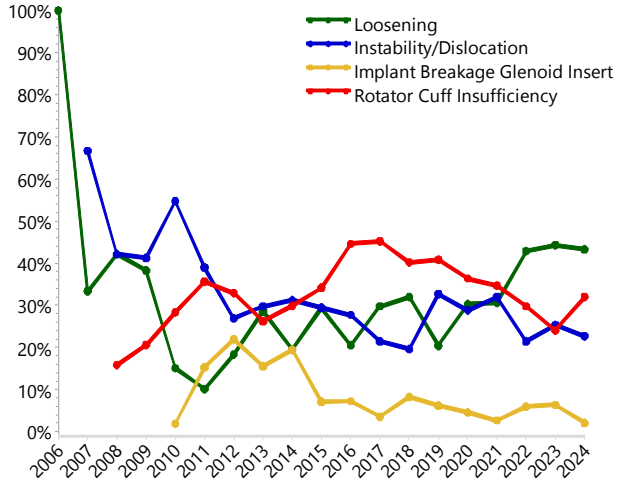
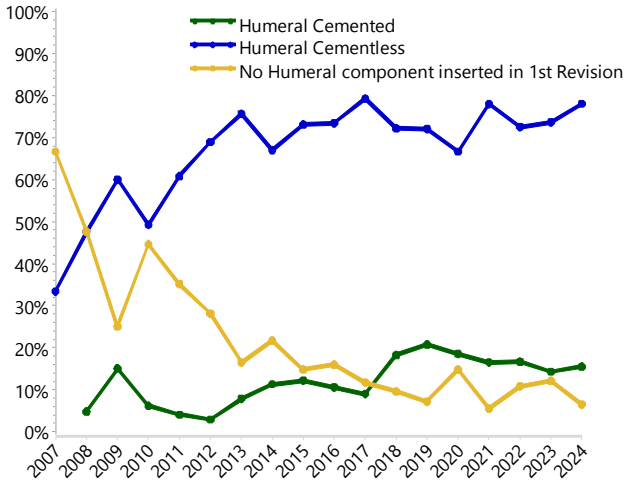


Figure N115 Primary Known 1st Revision Shoulder Replacement by Humeral Fixation (All Diagnoses, Primary class Total Stemmed Anatomic, Excluding 1st Revision for Infection) by Humeral Fixation in 1st Revision



OUTCOMES OF THE 1ST REVISION BY REASON FOR 1ST REVISION

Further analyses on the outcomes of the most common reasons for 1st revision have been performed. These include loosening, prosthesis instability/dislocation, implant breakage of the glenoid insert, and rotator cuff insufficiency.

When compared to rotator cuff insufficiency, loosening and prosthesis instability/dislocation have a higher rate of 2nd revision. Implant breakage of the glenoid insert also has a higher rate of 2nd revision compared to rotator cuff insufficiency, but only after 6 months (Table N108 and Figure N116).

Instability/dislocation, loosening and implant breakage at 1st revision were predominately revised for the same reasons at the 2nd revision. 1st revisions for rotator cuff insufficiency most commonly underwent 2nd revision for instability/dislocation (Table N109).

Loosening and prosthesis instability/dislocation have a higher rate of 2nd revision compared to rotator cuff insufficiency.

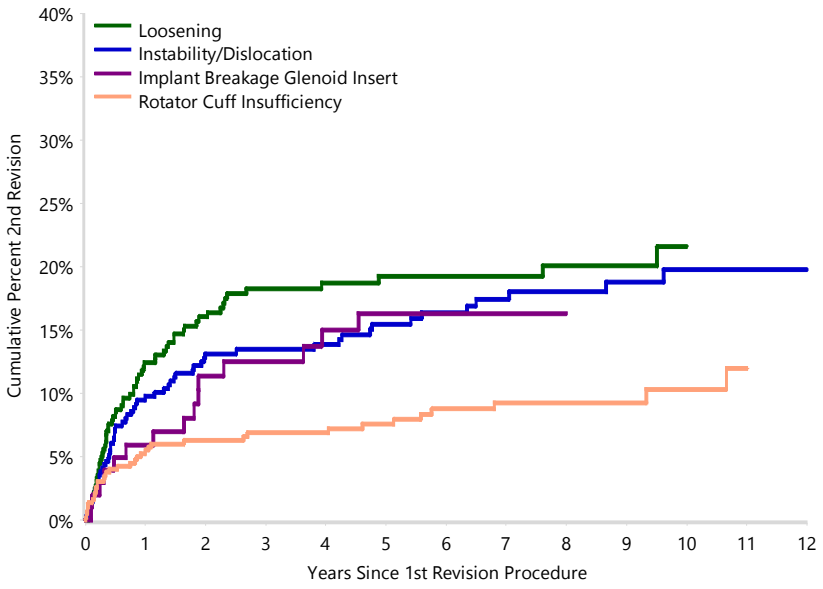
When the 1st revision is for loosening or instability/dislocation, the most common 2nd revision involves both humeral and glenoid components. In contrast, 1st revisions for implant breakage and rotator cuff insufficiency most commonly undergo 2nd revision of the humeral component only (Table N110).

Table N109 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Reason for 1st Revision (All Diagnoses)

Reason for 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Loosening	64	365	12.4 (9.4, 16.4)	18.3 (14.5, 22.9)	19.3 (15.3, 24.1)	19.3 (15.3, 24.1)	21.6 (16.8, 27.6)
Instability/Dislocation	59	367	9.8 (7.1, 13.3)	13.5 (10.3, 17.5)	15.5 (12.0, 19.9)	17.4 (13.6, 22.2)	19.8 (15.4, 25.3)
Implant Breakage Glenoid Insert	18	102	5.9 (2.7, 12.7)	12.5 (7.3, 21.0)	16.3 (10.1, 25.7)	16.3 (10.1, 25.7)	
Rotator Cuff Insufficiency	36	426	5.5 (3.7, 8.2)	6.9 (4.8, 9.8)	7.6 (5.3, 10.7)	9.3 (6.6, 12.9)	10.3 (7.2, 14.7)
TOTAL	177	1260					

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N116 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Reason for 1st Revision (All Diagnoses)



HR - adjusted for age and gender

Loosening vs Rotator Cuff Insufficiency

Entire Period: HR=2.29 (95% CI 1.52, 3.45), p<0.001

Instability/Dislocation vs Rotator Cuff Insufficiency

Entire Period: HR=1.80 (95% CI 1.19, 2.73), p=0.005

Implant Breakage Glenoid Insert vs Rotator Cuff Insufficiency

0 - 3Mth: HR=1.25 (95% CI 0.37, 4.17), p=0.721

3Mth - 6Mth: HR=1.20 (95% CI 0.28, 5.20), p=0.802

6Mth+: HR=2.39 (95% CI 1.24, 4.60), p=0.009

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Loosening	365	279	194	149	103	48
Instability/Dislocation	367	310	252	200	142	78
Implant Breakage Glenoid Insert	102	93	73	62	48	27
Rotator Cuff Insufficiency	426	369	307	250	170	72

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N110 Revision Diagnosis of 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Reason for 1st Revision (All Diagnoses)

2nd Revision Diagnosis	Loosening		Instability/ Dislocation		Implant Breakage Glenoid Insert		Rotator Cuff Insufficiency		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
Instability/Dislocation	9	14.1	31	52.5	2	11.1	12	33.3	54	30.5
Loosening	30	46.9	10	16.9	1	5.6	10	27.8	51	28.8
Infection	14	21.9	5	8.5	.	.	5	13.9	24	13.6
Rotator Cuff Insufficiency	3	4.7	5	8.5	.	.	3	8.3	11	6.2
Pain	3	4.7	2	3.4	.	.	2	5.6	7	4.0
Dissociation	2	3.1	1	1.7	4	22.2	.	.	7	4.0
Implant Breakage Glenoid Insert	.	.	.	.	5	27.8	.	.	5	2.8
Wear Glenoid Insert	1	1.6	1	1.7	1	5.6	.	.	3	1.7
Implant Breakage Glenoid	.	.	.	.	3	16.7	.	.	3	1.7
Fracture	1	1.6	1	1.7	.	.	1	2.8	3	1.7
Malposition	.	.	1	1.7	.	.	1	2.8	2	1.1
Metal Related Pathology	.	.	1	1.7	1	5.6	.	.	2	1.1
Osteonecrosis	1	1.6	.	.	.	.	.	.	1	0.6
Implant Breakage Humeral	.	.	.	.	1	5.6	.	.	1	0.6
Lysis	.	.	.	.	.	.	1	2.8	1	0.6
Glenoid Erosion	.	.	1	1.7	.	.	.	.	1	0.6
Other	.	.	.	.	.	.	1	2.8	1	0.6
TOTAL	64	100.0	59	100.0	18	100.0	36	100.0	177	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N111 Type of 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses)

Type of 2nd Revision	Loosening		Instability/ Dislocation		Implant Breakage Glenoid Insert		Rotator Cuff Insufficiency		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
Humeral Component	10	15.6	20	33.9	13	72.2	14	38.9	57	32.2
Humeral/Glenoid	24	37.5	21	35.6	2	11.1	7	19.4	54	30.5
Head Only	9	14.1	6	10.2	1	5.6	3	8.3	19	10.7
Glenoid Component	7	10.9	3	5.1	1	5.6	3	8.3	14	7.9
Cement Spacer	8	12.5	4	6.8	.	.	2	5.6	14	7.9
Cup Only	1	1.6	2	3.4	.	.	4	11.1	7	4.0
Cup/Head	.	.	2	3.4	.	.	2	5.6	4	2.3
Removal of Prostheses	2	3.1	.	.	.	.	1	2.8	3	1.7
Head/Insert	.	.	1	1.7	1	5.6	.	.	2	1.1
Cement Only	2	3.1	.	.	.	.	.	.	2	1.1
Reinsertion of Components	1	1.6	.	.	.	.	.	.	1	0.6
TOTAL	64	100.0	59	100.0	18	100.0	36	100.0	177	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

LOOSENING

There are 365 1st revision total stemmed anatomic shoulder replacements for loosening, and 46 of these have had a 2nd revision (Table N111).

The most common 1st revision for loosening is humeral/glenoid revision, followed by isolated humeral and glenoid revisions. There is no difference in the cumulative percent 2nd revision comparing types of 1st revision (Table N111).

Where the humeral component is revised in a 1st revision for loosening, the fixation chosen is most commonly cementless. There is no difference in the rate of 2nd revision comparing the fixation of a revised humeral component (Table N112).

Table N112 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Head Only	5	24	12.9 (4.3, 34.8)	22.6 (10.0, 46.3)	22.6 (10.0, 46.3)	22.6 (10.0, 46.3)	22.6 (10.0, 46.3)
Humeral/Glenoid	23	213	5.5 (3.1, 9.7)	11.2 (7.3, 16.8)	12.1 (8.0, 18.2)	12.1 (8.0, 18.2)	
Glenoid Component	9	48	12.6 (5.9, 25.9)	19.2 (10.5, 33.6)	19.2 (10.5, 33.6)	19.2 (10.5, 33.6)	19.2 (10.5, 33.6)
Humeral Component	9	49	12.3 (5.7, 25.3)	16.8 (8.8, 30.9)	19.5 (10.6, 34.3)	19.5 (10.6, 34.3)	19.5 (10.6, 34.3)
TOTAL	46	334					

Note: Excludes 31 1st revisions with other minor revision types.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N113 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Humeral Fixation of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Humeral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	8	91	3.4 (1.1, 10.2)	9.1 (4.4, 18.4)	9.1 (4.4, 18.4)	9.1 (4.4, 18.4)
Humeral Cementless	24	171	8.7 (5.2, 14.2)	14.0 (9.3, 20.7)	16.4 (11.1, 24.0)	16.4 (11.1, 24.0)
No Humeral component inserted in 1st Revision	32	103	26.1 (18.6, 35.9)	32.6 (24.3, 42.9)	32.6 (24.3, 42.9)	
TOTAL	64	365				

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

INSTABILITY/DISLOCATION

Instability/dislocation is the second most common 1st revision diagnosis for total stemmed anatomic shoulder replacement. There are 349 1st revision total stemmed anatomic shoulder replacements for instability/dislocation, and 52 of these have had a 2nd revision.

The most common 1st revision for instability/dislocation is isolated humeral revision, followed by revision of the humeral and glenoid components. There is no difference in the rate of 2nd revision when these two types of revision are compared.

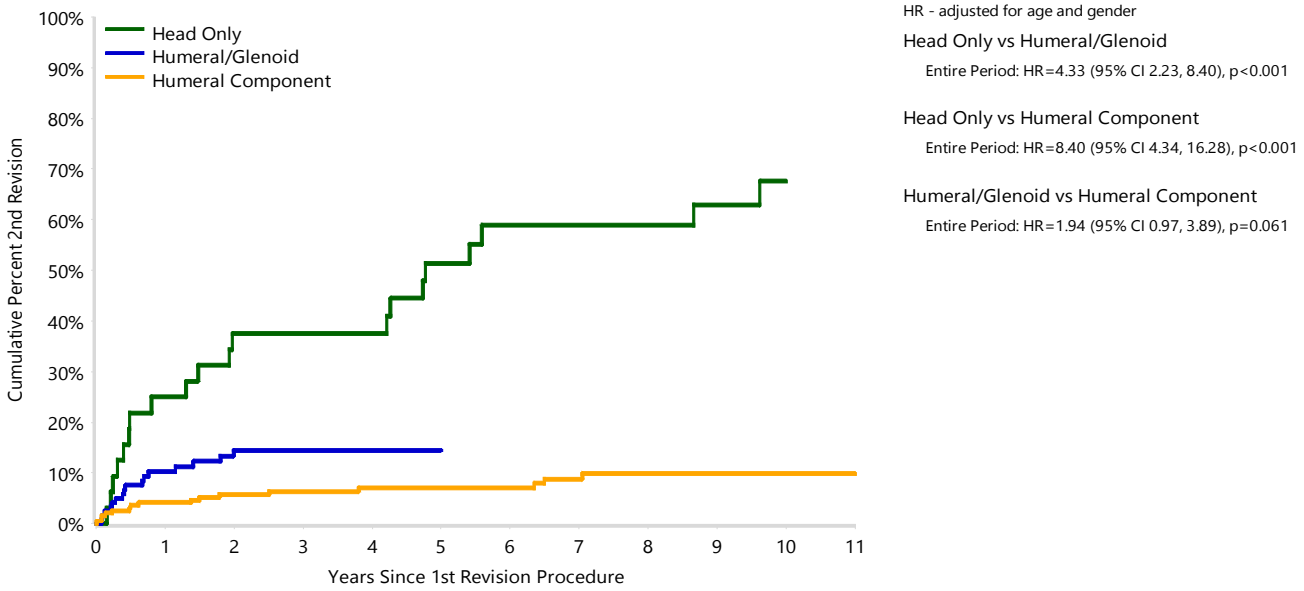
Head only 1st revisions for instability/dislocation are the least common form of revision procedure. When performed for instability/dislocation, they are associated with a higher rate of 2nd revision compared to isolated humeral and humeral glenoid combinations (Table N113 and Figure N117).

Table N114 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Instability/Dislocation)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Head Only	20	32	25.0 (13.4, 43.8)	37.5 (23.3, 56.5)	51.4 (35.3, 69.8)	58.9 (42.1, 76.4)	67.6 (50.1, 84.0)
Humeral/Glenoid	16	122	10.3 (6.0, 17.4)	14.4 (9.1, 22.6)	14.4 (9.1, 22.6)		
Humeral Component	16	195	4.1 (2.1, 8.1)	6.4 (3.7, 10.9)	7.0 (4.1, 11.8)	8.8 (5.3, 14.4)	9.8 (6.0, 15.8)
TOTAL	52	349					

Note: Excludes 18 1st revisions with other minor revision types.

Figure N117 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Instability/Dislocation)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Head Only	32	24	18	14	10	6
Humeral/Glenoid	122	94	70	52	32	15
Humeral Component	195	182	156	126	92	51

ROTATOR CUFF INSUFFICIENCY

There are 415 primary total stemmed anatomic shoulder replacements that have been revised for rotator cuff insufficiency, and 30 of these have had a 2nd revision.

The most common type of 1st revision for rotator cuff insufficiency is isolated humeral component revision, followed by combined humeral/glenoid revision. There is no difference in the rate of 2nd revision when these two types of revision are compared (Table N114).

Table N115 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Rotator Cuff Insufficiency)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Humeral/Glenoid	13	144	5.0 (2.4, 10.2)	6.6 (3.5, 12.3)	7.9 (4.2, 14.3)		
Glenoid Component	0	1					
Humeral Component	17	270	4.2 (2.3, 7.4)	5.4 (3.3, 9.0)	5.9 (3.6, 9.7)	6.5 (4.0, 10.4)	7.8 (4.7, 12.8)
TOTAL	**30**	**415**					

Note: Excludes 11 1st revisions with other minor revision types.

Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OUTCOMES OF 1ST REVISION OVER TIME

This analysis compares the outcomes of 1st revisions of total stemmed anatomic replacement over two successive time periods: pre 2016 and 2016–2024. There has been an improvement in the rate of 2nd revision comparing the most recent period to pre 2016 (Table N115 and Figure N118).

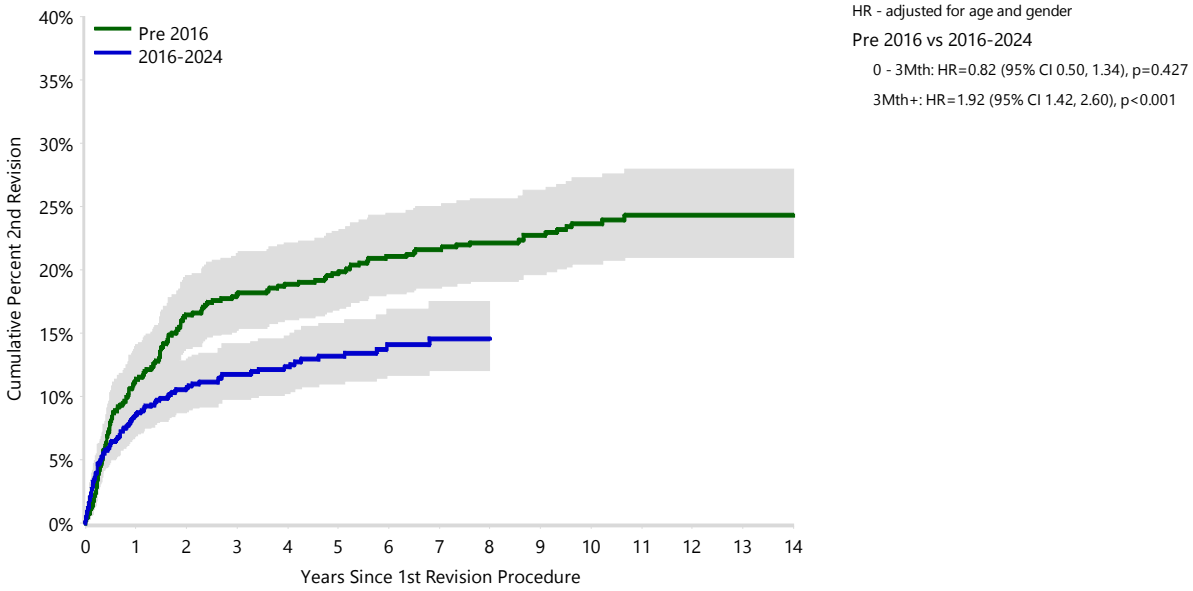
There has been a reduction in the cumulative percent revision for instability/dislocation between the two time periods (Figure N119, Table N116 and Figure N120). There is no difference in the rate of 2nd revision for infection or loosening for time periods pre 2016 and 2016-2024 (Table N117 and Table N118).

Table N116 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	148	643	11.4 (9.1, 14.1)	18.1 (15.3, 21.3)	19.7 (16.8, 23.0)	21.6 (18.6, 25.0)	23.7 (20.5, 27.3)
2016-2024	111	938	8.6 (6.9, 10.6)	11.8 (9.8, 14.2)	13.2 (11.0, 15.8)	14.6 (12.1, 17.5)	
TOTAL	259	1581					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.

Figure N118 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	643	566	503	474	431	289
2016-2024	938	736	523	347	155	0

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.

Figure N119 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

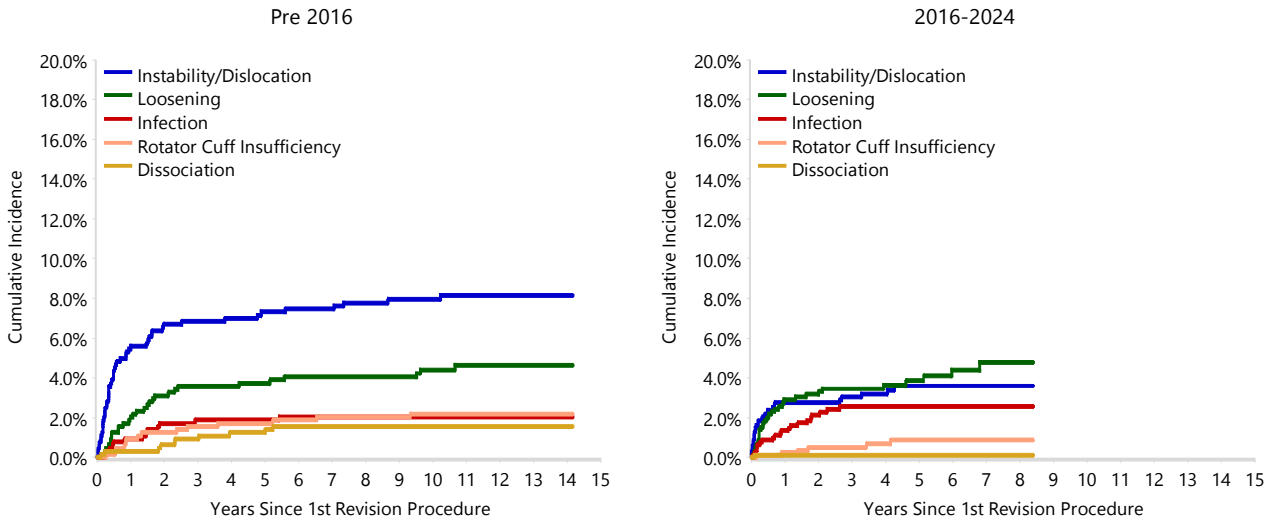
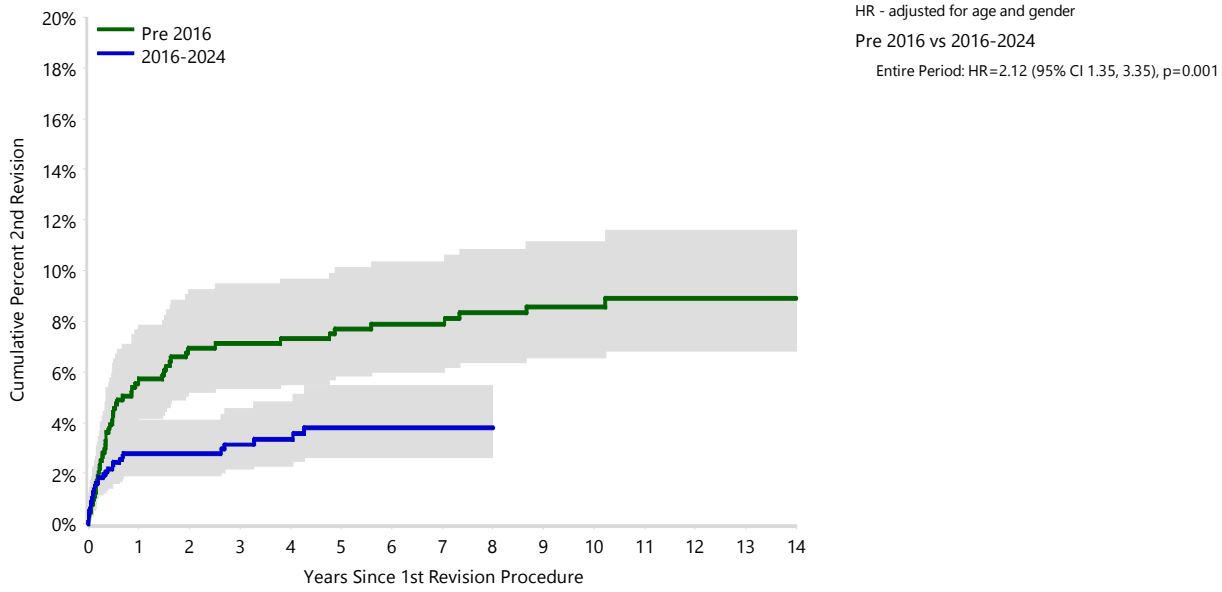


Table N117 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Dislocation/Instability)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Pre 2016	52	643	5.7 (4.2, 7.8)	7.1 (5.3, 9.5)	7.7 (5.8, 10.1)	7.9 (6.0, 10.4)	8.6 (6.6, 11.1)	8.9 (6.8, 11.6)
2016-2024	30	938	2.8 (1.9, 4.1)	3.1 (2.1, 4.6)	3.8 (2.6, 5.5)	3.8 (2.6, 5.5)		
TOTAL	82	1581						

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.

Figure N120 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Dislocation/Instability)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Pre 2016	643	566	503	474	431	289	46
2016-2024	938	736	523	347	155	0	0

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.

Table N118 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Pre 2016	13	643	1.0 (0.4, 2.2)	2.1 (1.2, 3.7)	2.1 (1.2, 3.7)	2.3 (1.3, 3.9)	2.3 (1.3, 3.9)	2.3 (1.3, 3.9)
2016-2024	21	938	1.4 (0.8, 2.5)	2.8 (1.8, 4.2)	2.8 (1.8, 4.2)	2.8 (1.8, 4.2)		
TOTAL	34	1581						

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N119 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Anatomic Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Loosening)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Pre 2016	29	643	2.1 (1.3, 3.7)	3.9 (2.6, 5.9)	4.1 (2.8, 6.1)	4.6 (3.1, 6.6)	5.1 (3.6, 7.4)	5.6 (3.8, 8.0)
2016-2024	35	938	3.0 (2.1, 4.4)	3.6 (2.5, 5.1)	4.1 (2.9, 5.8)	5.3 (3.6, 7.7)		
TOTAL	64	1581						

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

MORTALITY FOLLOWING THE 1ST REVISION

Mortality following a 1st revision of total stemmed anatomic shoulder replacement has been calculated for all 1st revision procedures and according to the more common 1st revision diagnoses.

The overall mortality is 0.1% at 30 days, 0.1% at 90 days, 0.7% at 1 year and 24.0% at 10 years (Table N119 and Figure N121).

Overall, the mortality after 1st revision of total stemmed anatomic shoulder replacement does not change depending on the reason for 1st revision or the class of the 1st revision (Table N121 and Table N122).

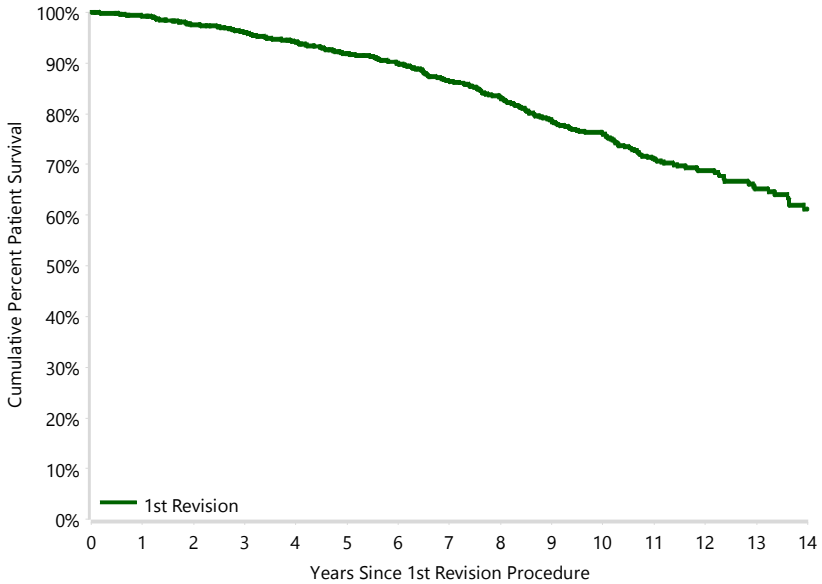
The cumulative percentage survival of the 1st revision total stemmed anatomic shoulder replacement is lower than an unrevised primary total stemmed anatomic (Table N120 and Figure N122).

The overall mortality is 0.1% at 30 days, 0.1% at 90 days, 0.7% at 1 year and 24.0% at 10 years.

Table N120 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Anatomic Replacement since 1st Revised (Excluding 1st Revision for Infection)

1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revision	278	1536	99.9 (99.5, 100.0)	99.9 (99.5, 100.0)	99.3 (98.7, 99.6)	96.1 (94.9, 97.0)	91.8 (90.1, 93.2)	86.4 (84.3, 88.3)	76.0 (73.0, 78.7)
TOTAL	278	1536							

Figure N121 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Anatomic Replacement since 1st Revised (Excluding 1st Revision for Infection)



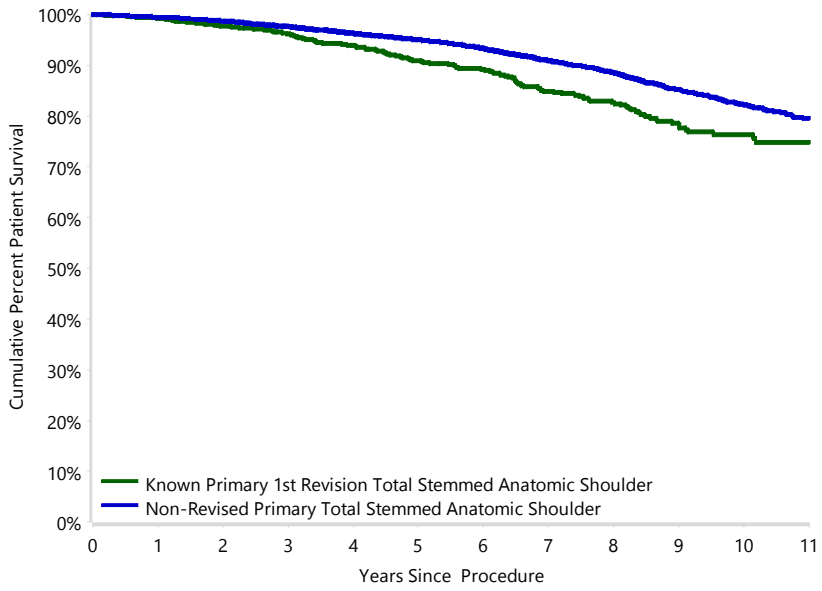
Number at Risk	0 Yr	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revision	1536	1531	1513	1410	1185	981	736	402

Table N121 Cumulative Percent Survival of Patients with Non-Revised Primary Total Stemmed Anatomic Shoulder and Known Primary 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Procedure Type	N Deceased	N Total	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Stemmed Anatomic Shoulder	142	1156	99.3 (98.5, 99.6)	90.9 (88.7, 92.6)	76.4 (72.1, 80.1)	
Non-Revised Primary Total Stemmed Anatomic Shoulder	933	9053	99.5 (99.3, 99.6)	95.0 (94.5, 95.5)	82.3 (81.0, 83.4)	
TOTAL	1075	10209				

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Figure N122 Cumulative Percent Survival of Patients with Non-Revised Primary Total Stemmed Anatomic Shoulder and Known Primary 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



HR - adjusted for age, gender and ASA score at procedure

Known Primary 1st Revision Total Stemmed Anatomic Shoulder VS Non-Revised Primary Total Stemmed Anatomic Shoulder

Entire period: HR=1.31 (95% CI: 1.10, 1.57), P=0.0029

Number at Risk	0 Yr	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Stemmed Anatomic Shoulder	1156	1032	625	116	0
Non-Revised Primary Total Stemmed Anatomic Shoulder	9053	8665	6191	1381	1

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Table N122 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Anatomic Replacement since 1st Revised by Reason for 1st Revision

Reason for 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	10 Yrs
Rotator Cuff Insufficiency	76	414	100.0 (100.0, 100.0)	99.8 (98.3, 100.0)	99.0 (97.4, 99.6)	95.2 (92.5, 97.0)	91.4 (87.9, 93.9)	71.0 (64.1, 76.9)
Instability/ Dislocation	73	357	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	99.7 (97.9, 100.0)	96.2 (93.4, 97.8)	92.9 (89.4, 95.3)	76.9 (70.6, 82.1)
Loosening	53	355	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	99.4 (97.5, 99.8)	96.4 (93.4, 98.0)	91.5 (87.2, 94.4)	79.6 (72.7, 84.9)
Infection	21	116	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	98.2 (93.2, 99.6)	94.4 (87.9, 97.5)	92.2 (85.0, 96.0)	
TOTAL	223	1242						

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N123 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Anatomic Shoulder Procedures since 1st Revised by Reason for 1st Revision (Excluding 1st Revision for Infection)

Type of 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	10 Yrs
Major Partial	175	820	99.9 (99.1, 100.0)	99.8 (99.0, 99.9)	99.0 (98.0, 99.5)	95.9 (94.3, 97.1)	91.9 (89.7, 93.7)	75.4 (71.5, 78.8)
Major Total	64	533	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	99.8 (98.6, 100.0)	96.5 (94.2, 97.9)	91.5 (88.1, 94.1)	77.2 (70.4, 82.6)
Minor	39	183	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	99.4 (96.1, 99.9)	95.8 (91.4, 98.0)	91.9 (86.5, 95.2)	78.0 (70.0, 84.1)
TOTAL	278	1536						

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Revision of Total Stemmed Reverse Shoulder Replacement

The Registry has recorded 2,490 1st revision procedures of total stemmed reverse shoulder replacement for all diagnoses. There are 628 procedures excluded where the 1st revision was undertaken for infection. There are also 11 procedures excluded where minor or major shoulder prostheses were not inserted, and the diagnosis was not infection. Therefore, this analysis includes 1851 1st revision procedures of total stemmed reverse shoulder replacements.

DEMOGRAPHICS OF 1ST REVISION

The mean age for patients undergoing a 1st revision total stemmed reverse shoulder replacement is 73 years. 1st revision procedures are more common in males (50.1%), and the highest proportion of patients have an ASA score of 2 (26.4%) or 3 (66.1%) and have a BMI in the pre obese category (30.5%). Demographic details for the 1st revision of total stemmed reverse shoulder replacement procedures are shown in Table N123

.

Table N124 Summary of 1st Revision of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revisions for Infection)

Variable	Instability/ Dislocation (n=782)	Loosening (n= 406)	Fracture (n=273)	Rotator Cuff Insufficiency (n=9)	Other (n=381)	TOTAL (n=1,851)
Follow-up Years (Primary to 1st Revision)						
Mean (SD)	0.9 ± 1.7	2 ± 2.5	1.9 ± 2.6	1.9 ± 2.3	2.1 ± 2.4	1.5 ± 2.3
Median (IQR)	0.2 (0.1, 0.7)	1.1 (0.3, 2.8)	0.7 (0.2, 2.1)	1.2 (0.4, 2.5)	1.3 (0.5, 2.8)	0.5 (0.1, 1.9)
Minimum	0	0	0	0	0	0
Maximum	11.2	16.7	12.2	6.9	14.8	16.7
Age at 1st Revision						
Mean (SD)	71.7 ± 9.7	74.2 ± 8.4	75.9 ± 7.9	74.8 ± 9.4	72.5 ± 8.7	73 ± 9.1
Median (IQR)	72 (65, 78)	75 (69, 80)	76 (71, 82)	75 (68, 83)	73 (67, 78)	74 (67, 79)
Age at 1st Revision in groups						
<55	29 (3.7%)	6 (1.5%)	2 (0.7%)		12 (3.1%)	49 (2.6%)
55-64	144 (18.4%)	48 (11.8%)	22 (8.1%)	1 (11.1%)	51 (13.4%)	266 (14.4%)
65-74	289 (37%)	136 (33.5%)	89 (32.6%)	3 (33.3%)	152 (39.9%)	669 (36.1%)
≥75	320 (40.9%)	216 (53.2%)	160 (58.6%)	5 (55.6%)	166 (43.6%)	867 (46.8%)
Gender						
Male	471 (60.2%)	153 (37.7%)	98 (35.9%)	5 (55.6%)	201 (52.8%)	928 (50.1%)
Female	311 (39.8%)	253 (62.3%)	175 (64.1%)	4 (44.4%)	180 (47.2%)	923 (49.9%)
ASA at 1st Revision[1]						
ASA 1	11 (1.6%)	6 (1.7%)	5 (2.1%)	1 (14.3%)	5 (1.4%)	28 (1.7%)
ASA 2	163 (24%)	105 (29.2%)	61 (25.3%)	2 (28.6%)	99 (28.7%)	430 (26.4%)
ASA 3	467 (68.9%)	231 (64.3%)	147 (61%)	4 (57.1%)	228 (66.1%)	1,077 (66.1%)
ASA 4	37 (5.5%)	17 (4.7%)	28 (11.6%)		13 (3.8%)	95 (5.8%)
BMI at 1st Revision[2]						
Underweight	8 (1.4%)	4 (1.3%)	3 (1.5%)		4 (1.3%)	19 (1.3%)
Normal	93 (16.1%)	62 (19.6%)	42 (21.2%)	2 (28.6%)	67 (21.1%)	266 (18.8%)
Pre Obese	159 (27.5%)	104 (32.8%)	62 (31.3%)	1 (14.3%)	106 (33.3%)	432 (30.5%)
Obese Class 1	170 (29.4%)	93 (29.3%)	56 (28.3%)	2 (28.6%)	82 (25.8%)	403 (28.4%)
Obese Class 2	86 (14.9%)	31 (9.8%)	22 (11.1%)	2 (28.6%)	35 (11%)	176 (12.4%)
Obese Class 3	62 (10.7%)	23 (7.3%)	13 (6.6%)		24 (7.5%)	122 (8.6%)
Fixation of Primary Procedure						
Cemented	8 (1%)	4 (1%)	1 (0.4%)		2 (0.5%)	15 (0.8%)
Cementless	557 (71.2%)	322 (79.3%)	214 (78.4%)	7 (77.8%)	303 (79.5%)	1,403 (75.8%)

Revision Arthroplasty

Variable	Instability/ Dislocation (n=782)	Loosening (n= 406)	Fracture (n=273)	Rotator Cuff Insufficiency (n=9)	Other (n=381)	TOTAL (n=1,851)
Hybrid	217 (27.7%)	80 (19.7%)	58 (21.2%)	2 (22.2%)	76 (19.9%)	433 (23.4%)
Glenoid Fixation in 1st Revision						
Glenoid Cemented	16 (3.9%)		1 (0.4%)		1 (0.3%)	18 (1%)
Glenoid Cementless	41 (5.2%)	133 (32.8%)	43 (15.8%)	6 (66.7%)	95 (24.9%)	318 (17.2%)
No Glenoid inserted in 1st Revision	741 (94.8%)	257 (63.3%)	229 (83.9%)	3 (33.3%)	285 (74.8%)	1,515 (81.8%)
Humeral Fixation in 1st Revision						
Humeral Cemented	58 (7.4%)	80 (19.7%)	99 (36.3%)	1 (11.1%)	33 (8.7%)	271 (14.6%)
Humeral Cementless	194 (24.8%)	72 (17.7%)	70 (25.6%)	6 (66.7%)	105 (27.6%)	447 (24.1%)
No Humeral component inserted in 1st Revision	530 (67.8%)	254 (62.6%)	104 (38.1%)	2 (22.2%)	243 (63.8%)	1,133 (61.2%)

Abbreviations: SD - standard deviation, IQR - interquartile range, ASA - American Society of Anesthesiologists, BMI - Body Mass Index (kg/m^2)

[1]Excludes 221 procedures with unknown ASA at the1st Revision

[2]Excludes 433 procedures with unknown BMI at the 1st Revision

OUTCOME OF 1ST REVISION

There are 366 2nd revisions of the 1,851 1st revision procedures, and the cumulative percent 2nd revision at 10 years is 25.6% (Table N124 and Figure N123).

The most common reasons for 2nd revision are instability/dislocation (45.6%), infection (19.1%), loosening (18%), and fracture (5.2%) (Table N125 and Figure N124).

Isolated revision of the humeral component is the most common 2nd revision procedure (25.4%), followed by humeral and glenoid revision (17.8%), cup and head (16.1%), glenoid only (10.7%), and head only (10.1%) (Table N126).

Primary total stemmed reverse shoulder replacement implants may encompass a single design platform prosthesis (SDPP). These platform implants range include both anatomic and reverse shoulder replacement. They feature common design, composition metallurgy, coatings, and bearing surfaces. They allow polarity change of humeral or glenoid prostheses by modular exchange. In revision surgery, the humeral stem may be retained if a SDPP was used in the primary procedure. In the first two weeks following the 1st revision, procedures that retain the humeral stem have a higher rate of 2nd revision compared to procedures that do not retain the humeral stem. After this time, there is no difference (Table N127 and Figure N125).

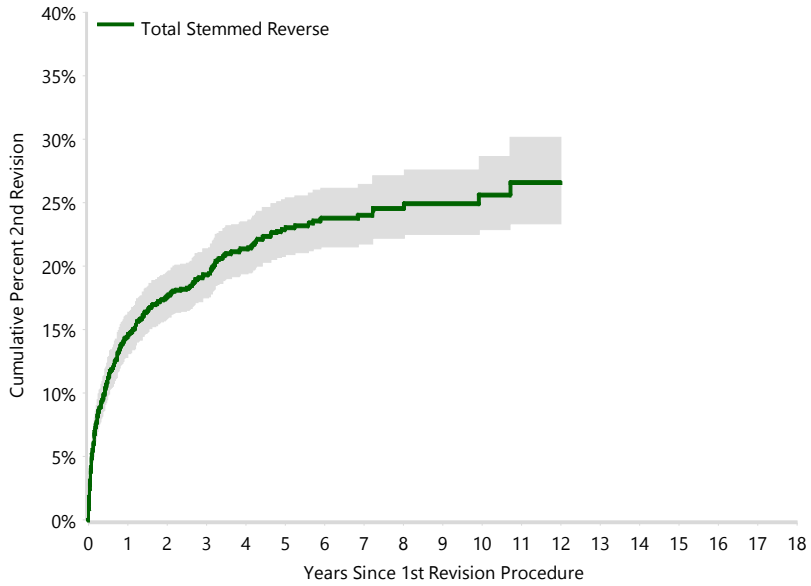
At 10 years, the cumulative percent 2nd revision for known primary total stemmed reverse replacement is 25.6%.

Table N125 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revision for Infection)

Revision of Primary	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Total Stemmed Reverse	366	1851	14.5 (12.9, 16.2)	19.3 (17.5, 21.4)	22.9 (20.8, 25.2)	24.0 (21.8, 26.5)	25.6 (22.9, 28.6)
TOTAL	366	1851					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N123 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Total Stemmed Reverse	1851	1327	860	519	292	105

Table N126 Revision Diagnosis of 2nd Revision of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revision for Infection)

2nd Revision Diagnosis	Number	Percent
Instability/Dislocation	167	45.6
Infection	70	19.1
Loosening	66	18.0
Fracture	19	5.2
Dissociation	14	3.8
Pain	7	1.9
Implant Breakage Humeral	3	0.8
Glenoid Erosion	3	0.8
Metal Related Pathology	3	0.8
Malposition	2	0.5
Rotator Cuff Insufficiency	2	0.5
Lysis	2	0.5
Wear Humeral Cup	1	0.3
Implant Breakage Glenoid Insert	1	0.3
Arthrofibrosis	1	0.3
Implant Breakage Head	1	0.3
Incorrect Sizing	1	0.3
Other	3	0.8
TOTAL	366	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N127 Type of Revision of 2nd Revision of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revision for Infection)

Type of 2nd Revision	Number	Percent
Humeral Component	93	25.4
Humeral/Glenoid	65	17.8
Cup/Head	59	16.1
Glenoid Component	39	10.7
Head Only	37	10.1
Cup Only	30	8.2
Cement Spacer	25	6.8
Removal of Prostheses	9	2.5
Head/Insert	3	0.8
Minor Components	3	0.8
Cement Only	2	0.5
Reoperation	1	0.3
TOTAL	366	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted

Figure N124 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Stemmed Reverse Replacement (All Diagnoses, Excluding 1st Revision for Infection)

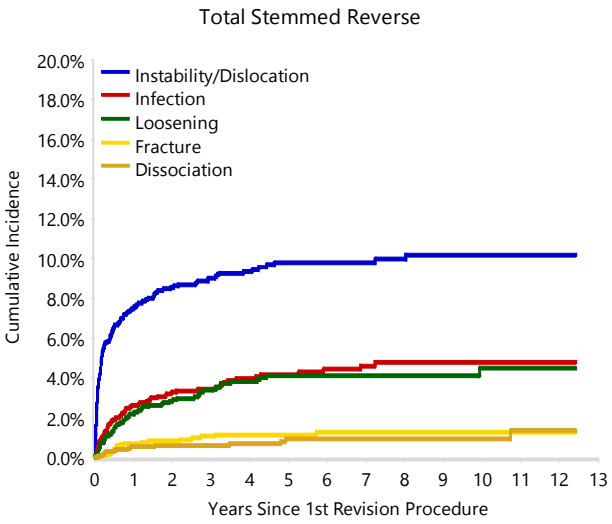
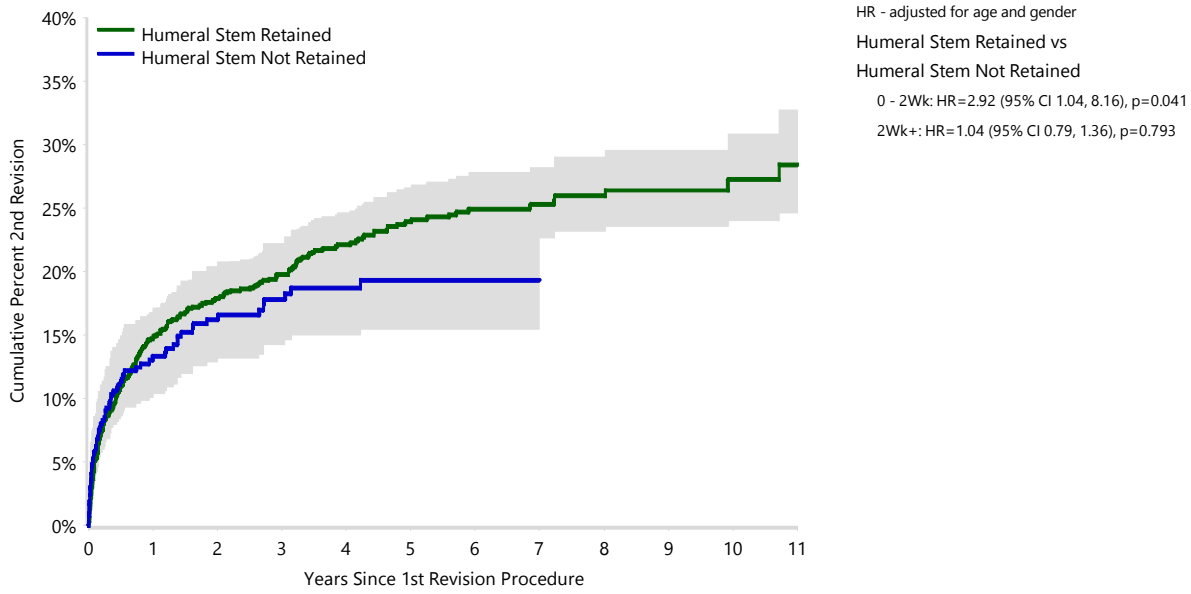


Table N128 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Retention (All Diagnoses, Excluding 1st Revision for Infection and Removal of Prosthesis Only Revision)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Humeral Stem Retained	292	1416	14.7 (12.9, 16.7)	19.8 (17.6, 22.1)	23.9 (21.4, 26.6)	25.3 (22.6, 28.2)	27.3 (24.0, 30.8)
Humeral Stem Not Retained	70	414	13.3 (10.4, 17.1)	17.8 (14.2, 22.2)	19.4 (15.5, 24.1)	19.4 (15.5, 24.1)	
TOTAL	362	1830					

Figure N125 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Retention (All Diagnoses, Excluding 1st Revision for Infection and Removal of Prosthesis Only Revision)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Humeral Stem Retained	1416	1021	661	409	230	85
Humeral Stem Not Retained	414	293	188	100	58	20

OUTCOME OF 1ST REVISION BY CLASS OF REVISION

Minor revision is the most common class of 1st revision procedure of a primary total stemmed reverse shoulder replacement (51.6%), followed by major partial (39.6%) and then major total revision (8.8%). Since 2006, there has been an ongoing increase in the proportion of major partial 1st revisions with a corresponding reduction in the proportion of minor 1st revisions (Figure N126).

When the outcomes of the 1st revision by class of 1st revision are compared, there is no difference in the rate of 2nd revision (Table N128 and Figure N127).

All classes of 1st revision undergo 2nd revision predominately for instability/dislocation (Figure N128).

When comparing 1st revision outcomes by class, the rate of 2nd revision does not vary.

Figure N126 Revision Shoulder Replacement by Class of 1st Revision (Primary Total Stemmed Reverse Shoulder Replacement)

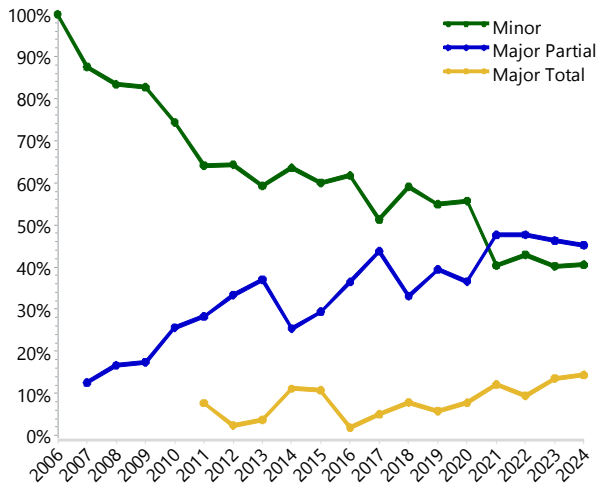
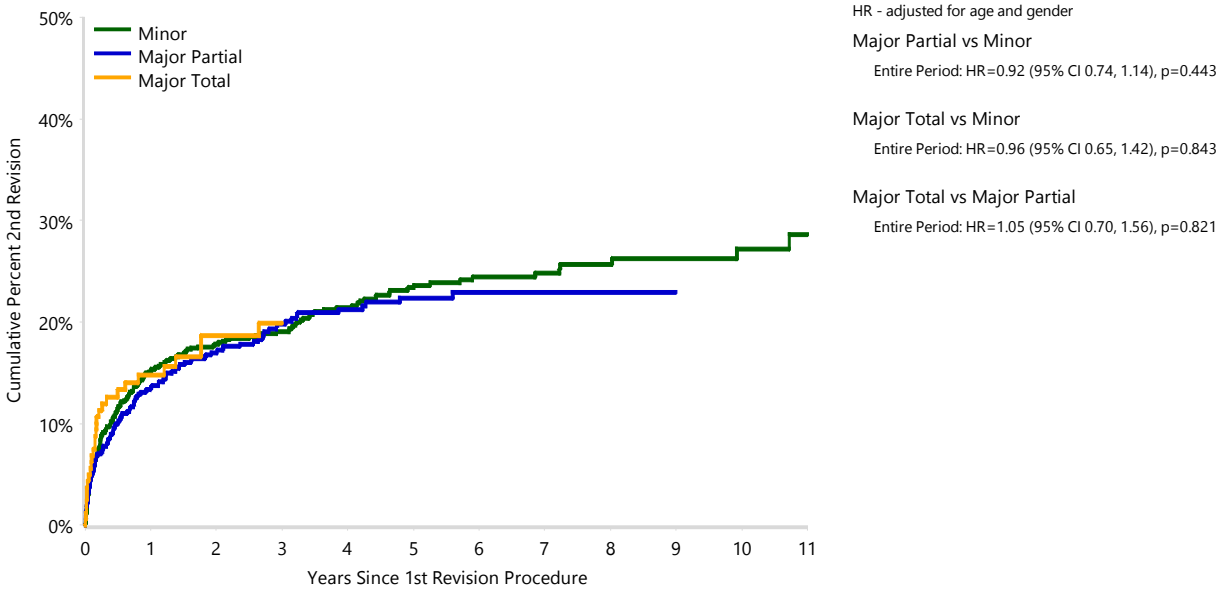


Table N129 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Class of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Minor	202	956	15.1 (12.9, 17.6)	19.0 (16.6, 21.8)	23.4 (20.5, 26.6)	24.8 (21.8, 28.2)	27.2 (23.4, 31.5)
Major Partial	135	733	13.6 (11.2, 16.4)	19.8 (16.8, 23.2)	22.4 (19.0, 26.2)	23.0 (19.5, 26.9)	
Major Total	29	162	14.8 (10.1, 21.5)	19.9 (14.0, 27.8)			
TOTAL	366	1851					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

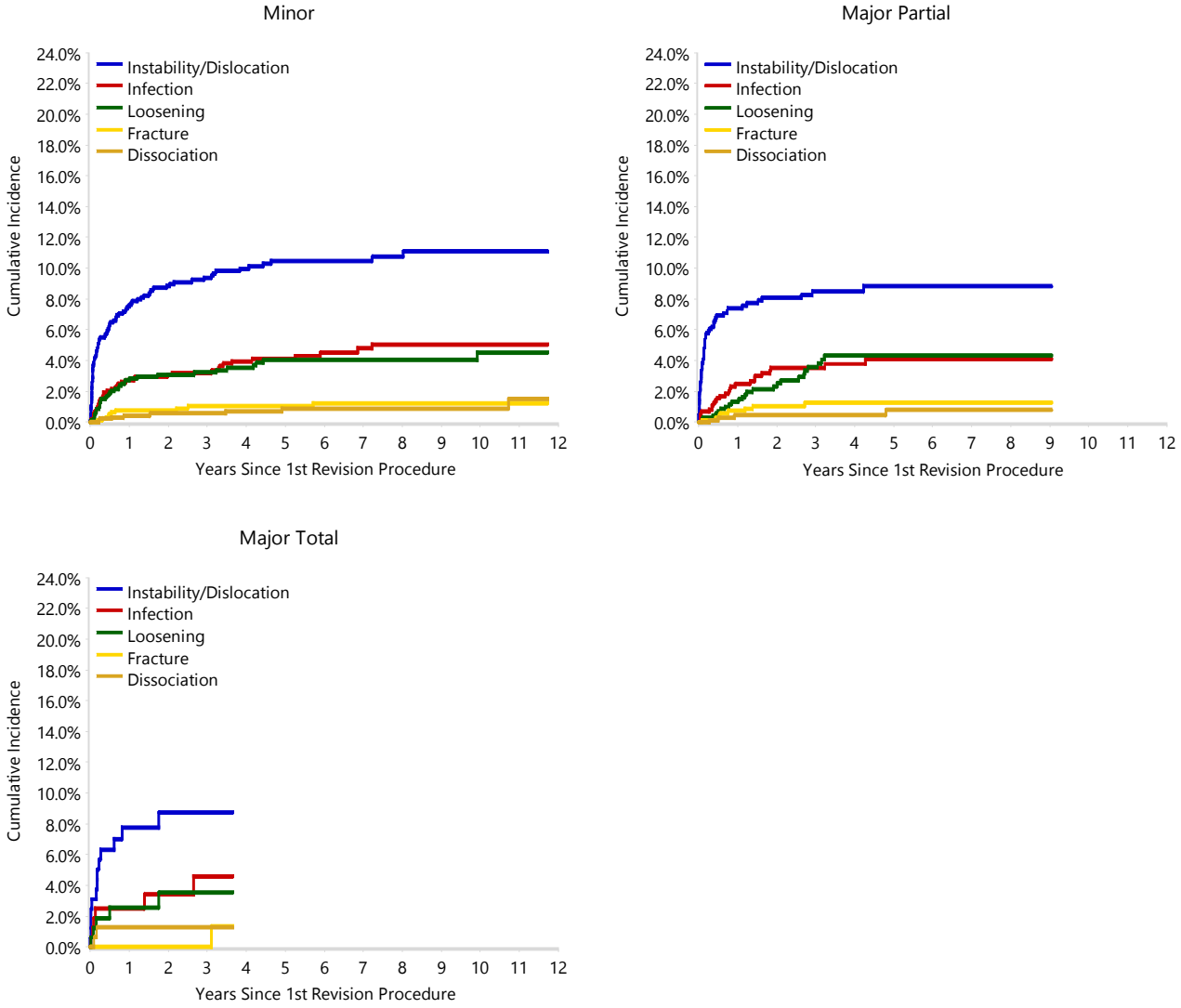
Figure N127 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Minor	956	703	496	320	186	70
Major Partial	733	519	305	171	89	29
Major Total	162	105	59	28	17	6

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N128 Cumulative Incidence 2nd Revision Diagnosis of Known Primary Total Stemmed Reverse Replacement by Class of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Outcome of 1ST Revision by Type of Revision

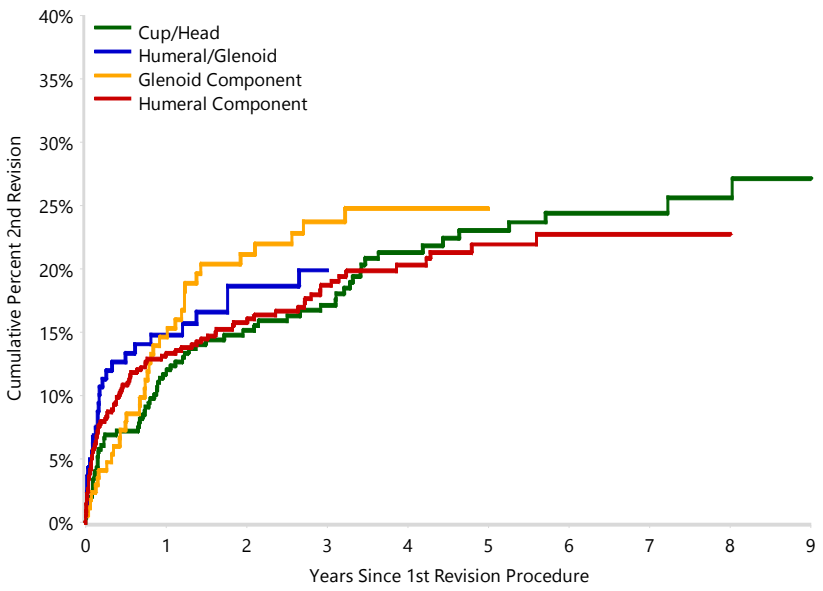
The most common type of 1st revision of a total stemmed reverse is of the humeral component followed by a cup and head exchange.

A humeral/glenoid 1st revision has a higher rate of 2nd revision than head and cup revisions in the first 3 months, but no difference after that time. There is no difference in the rate of 2nd revision between other 1st revision combinations (Table N129 and Figure N129).

Table N130 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Cup/Head	71	350	11.7 (8.7, 15.7)	17.2 (13.4, 21.9)	23.0 (18.4, 28.6)	24.4 (19.6, 30.3)
Humeral/Glenoid	29	162	14.8 (10.1, 21.5)	19.9 (14.0, 27.8)		
Glenoid Component	36	172	14.6 (10.0, 21.2)	23.7 (17.6, 31.6)	24.7 (18.4, 32.8)	
Humeral Component	99	557	13.3 (10.7, 16.5)	18.7 (15.4, 22.6)	21.9 (18.1, 26.5)	22.8 (18.7, 27.6)
TOTAL	235	1241				

Figure N129 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



HR - adjusted for age and gender

Humeral/Glenoid vs Cup/Head

0 - 3Mth: HR=2.02 (95% CI 1.11, 3.68), p=0.020

3Mth+: HR=0.62 (95% CI 0.33, 1.19), p=0.154

Glenoid Component vs Cup/Head

Entire Period: HR=1.15 (95% CI 0.77, 1.72), p=0.499

Humeral Component vs Cup/Head

0 - 3Mth: HR=1.45 (95% CI 0.90, 2.35), p=0.126

3Mth+: HR=0.80 (95% CI 0.55, 1.17), p=0.250

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cup/Head	350	270	188	119	67	34
Humeral/Glenoid	162	105	59	28	17	6
Glenoid Component	172	123	79	49	22	6
Humeral Component	557	393	223	119	65	23

Humeral Fixation Outcome

Total stemmed reverse shoulder replacements are the most commonly revised without exchange of the humeral component in the 1st revision.

There is no difference in the rate of 2nd revision of total stemmed reverse shoulder replacements when cemented or cementless humeral components are revised in the 1st revision compared to procedures with no exchange of the humeral component (Table N130).

Table N131 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Fixation of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Humeral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	51	271	13.8 (10.1, 18.6)	19.9 (15.2, 25.8)	22.4 (17.2, 29.0)	
Humeral Cementless	77	447	13.6 (10.7, 17.3)	18.5 (14.8, 22.9)	21.6 (17.3, 26.8)	22.5 (17.9, 28.0)
No Humeral Component Inserted in 1st Revision	238	1133	14.9 (12.9, 17.2)	19.6 (17.3, 22.2)	23.5 (20.8, 26.4)	24.7 (21.9, 27.8)
TOTAL	**366**	**1851**				

Note: Excluding 1st revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

TIMING OF 1ST REVISION

The timing of the 1st revision was classified as early if it occurred within 2 years of the primary procedure (<2 years) or late if it occurred 2 years or more (≥2 years) after the primary procedure.

There are 1,412 early 1st revisions (76.3%). Diagnoses and timing of 1st revisions of primary total stemmed reverse shoulder replacements are shown in Table N132.

1st revisions performed within 2 years have a higher rate of 2nd revision in the first 2 weeks when compared to late 1st revisions and do not differ after that time (Table N131 and Figure N130).

There are 276 early 1st revisions for loosening (68%). These early revisions have a higher rate of 2nd revision compared to those performed later (Table N133 and Figure N131).

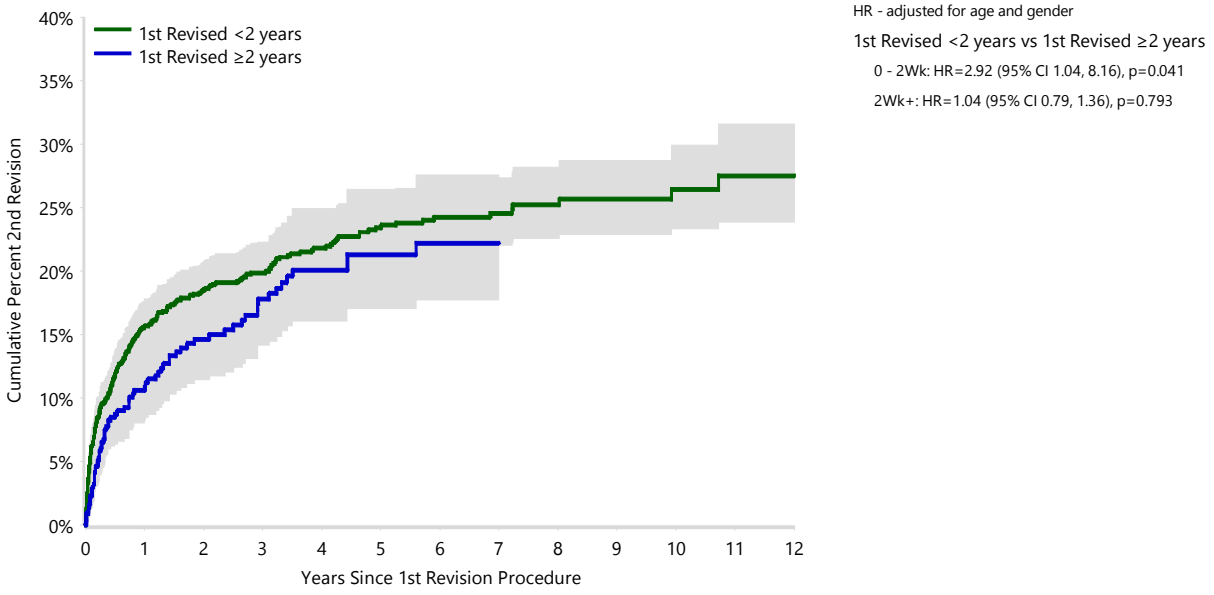
There are 681 early 1st revisions for dislocation/instability (87.1%). There is no difference in the rate of 2nd revision comparing early or late 1st revisions performed for dislocation/ instability (Table N134).

There are 198 early 1st revisions for fracture (72.5%). There is no difference in 2nd revision rates comparing early and late 1st revisions performed for fracture (Table N135).

Table N132 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	293	1412	15.6 (13.8, 17.7)	19.9 (17.8, 22.2)	23.4 (21.0, 26.1)	24.6 (22.0, 27.4)	26.5 (23.4, 29.9)
1st Revised ≥2 years	73	439	10.6 (8.0, 14.0)	17.8 (14.1, 22.3)	21.3 (17.1, 26.4)	22.2 (17.7, 27.6)	
TOTAL	**366**	**1851**					

Figure N130 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised <2 years	1412	1017	666	412	238	92
1st Revised ≥2 years	439	310	194	107	54	13

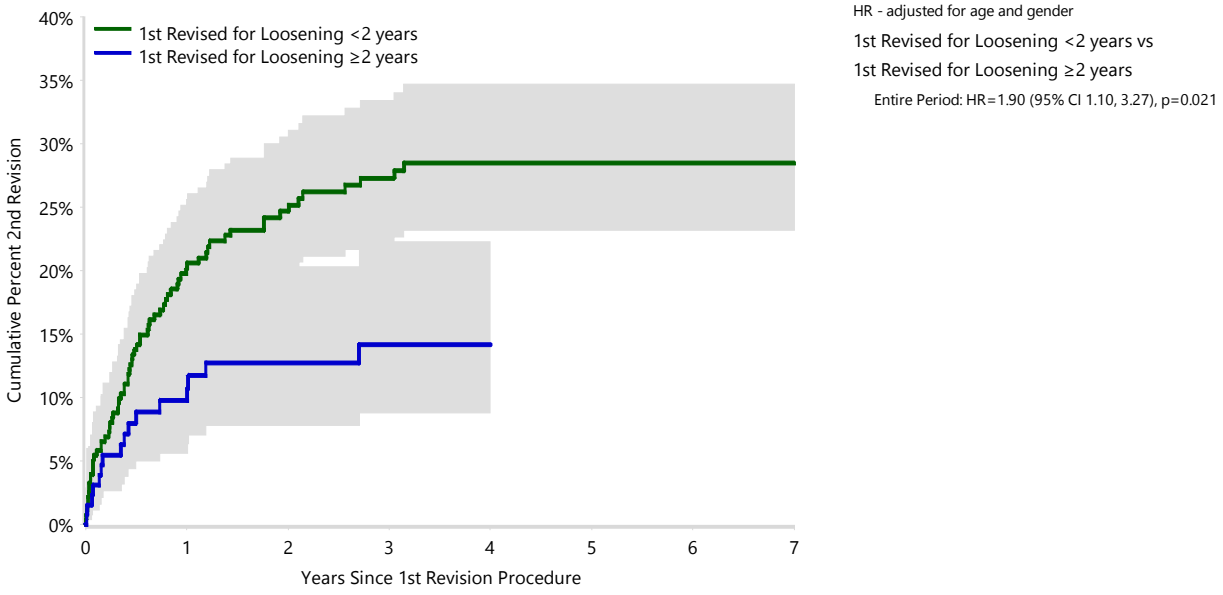
Table N133 Known Primary Total Stemmed Reverse Shoulder by Timing and Reason of 1st Revision (Excluding 1st Revision for Infection)

Revision of 1st Revision	1st Revised <2 years			1st Revised ≥2 years			TOTAL		
	N	Row%	Col%	N	Row%	Col%	N	Row%	Col%
Arthrofibrosis	20	71.4	1.4	8	28.6	1.8	28	100.0	1.5
Dissociation	71	79.8	5.0	18	20.2	4.1	89	100.0	4.8
Fracture	198	72.5	14.0	75	27.5	17.1	273	100.0	14.7
Glenoid Erosion	2	100.0	0.1	.	.	.	2	100.0	0.1
Heterotopic Bone	7	58.3	0.5	5	41.7	1.1	12	100.0	0.6
Implant Breakage Glenoid	13	68.4	0.9	6	31.6	1.4	19	100.0	1.0
Implant Breakage Glenoid Insert	1	25.0	0.1	3	75.0	0.7	4	100.0	0.2
Implant Breakage Humeral	3	50.0	0.2	3	50.0	0.7	6	100.0	0.3
Incorrect Sizing	14	82.4	1.0	3	17.6	0.7	17	100.0	0.9
Instability/Dislocation	681	87.1	48.2	101	12.9	23.0	782	100.0	42.2
Loosening	276	68.0	19.5	130	32.0	29.6	406	100.0	21.9
Lysis	11	36.7	0.8	19	63.3	4.3	30	100.0	1.6
Malposition	24	92.3	1.7	2	7.7	0.5	26	100.0	1.4
Metal Related Pathology	6	46.2	0.4	7	53.8	1.6	13	100.0	0.7
Pain	31	63.3	2.2	18	36.7	4.1	49	100.0	2.6
Rotator Cuff Insufficiency	6	66.7	0.4	3	33.3	0.7	9	100.0	0.5
Synovitis	.	.	.	1	100.0	0.2	1	100.0	0.1
Tumour	3	60.0	0.2	2	40.0	0.5	5	100.0	0.3
Wear Glenoid Insert	.	.	.	2	100.0	0.5	2	100.0	0.1
Wear Humeral Cup	.	.	.	9	100.0	2.1	9	100.0	0.5
Other	45	65.2	3.2	24	34.8	5.5	69	100.0	3.7
TOTAL	**1412**	**76.3**	**100.0**	**439**	**23.7**	**100.0**	**1851**	**100.0**	**100.0**

Table N134 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
1st Revised for Loosening <2 years	70	276	20.2 (15.8, 25.6)	27.3 (22.1, 33.4)	28.5 (23.2, 34.7)	28.5 (23.2, 34.7)
1st Revised for Loosening ≥2 years	16	130	9.8 (5.7, 16.6)	14.2 (8.8, 22.3)		
TOTAL	**86**	**406**				

Figure N131 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
1st Revised for Loosening <2 years	276	193	128	76	52
1st Revised for Loosening ≥2 years	130	92	55	32	18

Table N135 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, 1st Revision for Instability/Dislocation)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revised for Dislocation/Instability <2 years	164	681	17.6 (14.9, 20.8)	21.9 (18.9, 25.4)	26.3 (22.7, 30.3)	28.5 (24.6, 32.9)	32.0 (27.0, 37.6)
1st Revised for Dislocation/Instability ≥2 years	22	101	15.1 (9.2, 24.3)	22.8 (15.0, 33.8)			
TOTAL	186	782					

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Table N136 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Timing of 1st Revision (All Diagnoses, 1st Revision for Fracture)

Timing of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
1st Revised for Fracture <2 years	25	198	10.0 (6.5, 15.3)	12.1 (8.1, 17.8)	14.4 (9.7, 21.2)	
1st Revised for Fracture ≥2 years	9	75	11.2 (5.8, 21.2)	13.0 (6.9, 23.6)	13.0 (6.9, 23.6)	13.0 (6.9, 23.6)
TOTAL	34	273				

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

OUTCOME OF 1ST REVISION BY PATIENT CHARACTERISTICS

The outcome of the 1st revision of a primary total stemmed reverse shoulder replacement varies by age and gender, with females aged <65 years having a higher rate of 2nd revision than females aged ≥65 years.

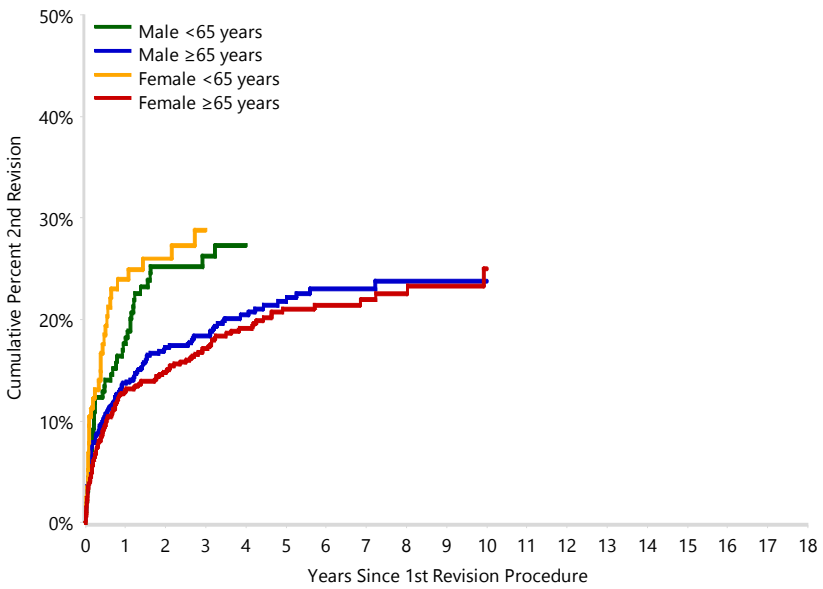
In males, the 2nd revision rate does not differ by age or when compared to females in the same age group (Table N136 and Figure N132).

Table N137 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Gender and Age (All Diagnoses, Excluding 1st Revision for Infection)

Gender	Age at 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	<65 years	48	199	17.6 (12.8, 23.9)	26.2 (20.2, 33.6)			
	≥65 years	138	729	13.7 (11.4, 16.5)	18.4 (15.6, 21.6)	21.8 (18.5, 25.5)	23.0 (19.6, 26.9)	23.8 (20.1, 28.0)
Female	<65 years	34	116	23.9 (17.1, 33.0)	28.8 (21.1, 38.6)			
	≥65 years	146	807	13.0 (10.8, 15.6)	17.1 (14.5, 20.1)	21.1 (18.0, 24.6)	22.0 (18.7, 25.7)	25.0 (20.4, 30.4)
TOTAL		366	1851					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N132 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Gender and Age (All Diagnoses, Excluding 1st Revision for Infection)



Male <65 years vs Male ≥65 years
Entire Period: HR=1.36 (95% CI 0.98, 1.88), p=0.069

Male <65 years vs Female <65 years
Entire Period: HR=0.83 (95% CI 0.54, 1.29), p=0.408

Male ≥65 years vs Female ≥65 years
Entire Period: HR=1.09 (95% CI 0.86, 1.37), p=0.472

Female <65 years vs Female ≥65 years
Entire Period: HR=1.78 (95% CI 1.22, 2.58), p=0.002

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	<65 years	199	134	71	37	24	9
	≥65 years	729	522	337	202	105	43
Female	<65 years	116	78	43	29	18	8
	≥65 years	807	593	409	251	145	45

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

ASA SCORE AND BMI CATEGORY

ASA score is available for 1,630 1st revision total stemmed reverse shoulder replacements. There is no difference in the rate of 2nd revision between patients of ASA scores 1-4 (Table N137).

BMI is recorded for 1,418 1st revision procedures. The rate of 2nd revision does not differ between BMI classes (Table N138).

Table N138 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by ASA (All Diagnoses, Excluding 1st Revision for Infection)

ASA Grade	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
ASA 1	7	28	15.6 (6.1, 36.3)	26.4 (12.5, 50.5)	26.4 (12.5, 50.5)	
ASA 2	110	430	18.1 (14.7, 22.2)	26.6 (22.3, 31.5)	29.7 (25.1, 34.9)	30.4 (25.6, 35.7)
ASA 3	197	1077	14.6 (12.6, 16.9)	18.4 (16.1, 21.0)	21.7 (18.9, 24.7)	23.1 (20.0, 26.6)
ASA 4	6	95	5.7 (2.4, 13.2)	7.2 (3.3, 15.4)	7.2 (3.3, 15.4)	
TOTAL	320	1630				

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.
Excludes 221 procedures with no ASA recorded.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N139 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by BMI (All Diagnoses, Excluding 1st Revision for Infection)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Underweight	2	19	5.3 (0.8, 31.9)	5.3 (0.8, 31.9)	21.1 (4.8, 68.2)			
Normal	48	266	14.4 (10.6, 19.4)	16.5 (12.3, 21.8)	19.6 (14.9, 25.5)	21.0 (16.1, 27.2)	21.0 (16.1, 27.2)	
Pre Obese	84	432	15.5 (12.3, 19.5)	19.5 (15.9, 23.9)	20.3 (16.6, 24.8)	22.5 (18.3, 27.3)	23.2 (18.9, 28.3)	24.4 (19.7, 30.0)
Obese Class 1	85	403	16.0 (12.7, 20.1)	20.3 (16.5, 24.9)	22.4 (18.3, 27.2)	24.0 (19.7, 29.1)	25.4 (20.8, 30.9)	27.0 (21.7, 33.2)
Obese Class 2	36	176	17.5 (12.5, 24.3)	20.5 (15.0, 27.7)	21.5 (15.8, 28.9)	21.5 (15.8, 28.9)	24.8 (18.0, 33.4)	
Obese Class 3	22	122	13.6 (8.4, 21.6)	19.8 (13.1, 29.2)	21.4 (14.3, 31.3)			
TOTAL	277	1418						

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.
Excludes 433 procedures are excluded as BMI has not been recorded.
BMI has not been presented for patients aged ≤19 years.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

CHANGES IN REVISION SHOULDER SURGERY OVER TIME

The most common reason for 1st revision of total stemmed reverse shoulder replacements has changed over time. In 2008, loosening was more common than instability/dislocation, but after 2008, instability/dislocation predominated (Figure N133).

Up to 2020, the most common 1st revision of primary total stemmed reverse shoulder arthroplasty was a minor revision, but after that time, it was major partial revision.

In 2024, 45.1% of 1st revisions were major partial, 40.5% minor and 14.3% major total (Figure N126).

The type of fixation of the humeral component at 1st revision has remained predominately cementless when the humeral component was exchanged (Figure N134). The results of cemented or uncemented 1st revision humeral components are stratified by reason of 1st revision in the following section.

Figure N133 Revision Shoulder Replacement by Reason for 1st Revision (Primary Total Stemmed Reverse Shoulder Replacement)

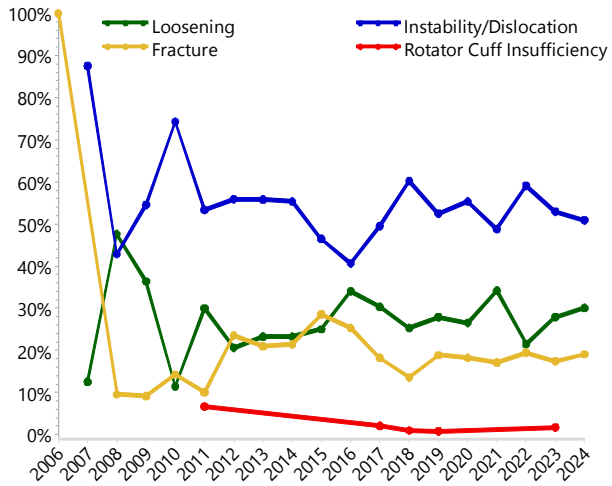
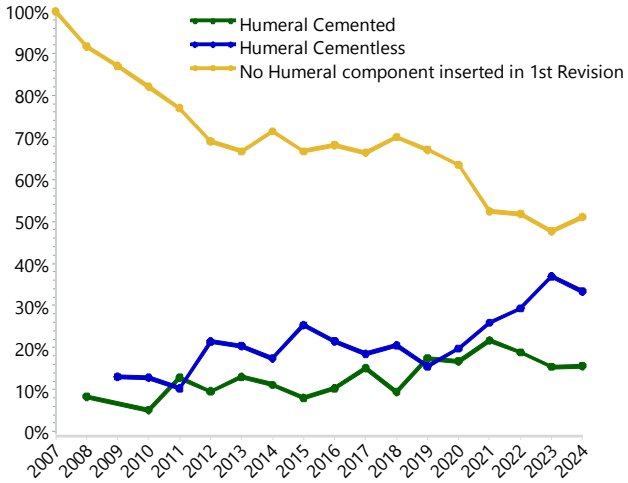


Figure N134 Primary Known 1st Revision Shoulder Replacement by Humeral Fixation (All Diagnoses, Primary Class Total Stemmed Reverse, Excluding 1st Revision for Infection)



OUTCOMES OF THE 1ST REVISION BY REASON FOR 1ST REVISION

Further analyses on the outcomes of the most common reasons for 1st revision have been performed. These include loosening, prosthesis dislocation/instability, fracture, and rotator cuff insufficiency.

When compared to fracture, loosening and prosthesis dislocation/instability and rotator cuff insufficiency have a higher rate of 2nd revision (Table N139 and Figure N135).

1st revision procedures for instability/ dislocation and loosening were predominately revised for the same reasons at 2nd revision. 1st revision procedures for rotator cuff insufficiency mainly underwent 2nd revision for loosening. 1st revision for fracture was most commonly revised for instability/dislocation (Table N140).

When there is a 1st revision for instability/dislocation or fracture, the most common 2nd revision was an isolated humeral revision. There was no predominate 2nd revision type for rotator cuff insufficiency (Table N141).

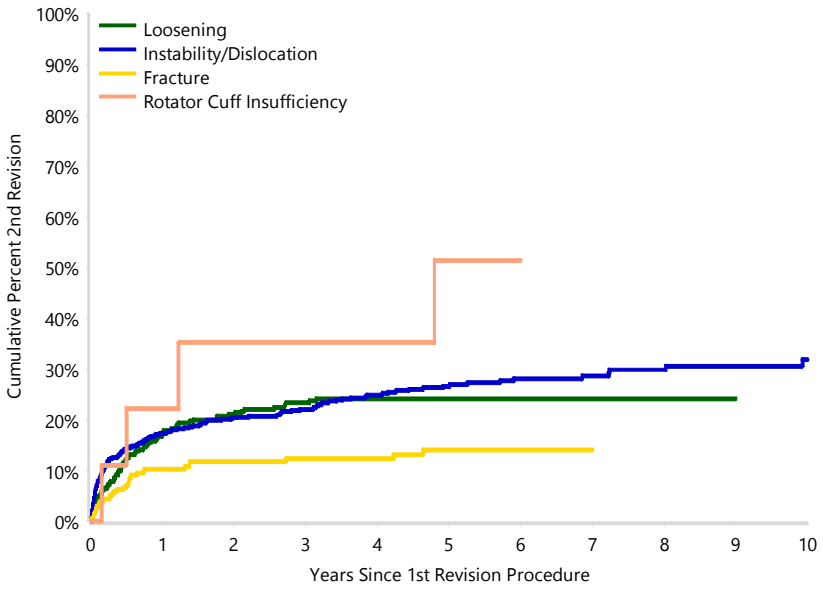
When compared to fracture, loosening and prosthesis dislocation/instability and rotator cuff insufficiency have a higher rate of 2nd revision.

Table N140 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Reason for 1st Revision (All Diagnoses)

Reason for 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Loosening	86	406	17.0 (13.6, 21.1)	23.3 (19.2, 28.1)	24.1 (19.9, 29.0)	24.1 (19.9, 29.0)	
Instability/Dislocation	186	782	17.3 (14.8, 20.2)	22.0 (19.1, 25.3)	26.6 (23.2, 30.4)	28.7 (25.0, 32.8)	31.9 (27.2, 37.1)
Fracture	34	273	10.4 (7.2, 14.8)	12.3 (8.8, 17.1)	14.1 (10.1, 19.6)	14.1 (10.1, 19.6)	
Rotator Cuff Insufficiency	4	9	22.2 (6.1, 63.5)	35.2 (12.8, 74.7)	51.4 (22.4, 87.2)		
TOTAL	310	1470					

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N135 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Reason for 1st Revision (All Diagnoses)



HR - adjusted for age and gender

Loosening vs Fracture

Entire Period: HR=1.72 (95% CI 1.15, 2.56), p=0.007

Instability/Dislocation vs Fracture

Entire Period: HR=1.77 (95% CI 1.22, 2.57), p=0.002

Rotator Cuff Insufficiency vs Fracture

Entire Period: HR=3.42 (95% CI 1.21, 9.65), p=0.020

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Loosening	406	285	183	108	70	26
Instability/Dislocation	782	545	352	221	124	53
Fracture	273	209	139	82	49	8
Rotator Cuff Insufficiency	9	7	4	3	1	0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N141 Revision Diagnosis of 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Reason for 1st Revision (All Diagnoses)

2nd Revision Diagnosis	Loosening		Instability/ Dislocation		Fracture		Rotator Cuff Insufficiency		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
Instability/Dislocation	18	20.9	125	67.2	11	32.4	.	.	154	49.7
Loosening	35	40.7	15	8.1	5	14.7	2	50.0	57	18.4
Infection	24	27.9	27	14.5	5	14.7	.	.	56	18.1
Fracture	3	3.5	5	2.7	10	29.4	.	.	18	5.8
Dissociation	1	1.2	7	3.8	.	.	1	25.0	9	2.9
Pain	2	2.3	.	.	1	2.9	.	.	3	1.0
Malposition	.	.	1	0.5	.	.	1	25.0	2	0.6
Glenoid Erosion	.	.	1	0.5	1	2.9	.	.	2	0.6
Lysis	2	2.3	.	.	.	.	.	.	2	0.6
Metal Related Pathology	.	.	2	1.1	.	.	.	.	2	0.6
Implant Breakage Glenoid Insert	.	.	1	0.5	.	.	.	.	1	0.3
Arthrofibrosis	.	.	1	0.5	.	.	.	.	1	0.3
Implant Breakage Humeral	.	.	1	0.5	.	.	.	.	1	0.3
Other	1	1.2	.	.	1	2.9	.	.	2	0.6
TOTAL	86	100.0	186	100.0	34	100.0	4	100.0	310	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Table N142 Type of 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (Primary Diagnosis OA)

Type of 2nd Revision	Loosening		Instability/ Dislocation		Fracture		Rotator Cuff Insufficiency		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%	N	Col%
Humeral Component	15	17.4	56	30.1	7	20.6	1	25.0	79	25.5
Cup/Head	9	10.5	39	21.0	4	11.8	1	25.0	53	17.1
Humeral/Glenoid	25	29.1	19	10.2	5	14.7	1	25.0	50	16.1
Head Only	8	9.3	20	10.8	5	14.7	.	.	33	10.6
Glenoid Component	12	14.0	10	5.4	6	17.6	1	25.0	29	9.4
Cup Only	3	3.5	20	10.8	3	8.8	.	.	26	8.4
Cement Spacer	12	14.0	10	5.4	.	.	.	.	22	7.1
Removal of Prostheses	1	1.2	6	3.2	2	5.9	.	.	9	2.9
Head/Insert	.	.	2	1.1	1	2.9	.	.	3	1.0
Minor Components	.	.	2	1.1	1	2.9	.	.	3	1.0
Cement Only	.	.	2	1.1	.	.	.	.	2	0.6
Reoperation	1	1.2	.	.	.	.	.	.	1	0.3
TOTAL	86	100.0	186	100.0	34	100.0	4	100.0	310	100.0

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

LOOSENING

Loosening is the most common 1st revision diagnosis for total stemmed reverse shoulder replacement. There are 260 1st revision total stemmed reverse shoulder replacement procedures for loosening, and 52 of these have had a 2nd revision.

The most common 1st revision for loosening is an isolated humeral revision, followed by isolated glenoid and humeral/glenoid revision.

Isolated glenoid 1st revisions have the highest number of 2nd revisions. Isolated glenoid 1st revisions have a higher rate of 2nd revision than humeral 1st revisions (Table N142 and Figure N136).

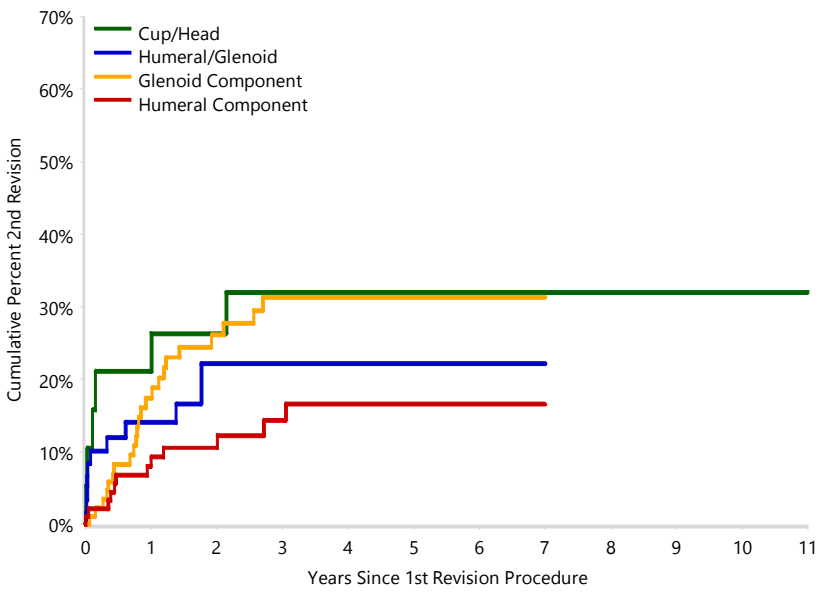
Where a 1st revision is performed for loosening and the humeral component is exchanged, the majority are cemented. There is a higher rate of 2nd revision where the exchanged humeral component in the 1st revision is cementless (Table N143 and Figure N137).

Table N143 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cup/Head	6	19	21.1 (8.5, 46.8)	32.0 (15.8, 57.9)	32.0 (15.8, 57.9)	32.0 (15.8, 57.9)	32.0 (15.8, 57.9)
Humeral/Glenoid	11	60	14.1 (7.3, 26.3)	22.2 (12.7, 37.1)	22.2 (12.7, 37.1)	22.2 (12.7, 37.1)	
Glenoid Component	23	89	17.4 (10.7, 27.7)	31.3 (21.9, 43.6)	31.3 (21.9, 43.6)	31.3 (21.9, 43.6)	
Humeral Component	12	92	9.3 (4.7, 17.7)	14.3 (8.0, 24.7)	16.5 (9.5, 28.0)	16.5 (9.5, 28.0)	
TOTAL	52	260					

Note: Excludes 146 1st revisions with other revision types.

Figure N136 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Loosening)



HR - adjusted for age and gender

Cup/Head vs Humeral Component

Entire Period: HR=2.18 (95% CI 0.81, 5.87), p=0.124

Humeral/Glenoid vs Humeral Component

Entire Period: HR=1.91 (95% CI 0.83, 4.39), p=0.129

Glenoid Component vs Humeral Component

Entire Period: HR=2.30 (95% CI 1.13, 4.71), p=0.022

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cup/Head	19	15	10	7	7	4
Humeral/Glenoid	60	38	22	10	7	2
Glenoid Component	89	61	37	22	12	4
Humeral Component	92	73	39	18	12	4

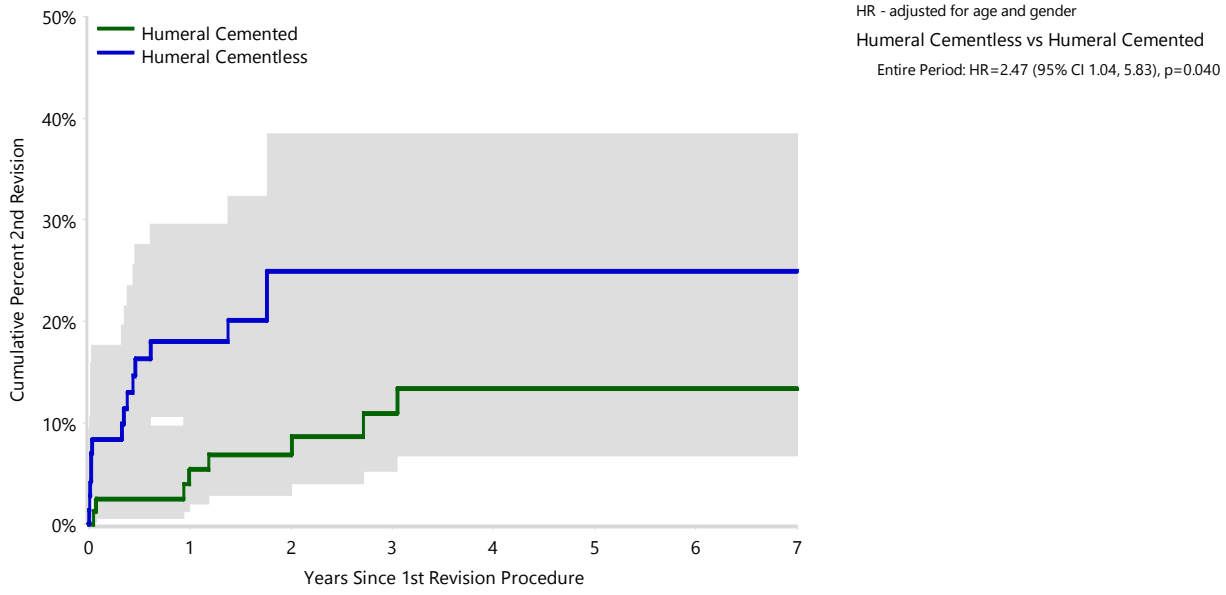
Note: Excludes 146 1st revisions with other revision types.

Table N144 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Fixation of 1st Revision (All Diagnoses, 1st Revision for Loosening)

Humeral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	8	80	5.4 (2.0, 13.7)	10.9 (5.3, 22.0)	13.3 (6.7, 25.5)	13.3 (6.7, 25.5)
Humeral Cementless	15	72	18.0 (10.6, 29.6)	24.9 (15.6, 38.5)	24.9 (15.6, 38.5)	24.9 (15.6, 38.5)
No Humeral component inserted in 1st Revision	63	254	20.3 (15.7, 25.9)	26.7 (21.4, 33.0)	27.3 (22.0, 33.7)	27.3 (22.0, 33.7)
TOTAL	86	406				

Note: Excludes 1st revisions where no minor or major humeral/glenoid components have been inserted.

Figure N137 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Fixation of 1st Revision (All Diagnoses, 1st Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	80	66	37	15	9
Humeral Cementless	72	45	24	13	10

DISLOCATION/INSTABILITY

Instability/dislocation is the second most common 1st revision diagnosis for total stemmed reverse shoulder replacement. There are 692 1st revision total stemmed reverse shoulder replacements for dislocation/instability, and 165 of these have had a 2nd revision.

The most common 1st revision for instability/dislocation is isolated humeral cup revision, followed by humeral revision.1st revision of humeral cup only has the highest number of 2nd revisions. There is no difference in the rate of 2nd revision between these types of 1st revision (Table N144).

Table N145 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Instability/Dislocation)

Type of 1st Revision	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cup/Head	46	204	14.4 (10.1, 20.1)	17.3 (12.6, 23.5)	18.8 (13.8, 25.4)	24.1 (18.1, 31.7)	
Cup Only	65	264	16.4 (12.4, 21.6)	19.6 (15.2, 25.2)	21.2 (16.5, 26.9)	26.8 (21.2, 33.5)	29.3 (23.1, 36.7)
Humeral Component	54	224	20.4 (15.6, 26.4)	24.2 (18.9, 30.8)	26.0 (20.3, 32.9)	28.2 (22.0, 35.6)	
TOTAL	165	692					

Note: Excludes 90 1st revisions with other revision types.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

FRACTURE

There are 244 primary total stemmed reverse shoulder replacements that have been revised for fracture, and 32 of these have had a 2nd revision.

The most common type of 1st revision for fracture is isolated humeral component revision, followed by head only revision. Humeral component only 1st revision has the highest number of 2nd revisions.

There is an increased rate of 2nd revision for isolated glenoid 1st revisions compared to humeral 1st revisions (Table N145 and Figure N138).

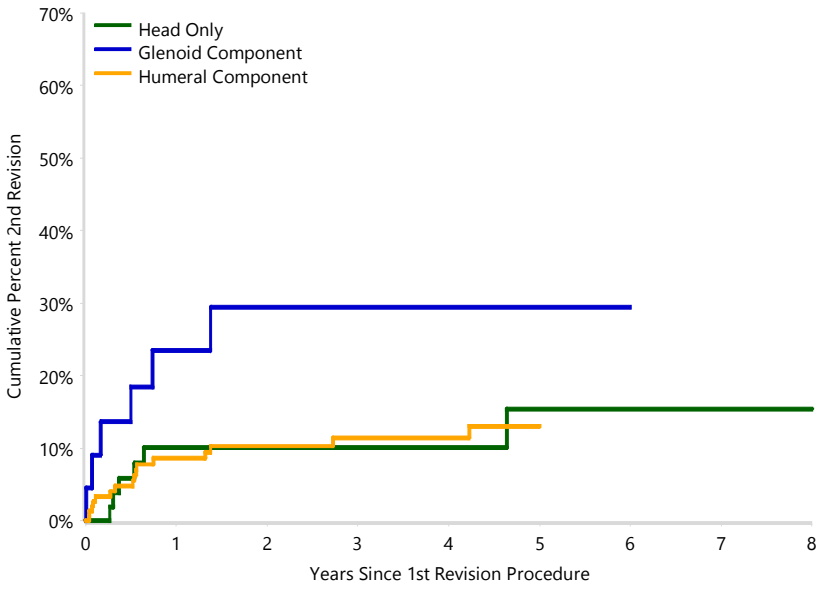
When 1st revision procedures are performed for fracture and the humeral component revised, cemented fixation predominates. There is no difference in the rate of 2nd revision comparing cemented versus cementless fixation of the humeral component used in the 1st revision (Table N146).

Table N146 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Fracture)

Type of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Head Only	6	52	10.1 (4.3, 22.6)	10.1 (4.3, 22.6)	15.4 (6.5, 33.8)	15.4 (6.5, 33.8)
Humeral/Glenoid	3	21	14.3 (4.8, 38.0)	14.3 (4.8, 38.0)	14.3 (4.8, 38.0)	14.3 (4.8, 38.0)
Glenoid Component	6	22	23.5 (10.5, 47.7)	29.4 (14.3, 54.5)	29.4 (14.3, 54.5)	
Humeral Component	17	149	8.6 (5.0, 14.7)	11.4 (7.0, 18.4)	13.0 (8.0, 20.9)	
TOTAL	32	244				

Note: Excludes 29 1st revisions with other revision types.

Figure N138 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Type of 1st Revision (All Diagnoses, 1st Revision for Fracture)



HR - adjusted for age and gender

Glenoid Component vs Head Only

Entire Period: HR=2.24 (95% CI 0.69, 7.29), p=0.182

Glenoid Component vs Humeral Component

Entire Period: HR=2.59 (95% CI 1.00, 6.70), p=0.049

Humeral Component vs Head Only

Entire Period: HR=0.86 (95% CI 0.33, 2.26), p=0.764

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
Head Only	52	42	27	16	13
Glenoid Component	22	14	9	7	3
Humeral Component	149	112	74	41	22

Table N147 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Humeral Fixation in 1st Revision (All Diagnoses, 1st Revision for Fracture)

Humeral Fixation in 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs
Humeral Cemented	15	99	11.4 (6.5, 19.7)	14.4 (8.5, 23.8)	17.0 (10.0, 28.0)	
Humeral Cementless	5	70	6.3 (2.4, 16.0)	8.2 (3.5, 18.7)	8.2 (3.5, 18.7)	8.2 (3.5, 18.7)
No Humeral component inserted in 1st Revision	14	104	11.9 (6.9, 20.0)	13.1 (7.8, 21.5)		
TOTAL	**34**	**273**				

Note: Excludes 1 humeral component revision with unknown fixation.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OUTCOMES OF 1ST REVISION OVER TIME

This analysis compares the outcomes of 1st revisions of total stemmed reverse replacement over-two successive time periods: pre 2016 and 2016–2024. There is no difference in the rate of 2nd revision of revised primary total stemmed reverse shoulder replacements when the two time periods are compared (Table N147).

There is no change in the rate of 2nd revision between pre-2016 and 2016-2024 for 2nd revision diagnoses of instability/dislocation, infection, loosening or fracture (Table N148 to Table N151).

Table N148 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	75	368	10.7 (7.9, 14.3)	14.2 (11.0, 18.2)	19.0 (15.2, 23.6)	19.7 (15.9, 24.4)	21.8 (17.6, 26.9)
2016-2024	291	1483	15.5 (13.7, 17.5)	20.8 (18.6, 23.1)	23.6 (21.2, 26.3)	25.3 (22.4, 28.5)	
TOTAL	366	1851					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N149 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Dislocation/Instability)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	35	368	6.3 (4.2, 9.4)	8.2 (5.7, 11.6)	9.6 (6.9, 13.3)	9.6 (6.9, 13.3)	10.6 (7.7, 14.6)
2016-2024	132	1483	8.1 (6.7, 9.6)	9.7 (8.2, 11.5)	10.5 (8.9, 12.5)	10.5 (8.9, 12.5)	
TOTAL	167	1851					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N150 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Infection)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	13	368	2.0 (1.0, 4.2)	2.3 (1.2, 4.6)	3.4 (1.9, 6.1)	3.9 (2.2, 6.7)	4.4 (2.5, 7.5)
2016-2024	57	1483	3.0 (2.2, 4.1)	4.3 (3.3, 5.7)	5.3 (4.0, 7.0)	6.6 (4.6, 9.5)	
TOTAL	70	1851					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N151 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Loosening)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	15	368	1.5 (0.6, 3.6)	2.5 (1.3, 5.0)	4.0 (2.3, 6.9)	4.0 (2.3, 6.9)	4.9 (2.7, 8.6)
2016-2024	51	1483	2.6 (1.9, 3.6)	4.2 (3.2, 5.6)	5.0 (3.8, 6.7)	5.0 (3.8, 6.7)	
TOTAL	66	1851					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N152 Cumulative Percent 2nd Revision of Known Primary Total Stemmed Reverse Replacement by Year of 1st Revision (All Diagnoses, Excluding 1st Revision for Infection, 2nd Revision for Fracture)

Year of 1st Revision	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Pre 2016	2	368	0.3 (0.0, 2.1)	0.3 (0.0, 2.1)	0.3 (0.0, 2.1)	0.7 (0.2, 3.1)	0.7 (0.2, 3.1)
2016-2024	17	1483	0.9 (0.5, 1.7)	1.6 (0.9, 2.6)	1.7 (1.1, 2.8)	1.7 (1.1, 2.8)	
TOTAL	19	1851					

Note: Excludes revisions where no minor or major humeral/glenoid components have been inserted.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

MORTALITY FOLLOWING THE 1ST REVISION

Mortality following a 1st revision of a primary total stemmed reverse shoulder replacement has been calculated for all 1st revision procedures and according to the more common 1st revision diagnoses.

The overall mortality is 0.2% at 30 days, 0.8% at 90 days, 3.3% at 1 year and 47.0% at 10 years (Table N152 and Figure N139).

There is no difference in mortality of 1st revision for total stemmed reverse shoulder replacements with respect to the 1st revision diagnosis or class of revision (Table N154 and Table N155).

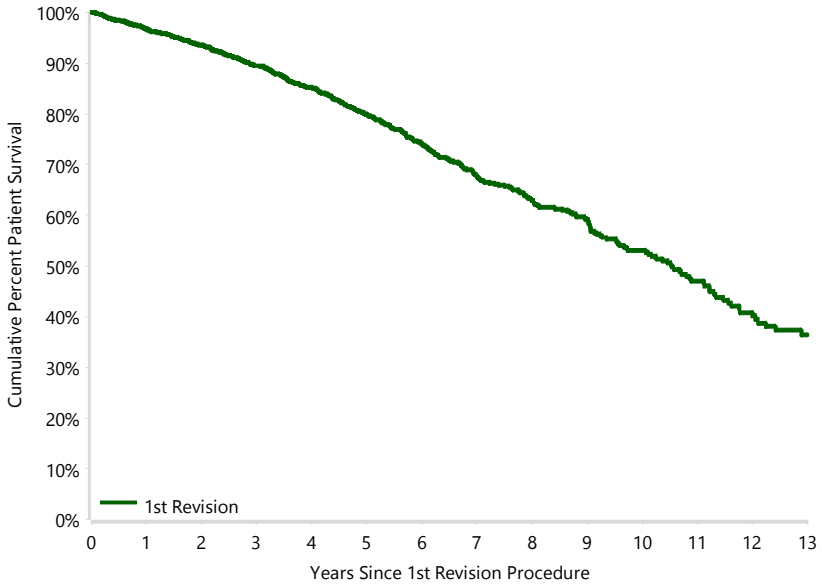
However, 1st revision total stemmed reverse shoulder replacements have a higher risk of mortality compared to unrevised primary total stemmed reverse patients (Table N153 and Figure N140).

The overall mortality is 0.2% at 30 days, 0.8% at 90 days, 3.3% at 1 year and 47.0% at 10 years.

Table N153 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Reverse Replacement since 1st Revised (Excluding 1st Revision for Infection)

1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	10 Yrs
1st Revision	430	1806	99.8 (99.5, 99.9)	99.2 (98.7, 99.5)	96.7 (95.8, 97.5)	89.5 (87.8, 91.0)	79.8 (77.4, 82.1)	53.0 (48.7, 57.1)
TOTAL	430	1806						

Figure N139 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Reverse Replacement since 1st Revised (Excluding 1st Revision for Infection)



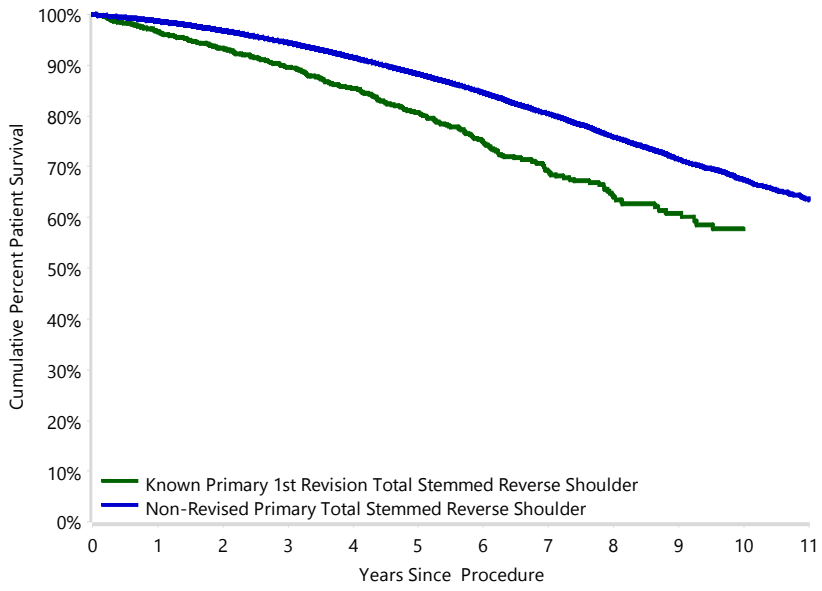
Number at Risk	0 Yr	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
1st Revision	1806	1781	1736	1526	1047	671	382	142

Table N154 Cumulative Percent Survival of Patients with Non-Revised Primary Total Stemmed Reverse Shoulder Replacement and Known Primary 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)

Procedure Type	N Deceased	N Total	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Stemmed Reverse Shoulder	281	1587	96.6 (95.5, 97.4)	80.7 (78.0, 83.1)	57.7 (52.2, 62.9)	
Non-Revised Primary Total Stemmed Reverse Shoulder	6393	57513	98.7 (98.6, 98.8)	88.2 (87.9, 88.6)	67.4 (66.5, 68.4)	
TOTAL	6674	59100				

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Figure N140 Cumulative Percent Survival of Patients with Non-Revised Primary Total Stemmed Reverse Shoulder Replacement and Known Primary 1st Revision (All Diagnoses, Excluding 1st Revision for Infection)



HR - adjusted for age, gender and ASA score at procedure

Known Primary 1st Revision Total Stemmed Reverse Shoulder VS Non-Revised Primary Total Stemmed Reverse Shoulder

Entire period: HR=1.52 (95% CI: 1.34, 1.71), P<0.0001

Number at Risk	0 Yr	1 Yr	5 Yrs	10 Yrs	15 Yrs
Known Primary 1st Revision Total Stemmed Reverse Shoulder	1587	1314	503	41	0
Non-Revised Primary Total Stemmed Reverse Shoulder	57513	48057	19542	1831	0

Note: Restricted to the first of the revision or primary procedures for bilateral patients in each procedure type with known age, sex and ASA score.
Time to survival is time from the primary procedure to death for the non-revised primary cohort and from the 1st revision procedure to death for the known primary 1st revision cohort

Table N155 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Reverse Replacement since 1st Revised by Reason for 1st Revision

Reason for 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	10 Yrs
Instability/Dislocation	182	765	99.9 (99.1, 100.0)	98.9 (97.9, 99.5)	96.0 (94.2, 97.2)	89.0 (86.3, 91.2)	81.6 (77.9, 84.7)	55.7 (49.3, 61.6)
Infection	107	617	99.7 (98.7, 99.9)	99.2 (98.0, 99.7)	97.2 (95.5, 98.3)	91.7 (88.8, 93.8)	83.6 (79.4, 87.1)	
Loosening	107	395	99.5 (98.0, 99.9)	99.2 (97.6, 99.8)	97.3 (95.0, 98.5)	87.7 (83.5, 90.9)	77.0 (71.4, 81.6)	
Fracture	70	267	100.0 (100.0, 100.0)	99.2 (97.0, 99.8)	97.3 (94.3, 98.7)	89.9 (85.0, 93.3)	76.2 (68.9, 82.0)	
TOTAL	466	2044						

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table N156 Cumulative Percent Survival of Patients with Known Primary Total Stemmed Reverse Shoulder Procedures since 1st Revised by Type of 1st Revision (Excluding 1st Revision for Infection)

Type of 1st Revision	N Deceased	N Total	30 Days	90 Days	1 Yr	3 Yrs	5 Yrs	10 Yrs
Minor	269	933	99.9 (99.2, 100.0)	99.2 (98.4, 99.6)	96.8 (95.4, 97.8)	89.4 (87.0, 91.3)	78.9 (75.6, 81.8)	51.6 (46.3, 56.7)
Major Partial	140	716	99.9 (99.0, 100.0)	99.1 (98.1, 99.6)	96.4 (94.6, 97.6)	89.3 (86.4, 91.6)	80.9 (76.7, 84.4)	
Major Total	21	157	99.4 (95.5, 99.9)	99.4 (95.5, 99.9)	97.9 (93.5, 99.3)	91.6 (84.2, 95.6)		
TOTAL	430	1806						

Note: Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05); it is available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.





Hip Replacement

Hip Replacement

As with previous year's Annual Reports, to ensure that the relevance and currency of AOANJRR data are maintained, almost all analyses (unless specifically stated) have been confined to hip, knee and shoulder prostheses that were still being used in 2024. Again, historic data are still available in previous Annual Reports on the AOANJRR website.

In addition to the main report, the Registry continues to publish Supplementary Reports. The Supplementary Reports are listed in the introductory chapter and will be available on the AOANJRR website https://aoanjrr.sahmri.com/annual-reports-2025 from 1 October 2025. They include a Lay Summary of the main report and 13 additional reports on arthroplasty topics, as well as detailed analyses of all prostheses identified as having a higher than anticipated rate of revision.

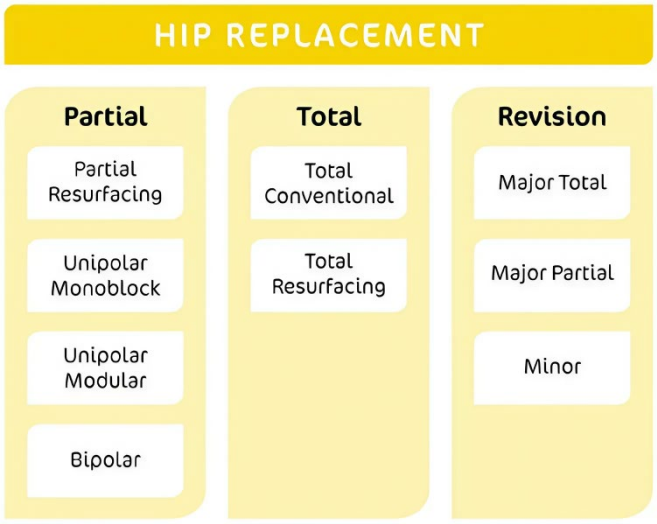
Categories of Hip Replacement

Hip replacement is grouped into three broad categories: primary partial, primary total and revision hip replacement.

A primary replacement is an initial replacement procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface.

Primary partial and primary total hip replacement are further subcategorised into classes depending on the type of prostheses used. Partial hip classes include partial resurfacing, unipolar monoblock, unipolar modular, and bipolar. Total hip classes include total conventional and total resurfacing. Definitions for each of these classes are detailed in the subsequent sections.

Revision hip replacements are re-operations of previous hip replacements where one or more of the prosthetic components are replaced, removed, or one or more components are added. Revisions include re-operations of primary partial, primary total, or previous revision procedures. Hip revisions are subcategorised into three classes: major total, major partial, or minor revisions.



Detailed information on demographics of each category of hip replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://www.aoanjrr.sahmri.com/annual-reports-2025

Executive Summary Reference Tables

An index of the analyses presented in this chapter is provided in Table H1, Table H2 and Table H3. Variables are listed, and where there is a significant finding for a comparison, a red diamond is shown in the table. Hyperlinks to the relevant tables and figures are included.

Table H1 Indexing Significant Characteristic Comparisons: Partial Hip Replacements

Characteristic	Variable	Partial Hip Fractured NoF		Unipolar Monoblock Fractured NoF		Unipolar Modular Fractured NoF		Bipolar Fractured NoF	
		Significant HR	Figure	Significant HR	Figure	Significant HR	Figure	Significant HR	Figure
	Mortality*	♦	Figure HP3	NT		NT		NT	
	Class	♦	Figure HP4	NT		NT		NT	
	Class and Age	♦	Figure HP5	NT		NT		NT	
Patient									
	Age	NT		♦	Figure HP9	♦	Figure HP14	♦	Figure HP21
	Gender	NT			Figure HP10	♦	Figure HP15		Figure HP22
Prosthesis									
	Fixation	NT		NT		♦	Figure HP16	♦	Figure HP23

♦ Significant Hazard Ratio difference between categories where $p<0.05$
N T Not tested: Insufficient numbers to make statistical comparisons
*New analysis for this year's Annual Report

Table H2 Indexing Significant Characteristic Comparisons: Total Hip Replacements

Characteristic	Variable	Total Conventional Hip Osteoarthritis		Total Conventional Hip All Diagnoses		Total Conventional Hip Fractured NoF		Hip Fractured NoF	
		Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure
	Primary Diagnosis	NT		♦	Figure HT4	NT		NT	
	Class	NT		NT		♦		♦	Figure HT112
	Class and Age <70	NT		NT		NT		♦	Figure HT113
	Class and Age ≥70	NT		NT		NT		♦	Figure HT114
	Class and Gender	NT		NT		NT		NT	
Patient									
	Age	♦	Figure HT7	NT		♦	Figure HT93	NT	
	Gender	♦	Figure HT8	NT		♦	Figure HT94	NT	
	Gender by Age	♦	Figure HT9 Figure HT10	NT		♦	Figure HT95 Figure HT96	NT	
	ASA Score	♦	Figure HT14	NT		♦	Figure HT100	NT	
	ASA and Gender*	♦	Figure HT16			NT		NT	
	ASA and Age*	♦	Figure HT17			NT		NT	
	BMI	♦	Figure HT19	NT		♦	Figure HT103	NT	
	BMI and Gender*		Figure HT21			NT		NT	
	BMI and Age*		Figure HT22			NT		NT	
Prosthesis									
	Fixation	♦	Figure HT25	NT		♦	Figure HT105	NT	

Hip Replacement

Characteristic	Variable	Total Conventional Hip Osteoarthritis Significant HR	Total Conventional Hip Osteoarthritis Table/ Figure	Total Conventional Hip All Diagnoses Significant HR	Total Conventional Hip All Diagnoses Table/ Figure	Total Conventional Hip Fractured NoF Significant HR	Total Conventional Hip Fractured NoF Table/ Figure	Hip Fractured NoF Significant HR	Hip Fractured NoF Table/ Figure
	Fixation and age <55		Figure HT26	NT		NT		NT	
	Fixation and age 55-64	♦	Figure HT27	NT		NT		NT	
	Fixation and age 65-74	♦	Figure HT28	NT		NT		NT	
	Fixation and age ≥75	♦	Figure HT29	NT		NT		NT	
	Fixation and age <70	NT		NT		♦	Figure HT106	NT	
	Fixation and age ≥70	NT		NT		♦	Figure HT107	NT	
	Stem Collar	♦	Figure HT30	NT		NT		NT	
	Surgical Approach and Stem Collar Use	♦	Figure HT32 Figure HT33 Figure HT34	NT		NT		NT	
	Prosthesis Combinations and Stem Collar Use*	♦	Table HT33	NT		NT		NT	
	Mini Stems	♦	Figure HT35	NT		NT		NT	
	Mini Stems and Age	♦	Figure HT36			NT		NT	
	Mini Stems and BMI	♦	Figure HT37			NT		NT	
	Mini Stems Revision for Loosening	♦	Figure HT39	NT		NT		NT	
	Mini Stems Revision for Fracture	♦	Figure HT40	NT		NT		NT	
	Bearing Surface	♦	Figure HT45	NT		NT		NT	
	Polyethylene Type	♦	Figure HT47 Figure HT53	NT		NT		NT	
	Head Size	NT		NT		♦	Figure HT108	NT	
	Head Size and Revision for Prosthesis Dislocation/Instability	NT		NT		♦	Figure HT109	NT	
	Non XLPE Polyethylene and Head Size		Figure HT49	NT		NT		NT	
	XLPE Polyethylene Type and Head Size	♦	Figure HT50	NT		NT		NT	
	Mixed Ceramic Bearings by Head Size		Figure HT56	NT		NT		NT	
	Acetabular Size <52cm*	♦	Figure HT58			NT		NT	
	Acetabular Size 52cm*	♦	Figure HT59			NT		NT	
	Acetabular Size >52cm*	♦	Figure HT60			NT		NT	
	Acetabular Type	NT		♦	Figure HT61		Figure HT110	NT	
	Constrained Acetabular Components	♦	Table HT53	NT		NT		NT	
	Dual Mobility			♦	Figure HT63	♦	Figure HT111	NT	
	Dual Mobility and Age		Table HT62	NT		NT		NT	
	Dual Mobility and Gender	♦	Table HT62	NT		NT		NT	
	Dual Mobility and Fixation		Table HT62	NT		NT		NT	

Characteristic	Variable	Total Conventional Hip Osteoarthritis Significant HR	Total Conventional Hip Osteoarthritis Table/ Figure	Total Conventional Hip All Diagnoses Significant HR	Total Conventional Hip All Diagnoses Table/ Figure	Total Conventional Hip Fractured NoF Significant HR	Total Conventional Hip Fractured NoF Table/ Figure	Hip Fractured NoF Significant HR	Hip Fractured NoF Table/ Figure
	Dual Mobility and Reason for Revision	♦	Table HT62	NT		NT		NT	
	Dual Mobility and* Surgical Approach		Figure HT66 Figure HT67 Figure HT68 Figure HT67	NT		NT		NT	
Surgeon Assistive Tools (SAT)*									
	Computer Navigation*		Figure HT70	NT		NT		NT	
	Computer Navigation and Age*		Figure HT72	NT		NT		NT	
	IDI*	♦	Figure HT74	NT		NT		NT	
	IDI and Age*	♦	Figure HT75	NT		NT		NT	
	Robotic Assistance*	♦	Figure HT76	NT		NT		NT	
	Robotic Assistance and Age*		Figure HT78	NT		NT		NT	
	XLPE by SAT*	♦	Figure HT79	NT		NT		NT	
	Accolade II/Trident (Shell)Combination with XLPE by SAT*		Figure HT80	NT		NT		NT	
	Exeter V40/Trident (Shell) Combination with XLPE by SAT*		Figure HT81	NT		NT		NT	
Surgical Approach									
	Surgical Approach for osteoarthritis	♦	Figure HT83	NT		NT		NT	
	Surgical Approach Major Revision	♦	Figure HT84	NT		NT		NT	
	Surgical Approach Revision for Loosening	♦	Figure HT86	NT		NT		NT	
	Surgical Approach Revision for Fracture	♦	Figure HT87	NT		NT		NT	
	Surgical Approach Revision for Infection	♦	Figure HT88	NT		NT		NT	
	Surgical Approach Revision for Dislocation/Instability	♦	Figure HT89	NT		NT		NT	

♦ Significant Hazard Ratio difference between categories where $p<0.05$

N T Not tested: Insufficient numbers to make statistical comparisons.

*New analysis for this year's Annual Report

Hip Replacement

Table H3 Indexing Significant Characteristic Comparisons: Total Hip Replacements

Characteristic	Variable	Total Resurfacing Hip All Diagnoses		Total Resurfacing Hip Osteoarthritis		Primary Total Hip Osteoarthritis	
		Significant HR	Figure	Significant HR	Figure	Significant HR	Figure
	Primary Diagnosis	♦	Figure HT117	NT		NT	
	Class	NT		NT		♦	Figure HT127
	Class and Gender	NT		NT		♦	Figure HT128
Patient							
	Age	NT		♦	Figure HT120	NT	
	Gender	NT		♦	Figure HT121	NT	
	Male Gender by Age	NT		♦	Figure HT122	NT	
	Female Gender by Age	NT			Figure HT123	NT	
Prosthesis							
	Head Size	NT		♦	Figure HT124	NT	
	Head Size and Gender	NT		♦	Figure HT125	NT	

♦ Note Significant Hazard Ratio difference between categories where p<0.05 Not tested: Insufficient numbers to make statistical comparisons

Use of Hip Replacement

There are 972,256 hip replacements with a procedure date up to and including 31 December 2024. This represents an additional 62,206 hip procedures compared to the number reported last year. The relative frequency of each type of hip procedure is provided in Table H4.

For further information on the **closure of the database** please see the Glossary of this report.

Table H4 Number of Hip Replacements

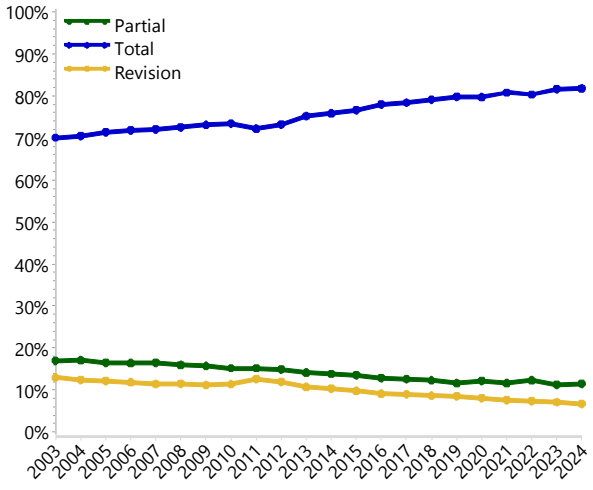
Hip Category	Number	Percent
Partial	134340	13.8
Total	742248	76.3
Revision	95668	9.8
TOTAL	**972256**	**100.0**

The number of hip replacement procedures undertaken in 2024 is a 127.1% increase since 2003. The corresponding increase in primary total hip replacement is 165.1%, for primary partial it is 53.3% and for revision hip replacement it is 18.3%.

There have been 632 more hip replacement procedures undertaken in 2024 compared to the previous year. During this time, the use of primary total hip replacement increased by 1.3%, accounting for 81.8% of all hip replacement procedures in 2024. Primary partial hip replacement increased by 3.0%, accounting for 11.5% of hip procedures in 2024.

The proportion of revision hip procedures has declined from a peak of 12.9% in 2003 to 6.7% in 2024. This equates to 3,747 fewer revision procedures in 2024 than would have been expected if the proportion of revision procedures had remained at the level reported in 2003 (Figure H1).

Figure H1 Proportion of Hip Replacement



ASA Score and BMI in Hip Replacement

Data are reported on hip replacement procedures for both the American Society of Anesthesiologists – Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of hip replacement surgery. The Registry commenced collection of ASA score in 2012 and BMI data in 2015.

There are ASA score data on 583,980 hip replacement procedures and BMI data on 461,747 hip replacement procedures. Since its initial collection, ASA score has been recorded for 97.2% of procedures. BMI has been recorded for 89.2% of procedures since collection commenced.

ASA Score

There are five ASA score classifications:[3]

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

There is a difference in ASA score depending on the class of hip replacement. Partial hip replacement procedures have a higher proportion of patients with ASA scores 3 and 4 compared to patients undergoing primary total or revision hip replacement. Total hip replacement procedures have more patients with ASA scores 1 and 2 (Table H5).

BMI Category

BMI for adults is classified into six main categories:[4]

Underweight	<18.5
Normal	18.5 – 24.9
Pre-obese	25.0 – 29.9
Obese Class 1	30.0 – 34.9
Obese Class 2	35.0 – 39.9
Obese Class 3	≥40.0

The majority of hip replacement procedures are undertaken in patients who have a normal BMI or are pre-obese (Table H6).

Table H5 ASA Score for Hip Replacement

ASA Score	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
ASA 1	189	0.3	38502	8.3	1706	3.5	40397	6.9
ASA 2	6814	9.5	240187	51.8	15876	32.4	262877	45.0
ASA 3	43397	60.6	175465	37.9	27013	55.2	245875	42.1
ASA 4	20930	29.2	9221	2.0	4317	8.8	34468	5.9
ASA 5	292	0.4	41	0.0	30	0.1	363	0.1
TOTAL	**71622**	**100.0**	**463416**	**100.0**	**48942**	**100.0**	**583980**	**100.0**

Table H6 BMI Category for Hip Replacement

BMI Category	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Underweight	3479	9.7	4186	1.1	623	1.8	8288	1.8
Normal	17700	49.4	86454	22.1	8462	23.9	112616	24.4
Pre Obese	10228	28.6	142319	36.4	12145	34.2	164692	35.7
Obese Class 1	3180	8.9	96918	24.8	8324	23.5	108422	23.5
Obese Class 2	872	2.4	40879	10.5	3696	10.4	45447	9.8
Obese Class 3	343	1.0	19716	5.0	2223	6.3	22282	4.8
TOTAL	**35802**	**100.0**	**390472**	**100.0**	**35473**	**100.0**	**461747**	**100.0**

Note: BMI has not been presented for patients aged ≤19 years

[3] https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system

[4] https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity/contents/measuring-overweight-and-obesity

Primary Partial Hip Replacement

Classes of Partial Hip Replacement

There are four classes of primary partial hip replacement. These are defined by the type of prostheses used.

Partial resurfacing involves the use of one or more button prostheses to replace part of the natural articulating surface on one or both sides of the hip joint. These prostheses are no longer used.

Unipolar monoblock involves the use of a femoral stem prosthesis with a fixed large head that replaces the natural femoral head.

Unipolar modular involves the use of a femoral stem and exchangeable large head prosthesis that replaces the natural femoral head.

Bipolar involves the use of a femoral stem and standard head prosthesis that articulates with a non-fixed component replacing the natural femoral head.

Use of Partial Hip Replacement

The most common class of primary partial hip replacement is unipolar modular followed by bipolar and unipolar monoblock (Table HP1).

Table HP1 Primary Partial Hip Replacement by Class

Hip Class	Number	Percent
Unipolar Monoblock	29417	21.9
Unipolar Modular	60161	44.8
Bipolar	44747	33.3
TOTAL	134325	100.0

Note: Excludes 15 partial resurfacing hip procedures.
Partial resurfacing hip procedures have not been performed since 2014

Continuing the trend from 2020, in 2024, bipolar hip replacement was more commonly used than unipolar modular. The use of unipolar monoblock has declined since 2004 and now accounts for only 1.1% of primary partial hip replacements (Figure HP1).

Cement fixation remains the most common fixation method for partial hip replacement (Figure HP2).

The 10 most used femoral prostheses for partial hip replacement are listed in Table HP2. The Exeter V40, CPCS and CPT were the most frequently used femoral prostheses.

Detailed demographic information on primary partial hip replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Figure HP1 Primary Partial Hip Replacement by Class

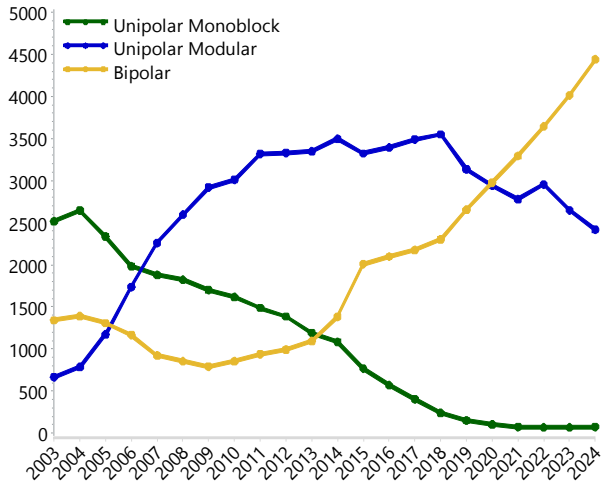
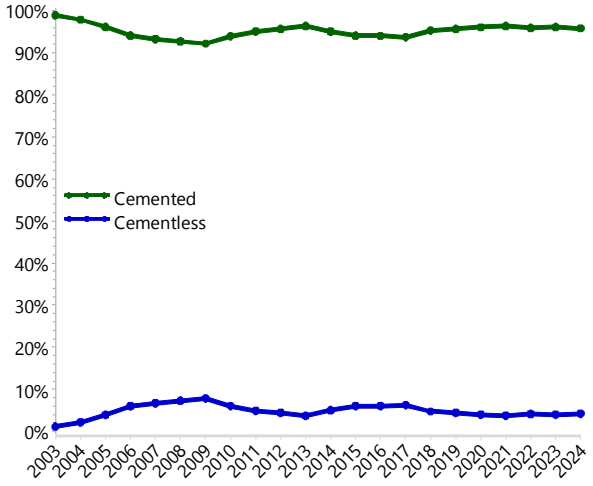


Figure HP2 Primary Partial Hip Replacement by Fixation (All Diagnoses)



Detailed information on partial resurfacing hip replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Table HP2 10 Most Used Femoral Prostheses in Primary Partial Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1988	Austin-Moore Type	3115	Exeter V40	3491	Exeter V40	3345	Exeter V40	3469	Exeter V40
810	Exeter V40	875	CPT	874	CPT	914	CPT	723	CPCS
526	Thompson Type	724	CPCS	732	CPCS	772	CPCS	623	CPT
186	Alloclassic	500	C-Stem AMT	496	C-Stem AMT	488	C-Stem AMT	525	C-Stem AMT
127	Elite Plus	132	CORAIL	205	Short Exeter V40	216	Taper Fit	284	Taper Fit
105	CPT	130	Short Exeter V40	185	CORAIL	165	CORAIL	221	MS 30
95	Spectron EF	93	Absolut	102	Quadra-C	148	Short Exeter V40	217	Short Exeter V40
74	C-Stem	74	Taper Fit	82	Taper Fit	110	Quadra-C	176	CORAIL
65	CPCS	73	ETS	70	ETS	93	MS 30	135	Quadra-C
63	Omnifit	72	Quadra-C	60	Polarstem	73	Polarstem	116	Polarstem
10 Most Used									
4039	(10) 89.3%	5788	(10) 94.2%	6297	(10) 94.5%	6324	(10) 93.9%	6489	(10) 93.6%
Remainder									
482	(52) 10.7%	356	(38) 5.8%	370	(39) 5.5%	409	(35) 6.1%	443	(33) 6.4%
TOTAL									
4521	(62) 100.0%	6144	(48) 100.0%	6667	(49) 100.0%	6733	(45) 100.0%	6932	(43) 100.0%

Note: Excludes partial resurfacing

Primary Partial Hip Replacement

Outcome for Fractured Neck of Femur

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified. Due to the restriction to modern prostheses 41,329 (30.8%) partial hip replacement procedures have been excluded from this analysis in 2025.

Fractured neck of femur is the principal diagnosis for the three main classes of primary partial hip replacement: unipolar monoblock (98.1%), unipolar modular (96.5%) and bipolar (94.8%). A comparative analysis of partial hip replacement and total conventional hip replacement has been undertaken for fractured neck of femur and is presented after the primary total conventional hip replacement for osteoarthritis section of this report.

The outcome of primary partial hip replacement varies depending on the class. Outcomes are restricted to 10 years because of the high mortality in this group.

The prosthesis class variation in mortality is almost certainly due to patient selection (Table HT3).

When used for fractured neck of femur, bipolar has a lower cumulative percent revision compared to unipolar modular after 2.5 years. While unipolar monoblock has the lowest cumulative percent revision, this most likely is related to recent low rate of use, patient selection, restriction of analyses to modern prostheses and the high competing risk of mortality (Table HP4 and Figure HP4). The difference in outcome between bipolar and unipolar modular classes is more apparent in patients aged <75 years (Table HP5 and Figure HP5).

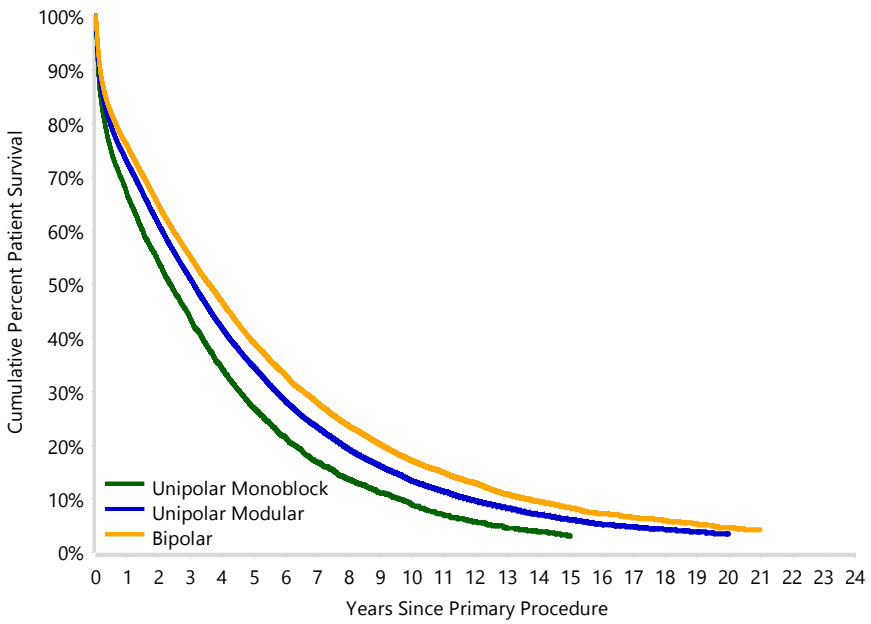
The rate of revision for fractured neck of femur in primary total conventional hip replacement compared to primary partial hip replacement can be found later in this chapter in the following section: **Outcome of Total Conventional Compared to Partial Hip Replacement**.

Table HP3 Cumulative Percent Survival of Patients with Mortality of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Deceased	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3343	3779	66.2 (64.6, 67.7)	53.8 (52.2, 55.4)	43.2 (41.6, 44.9)	26.8 (25.4, 28.3)	16.8 (15.6, 18.1)	8.8 (7.8, 9.8)
Unipolar Modular	35196	47442	72.3 (71.9, 72.7)	60.9 (60.5, 61.4)	50.7 (50.3, 51.2)	34.4 (33.9, 34.9)	23.2 (22.8, 23.7)	13.3 (12.9, 13.7)
Bipolar	20558	35146	75.5 (75.0, 76.0)	64.5 (63.9, 65.0)	54.8 (54.2, 55.4)	38.9 (38.3, 39.5)	27.8 (27.2, 28.5)	17.1 (16.5, 17.7)
TOTAL	59097	86367						

Note: Restricted to modern prostheses
Restricted to first procedure performed per patient

Figure HP3 Cumulative Percent Survival of Patients with Mortality of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Unipolar Monoblock vs Unipolar Modular

Entire Period: HR=1.19 (95% CI 1.15, 1.23), p<0.001

Unipolar Monoblock vs Bipolar

0 - 2Wk: HR=1.49 (95% CI 1.30, 1.70), p<0.001

2Wk - 3Mth: HR=1.30 (95% CI 1.18, 1.43), p<0.001

3Mth+: HR=1.30 (95% CI 1.25, 1.36), p<0.001

Unipolar Modular vs Bipolar

0 - 3Mth: HR=1.14 (95% CI 1.10, 1.18), p<0.001

3Mth+: HR=1.10 (95% CI 1.08, 1.12), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3779	2418	1924	1509	905	537	229
Unipolar Modular	47442	31897	25283	19648	11696	6801	2876
Bipolar	35146	22559	16756	12508	6859	3828	1507

Note: Restricted to modern prostheses
Restricted to first procedure performed per patient

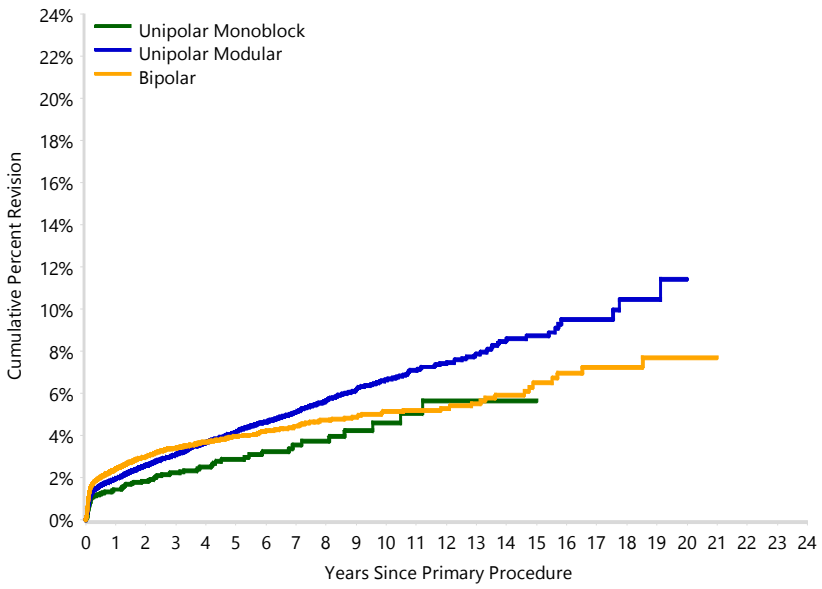
Primary Partial Hip Replacement

Table HP4 Cumulative Percent Revision of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	82	3866	1.4 (1.1, 1.9)	1.8 (1.4, 2.4)	2.2 (1.7, 2.8)	2.9 (2.2, 3.7)	3.6 (2.7, 4.6)	4.6 (3.4, 6.2)
Unipolar Modular	1531	49089	2.0 (1.8, 2.1)	2.6 (2.4, 2.7)	3.1 (2.9, 3.3)	4.2 (3.9, 4.4)	5.1 (4.8, 5.4)	6.6 (6.2, 7.1)
Bipolar	1061	36182	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	3.4 (3.2, 3.6)	3.9 (3.7, 4.2)	4.4 (4.1, 4.8)	5.1 (4.7, 5.6)
TOTAL	2674	89137						

Note: Restricted to modern prostheses

Figure HP4 Cumulative Percent Revision of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Unipolar Monoblock vs Unipolar Modular

Entire Period: HR=0.73 (95% CI 0.59, 0.91), p=0.005

Bipolar vs Unipolar Monoblock

0 - 3Mth: HR=1.64 (95% CI 1.29, 2.09), p<0.001

3Mth - 6Mth: HR=1.52 (95% CI 1.06, 2.18), p=0.023

6Mth - 1.5Yr: HR=1.41 (95% CI 1.06, 1.88), p=0.019

1.5Yr - 2Yr: HR=1.22 (95% CI 0.81, 1.84), p=0.334

2Yr - 2.5Yr: HR=1.22 (95% CI 0.80, 1.87), p=0.356

2.5Yr+: HR=0.67 (95% CI 0.50, 0.89), p=0.005

Bipolar vs Unipolar Modular

0 - 1Mth: HR=1.32 (95% CI 1.13, 1.54), p<0.001

1Mth - 3Mth: HR=1.09 (95% CI 0.93, 1.28), p=0.296

3Mth - 2.5Yr: HR=1.01 (95% CI 0.88, 1.15), p=0.938

2.5Yr+: HR=0.49 (95% CI 0.40, 0.59), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3866	2468	1963	1540	919	546	233
Unipolar Modular	49089	32943	26055	20216	12002	6952	2934
Bipolar	36182	23182	17191	12809	7002	3882	1528

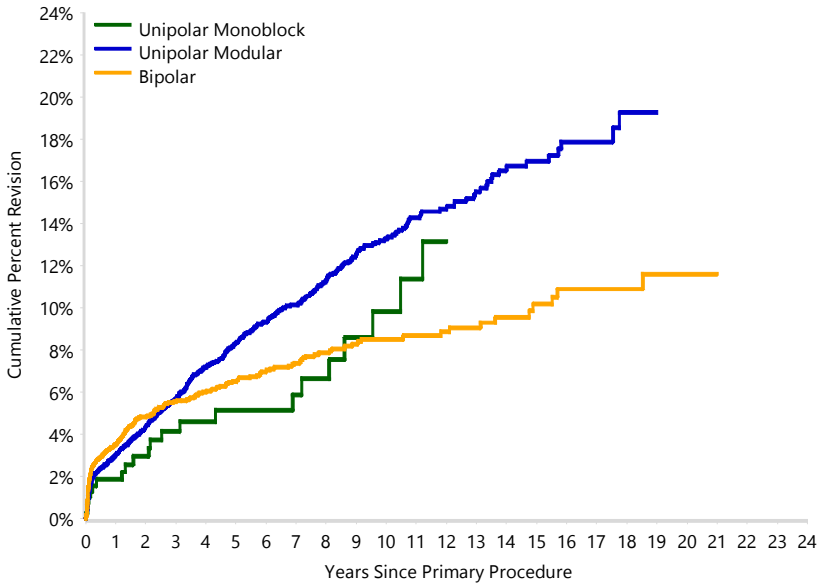
Note: Restricted to modern prostheses

Table HP5 Cumulative Percent Revision of Primary Partial Hip Replacement in Patients Aged <75 Years by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	22	415	1.9 (0.9, 3.9)	2.9 (1.6, 5.5)	4.2 (2.4, 7.1)	5.2 (3.1, 8.5)	5.9 (3.5, 9.7)	9.8 (6.0, 15.9)
Unipolar Modular	526	6776	3.0 (2.6, 3.5)	4.3 (3.8, 4.9)	5.7 (5.1, 6.4)	8.3 (7.5, 9.2)	10.1 (9.2, 11.1)	13.3 (12.1, 14.6)
Bipolar	334	6186	3.5 (3.1, 4.0)	4.8 (4.3, 5.5)	5.5 (4.9, 6.2)	6.5 (5.8, 7.3)	7.4 (6.6, 8.3)	8.5 (7.5, 9.7)
TOTAL	882	13377						

Note: Restricted to modern prostheses

Figure HP5 Cumulative Percent Revision of Primary Partial Hip Replacement in Patients Aged <75 Years by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Unipolar Monoblock vs Bipolar

0 - 1Mth: HR=0.61 (95% CI 0.19, 1.92), p=0.397

1Mth - 2Yr: HR=0.64 (95% CI 0.30, 1.36), p=0.244

2Yr+: HR=1.59 (95% CI 0.87, 2.89), p=0.128

Unipolar Modular vs Unipolar Monoblock

Entire Period: HR=1.42 (95% CI 0.93, 2.18), p=0.107

Unipolar Modular vs Bipolar

0 - 3Mth: HR=0.79 (95% CI 0.62, 1.00), p=0.050

3Mth - 3Yr: HR=1.18 (95% CI 0.94, 1.48), p=0.148

3Yr - 3.5Yr: HR=4.66 (95% CI 1.95, 11.15), p<0.001

3.5Yr+: HR=2.42 (95% CI 1.79, 3.25), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	415	291	248	218	164	127	65
Unipolar Modular	6776	5090	4283	3624	2584	1856	1049
Bipolar	6186	4298	3396	2742	1813	1234	633

Note: Restricted to modern prostheses

Primary Partial Hip Replacement

Unipolar Monoblock

DEMOGRAPHICS

There are 29,417 unipolar monoblock procedures recorded. This is an additional 84 procedures compared to the previous report.

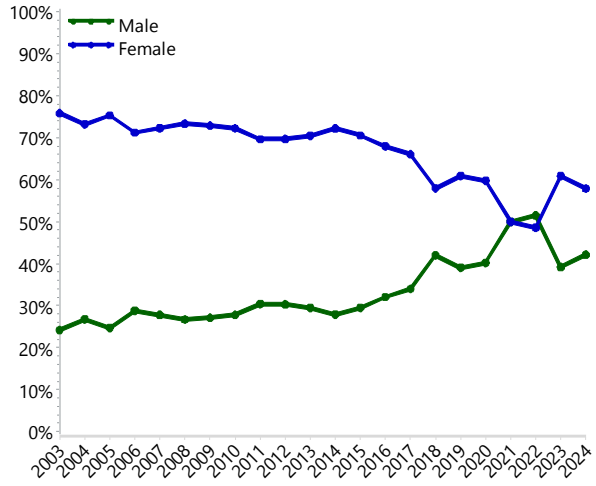
For further information on the **closure of the database** please see the Glossary of this report.

The yearly use of unipolar monoblock hip replacement in Australia in 2024 has decreased by 97.0% compared to 2003. While the number of procedures reported in 2024 remains small, this has increased by 10.1% compared to 2023.

Fractured neck of femur is the principal diagnosis for primary unipolar monoblock hip replacement (97.7%).

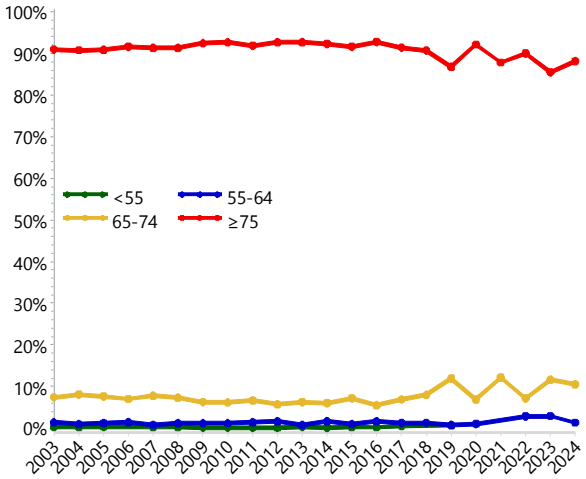
The majority of patients are female (57.9%) and aged ≥75 years (91.2%).

Figure HP6 Primary Unipolar Monoblock Hip Replacement by Gender



The proportion of patients aged ≥85 years has change little from 51.0% in 2003 to 50.0% in 2024. The mean age of patients is 84.5 years (Table HP6, Figure HP6, and Figure HP7).

Figure HP7 Primary Unipolar Monoblock Hip Replacement by Age



The Exeter Trauma Stem (ETS) is the only unipolar monoblock prosthesis used in 2024 (Table HP7).

Table HP6 Age and Gender of Primary Unipolar Monoblock Hip Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	8065	27.4%	32	107	84	83.5	7.8
Female	21352	72.6%	16	108	86	85.0	7.2
TOTAL	**29417**	**100.0%**	**16**	**108**	**85**	**84.5**	**7.4**

Table HP7 Most Used Prostheses in Primary Unipolar Monoblock Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1988	Austin-Moore Type	73	ETS	70	ETS	68	ETS	76	ETS
526	Thompson Type	1	Austin-Moore Type			1	Austin-Moore Type		
Most Used									
2514	(2) 100.0%	74	(2) 100.0%	70	(1) 100.0%	69	(2) 100.0%	76	(1) 100.0%

Outcome for Fractured Neck of Femur

The cumulative percent revision at 10 years for unipolar monoblock replacement undertaken for fractured neck of femur is 4.6% (Table HP8 and Figure HP8).

The main reason for revision is dislocation/instability (26.8%), followed by infection (24.4%), fracture (14.6%) and chondrolysis/acetabular erosion (13.4%) (Table HP9). Of the revisions of unipolar monoblock hip replacements, the majority are revised to a total hip replacement (61.0%). Revision to another unipolar hip replacement (femoral component only) has occurred in 12.2% of revisions with the same proportion revised to cement spacers (Table HP10).

Age <75 years is a risk factor for revision. The rate of revision for this age group is higher than for those 75-84 years and also ≥85 years (Table HP11 and Figure HP9).

There is no difference in the rate of revision between males and females (Table HP12 and Figure HP10).

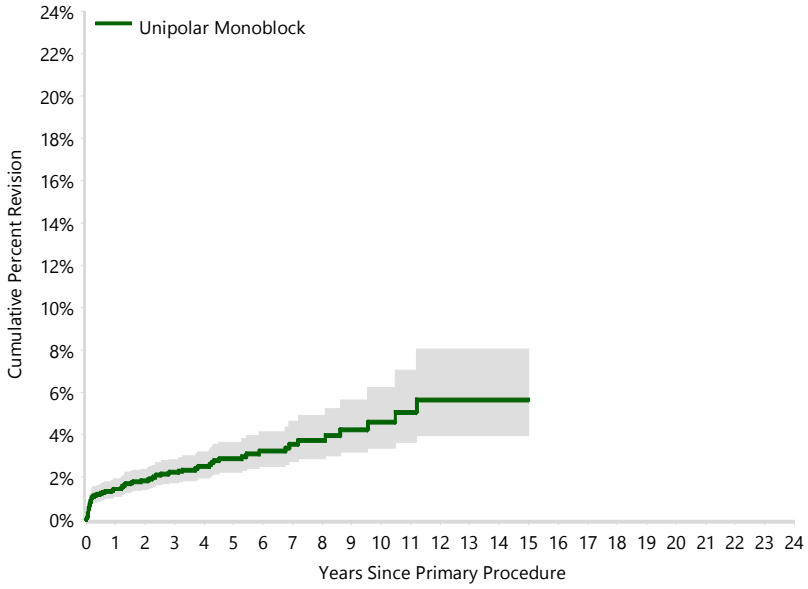
All unipolar monoblock hip replacements in 2024 used cemented fixation.

Table HP8 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	82	3866	1.4 (1.1, 1.9)	1.8 (1.4, 2.4)	2.2 (1.7, 2.8)	2.9 (2.2, 3.7)	3.6 (2.7, 4.6)	4.6 (3.4, 6.2)
TOTAL	82	3866						

Note: Restricted to modern prostheses

Figure HP8 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3866	2468	1963	1540	919	546	233

Note: Restricted to modern prostheses

Primary Partial Hip Replacement

Table HP9 Primary Unipolar Monoblock Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Prosthesis Dislocation/Instability	22	26.8
Infection	20	24.4
Fracture	12	14.6
Chondrolysis/Acetabular Erosion	11	13.4
Pain	9	11.0
Loosening	5	6.1
Malposition	1	1.2
Other	2	2.4
TOTAL	82	100.0

Note: Restricted to modern prostheses

Table HP10 Primary Unipolar Monoblock Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
THR (Femoral/Acetabular)	50	61.0
Cement Spacer	10	12.2
Femoral Component	10	12.2
Removal of Prostheses	7	8.5
Minor Components	3	3.7
Bipolar Head and Femoral	2	2.4
TOTAL	82	100.0

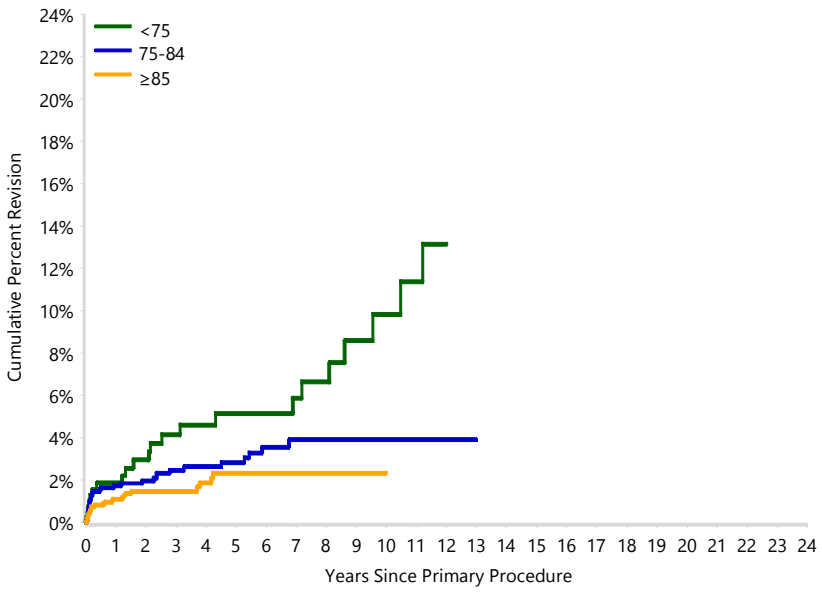
Note: Restricted to modern prostheses.

Table HP11 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	22	415	1.9 (0.9, 3.9)	2.9 (1.6, 5.5)	4.2 (2.4, 7.1)	5.2 (3.1, 8.5)	5.9 (3.5, 9.7)	9.8 (6.0, 15.9)
75-84	34	1433	1.7 (1.2, 2.6)	2.0 (1.3, 2.9)	2.5 (1.7, 3.6)	2.8 (2.0, 4.1)	3.9 (2.7, 5.7)	3.9 (2.7, 5.7)
≥85	26	2018	1.1 (0.7, 1.8)	1.5 (1.0, 2.3)	1.5 (1.0, 2.3)	2.3 (1.5, 3.7)	2.3 (1.5, 3.7)	2.3 (1.5, 3.7)
TOTAL	82	3866						

Note: Restricted to modern prostheses

Figure HP9 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

<75 vs 75-84

Entire Period: HR=1.90 (95% CI 1.11, 3.27), p=0.020

<75 vs ≥85

Entire Period: HR=2.74 (95% CI 1.53, 4.90), p<0.001

75-84 vs ≥85

Entire Period: HR=1.44 (95% CI 0.86, 2.40), p=0.166

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	415	291	248	218	164	127	65
75-84	1433	987	829	683	442	278	124
≥85	2018	1190	886	639	313	141	44

Note: Restricted to modern prostheses

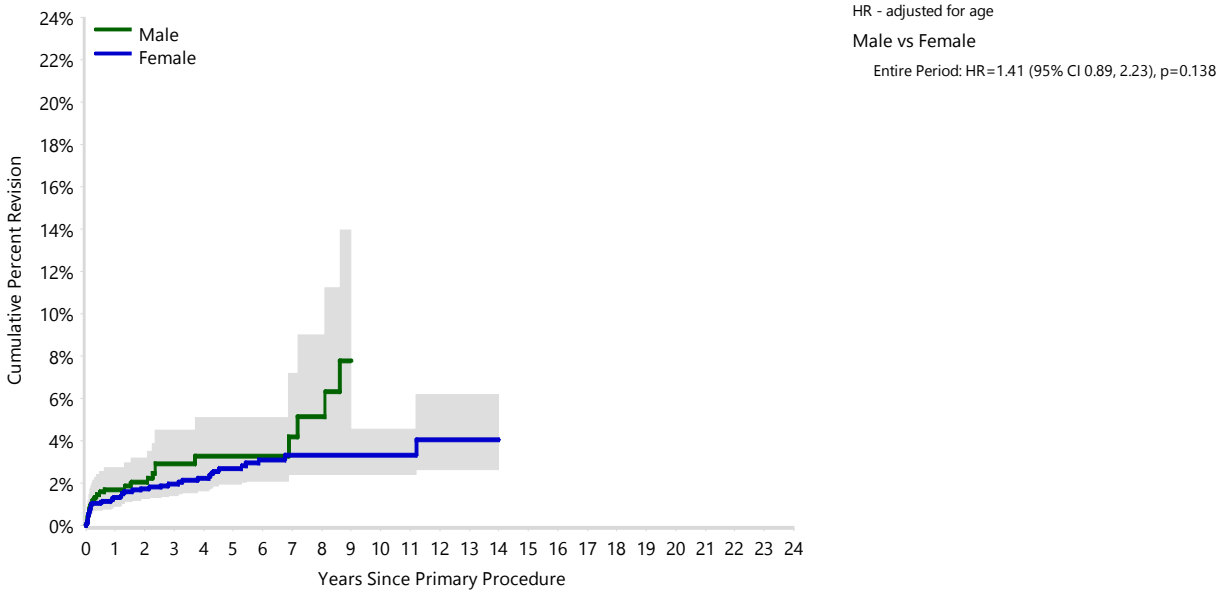
Primary Partial Hip Replacement

Table HP12 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Gender (Primary Diagnosis Fractured NOF)

Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	30	1257	1.7 (1.1, 2.7)	2.0 (1.3, 3.2)	2.9 (1.9, 4.5)	3.3 (2.1, 5.1)	4.2 (2.4, 7.2)	
Female	52	2609	1.3 (0.9, 1.9)	1.7 (1.3, 2.4)	2.0 (1.4, 2.7)	2.7 (2.0, 3.6)	3.3 (2.4, 4.5)	3.3 (2.4, 4.5)
TOTAL	82	3866						

Note: Restricted to modern prostheses

Figure HP10 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Gender (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	1257	686	485	332	180	105	39
Female	2609	1782	1478	1208	739	441	194

Note: Restricted to modern prostheses

Unipolar Modular

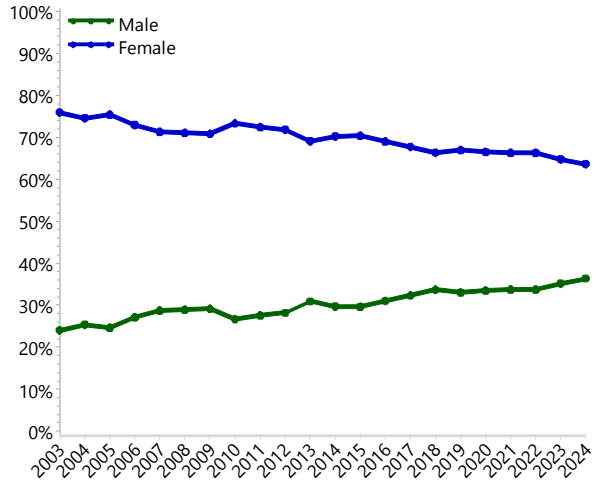
Demographics

There are 60,161 unipolar modular procedures recorded. This is an additional 2,464 procedures compared to the previous report.

In 2024, the number of unipolar modular procedures decreased by 232 procedures (8.8%) compared to 2023 but has increased by 262.9% since 2003.

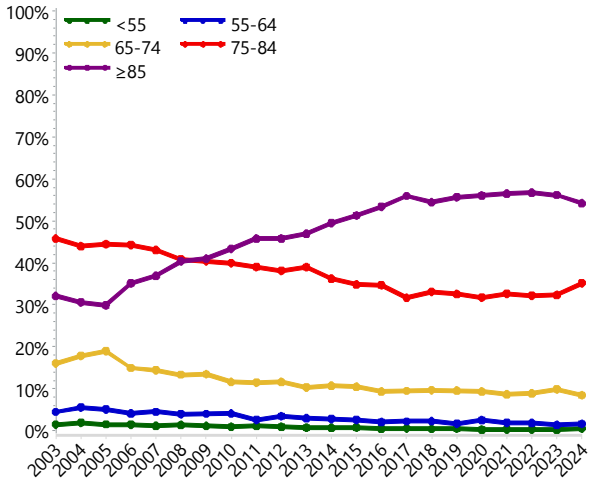
Fractured neck of femur is the principal diagnosis for primary unipolar modular hip replacement (96.2%).

Figure HP11 Primary Unipolar Modular Hip Replacement by Gender



The majority of patients are female (69.3%) and aged ≥75 years (85.2%). The proportion of patients aged ≥85 years has increased from 32.1% in 2003 to 54.2% in 2024. The mean age of patients is 83.0 years (Table HP13, Figure HP11 and Figure HP12).

Figure HP12 Primary Unipolar Modular Hip Replacement by Age



Overall, there have been 254 unipolar modular head and stem combinations recorded by the Registry. The 10 most frequently used unipolar modular head prostheses and femoral stems are listed in Table HP14 and Table HP15.

In 2024, 13 different unipolar modular head prostheses were used. The Unitrax head is the most frequently used (74.4%). The 10 most used unipolar modular head prostheses account for 99.8% of all primary unipolar modular hip procedures (Table HP14).

There were 17 different stem prostheses used in 2024. The most frequently used stem is the Exeter V40 (70%). The 10 most used femoral stems account for 99.3% of all primary unipolar modular hip procedures (Table HP15).

The cumulative percent revision of unipolar modular head/stem prosthesis combinations with more than 100 procedures is detailed in Table HP16.

Table HP13 Age and Gender of Primary Unipolar Modular Hip Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	18461	30.7%	5	106	84	82.1	9.3
Female	41700	69.3%	18	108	85	83.4	8.4
TOTAL	**60161**	**100.0%**	**5**	**108**	**84**	**83.0**	**8.7**

Primary Partial Hip Replacement

Table HP14 10 Most Used Unipolar Head Prostheses in Primary Unipolar Modular Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
193	Unitrax	1848	Unitrax	2074	Unitrax	1822	Unitrax	1799	Unitrax
142	Unipolar Head (Zimmer)	438	Unipolar Head (S&N)	411	Unipolar Head (S&N)	401	Unipolar Head (S&N)	317	Unipolar Head (S&N)
127	Unipolar Head (S&N)	322	Cathcart	317	Cathcart	300	Cathcart	221	Cathcart
75	VerSys	101	VerSys	97	VerSys	66	VerSys	26	Unipolar Head (Signature)
64	Unipolar Head (Mathys)	37	Unipolar Head (Mathys)	25	Unipolar Head (Mathys)	18	Unipolar Head (Mathys)	25	VerSys
46	Elite	16	Unipolar Head (Signature)	16	Unipolar Head (Signature)	17	Unipolar Head (Signature)	8	Unipolar Head (Mathys)
16	Ultima	6	Femoral Head (Stryker)	6	Femoral Head (Stryker)	8	Femoral Head (Stryker)	6	Femoral Head (S&N)
1	Metasul	4	Articul/Eze	3	Articul/Eze	4	Femoral Head (S&N)	6	Trinity
1	Optimom	2	Femoral Head (S&N)	2	Femoral Head (S&N)	3	Femoral Head (Zimmer)	3	Femoral Head (Stryker)
1	Unipolar Head (Sulzer)	1	Generic Unipolar Head	1	Articul/Eze Zir	2	Articul/Eze	2	Articul/Eze
10 Most Used									
666	(10) 100.0%	2775	(10) 99.9%	2952	(10) 99.9%	2641	(10) 99.7%	2413	(10) 99.8%
Remainder									
0	(0) 0%	2	(2) 0.1%	4	(4) 0.1%	8	(6) 0.3%	4	(3) 0.2%
TOTAL									
666	(10) 100.0%	2777	(12) 100.0%	2956	(14) 100.0%	2649	(16) 100.0%	2417	(13) 100.0%

Table HP15 10 Most Used Femoral Stem Prostheses in Primary Unipolar Modular Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
180	Exeter V40	1762	Exeter V40	1961	Exeter V40	1743	Exeter V40	1692	Exeter V40
111	Alloclassic	371	CPCS	360	CPCS	348	CPCS	264	CPCS
91	CPT	297	C-Stem AMT	278	C-Stem AMT	273	C-Stem AMT	195	C-Stem AMT
70	Spectron EF	98	CPT	109	Short Exeter V40	78	Short Exeter V40	103	Short Exeter V40
49	Fullfix	80	Short Exeter V40	93	CPT	60	CPT	56	Polarstem
38	SL-Plus	37	twinSys (ctd)	43	CORAIL	43	Polarstem	30	CORAIL
33	Elite Plus	36	Spectron EF	30	Polarstem	31	CORAIL	26	Evolve
18	Basis	26	CORAIL	23	twinSys (ctd)	18	twinSys (ctd)	20	CPT
15	CCA	24	Polarstem	13	Evolve	17	Evolve	7	Taper Fit
15	Thompson Modular Stem	14	Evolve	13	Spectron EF	9	Accolade II	7	twinSys (ctd)
10 Most Used									
620	(10) 93.1%	2745	(10) 98.8%	2923	(10) 98.9%	2620	(10) 98.9%	2400	(10) 99.3%
Remainder									
46	(13) 6.9%	32	(12) 1.2%	33	(15) 1.1%	29	(11) 1.1%	17	(7) 0.7%
TOTAL									
666	(23) 100.0%	2777	(22) 100.0%	2956	(25) 100.0%	2649	(21) 100.0%	2417	(17) 100.0%

Table HP16 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Prosthesis Combination

Unipolar Head	Femoral Component	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cathcart	C-Stem AMT	61	2783	1.8 (1.3, 2.4)	2.1 (1.6, 2.8)	2.4 (1.8, 3.2)	3.7 (2.7, 5.1)	4.0 (2.9, 5.6)	
	CORAIL	100	1673	3.1 (2.3, 4.1)	4.3 (3.3, 5.5)	5.5 (4.3, 6.9)	6.7 (5.3, 8.4)	9.2 (7.3, 11.4)	11.5 (9.1, 14.6)
Unipolar Head (Mathys)	twinSys (ctd)	7	265	3.1 (1.5, 6.4)	3.1 (1.5, 6.4)	3.1 (1.5, 6.4)			
Unipolar Head (S&N)	CPCS	206	7678	1.9 (1.6, 2.3)	2.3 (2.0, 2.7)	2.7 (2.3, 3.2)	3.7 (3.1, 4.3)	4.3 (3.7, 5.1)	5.5 (4.5, 6.7)
	Polarstem	8	272	1.5 (0.5, 4.5)	2.2 (0.8, 5.9)	4.9 (2.0, 11.6)			
	Spectron EF	126	3149	1.6 (1.2, 2.2)	2.5 (2.0, 3.2)	3.0 (2.4, 3.7)	4.0 (3.3, 5.0)	5.4 (4.4, 6.6)	7.5 (6.1, 9.3)
Unipolar Head (Signature)	Evolve	7	221	2.1 (0.8, 5.6)	4.0 (1.8, 9.2)	5.2 (2.4, 11.2)			
Unitrax	Exeter V40	878	28767	2.0 (1.8, 2.2)	2.6 (2.4, 2.8)	3.1 (2.9, 3.3)	4.2 (3.9, 4.5)	5.1 (4.7, 5.6)	6.7 (6.1, 7.3)
	Short Exeter V40	12	655	1.7 (0.9, 3.2)	1.7 (0.9, 3.2)	2.1 (1.1, 3.9)	2.8 (1.4, 5.3)		
VerSys	CPT	192	5001	2.0 (1.7, 2.5)	2.9 (2.4, 3.5)	3.4 (2.9, 4.1)	4.6 (3.9, 5.4)	5.7 (4.9, 6.7)	6.9 (5.8, 8.1)
Other (31)		24	416	4.4 (2.7, 7.1)	5.7 (3.7, 8.9)	6.3 (4.0, 9.7)	7.8 (5.0, 12.0)	7.8 (5.0, 12.0)	
TOTAL		1621	50880						

Note: Restricted to modern prostheses. Only combinations with >100 procedures have been listed

Primary Partial Hip Replacement

Outcome for Fractured Neck of Femur

The cumulative percent revision at 10 years for unipolar modular hip replacement, when undertaken for fractured neck of femur, is 6.6% (Table HP17 and Figure HP13).

The Registry has recorded 1,531 revisions of primary unipolar modular hip replacement with a primary diagnosis of fractured neck of femur.

The main reasons for revision are infection (25.8%), prosthesis dislocation/instability (21.3%), chondrolysis/acetabular erosion (16.3%), fracture (15.7%), pain (9.7%) and loosening (7.9%) (Table HP18).

Most revisions are acetabular only (39.8%), followed by head only (17.6%) and THR (16.3%) (Table HP19).

Age, gender, and femoral stem fixation are risk factors for revision. The rate of revision decreases with increasing age (Table HP20 and Figure HP14). Males have a higher rate of revision than females (Table HP21 and Figure HP15).

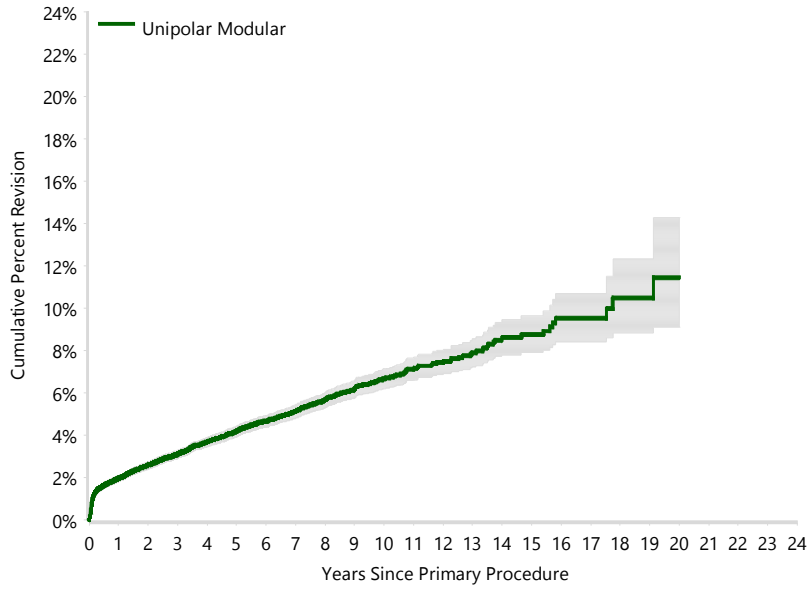
Cementless fixation has a higher rate of revision compared to cemented fixation (Table HP22 and Figure HP16). The cumulative incidence of revision for pain, fracture and chondrolysis/acetabular erosion is higher for cementless compared to cemented fixation (Figure HP17).

Table HP17 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Modular	1531	49089	2.0 (1.8, 2.1)	2.6 (2.4, 2.7)	3.1 (2.9, 3.3)	4.2 (3.9, 4.4)	5.1 (4.8, 5.4)	6.6 (6.2, 7.1)
TOTAL	1531	49089						

Note: Restricted to modern prostheses

Figure HP13 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Modular	49089	32943	26055	20216	12002	6952	2934

Note: Restricted to modern prostheses

Table HP18 Primary Unipolar Modular Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Infection	395	25.8
Prosthesis Dislocation/Instability	326	21.3
Chondrolysis/Acetabular Erosion	250	16.3
Fracture	241	15.7
Pain	149	9.7
Loosening	121	7.9
Lysis	18	1.2
Malposition	3	0.2
Other	28	1.8
TOTAL	1531	100.0

Note: Restricted to modern prostheses

Table HP19 Primary Unipolar Modular Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Acetabular Component	609	39.8
Head Only	269	17.6
THR (Femoral/Acetabular)	250	16.3
Femoral Component	158	10.3
Bipolar Head and Femoral	75	4.9
Cement Spacer	53	3.5
Removal of Prostheses	48	3.1
Minor Components	39	2.5
Bipolar Only	22	1.4
Reinsertion of Components	6	0.4
Head/Insert	2	0.1
TOTAL	1531	100.0

Note: Restricted to modern prostheses

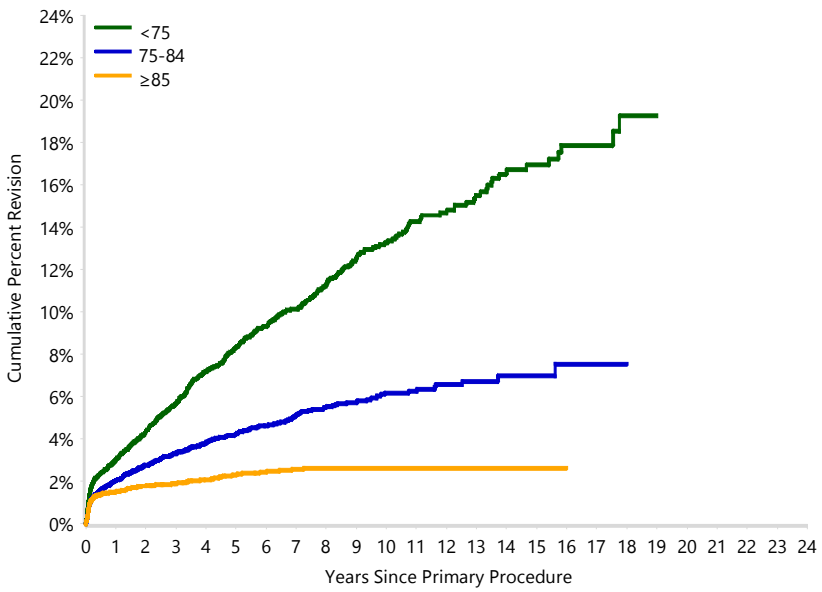
Primary Partial Hip Replacement

Table HP20 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	526	6776	3.0 (2.6, 3.5)	4.3 (3.8, 4.9)	5.7 (5.1, 6.4)	8.3 (7.5, 9.2)	10.1 (9.2, 11.1)	13.3 (12.1, 14.6)
75-84	601	17754	2.1 (1.9, 2.3)	2.8 (2.5, 3.1)	3.3 (3.0, 3.6)	4.3 (3.9, 4.7)	5.1 (4.7, 5.6)	6.2 (5.6, 6.9)
≥85	404	24559	1.5 (1.4, 1.7)	1.8 (1.6, 2.0)	1.9 (1.7, 2.2)	2.3 (2.1, 2.6)	2.6 (2.3, 2.9)	2.7 (2.3, 3.0)
TOTAL	1531	49089						

Note: Restricted to modern prostheses

Figure HP14 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

<75 vs 75-84

0 - 3Mth: HR=1.51 (95% CI 1.22, 1.89), p<0.001

3Mth - 2Yr: HR=1.51 (95% CI 1.21, 1.88), p<0.001

2Yr - 4.5Yr: HR=2.55 (95% CI 1.99, 3.26), p<0.001

4.5Yr+: HR=3.16 (95% CI 2.43, 4.10), p<0.001

<75 vs ≥85

0 - 3Mth: HR=1.53 (95% CI 1.24, 1.89), p<0.001

3Mth - 1.5Yr: HR=4.11 (95% CI 3.10, 5.43), p<0.001

1.5Yr - 2Yr: HR=5.67 (95% CI 3.53, 9.11), p<0.001

2Yr+: HR=8.21 (95% CI 6.47, 10.41), p<0.001

75-84 vs ≥85

0 - 3Mth: HR=1.01 (95% CI 0.85, 1.21), p=0.899

3Mth+: HR=2.91 (95% CI 2.38, 3.56), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	6776	5090	4283	3624	2584	1856	1049
75-84	17754	12787	10515	8476	5454	3282	1408
≥85	24559	15066	11257	8116	3964	1814	477

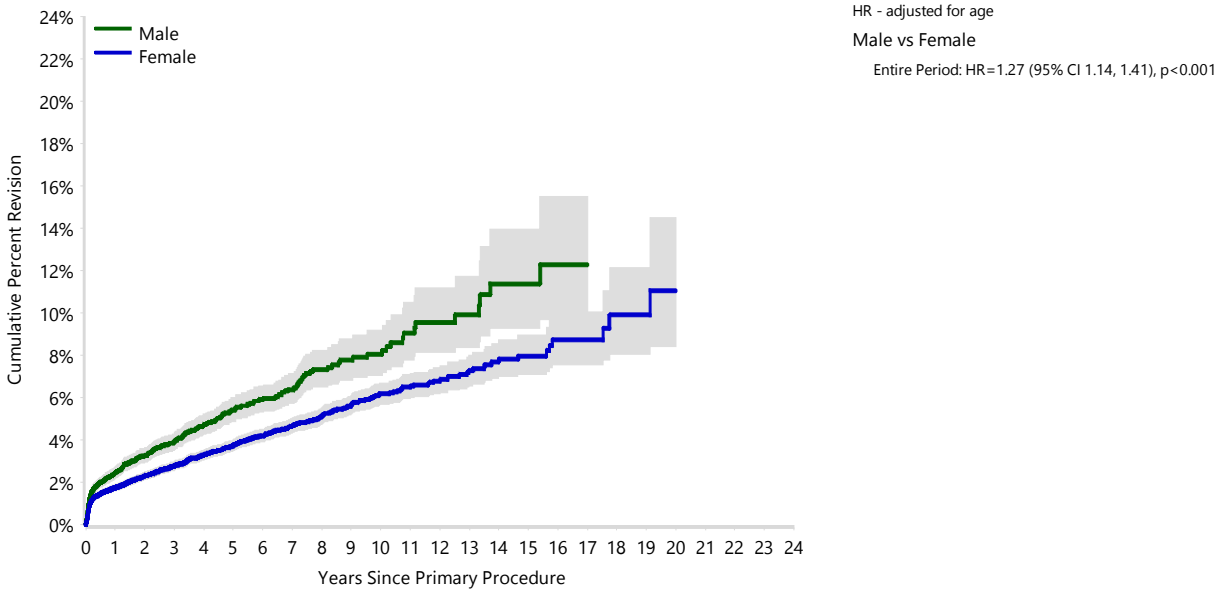
Note: Restricted to modern prostheses

Table HP21 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Gender (Primary Diagnosis Fractured NOF)

Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	509	15218	2.5 (2.2, 2.8)	3.3 (2.9, 3.6)	3.9 (3.6, 4.3)	5.4 (4.9, 6.0)	6.4 (5.7, 7.1)	8.1 (7.1, 9.2)
Female	1022	33871	1.8 (1.6, 1.9)	2.3 (2.1, 2.5)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	4.7 (4.3, 5.0)	6.2 (5.7, 6.7)
TOTAL	1531	49089						

Note: Restricted to modern prostheses

Figure HP15 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Gender (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	15218	8780	6398	4644	2458	1328	520
Female	33871	24163	19657	15572	9544	5624	2414

Note: Restricted to modern prostheses

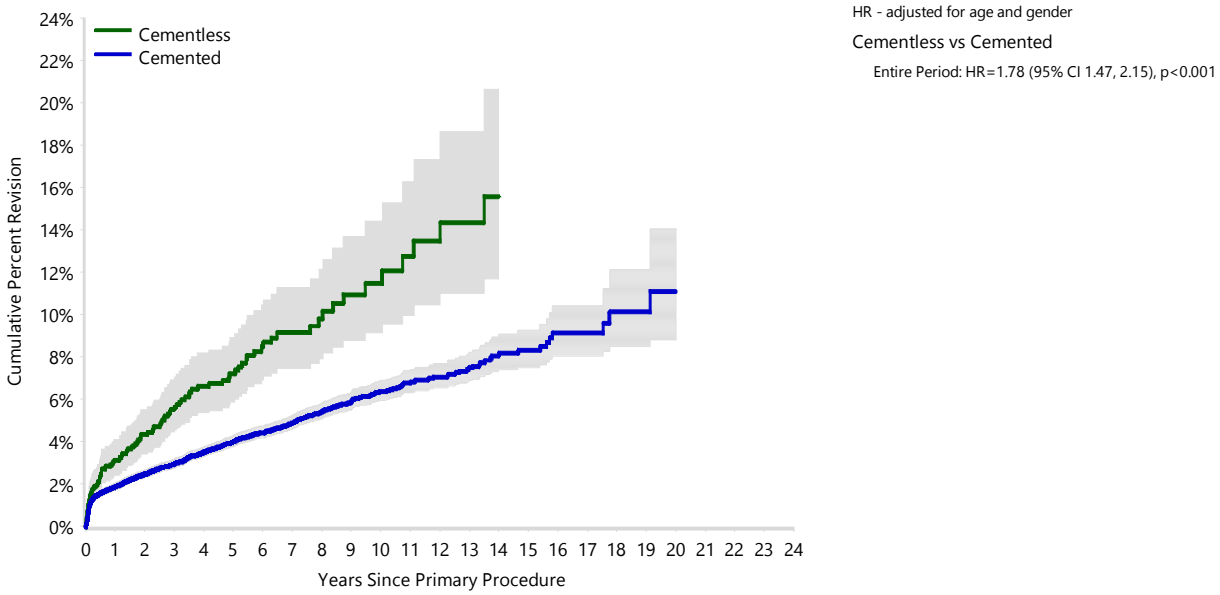
Primary Partial Hip Replacement

Table HP22 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)

Femoral Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	113	1903	3.1 (2.4, 4.1)	4.4 (3.4, 5.5)	5.7 (4.5, 7.0)	7.2 (5.9, 8.9)	9.2 (7.4, 11.3)	11.5 (9.1, 14.4)
Cemented	1418	47186	1.9 (1.8, 2.0)	2.5 (2.3, 2.7)	3.0 (2.8, 3.2)	4.0 (3.8, 4.3)	4.9 (4.6, 5.2)	6.4 (6.0, 6.9)
TOTAL	1531	49089						

Note: Restricted to modern prostheses

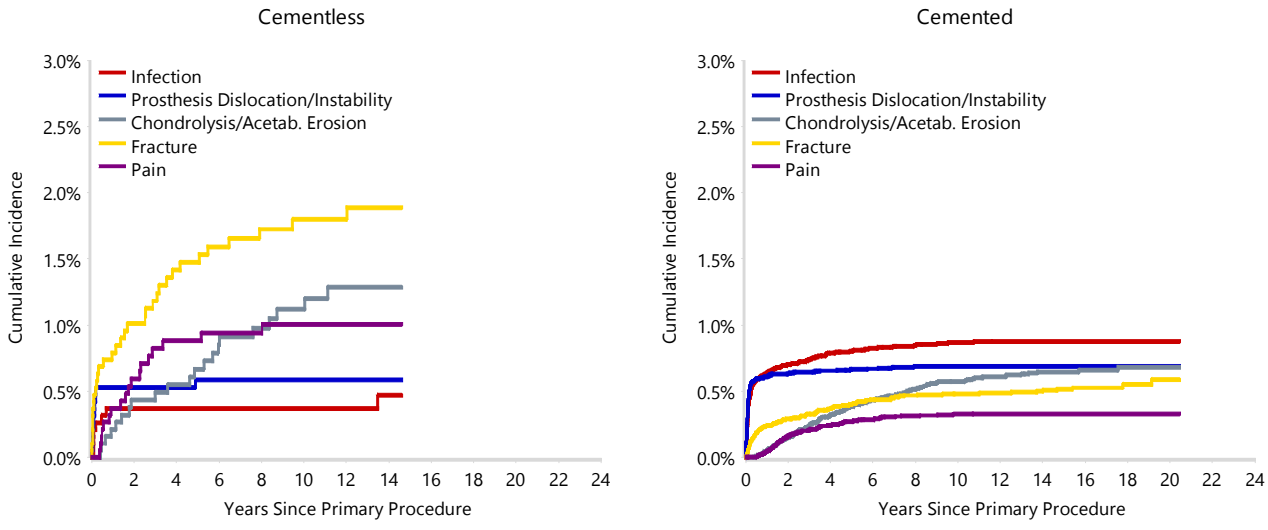
Figure HP16 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	1903	1329	1071	858	565	335	148
Cemented	47186	31614	24984	19358	11437	6617	2786

Note: Restricted to modern prostheses

Figure HP17 Cumulative Incidence Revision Diagnosis of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses

Bipolar

DEMOGRAPHICS

There are 44,747 bipolar hip replacement procedures recorded. This is an additional 4,574 procedures compared to the previous report.

Since 2010, there has been an increase in the number of bipolar procedures undertaken each year, with 10.6% more procedures in 2024 compared to 2023. The total number of bipolar procedures has increased by 231% since 2003.

Fractured neck of femur is the principal diagnosis for bipolar hip replacement (93.9%).

The majority of patients are female (67.7%) and aged ≥75 years (80.7%). The proportion of patients aged ≥85 years has increased from 26.0% in 2003 to 44.9% in 2024 (Figure HP18, and Figure HP19).

The mean age of patients is 81.6 years (Table HP23, Figure HP18 and Figure HP19).

Figure HP18 Primary Bipolar Hip Replacement by Gender

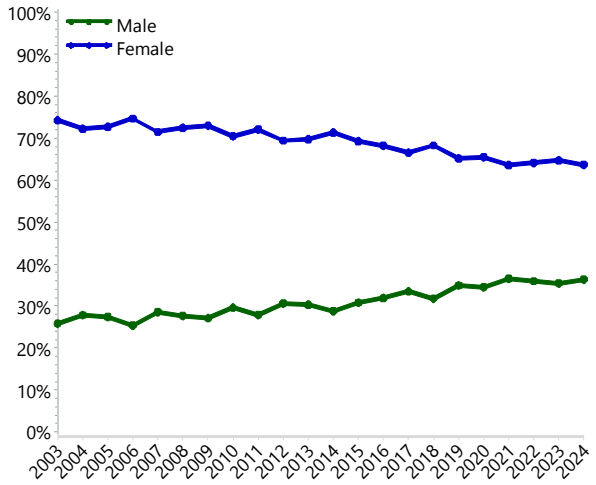
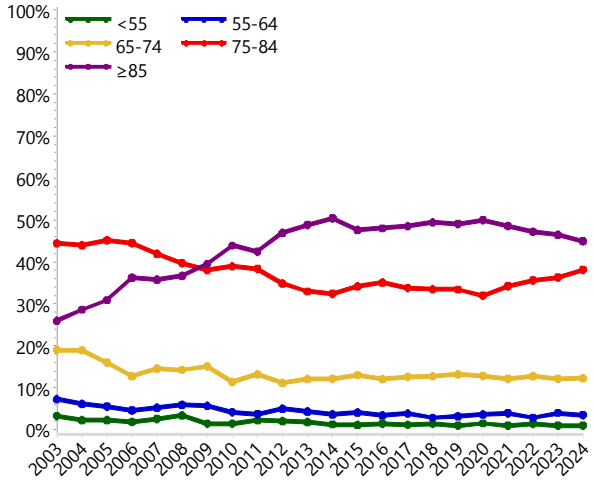


Figure HP19 Primary Bipolar Hip Replacement by Age



Overall, there have been 338 bipolar head and stem combinations recorded by the Registry. In 2024, there were 10 different bipolar heads, and 41 different femoral stem prostheses used.

In 2024, the UHR remains the most frequently used bipolar head (42.9%) (Table HP24). The Exeter V40 is the most frequently used femoral stem (40.0%). The 10 most used femoral stems account for 92.8% of all bipolar hip procedures (Table HP25).

The cumulative percent revision of bipolar head/stem prosthesis combinations with >100 procedures is detailed in Table HP26.

Table HP23 Age and Gender of Primary Bipolar Hip Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	14444	32.3%	9	105	83	80.7	10.5
Female	30303	67.7%	9	107	83	82.1	9.5
TOTAL	**44747**	**100.0%**	**9**	**107**	**83**	**81.6**	**9.8**

Primary Partial Hip Replacement

Table HP24 10 Most Used Bipolar Head Prostheses in Primary Bipolar Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
760	UHR	1443	UHR	1667	UHR	1716	UHR	1905	UHR
140	Hastings	843	Multipolar Bipolar	857	Multipolar Bipolar	978	Multipolar Bipolar	868	Multipolar Bipolar
115	Convene	383	Tandem	409	Tandem	455	Tandem	530	Tandem
91	Bipolar Head (Zimmer)	317	Self-Centering	375	Self-Centering	358	Self-Centering	482	Self-Centering
87	Self-Centering	180	BioBall	143	BioBall	264	BioBall	351	BioBall
59	Multipolar Bipolar	90	Bipolar Head (Medacta)	137	Bipolar Head (Medacta)	198	Bipolar Head (Medacta)	277	Bipolar Head (Medacta)
39	Bipolar Head (Mathys)	22	Bipolar Head (Mathys)	25	Bipolar Head (Mathys)	15	Bipolar Head (Lima)	16	Vario-Cup (Bipolar Head)
19	Bipolar Head (Lima)	8	Bipolar Head (Lima)	20	Bipolar Head (Lima)	12	Bipolar Head (Mathys)	8	Bipolar Head (Implantcast)
19	Ringloc	7	Bipolar Head (Implantcast)	8	Bipolar Head (Implantcast)	11	Bipolar Head (Implantcast)	1	Bipolar Head (Lima)
5	UHL					8	Vario-Cup (Bipolar Head)	1	Bipolar Head (Mathys)
10 Most Used									
1334	(10) 99.5%	3293	(9) 100.0%	3641	(9) 100.0%	4015	(10) 100.0%	4439	(10) 100.0%
Remainder									
7	(2) 0.5%	0	(0) 0%	0	(0) 0%	0	(0) 0%	0	(0) 0%
TOTAL									
1341	(12) 100.0%	3293	(9) 100.0%	3641	(9) 100.0%	4015	(10) 100.0%	4439	(10) 100.0%

Table HP25 10 Most Used Femoral Stem Prostheses in Primary Bipolar Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
630	Exeter V40	1353	Exeter V40	1530	Exeter V40	1602	Exeter V40	1777	Exeter V40
94	Elite Plus	777	CPT	781	CPT	854	CPT	603	CPT
75	Alloclassic	353	CPCS	372	CPCS	424	CPCS	459	CPCS
65	CPCS	203	C-Stem AMT	218	C-Stem AMT	215	C-Stem AMT	330	C-Stem AMT
61	C-Stem	106	CORAIL	142	CORAIL	213	Taper Fit	277	Taper Fit
59	Omnifit	91	Absolut	102	Quadra-C	134	CORAIL	217	MS 30
33	VerSys	73	Taper Fit	96	Short Exeter V40	110	Quadra-C	146	CORAIL
26	ABGII	72	Quadra-C	82	Taper Fit	90	MS 30	135	Quadra-C
25	CCA	50	Short Exeter V40	49	Absolut	70	Short Exeter V40	114	Short Exeter V40
25	Spectron EF	29	MS 30	37	MS 30	41	Evolve	62	X-Acta
10 Most Used									
1093	(10) 81.5%	3107	(10) 94.4%	3409	(10) 93.6%	3753	(10) 93.5%	4120	(10) 92.8%
Remainder									
248	(46) 18.5%	186	(32) 5.6%	232	(33) 6.4%	262	(31) 6.5%	319	(31) 7.2%
TOTAL									
1341	(56) 100.0%	3293	(42) 100.0%	3641	(43) 100.0%	4015	(41) 100.0%	4439	(41) 100.0%

Table HP26 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Prosthesis Combination

Bipolar Head	Femoral Component	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
BioBall	Taper Fit	17	718	3.0 (1.8, 4.8)	3.0 (1.8, 4.8)	3.0 (1.8, 4.8)			
Bipolar Head (Lima)	H-Max	8	194	2.8 (1.2, 6.6)	4.2 (2.0, 8.7)	4.2 (2.0, 8.7)	5.5 (2.7, 11.1)		
Bipolar Head (Medacta)	Quadra-C	16	887	1.9 (1.1, 3.2)	2.1 (1.3, 3.5)	2.1 (1.3, 3.5)	2.1 (1.3, 3.5)	3.5 (1.5, 7.8)	
	X-Acta	3	260	1.4 (0.5, 4.5)	1.4 (0.5, 4.5)	1.4 (0.5, 4.5)			
Multipolar Bipolar	Avenir	6	118	5.0 (2.1, 11.8)	5.0 (2.1, 11.8)	5.0 (2.1, 11.8)			
	CPT	249	7438	3.0 (2.6, 3.4)	3.7 (3.2, 4.2)	3.9 (3.5, 4.5)	4.6 (4.0, 5.3)	4.8 (4.2, 5.6)	5.7 (4.6, 7.1)
	MS 30	7	492	1.4 (0.6, 3.1)	1.4 (0.6, 3.1)	1.4 (0.6, 3.1)	2.5 (1.0, 6.6)		
	VerSys	7	306	1.3 (0.4, 4.0)	3.1 (1.4, 7.0)	3.1 (1.4, 7.0)	3.1 (1.4, 7.0)	3.1 (1.4, 7.0)	
Self-Centering	C-Stem AMT	40	1576	1.9 (1.3, 2.8)	3.1 (2.2, 4.3)	3.4 (2.5, 4.8)	4.1 (2.9, 5.8)		
	CORAIL	58	1536	3.6 (2.7, 4.7)	4.3 (3.3, 5.5)	4.5 (3.5, 5.9)	4.5 (3.5, 5.9)	5.0 (3.7, 6.6)	5.0 (3.7, 6.6)
Tandem	CPCS	115	4152	2.3 (1.8, 2.8)	2.8 (2.3, 3.4)	3.2 (2.6, 3.9)	3.8 (3.1, 4.7)	4.7 (3.7, 5.9)	4.9 (3.9, 6.3)
	Polarstem	3	199	1.1 (0.3, 4.2)	1.1 (0.3, 4.2)				
	Spectron EF	8	212	2.1 (0.8, 5.5)	3.4 (1.5, 7.5)	4.1 (2.0, 8.5)	5.0 (2.5, 9.9)	5.0 (2.5, 9.9)	
UHR	Accolade II	1	199	0.6 (0.1, 3.9)	0.6 (0.1, 3.9)	0.6 (0.1, 3.9)			
	Exeter V40	536	18178	2.2 (2.0, 2.5)	2.8 (2.5, 3.1)	3.3 (3.0, 3.6)	3.8 (3.5, 4.2)	4.3 (3.9, 4.7)	5.1 (4.5, 5.7)
	GMRS	18	228	1.9 (0.7, 5.1)	4.8 (2.4, 9.6)	6.6 (3.5, 12.1)	10.1 (5.8, 17.2)		
	Short Exeter V40	12	454	2.2 (1.2, 4.3)	2.7 (1.4, 5.0)	2.7 (1.4, 5.0)			
Other (86)		38	1029	2.6 (1.7, 4.0)	3.3 (2.2, 5.0)	4.2 (2.8, 6.1)	5.8 (3.9, 8.5)	6.5 (4.3, 9.8)	
TOTAL		1142	38176						

Note: Restricted to modern prostheses
Only prostheses with >100 procedures have been listed.

Primary Partial Hip Replacement

OUTCOME FOR FRACTURED NECK OF FEMUR

The cumulative percent revision at 10 years for primary bipolar hip replacement undertaken for fractured neck of femur is 5.1% (Table HP27 and Figure HP20).

The Registry has recorded 1,061 revisions of primary bipolar hip replacement procedures with a primary diagnosis of fractured neck of femur.

The main reasons for revision are infection (31.5%), prosthesis dislocation/instability (26.7%), fracture (17.8%), chondrolysis/acetabular erosion (8.0%) and loosening (7.4%) (Table HP28).

The most frequent type of revision is acetabular component only (31.3%), followed by bipolar only (22.7%), total hip replacement (femoral/acetabular) (17.2%), and bipolar head and femoral stem replacement (13.6%) (Table HP29).

Age is a risk factor for revision. The rate of revision decreases with increasing age (Table HP30 and Figure HP21).

Males have a similar rate of revision to females (Table HP31 and Figure HP22).

The rate of revision decreases with increasing age.

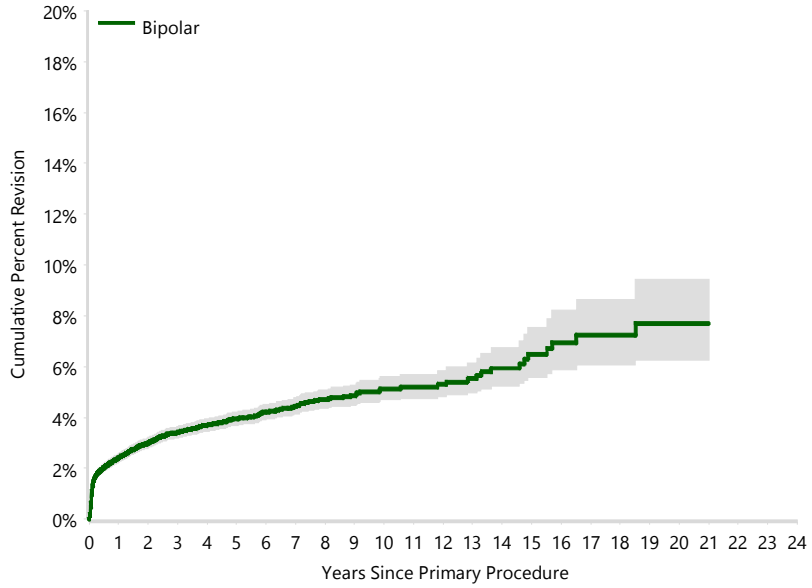
Cementless fixation has a higher rate of revision compared to cemented fixation for the first 3 months only (Table HP32 and Figure HP23). The cumulative incidence of revision for fracture and prosthesis dislocation/instability with cementless fixation is higher than for cemented fixation (Figure HP24).

Table HP27 Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Bipolar	1061	36182	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	3.4 (3.2, 3.6)	3.9 (3.7, 4.2)	4.4 (4.1, 4.8)	5.1 (4.7, 5.6)
TOTAL	1061	36182						

Note: Restricted to modern prostheses

Figure HP20 Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Bipolar	36182	23182	17191	12809	7002	3882	1528

Note: Restricted to modern prostheses

Table HP28 Bipolar Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Infection	334	31.5
Prosthesis Dislocation/Instability	283	26.7
Fracture	189	17.8
Chondrolysis/Acetabular Erosion	85	8.0
Loosening	79	7.4
Pain	65	6.1
Lysis	4	0.4
Malposition	3	0.3
Other	19	1.8
TOTAL	1061	100.0

Note: Restricted to modern prostheses

Table HP29 Primary Bipolar Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Acetabular Component	332	31.3
Bipolar Only	241	22.7
THR (Femoral/Acetabular)	182	17.2
Bipolar Head and Femoral	144	13.6
Cement Spacer	39	3.7
Head Only	38	3.6
Femoral Component	36	3.4
Removal of Prostheses	27	2.5
Minor Components	21	2.0
Head/Insert	1	0.1
TOTAL	1061	100.0

Note: Restricted to modern prostheses

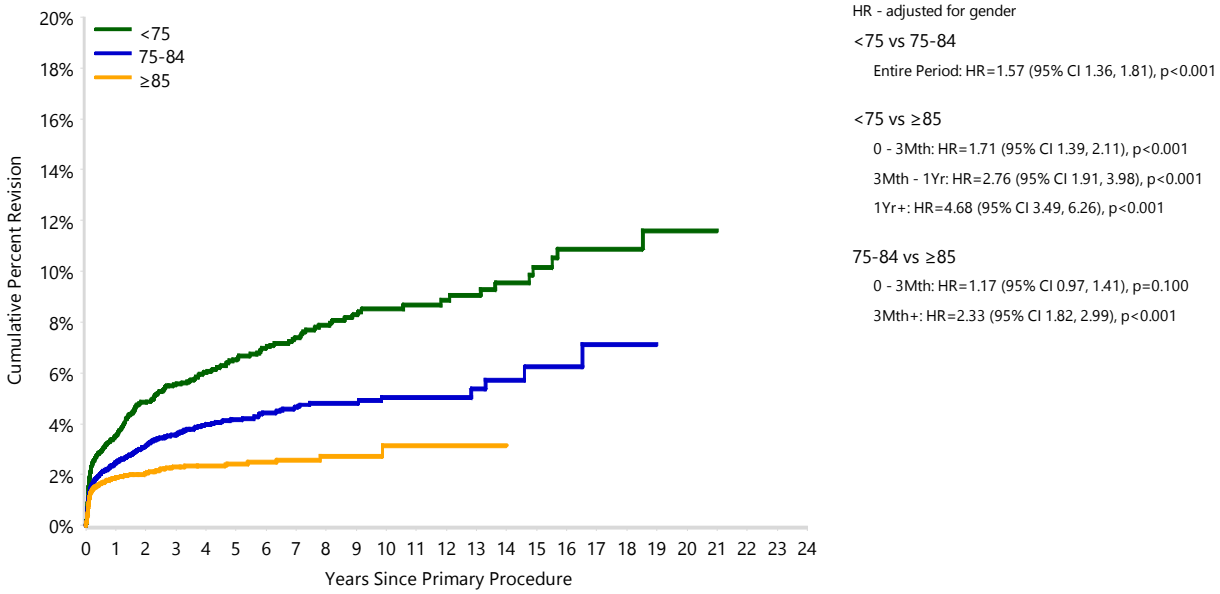
Primary Partial Hip Replacement

Table HP30 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	334	6186	3.5 (3.1, 4.0)	4.8 (4.3, 5.5)	5.5 (4.9, 6.2)	6.5 (5.8, 7.3)	7.4 (6.6, 8.3)	8.5 (7.5, 9.7)
75-84	417	13175	2.5 (2.2, 2.8)	3.2 (2.8, 3.5)	3.6 (3.2, 4.0)	4.2 (3.8, 4.6)	4.6 (4.2, 5.2)	5.1 (4.5, 5.7)
≥85	310	16821	1.9 (1.7, 2.1)	2.1 (1.8, 2.3)	2.3 (2.0, 2.6)	2.4 (2.2, 2.8)	2.6 (2.3, 3.0)	3.2 (2.3, 4.3)
TOTAL	1061	36182						

Note: Restricted to modern prostheses

Figure HP21 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	6186	4298	3396	2742	1813	1234	633
75-84	13175	8891	6745	5184	3029	1754	680
≥85	16821	9993	7050	4883	2160	894	215

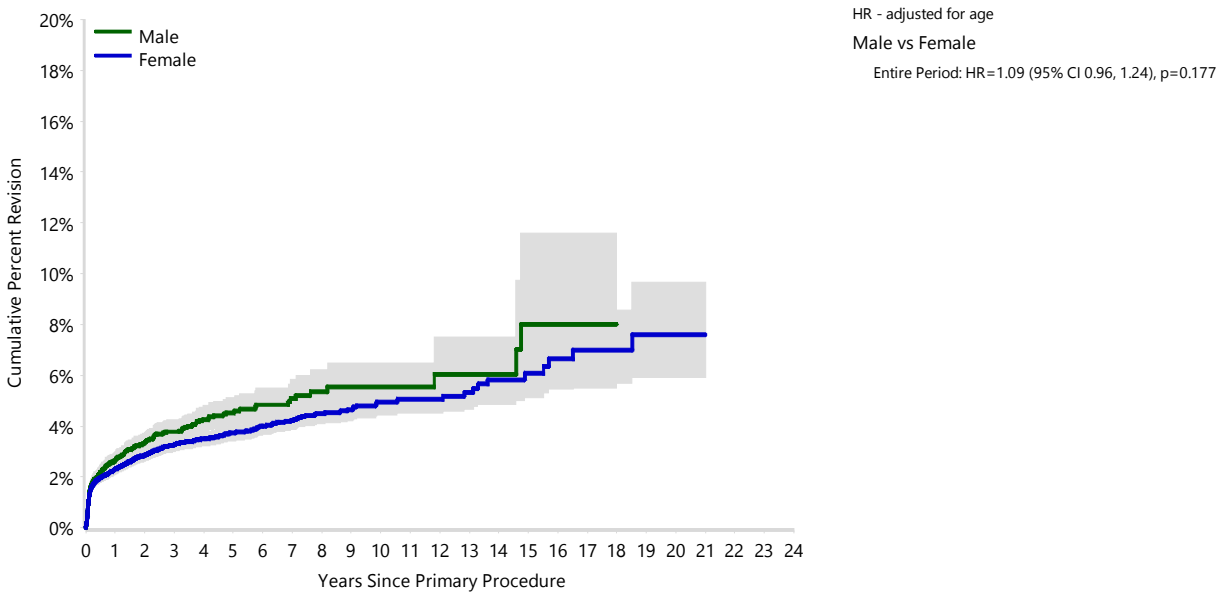
Note: Restricted to modern prostheses

Table HP31 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Gender (Primary Diagnosis Fractured NOF)

Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	347	11849	2.7 (2.4, 3.0)	3.4 (3.0, 3.8)	3.8 (3.4, 4.2)	4.5 (4.0, 5.1)	5.1 (4.4, 5.8)	5.5 (4.7, 6.5)
Female	714	24333	2.3 (2.1, 2.5)	2.8 (2.6, 3.1)	3.2 (3.0, 3.5)	3.7 (3.4, 4.0)	4.2 (3.9, 4.6)	4.9 (4.4, 5.5)
TOTAL	1061	36182						

Note: Restricted to modern prostheses

Figure HP22 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Gender (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	11849	6586	4512	3112	1481	776	277
Female	24333	16596	12679	9697	5521	3106	1251

Note: Restricted to modern prostheses

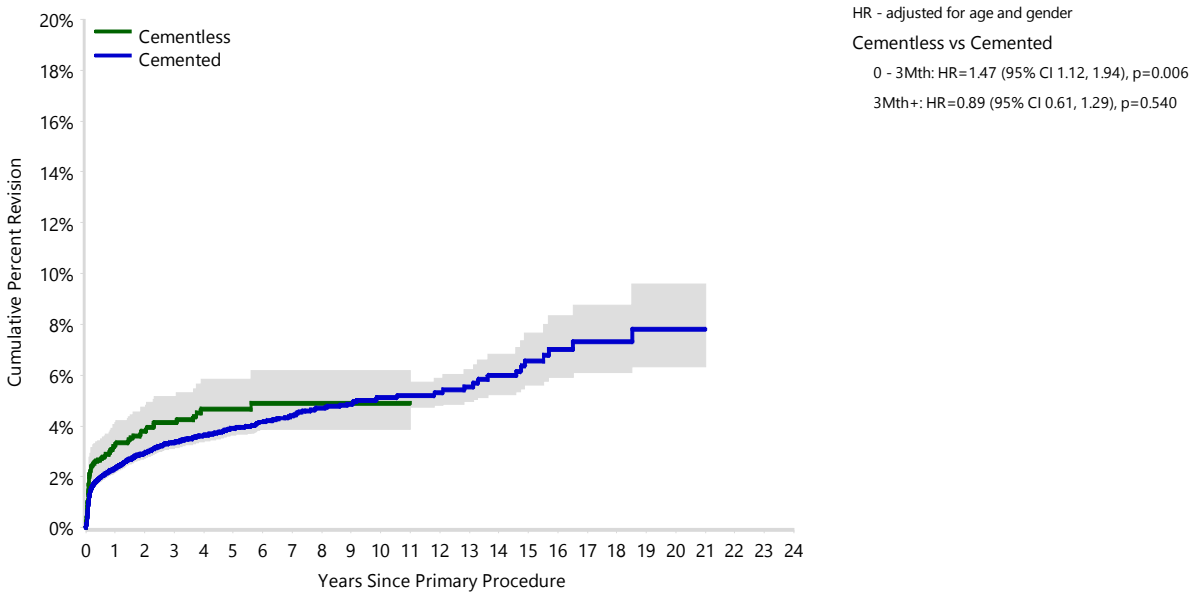
Primary Partial Hip Replacement

Table HP32 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)

Femoral Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	85	2395	3.3 (2.6, 4.1)	3.8 (3.0, 4.7)	4.1 (3.3, 5.2)	4.7 (3.7, 5.8)	4.9 (3.9, 6.2)	4.9 (3.9, 6.2)
Cemented	976	33787	2.4 (2.2, 2.5)	2.9 (2.7, 3.2)	3.4 (3.1, 3.6)	3.9 (3.6, 4.2)	4.4 (4.1, 4.8)	5.1 (4.7, 5.6)
TOTAL	1061	36182						

Note: Restricted to modern prostheses

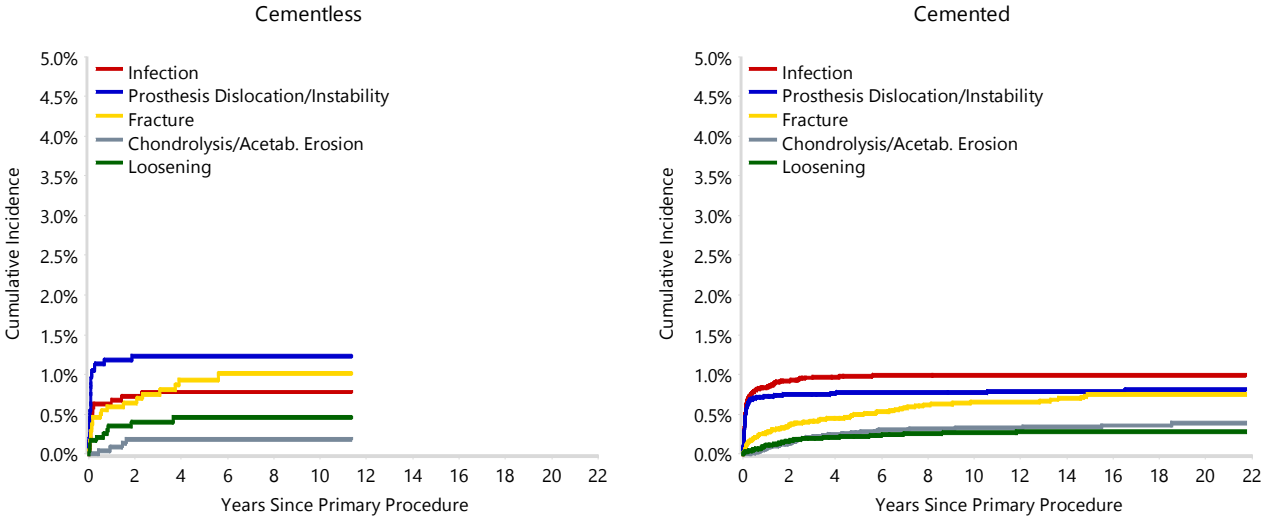
Figure HP23 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	2395	1511	1146	874	493	259	66
Cemented	33787	21671	16045	11935	6509	3623	1462

Note: Restricted to modern prostheses

Figure HP24 Cumulative Incidence Revision Diagnosis of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

Classes of Total Hip Replacement

A total hip replacement procedure replaces both the femoral and acetabular articular surfaces. Primary total hip replacement is subcategorised into two classes. These are defined by the type of femoral prosthesis used.

Total conventional involves acetabular replacement combined with resection of the femoral head and replacement with a stemmed femoral prosthesis and femoral head prosthesis.

Total resurfacing involves acetabular replacement and the use of a femoral prosthesis that replaces the femoral articular surface without resecting the head.

Detailed demographic information on primary total hip replacement is available in the supplementary report 'Demographics of Hip, Knee & Shoulder Arthroplasty' on the AOANJRR website:
https://aoanjrr.sahmri.com/annual-reports-2025

Use of Total Hip Replacement

There are 741,990 primary total hip replacement procedures. Of these, total conventional is the most common class, followed by total resurfacing (Table HT1).

Table HT1 Primary Total Hip Replacement by Class

Total Hip Class	Number	Percent
Total Conventional	720817	97.1
Total Resurfacing	21173	2.9
TOTAL	741990	100.0

Note: Excludes 258 thrust plate procedures

Osteoarthritis is the principal diagnosis for primary total hip replacement (88.1%).

Total conventional hip replacement (all bearing surfaces included) has a lower cumulative percent revision compared to total resurfacing at 20 years (Table HT2).

Table HT2 Cumulative Percent Revision of Primary Total Hip Replacement by Class

Total Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	2272	21173	1.6 (1.5, 1.8)	3.0 (2.8, 3.3)	4.6 (4.3, 4.9)	8.7 (8.3, 9.1)	11.7 (11.3, 12.2)	14.2 (13.7, 14.8)
Total Conventional	34654	720817	1.8 (1.7, 1.8)	2.7 (2.6, 2.7)	3.5 (3.4, 3.5)	5.5 (5.4, 5.6)	8.0 (7.9, 8.2)	10.8 (10.7, 11.0)
TOTAL	36926	741990						

Note: The data extends for 24 years but only data for the first 20 years follow-up is presented.

Primary Total Conventional Hip Replacement

DEMOGRAPHICS

There are 720,817 primary total conventional hip replacement procedures. This is an additional 49,933 procedures compared to the previous report.

For further information on the **closure of the database** please see the Glossary of this report.

The proportion of males and females has been stable for many years with a female predominance. This is primarily due to larger numbers of females compared to males in older age groups (Table HT1).

Figure HT1 Primary Total Conventional Hip Replacement by Gender



The mean age of patients is 67.9 years. There has been minimal change in the proportion of patients aged 55–64 years (21.9% in 2003 to 22.0% in 2024) and for patients aged <55 years (11.7% in 2003 to 11.2% in 2024) (Table HT3 and Figure HT2).

Primary total conventional hip replacement increased by 1.2% in 2024 compared to the previous year and by 185.6% since 2003.

The use of cementless fixation has increased from 51.3% in 2003 to 62.9% in 2024. Hybrid fixation has increased from 34.8% to 35.7% and cemented fixation has declined from 13.9% to 1.4% (Figure HT3).

Figure HT2 Primary Total Conventional Hip Replacement by Age

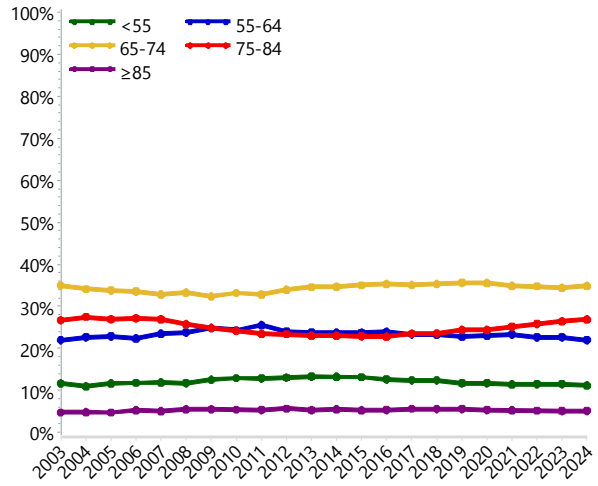


Figure HT3 Primary Total Conventional Hip Replacement by Fixation

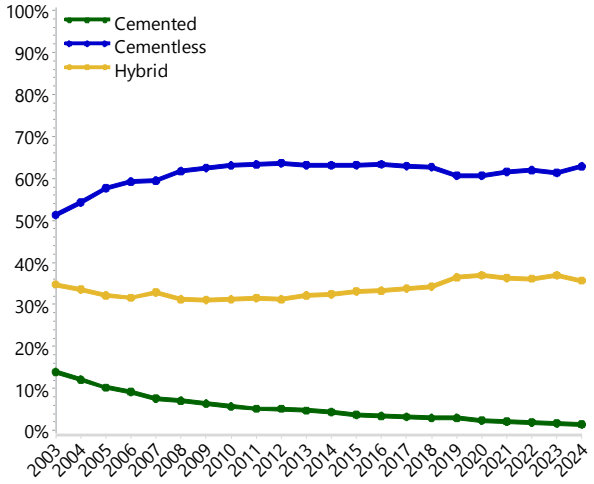


Table HT3 Age and Gender of Primary Total Conventional Hip Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	324188	45.0%	11	108	67	66.5	11.5
Female	396629	55.0%	11	103	70	69.0	11.3
TOTAL	**720817**	**100.0%**	**11**	**108**	**69**	**67.9**	**11.4**

Primary Total Hip Replacement

The Exeter V40, Accolade II, and CORAIL are the most used femoral stems for primary total conventional hip replacement (Table HT4). In 2024, 65.3% of primary total conventional hip replacements used stems in the 10 most used femoral component list. Seven of these stems are cementless. The 10 most used cemented and cementless stems are listed in Table HT5 and Table HT6, respectively. The 10 most used cemented stems account for 90.0% of cemented stem procedures. The 10 most used cementless stems account for 76.3% of cementless stem procedures.

The Trident (Shell), Trinity and G7 are the most frequently used acetabular prostheses for primary total conventional hip replacement. In 2024, 89.7% of primary total conventional hip procedures used acetabular components from the 10 most used list (Table HT7). All of the acetabular components in this list are cementless prostheses. The 10 most used cemented and cementless acetabular prostheses are listed separately in Table HT8 and Table HT9, respectively.

Table HT4 10 Most Used Femoral Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3901	Exeter V40	7612	Exeter V40	7840	Exeter V40	8409	Exeter V40	8342	Exeter V40
1029	ABGII	4450	CORAIL	3915	CORAIL	4682	Accolade II	5079	Accolade II
1000	Synergy	3621	Accolade II	3787	Accolade II	4349	CORAIL	4059	CORAIL
819	Alloclassic	2796	Polarstem	3313	Metafix	3452	Metafix	3475	Metafix
809	VerSys	2689	Metafix	2835	Polarstem	2953	Polarstem	3398	Polarstem
780	Spectron EF	1821	Quadra-H	1565	Quadra-H	2007	Paragon	2136	Paragon
713	Secur-Fit Plus HA	1455	Paragon	1520	Paragon	1758	Quadra-C	1495	Taperloc Microplasty
618	Omnifit	1446	Quadra-C	1509	Quadra-C	1566	CPT	1334	Quadra-C
565	C-Stem	1409	CPT	1449	AMIStem H	1506	AMIStem H	1302	Short Exeter V40
485	S-Rom	1276	AMIStem H	1333	CPT	1436	Quadra-H	1239	Taperloc
10 Most Used									
10719	(10) 62.8%	28575	(10) 67.6%	29066	(10) 67.7%	32118	(10) 66.7%	31859	(10) 65.3%
Remainder									
6353	(73) 37.2%	13674	(82) 32.4%	13883	(77) 32.3%	16056	(75) 33.3%	16896	(76) 34.7%
TOTAL									
17072	(83) 100.0%	42249	(92) 100.0%	42949	(87) 100.0%	48174	(85) 100.0%	48755	(86) 100.0%

Table HT5 10 Most Used Cemented Femoral Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3901	Exeter V40	7612	Exeter V40	7840	Exeter V40	8409	Exeter V40	8342	Exeter V40
780	Spectron EF	1446	Quadra-C	1509	Quadra-C	1758	Quadra-C	1334	Quadra-C
565	C-Stem	1409	CPT	1333	CPT	1566	CPT	1302	Short Exeter V40
477	CPT	976	CPCS	922	Short Exeter V40	1204	Taper Fit	1024	CPT
445	Elite Plus	900	Short Exeter V40	901	CPCS	1160	Short Exeter V40	933	Taper Fit
358	MS 30	798	Taper Fit	853	Taper Fit	943	CPCS	786	CPCS
338	Omnifit	705	C-Stem AMT	592	Evolve	686	Evolve	746	X-Acta
321	Charnley	636	Evolve	555	C-Stem AMT	684	X-Acta	637	MS 30
245	CPCS	368	MS 30	370	MS 30	602	C-Stem AMT	579	Evolve
122	Exeter	322	X-Acta	360	X-Acta	426	MS 30	551	C-Stem AMT
10 Most Used									
7552	(10) 91.7%	15172	(10) 93.7%	15235	(10) 93.5%	17438	(10) 93.9%	16234	(10) 90.0%
Remainder									
680	(26) 8.3%	1012	(19) 6.3%	1056	(20) 6.5%	1132	(21) 6.1%	1802	(23) 10.0%
TOTAL									
8232	(36) 100.0%	16184	(29) 100.0%	16291	(30) 100.0%	18570	(31) 100.0%	18036	(33) 100.0%

Table HT6 10 Most Used Cementless Femoral Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1029	ABGII	4450	CORAIL	3874	CORAIL	4682	Accolade II	5079	Accolade II
980	Synergy	3621	Accolade II	3787	Accolade II	4268	CORAIL	3966	CORAIL
819	Alloclassic	2689	Metafix	3313	Metafix	3452	Metafix	3475	Metafix
739	VerSys	2576	Polarstem	2595	Polarstem	2572	Polarstem	2880	Polarstem
713	Secur-Fit Plus HA	1821	Quadra-H	1565	Quadra-H	2007	Paragon	2136	Paragon
485	S-Rom	1455	Paragon	1520	Paragon	1506	AMIStem H	1495	Taperloc Microplasty
482	Secur-Fit	1276	AMIStem H	1449	AMIStem H	1436	Quadra-H	1239	Taperloc
376	CORAIL	978	Taperloc Microplasty	1050	Taperloc Microplasty	1251	Taperloc Microplasty	1154	ACTIS
334	Accolade I	918	Taperloc	1000	Taperloc	1209	Taperloc	1050	AMIStem-P
334	Mallory-Head	589	Origin	850	Origin	988	ACTIS	968	Quadra-P
10 Most Used									
6291	(10) 71.2%	20373	(10) 78.2%	21003	(10) 78.8%	23371	(10) 78.9%	23442	(10) 76.3%
Remainder									
2549	(47) 28.8%	5692	(58) 21.8%	5655	(53) 21.2%	6233	(54) 21.1%	7277	(53) 23.7%
TOTAL									
8840	(57) 100.0%	26065	(68) 100.0%	26658	(63) 100.0%	29604	(64) 100.0%	30719	(63) 100.0%

Primary Total Hip Replacement

Table HT7 10 Most Used Acetabular Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3986	Trident (Shell)	9843	Trident (Shell)	9481	Trident (Shell)	9517	Trident (Shell)	8779	Trident (Shell)
1748	Reflection (Shell)	5409	Trinity	6213	Trinity	7022	Trinity	6930	Trinity
1524	Trilogy	5157	PINNACLE	4641	PINNACLE	5229	PINNACLE	5365	G7
955	Vitalock	4201	R3	4099	G7	5096	G7	4779	PINNACLE
907	Duraloc	3641	G7	3973	R3	4195	Mpact	4756	Trident II/Tritanium (Shell)
827	ABGII	3383	Mpact	3547	Mpact	4040	R3	4690	Mpact
793	Allofit	1735	Versafitcup CC	1645	Versafitcup CC	3043	Trident II/Tritanium (Shell)	4419	R3
729	Mallory-Head	1553	Trident/Tritanium (Shell)	1397	Logical G	1846	Versafitcup CC	1780	Versafitcup CC
539	Contemporary	1327	Logical G	1396	Trident/Tritanium (Shell)	1505	Logical G	1642	Logical G
537	PINNACLE	804	RM Cup	786	Trident II/Tritanium (Shell)	858	Trident/Tritanium (Shell)	598	RM Cup
10 Most Used									
12545	(10) 73.5%	37053	(10) 87.7%	37178	(10) 86.6%	42351	(10) 87.9%	43738	(10) 89.7%
Remainder									
4527	(69) 26.5%	5196	(62) 12.3%	5771	(63) 13.4%	5823	(63) 12.1%	5017	(63) 10.3%
TOTAL									
17072	(79) 100.0%	42249	(72) 100.0%	42949	(73) 100.0%	48174	(73) 100.0%	48755	(73) 100.0%

Table HT8 10 Most Used Cemented Acetabular Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
539	Contemporary	489	Exeter X3 Rimfit	427	Exeter X3 Rimfit	378	Exeter X3 Rimfit	161	Exeter
256	Exeter	57	Avantage	76	Avantage	122	Avantage	158	Exeter X3 Rimfit
251	Reflection (Cup)	50	Marathon	41	Reflection (Cup)	39	Reflection (Cup)	93	Avantage
227	Exeter Contemporary	40	Reflection (Cup)	40	Marathon	37	Marathon	46	Reflection (Cup)
199	Charnley Ogee	27	Apricot	30	Muller	27	Apricot	35	Marathon
149	Elite Plus LPW	26	Contemporary	25	Apricot	23	BI-MENTUM	30	Apricot
130	Low Profile Cup	25	Novae E	17	Exeter Contemporary	23	Exeter Contemporary	30	Polarcup
109	Elite Plus Ogee	23	Muller	16	Trident (Cup)	21	Dual Mobility Cup	18	BI-MENTUM
102	Charnley	19	Exeter Contemporary	15	Novae E	21	Exeter	13	Versacem
90	ZCA	19	ZCA	15	ZCA	20	Polarcup	11	Dual Mobility Cup
10 Most Used									
2052	(10) 85.4%	775	(10) 87.5%	702	(10) 87.1%	711	(10) 88.3%	595	(10) 87.1%
Remainder									
351	(16) 14.6%	111	(17) 12.5%	104	(18) 12.9%	94	(18) 11.7%	88	(20) 12.9%
TOTAL									
2403	(26) 100.0%	886	(27) 100.0%	806	(28) 100.0%	805	(28) 100.0%	683	(30) 100.0%

Table HT9 10 Most Used Cementless Acetabular Components in Primary Total Conventional Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3986	Trident (Shell)	9842	Trident (Shell)	9480	Trident (Shell)	9517	Trident (Shell)	8779	Trident (Shell)
1748	Reflection (Shell)	5409	Trinity	6213	Trinity	7022	Trinity	6929	Trinity
1524	Trilogy	5156	PINNACLE	4641	PINNACLE	5229	PINNACLE	5365	G7
955	Vitalock	4201	R3	4099	G7	5096	G7	4779	PINNACLE
907	Duraloc	3641	G7	3973	R3	4195	Mpact	4756	Trident II/Tritanium (Shell)
827	ABGII	3383	Mpact	3547	Mpact	4040	R3	4690	Mpact
793	Allofit	1735	Versafitcup CC	1645	Versafitcup CC	3043	Trident II/Tritanium (Shell)	4418	R3
729	Mallory-Head	1553	Trident/Tritanium (Shell)	1397	Logical G	1846	Versafitcup CC	1780	Versafitcup CC
537	PINNACLE	1327	Logical G	1396	Trident/Tritanium (Shell)	1505	Logical G	1642	Logical G
521	Fitmore	804	RM Cup	786	Trident II/Tritanium (Shell)	858	Trident/Tritanium (Shell)	598	RM Cup
10 Most Used									
12527	(10) 85.4%	37051	(10) 89.6%	37177	(10) 88.2%	42351	(10) 89.4%	43736	(10) 91.0%
Remainder									
2142	(43) 14.6%	4306	(42) 10.4%	4953	(41) 11.8%	5000	(42) 10.6%	4320	(42) 9.0%
TOTAL									
14669	(53) 100.0%	41357	(52) 100.0%	42130	(51) 100.0%	47351	(52) 100.0%	48056	(52) 100.0%

Note: In 2024, 2 shells in the cementless group were inserted with cement

OUTCOME FOR ALL DIAGNOSES

Hip replacement prosthesis use and availability change with time. In order to keep data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified. This has resulted in 146,695 (21%) hip procedures being excluded from the analysis for the 2025 Annual Report.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Osteoarthritis is the principal diagnosis for primary total conventional hip replacement, followed by fractured neck of femur, osteonecrosis, developmental dysplasia, rheumatoid arthritis, and tumour (Table HT10). Osteoarthritis has a lower rate of revision compared to fractured neck of femur, rheumatoid arthritis and osteonecrosis. Osteoarthritis also has a lower rate of revision compared to developmental dysplasia. However, this difference is only evident in the first 4 weeks and between 3 months to 2.5 years (Figure HT4).

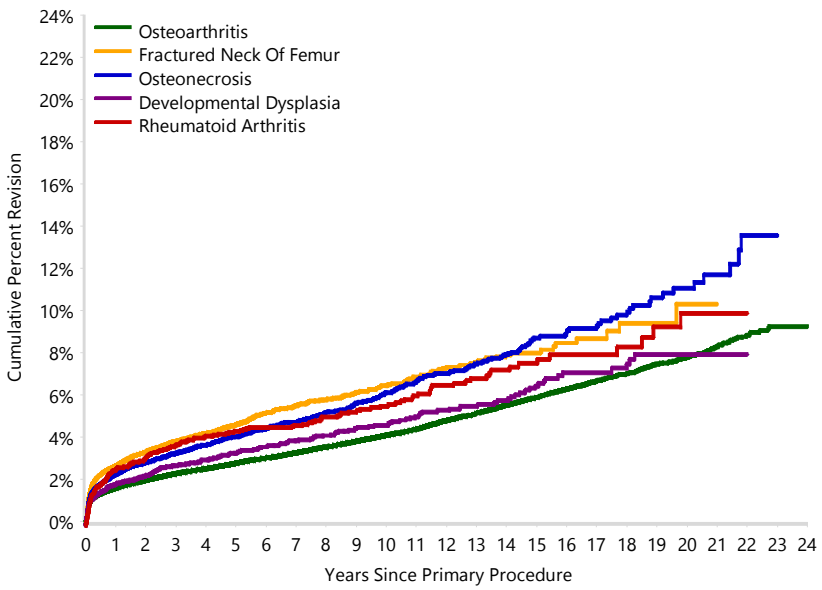
Primary Total Hip Replacement

Table HT10 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	16159	483080	1.6 (1.6, 1.6)	2.3 (2.3, 2.3)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	6.0 (5.9, 6.1)	7.9 (7.7, 8.2)
Fractured Neck of Femur	1435	31470	2.8 (2.6, 3.0)	3.9 (3.7, 4.2)	4.8 (4.5, 5.0)	6.6 (6.2, 7.0)	8.2 (7.5, 8.9)	10.5 (8.5, 12.9)
Osteonecrosis	856	17731	2.4 (2.2, 2.6)	3.4 (3.1, 3.7)	4.2 (3.9, 4.5)	6.3 (5.8, 6.8)	8.9 (8.1, 9.7)	11.2 (9.9, 12.7)
Developmental Dysplasia	305	7635	1.9 (1.6, 2.3)	2.8 (2.5, 3.3)	3.4 (3.0, 3.9)	4.7 (4.2, 5.4)	6.6 (5.7, 7.6)	8.1 (6.8, 9.6)
Rheumatoid Arthritis	210	3997	2.6 (2.2, 3.2)	3.8 (3.2, 4.4)	4.4 (3.8, 5.2)	5.7 (4.9, 6.6)	7.7 (6.5, 9.0)	10.1 (7.9, 12.7)
Tumour	148	2811	4.2 (3.5, 5.1)	6.5 (5.4, 7.8)	8.0 (6.6, 9.6)	13.3 (10.3, 17.0)	14.0 (10.8, 18.1)	
Other Inflammatory Arthritis	112	2143	2.3 (1.8, 3.1)	3.5 (2.8, 4.4)	4.2 (3.3, 5.2)	5.9 (4.8, 7.3)	8.5 (6.7, 10.7)	14.5 (10.0, 20.8)
Failed Internal Fixation	157	2128	4.8 (4.0, 5.9)	6.9 (5.8, 8.1)	8.0 (6.8, 9.4)	9.4 (7.9, 11.2)	11.5 (9.1, 14.4)	
Other (3)	86	1020	5.9 (4.5, 7.6)	7.8 (6.2, 9.8)	8.7 (6.9, 10.8)	11.3 (8.9, 14.2)	12.2 (9.4, 15.7)	
TOTAL	19468	552015						

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded. Only primary diagnoses with >2,000 procedures have been listed.

Figure HT4 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis



HR - adjusted for age and gender

Fractured Neck Of Femur vs Osteoarthritis

Entire Period: HR=1.71 (95% CI 1.62, 1.81), p<0.001

Osteonecrosis vs Osteoarthritis

Entire Period: HR=1.44 (95% CI 1.34, 1.54), p<0.001

Developmental Dysplasia vs Osteoarthritis

0 - 1Mth: HR=1.35 (95% CI 1.06, 1.71), p=0.014

1Mth - 3Mth: HR=0.74 (95% CI 0.51, 1.09), p=0.126

3Mth - 2.5Yr: HR=1.33 (95% CI 1.09, 1.63), p=0.005

2.5Yr+: HR=0.98 (95% CI 0.81, 1.18), p=0.809

Rheumatoid Arthritis vs Osteoarthritis

Entire Period: HR=1.41 (95% CI 1.23, 1.62), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	483080	429889	341258	264792	110429	34148	6519
Fractured Neck of Femur	31470	25985	18538	12519	3560	705	86
Osteonecrosis	17731	15394	11950	8925	3727	1269	328
Developmental Dysplasia	7635	6723	5272	4165	1956	830	248
Rheumatoid Arthritis	3997	3607	2976	2411	1242	498	128

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded. Only primary diagnoses with >3,000 procedures have been listed.

Prosthesis Types

There are 1,544 different stem and acetabular combinations for primary total conventional hip replacement. This is an increase of 80 prosthesis combinations since the previous report.

The cumulative percent revision of the 107 prosthesis combinations with ≥500 procedures are listed in Table HT11 to Table HT13. Although the listed combinations are a small proportion of the possible combinations, they represent 93.1% of all primary total conventional hip replacement procedures. A large number of prosthesis combinations have been used in small numbers. The 'Other' group consists of all prosthesis combinations with <500 procedures. This group accounts for 6.9% of all primary total conventional hip replacement procedures.

There are 9 cemented primary total conventional stem and acetabular combinations with ≥500 procedures. The CPT/ZCA has the lowest 15 year cumulative percent revision of 7.1% (n=1,071) (Table HT11).

There are 62 cementless primary total conventional stem and acetabular combinations with ≥500 procedures listed. The Secur-Fit Plus/Trident (Shell) has the lowest 15 year cumulative percent revision of 4.0% (n=3,163) (Table HT12).

There are 36 combinations of primary total hip replacement with hybrid fixation with ≥500 procedures listed. The Exeter V40 /Trilogy has the lowest cumulative percent revision at 15 years of 3.8% (n=606) followed by the Exeter V40 /PINNACLE with a cumulative percent revision of 4.3% (n=2,924) (Table HT13).

Table HT11 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cemented Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
C-Stem AMT	Marathon	20	686	1.8 (1.0, 3.2)	2.4 (1.4, 3.9)	2.8 (1.7, 4.4)	3.6 (2.3, 5.6)		
CPCS	Reflection (Cup)	111	1186	2.1 (1.4, 3.1)	3.1 (2.2, 4.3)	3.9 (2.9, 5.3)	8.3 (6.5, 10.5)	17.1 (13.9, 21.0)	26.2 (20.9, 32.6)
CPT	ZCA	58	1071	1.1 (0.6, 2.0)	2.5 (1.7, 3.6)	3.0 (2.1, 4.3)	4.9 (3.6, 6.6)	7.1 (5.2, 9.7)	11.0 (7.8, 15.4)
Exeter V40	Exeter	162	1868	0.8 (0.5, 1.4)	1.9 (1.3, 2.7)	3.1 (2.4, 4.1)	5.0 (4.0, 6.3)	10.1 (8.5, 12.0)	16.0 (13.6, 18.9)
	Exeter Contemporary	220	3488	1.4 (1.1, 1.9)	2.3 (1.9, 2.9)	3.1 (2.6, 3.8)	4.7 (4.0, 5.5)	8.1 (7.0, 9.3)	11.6 (9.7, 13.9)
	Exeter X3 Rimfit	188	6055	1.6 (1.3, 2.0)	2.4 (2.1, 2.9)	2.9 (2.5, 3.4)	3.8 (3.2, 4.4)		
MS 30	Low Profile Cup	23	500	1.0 (0.4, 2.4)	1.0 (0.4, 2.4)	1.5 (0.7, 3.2)	3.1 (1.8, 5.6)	8.4 (5.1, 13.5)	
Short Exeter V40	Exeter X3 Rimfit	17	583	1.6 (0.8, 3.0)	2.6 (1.5, 4.3)	3.1 (1.9, 5.0)			
Spectron EF	Reflection (Cup)	142	1672	1.1 (0.7, 1.7)	1.8 (1.3, 2.6)	2.9 (2.1, 3.8)	7.2 (5.9, 8.8)	12.7 (10.7, 15.1)	16.1 (13.3, 19.4)
Other (279)		279	4865	3.6 (3.1, 4.2)	5.0 (4.3, 5.7)	5.9 (5.2, 6.7)	8.4 (7.3, 9.6)	10.9 (9.1, 13.0)	
TOTAL		1220	21974						

Note: Restricted to modern prostheses
Some cementless components have been cemented
Procedures using metal/metal prostheses have been included
Only prostheses with ≥500 procedures have been listed

Table HT12 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cementless Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACTIS	PINNACLE	40	2314	1.7 (1.2, 2.3)	2.1 (1.5, 2.8)				
AMIStem H	Mpact	118	4895	1.5 (1.2, 1.9)	2.3 (1.9, 2.8)	3.0 (2.5, 3.7)			
	Versafitcup CC	116	4264	1.3 (1.0, 1.7)	1.8 (1.5, 2.3)	2.7 (2.2, 3.2)			
AMIStem-P	Mpact	8	875	1.1 (0.5, 2.1)					
Accolade II	Trident (Shell)	523	19963	1.8 (1.7, 2.0)	2.5 (2.3, 2.8)	2.9 (2.7, 3.2)	4.1 (3.5, 4.8)		
	Trident II/Tritanium (Shell)	72	4166	1.8 (1.4, 2.3)					
	Trident/Tritanium (Shell)	163	4359	2.3 (1.9, 2.8)	3.4 (2.9, 4.0)	3.9 (3.3, 4.6)			
Anthology	R3	320	9090	2.1 (1.8, 2.4)	2.7 (2.4, 3.0)	3.0 (2.7, 3.4)	3.8 (3.4, 4.2)	4.5 (4.0, 5.1)	
	Reflection (Shell)*	32	907	1.9 (1.2, 3.0)	2.2 (1.4, 3.4)	2.6 (1.7, 3.8)	3.4 (2.3, 4.8)	3.7 (2.6, 5.3)	
Avenir	Continuum	66	1461	3.1 (2.3, 4.1)	3.5 (2.7, 4.6)	4.1 (3.2, 5.3)	5.2 (4.0, 6.7)		
	G7	27	1113	2.1 (1.4, 3.2)	2.6 (1.7, 4.0)	3.3 (2.2, 5.2)			
	Trilogy*	16	626	1.0 (0.4, 2.1)	1.1 (0.5, 2.3)	1.3 (0.6, 2.6)	2.7 (1.6, 4.5)		
C2	Delta-TT	35	1378	1.3 (0.8, 2.0)	1.9 (1.3, 2.9)	2.3 (1.6, 3.3)	3.0 (2.1, 4.3)		
CLS	Allofit*	34	501	1.8 (0.9, 3.4)	3.4 (2.1, 5.5)	4.0 (2.6, 6.2)	5.4 (3.7, 7.8)	7.9 (5.6, 11.1)	7.9 (5.6, 11.1)
	Fitmore	26	724	1.2 (0.6, 2.4)	2.6 (1.6, 4.1)	3.0 (1.9, 4.6)	4.2 (2.8, 6.4)	4.2 (2.8, 6.4)	
CORAIL	BI-MENTUM	10	602	1.2 (0.6, 2.5)	2.1 (1.1, 3.9)				
	Fitmore*	16	514	2.1 (1.2, 3.8)	2.3 (1.3, 4.1)	2.3 (1.3, 4.1)	3.3 (2.0, 5.5)		
	G7	13	791	1.0 (0.5, 2.1)	1.6 (0.9, 2.9)	2.5 (1.2, 5.3)			
	PINNACLE	2811	69169	1.7 (1.6, 1.8)	2.5 (2.4, 2.7)	3.1 (3.0, 3.2)	4.7 (4.5, 4.9)	7.1 (6.8, 7.5)	8.7 (7.6, 10.0)
	PINNACLE*[MoM]	156	966	2.2 (1.4, 3.3)	3.7 (2.6, 5.1)	5.9 (4.6, 7.6)	12.3 (10.3, 14.7)	18.0 (15.5, 20.8)	
	Trident (Shell)	29	734	2.5 (1.6, 3.9)	3.5 (2.4, 5.2)	4.1 (2.8, 6.0)	6.1 (3.9, 9.6)		
	Trinity	24	1628	1.3 (0.9, 2.1)	1.5 (1.0, 2.2)	1.5 (1.0, 2.2)			
EVOK	Austral	22	668	2.6 (1.7, 4.2)	5.2 (3.2, 8.6)	5.2 (3.2, 8.6)			
	Logical G	38	952	2.8 (1.9, 4.1)	4.2 (3.0, 5.8)	4.7 (3.4, 6.5)			
H-Max	Delta-TT	91	1843	1.9 (1.4, 2.6)	3.3 (2.6, 4.3)	4.0 (3.2, 5.0)	6.3 (5.1, 7.9)		
HACTIV	Logical G	79	1382	3.8 (2.9, 4.9)	4.9 (3.9, 6.2)	5.3 (4.3, 6.7)			
	Saturne	25	1151	1.4 (0.8, 2.2)	2.1 (1.4, 3.3)	2.3 (1.5, 3.5)			
M/L Taper	Allofit*	27	752	1.6 (0.9, 2.8)	1.9 (1.1, 3.2)	2.2 (1.3, 3.5)	3.3 (2.2, 5.1)	5.9 (3.7, 9.2)	
	Continuum*	60	1423	2.3 (1.6, 3.2)	3.3 (2.5, 4.3)	3.7 (2.8, 4.8)	4.5 (3.5, 5.8)		
	Trilogy	38	924	1.3 (0.7, 2.3)	1.6 (1.0, 2.7)	2.7 (1.8, 4.0)	3.7 (2.6, 5.2)	4.7 (3.3, 6.6)	
MasterLoc	Mpact	22	1572	1.3 (0.8, 2.0)	1.4 (0.9, 2.1)	1.6 (1.0, 2.4)			
	Versafitcup CC	19	1161	1.2 (0.7, 2.1)	1.9 (1.2, 3.0)	1.9 (1.2, 3.0)			
Metafix	Trinity	503	23275	1.5 (1.3, 1.6)	2.2 (2.0, 2.4)	2.4 (2.2, 2.7)	3.2 (2.8, 3.7)		
MiniHip	Trinity	44	1345	2.5 (1.8, 3.5)	3.1 (2.3, 4.1)	3.2 (2.4, 4.4)	3.5 (2.6, 4.7)		
Nanos	R3	13	674	1.2 (0.6, 2.4)	1.5 (0.8, 2.8)	1.5 (0.8, 2.8)	1.8 (1.0, 3.2)		
Optimys	RM Cup	73	3160	1.7 (1.3, 2.3)	2.3 (1.8, 2.9)	2.6 (2.1, 3.3)	2.8 (2.2, 3.7)		
Origin	Logical G	163	4742	2.3 (1.9, 2.8)	3.2 (2.7, 3.8)	3.8 (3.2, 4.5)	5.9 (4.6, 7.7)		
Paragon	Acetabular Shell (Global)	17	693	1.9 (1.1, 3.2)	2.3 (1.4, 3.7)	2.6 (1.6, 4.2)			

Table HT12 ***Continued***

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
	Trinity	99	6010	1.5 (1.3, 1.9)	1.9 (1.5, 2.3)				
Polarstem	EP-Fit Plus	14	2804	0.2 (0.1, 0.4)	0.4 (0.2, 0.7)	0.5 (0.3, 0.8)	0.7 (0.4, 1.2)		
	Polarcup	12	631	1.1 (0.5, 2.4)	1.5 (0.8, 2.9)	2.1 (1.1, 3.9)			
	R3	661	22548	2.0 (1.8, 2.2)	2.6 (2.4, 2.8)	3.0 (2.7, 3.2)	4.0 (3.7, 4.4)	4.8 (4.1, 5.5)	
Profemur L	Procotyl L	25	1812	1.0 (0.6, 1.6)	1.2 (0.8, 1.9)	1.9 (1.2, 3.2)			
Quadra-H	Mpact	275	6798	2.0 (1.7, 2.4)	3.0 (2.6, 3.4)	4.0 (3.5, 4.6)	6.5 (5.2, 8.2)		
	Trident (Shell)*	27	712	1.5 (0.9, 2.8)	2.7 (1.7, 4.2)	3.1 (2.1, 4.7)			
	Versafitcup CC	450	11728	1.8 (1.6, 2.0)	2.5 (2.2, 2.8)	3.0 (2.7, 3.4)	4.9 (4.4, 5.4)	7.7 (6.4, 9.3)	
	Versafitcup DM	53	1286	2.7 (1.9, 3.7)	4.0 (3.0, 5.2)	4.4 (3.3, 5.8)			
Quadra-P	Mpact	21	1300	1.6 (1.0, 2.6)	2.0 (1.3, 3.2)				
S-Rom	PINNACLE	253	3867	2.5 (2.0, 3.0)	4.0 (3.5, 4.7)	4.8 (4.2, 5.5)	6.2 (5.5, 7.1)	7.4 (6.5, 8.4)	9.3 (7.6, 11.4)
SL-Plus	EP-Fit Plus	50	1229	1.5 (1.0, 2.4)	2.1 (1.4, 3.0)	2.7 (1.9, 3.7)	3.7 (2.8, 5.0)	4.3 (3.3, 5.7)	
	R3	121	1850	2.5 (1.9, 3.3)	3.9 (3.1, 4.9)	4.3 (3.5, 5.3)	6.3 (5.2, 7.6)	8.1 (6.7, 9.8)	
Secur-Fit	Trident (Shell)	602	10687	1.9 (1.7, 2.2)	3.0 (2.6, 3.3)	3.7 (3.3, 4.1)	4.9 (4.5, 5.3)	6.5 (6.0, 7.1)	8.2 (7.4, 9.1)
Secur-Fit Plus	Trident (Shell)	98	3163	1.3 (0.9, 1.7)	1.8 (1.4, 2.3)	2.3 (1.8, 2.9)	3.1 (2.5, 3.8)	4.0 (3.2, 4.9)	
Synergy	R3	226	5881	1.9 (1.6, 2.3)	2.5 (2.1, 2.9)	2.9 (2.5, 3.4)	3.8 (3.3, 4.4)	5.2 (4.5, 6.0)	
	Reflection (Shell)*	463	7910	1.5 (1.3, 1.8)	2.3 (2.0, 2.7)	2.7 (2.4, 3.1)	3.9 (3.5, 4.4)	5.6 (5.1, 6.2)	7.7 (7.0, 8.5)
Taperloc	Continuum	17	711	1.5 (0.9, 2.8)	2.3 (1.4, 3.7)	2.4 (1.5, 3.9)			
	G7	184	7241	2.1 (1.8, 2.4)	2.6 (2.2, 3.0)	2.8 (2.4, 3.3)	3.1 (2.7, 3.7)		
Taperloc Microplasty	Continuum*	21	633	2.7 (1.7, 4.3)	3.0 (1.9, 4.7)	3.2 (2.1, 5.0)			
	G7	105	6598	1.3 (1.1, 1.6)	1.7 (1.4, 2.1)	1.8 (1.5, 2.2)	2.6 (1.6, 4.2)		
Tri-Fit TS	Trinity	146	5295	1.4 (1.1, 1.7)	2.2 (1.9, 2.7)	2.6 (2.2, 3.1)	3.3 (2.7, 3.9)		
VerSys	Trilogy*	286	4497	2.6 (2.2, 3.1)	3.4 (2.9, 4.0)	4.0 (3.5, 4.7)	5.4 (4.7, 6.1)	6.4 (5.7, 7.2)	7.5 (6.7, 8.5)
twinSys (class)	RM Cup	67	1613	2.4 (1.7, 3.2)	3.1 (2.3, 4.0)	3.5 (2.7, 4.5)	5.1 (3.9, 6.7)		
Other (602)		850	21214	2.4 (2.2, 2.6)	3.4 (3.1, 3.6)	3.8 (3.6, 4.1)	5.3 (4.9, 5.7)	6.9 (6.3, 7.6)	8.4 (7.3, 9.7)
TOTAL		**11015**	**314775**						

Note: Restricted to modern prostheses. Procedures using metal/metal prostheses have been included.

^{MoM} denotes metal/metal prostheses with head size >32mm.

* Indicates a prosthesis combination with no reported use in primary total conventional hip procedures in 2024, while at least one component continues to be used.

Only prostheses with ≥500 procedures have been listed.

Table HT13 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Hybrid Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AMIStem C	Mpact	7	696	1.1 (0.5, 2.8)					
C-Stem AMT	PINNACLE	242	7175	1.6 (1.3, 1.9)	2.5 (2.1, 2.9)	3.3 (2.9, 3.8)	4.8 (4.1, 5.6)	7.0 (5.0, 9.7)	
CPCS	R3	399	10220	2.3 (2.0, 2.6)	3.0 (2.7, 3.4)	3.7 (3.3, 4.1)	5.2 (4.7, 5.8)	6.0 (5.2, 6.8)	
	Reflection (Shell)	138	3219	0.9 (0.6, 1.3)	1.3 (0.9, 1.7)	1.7 (1.3, 2.2)	3.5 (2.8, 4.3)	5.7 (4.7, 6.9)	8.8 (7.0, 11.1)
CPT	Allofit	77	1930	1.5 (1.0, 2.1)	2.1 (1.6, 2.9)	3.4 (2.6, 4.4)	5.0 (3.9, 6.3)	6.2 (4.6, 8.4)	
	Continuum	185	3135	3.1 (2.5, 3.7)	4.1 (3.5, 4.9)	4.9 (4.2, 5.7)	6.6 (5.7, 7.6)		
	G7	170	5283	2.4 (2.0, 2.9)	3.5 (3.0, 4.1)	4.2 (3.5, 4.9)			
	Trabecular Metal (Shell)	151	2580	2.4 (1.9, 3.1)	3.5 (2.8, 4.3)	4.4 (3.6, 5.3)	6.6 (5.6, 7.8)	8.7 (7.2, 10.6)	
	Trilogy	513	8996	1.9 (1.7, 2.3)	2.9 (2.5, 3.2)	3.7 (3.4, 4.2)	5.7 (5.2, 6.3)	7.3 (6.7, 8.1)	8.5 (7.5, 9.5)
Evolve	Agilis	5	591	0.6 (0.2, 1.7)	1.2 (0.5, 3.0)				
	Logical G	86	3092	1.9 (1.5, 2.4)	2.5 (2.0, 3.1)	3.0 (2.4, 3.7)	3.6 (2.9, 4.6)		
Exeter V40	Fixa	44	931	2.9 (2.0, 4.2)	3.5 (2.5, 4.9)	3.8 (2.7, 5.3)	5.1 (3.8, 7.0)		
	G7	22	523	2.9 (1.8, 4.8)	4.0 (2.6, 6.3)	5.9 (3.6, 9.7)			
	PINNACLE	85	2924	1.4 (1.0, 1.9)	2.0 (1.5, 2.6)	2.3 (1.8, 3.0)	3.7 (2.9, 4.7)	4.3 (3.3, 5.5)	
	R3	119	2904	2.1 (1.6, 2.7)	2.9 (2.4, 3.6)	3.7 (3.1, 4.5)	4.4 (3.6, 5.3)	5.7 (4.5, 7.2)	
	Trabecular Metal (Shell)	32	635	2.7 (1.7, 4.3)	3.2 (2.1, 5.0)	4.1 (2.7, 6.0)	5.6 (3.9, 8.0)	6.4 (4.5, 9.2)	
	Trident (Shell)	3174	97795	1.3 (1.3, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.8 (3.7, 4.0)	5.3 (5.1, 5.6)	6.7 (6.3, 7.1)
	Trident II (Shell)	15	1259	1.3 (0.7, 2.1)	1.5 (0.9, 2.6)				
	Trident II/Tritanium (Shell)	59	3366	2.0 (1.5, 2.6)					
	Trident/Tritanium (Shell)	272	7024	1.9 (1.6, 2.3)	2.9 (2.5, 3.3)	3.6 (3.2, 4.1)	4.9 (4.3, 5.6)		
	Trilogy*	20	606	1.7 (0.9, 3.1)	2.4 (1.4, 4.0)	2.6 (1.5, 4.2)	3.5 (2.2, 5.4)	3.8 (2.4, 5.9)	3.8 (2.4, 5.9)
MS 30	Allofit*	54	1337	1.1 (0.6, 1.8)	1.6 (1.0, 2.4)	2.2 (1.5, 3.1)	3.6 (2.7, 4.9)	5.5 (4.1, 7.4)	5.9 (4.4, 7.9)
	Continuum	21	980	1.6 (1.0, 2.7)	2.0 (1.3, 3.1)	2.1 (1.4, 3.3)	2.3 (1.5, 3.5)		
	Fitmore	27	724	1.4 (0.8, 2.6)	2.2 (1.3, 3.5)	3.1 (2.0, 4.9)	4.4 (3.0, 6.6)	5.9 (3.7, 9.3)	
	G7	40	1979	1.5 (1.0, 2.2)	2.2 (1.5, 3.1)	2.7 (1.9, 3.8)			
Polarstem	R3	23	1295	1.5 (1.0, 2.4)	2.5 (1.6, 3.9)				
Quadra-C	Mpact	123	7005	1.2 (0.9, 1.5)	1.8 (1.5, 2.1)	2.0 (1.7, 2.4)			
	Versafitcup CC	45	2461	1.3 (0.9, 1.9)	1.6 (1.2, 2.2)	1.9 (1.4, 2.7)	2.6 (1.8, 3.7)		
Short Exeter V40	Trident (Shell)	124	5590	1.4 (1.1, 1.7)	2.0 (1.7, 2.5)	2.6 (2.2, 3.2)			
	Trident II/Tritanium (Shell)	12	716	2.1 (1.2, 3.8)					
Spectron EF	R3	118	2449	1.8 (1.3, 2.4)	2.9 (2.3, 3.7)	3.7 (3.0, 4.6)	5.3 (4.4, 6.5)	7.0 (5.7, 8.6)	
	Reflection (Shell)*	380	5205	1.1 (0.9, 1.5)	2.0 (1.6, 2.4)	2.8 (2.4, 3.3)	5.5 (4.8, 6.2)	9.1 (8.2, 10.1)	12.2 (10.8, 13.6)
Taper Fit	Trinity	153	6442	1.6 (1.4, 2.0)	2.3 (2.0, 2.8)	2.8 (2.4, 3.4)	4.1 (3.0, 5.7)		
X-Acta	Mpact	27	1873	1.2 (0.8, 1.8)	1.8 (1.2, 2.7)	1.9 (1.3, 2.9)			
	Versafitcup CC	16	961	1.2 (0.7, 2.1)	1.3 (0.8, 2.3)	1.7 (1.0, 2.9)			
twinSys (ctd)	RM Cup	24	801	2.2 (1.3, 3.4)	2.9 (1.9, 4.3)	3.5 (2.3, 5.3)			
Other (556)		448	12011	2.2 (1.9, 2.4)	3.1 (2.8, 3.5)	3.8 (3.4, 4.2)	5.5 (4.9, 6.2)	7.9 (6.7, 9.2)	11.8 (9.1, 15.1)
TOTAL		7450	216713						

Note: Restricted to modern prostheses. Procedures using metal/metal prostheses have been included. MoM denotes metal/metal prostheses with head size >32mm
* Indicates a prosthesis combination with no reported use in primary total conventional hip procedures in 2024, while at least one component continues to be used. Only prostheses with ≥500 procedures have been listed.

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

The 20-year cumulative percent revision of primary total conventional hip replacement undertaken for osteoarthritis is 7.9% (Table HT14 and Figure HT5).

Reason for Revision

Dislocation and instability are combined together for the analyses as they both reflect a similar reason for revision. Periprosthetic joint infection is the most common reason for revision of primary total conventional hip replacement followed by fracture, dislocation/instability, and loosening (Table HT15).

The most common reasons for revision vary with time. In the first 11 years, infection and dislocation/instability are the most frequent reasons for revision. After 11 years, loosening and fracture are the predominant reasons for revision (Figure HT6).

The aetiology of loosening changes with time. Loosening reported in the first few years most likely reflects failure to gain fixation. Loosening reported in later years is often due to loss of fixation secondary to lysis and bone resorption.

Loosening and lysis are reported separately. The diagnosis of loosening is used when loosening is reported either alone or in combination with lysis. The diagnosis of lysis is used for procedures that report only this diagnosis.

Type of Revision

The five most common types of revision are femoral component, head and insert, acetabular component, total hip replacement (femoral/acetabular), and head only (Table HT16).

Age and Gender

There is a difference in the rate of revision with respect to age and this varies with time. Compared to all other age groups patients aged ≥75 years have a brief early period of a higher rate of revision, however this reverses and after 3 months they have a lower rate of revision when compared to patients aged <55 years, and also after 9 months when compared to patients 55-64 years. There is also a lower rate of revision compared to patients 65-74 years but only between 9 months and 1.5 years and then from 7.5 years onwards (Table HT17 and Figure HT7).

Compared to males, females have a higher rate of revision in the first 2 weeks. From 2 weeks to 3 months and 6 months onwards, females have a lower rate of revision. The cumulative percent revision at 20 years is 8.7% for males and 7.4% for females (Table HT18 and Figure HT8).

There is a difference in the rate of revision between age groups within gender. Males aged ≥75 years have a higher rate of revision when compared to those aged 55–64 years and aged 65–74 years, but when compared to those aged <55 years, the higher rate of revision is only for the period between 2 weeks and 3 months (Table HT18 and Figure HT9).

Females aged ≥75 years compared to all other age groups have a brief early period of a higher rate of revision but then have a lower rate of revision after 3 months compared to those aged <55 years, and after 6 months for those aged 55-64 and 65-74 years (Table HT18 and Figure HT10).

For both males and females <65 years of age, loosening is the most common reason for revision. For patients aged ≥65 years, the most common reason for revision is fracture (Figure HT11 and Figure HT12).

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. The definitions for these scores can be found in the introductory portion of this chapter. There are 363,901 primary total conventional hip replacement procedures for osteoarthritis with these scores.

The majority of patients have an ASA score of 2 or 3. There has been an increase in patients with an ASA score of 3 (Figure HT13). When compared to patients with an ASA score of 1, patients in all other ASA groups have a higher rate of revision (Table HT19 and Figure HT14). The difference in revision rate for each ASA score is partially due to an increase in revision for infection with increasing ASA score (Figure HT15).

When analysed by ASA score and gender, both males and females have similar rates of revision if they have no or little comorbidity (ASA score 1 or 2), and both genders have lower rates of revision when patients in these groups are compared to those with significant comorbidity (ASA scores 3-5). Males with ASA scores 3-5 have a higher rate of revision than females with similar scores after 6 months (Table HT20 and Figure HT16).

Patients with ASA scores 1 or 2 have lower rates of revision than those with scores 3-5 for regardless of age. Patients with ASA scores 1 or 2 aged <65 years have a lower rate of revision than those with the same ASA scores aged ≥65 years, while revision rates for those with ASA scores 3-5 varies little by age group (Table HT17 and Figure HT23).

BMI data have been collected since 2015. There are 320 primary total conventional hip replacement procedures for osteoarthritis with BMI data. Over 80% of patients are in the normal, pre-obese or obese class 1 category, and there has been little change in BMI over time (Figure HT18).

When compared to patients in the normal BMI category, there is no difference in the rate of revision for patients who are underweight or pre-obese. The rate of revision is increased for obese class 1, obese class 2 and obese class 3 compared to normal body weight (Table HT22 and Figure HT19).

The most common reasons for revision are shown in Figure HT18. There is an increasing rate of revision for infection with increasing obesity class. At 3 years, the cumulative incidence of revision for infection is 0.8% for obese class 1, 1.5% for obese class 2, and 2.3% for obese class 3.

Primary Total Hip Replacement

The cumulative incidence of revision for infection for patients in obese class 3 is over 5-fold compared to patients with a normal BMI (Figure HT20).

An analysis of patient BMI dichotomised into 'not obese' (BMI <30) and 'obese' (BMI ≥30) with gender has been conducted. Obese females have a higher rate of revision than females classed as not obese while obese males have a higher revision rate compared to not obese males only for the first 1.5 years.

There is no difference in rate of revision for obese patients regarding gender. When the not obese groups are compared, males have a higher rate of revision than females (Table HT23 and Figure HT21).

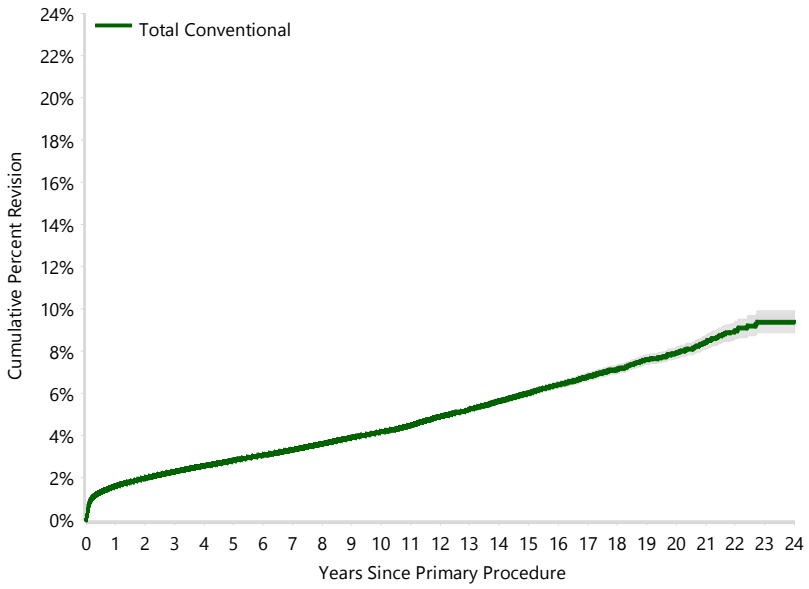
Patients who are not obese have a lower rate of revision than obese patients for both age groups (<65 years and ≥65 years) (Table HT24 and Figure HT22).

Table HT14 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)

Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	16159	483080	1.6 (1.6, 1.6)	2.3 (2.3, 2.3)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	6.0 (5.9, 6.1)	7.9 (7.7, 8.2)
TOTAL	**16159**	**483080**						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT5 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	483080	429889	341258	264792	110429	34148	6519

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT15 Primary Total Conventional Hip Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Infection	3997	24.7
Fracture	3622	22.4
Prosthesis Dislocation/Instability	3441	21.3
Loosening	3147	19.5
Pain	287	1.8
Leg Length Discrepancy	261	1.6
Malposition	242	1.5
Lysis	189	1.2
Implant Breakage Stem	172	1.1
Implant Breakage Acetabular Insert	112	0.7
Wear Acetabular Insert	95	0.6
Incorrect Sizing	86	0.5
Metal Related Pathology	78	0.5
Implant Breakage Acetabular	52	0.3
Implant Breakage Head	27	0.2
Other	351	2.2
TOTAL	16159	100.0

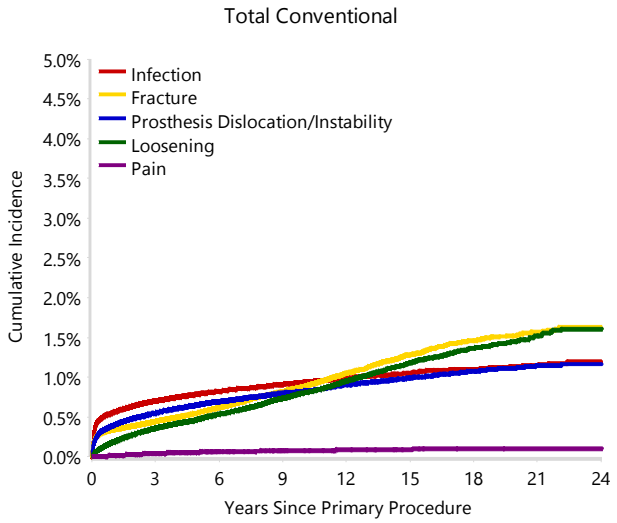
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT16 Primary Total Conventional Hip Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Femoral Component	5515	34.1
Head/Insert	4241	26.2
Acetabular Component	2780	17.2
THR (Femoral/Acetabular)	1826	11.3
Head Only	781	4.8
Cement Spacer	512	3.2
Minor Components	258	1.6
Insert Only	139	0.9
Removal of Prostheses	68	0.4
Reinsertion of Components	22	0.1
Bipolar Head and Femoral	7	0.0
Total Femoral	7	0.0
Cement Only	1	0.0
Head/Neck	1	0.0
Bipolar Only	1	0.0
TOTAL	16159	100.0

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Femoral heads are usually replaced when the acetabular component or femoral stem is revised

Figure HT6 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

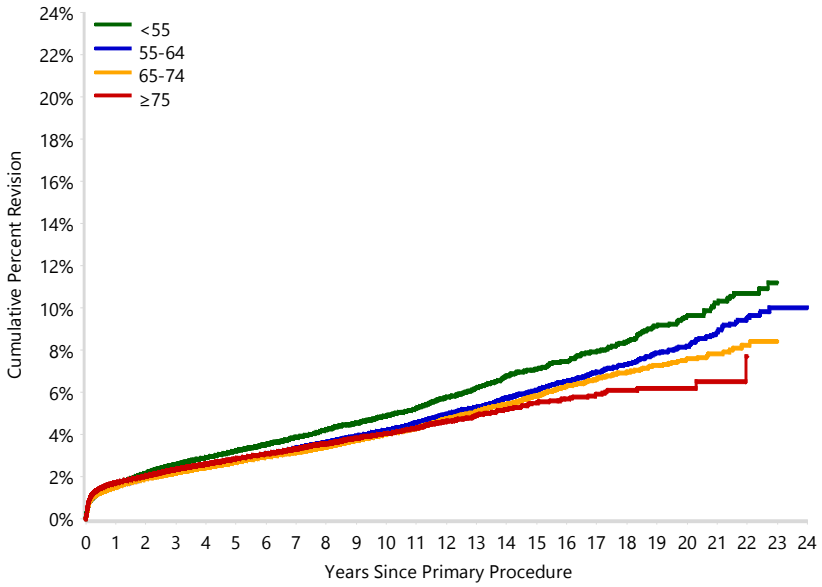
Primary Total Hip Replacement

Table HT17 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	2051	49937	1.6 (1.5, 1.8)	2.6 (2.4, 2.7)	3.2 (3.1, 3.4)	4.9 (4.6, 5.1)	7.1 (6.7, 7.5)	9.6 (8.9, 10.4)
55-64	4038	113266	1.6 (1.5, 1.6)	2.3 (2.2, 2.4)	2.8 (2.7, 2.9)	4.2 (4.1, 4.4)	6.1 (5.9, 6.4)	8.2 (7.7, 8.6)
65-74	5661	173242	1.5 (1.5, 1.6)	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	4.0 (3.9, 4.1)	5.8 (5.6, 6.0)	7.6 (7.2, 8.0)
≥75	4409	146635	1.7 (1.6, 1.8)	2.4 (2.3, 2.4)	2.9 (2.8, 2.9)	4.1 (3.9, 4.2)	5.5 (5.2, 5.8)	6.2 (5.8, 6.7)
TOTAL	16159	483080						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT7 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)



HR - adjusted for gender

<55 vs ≥75

0 - 2Wk: HR=1.10 (95% CI 0.92, 1.32), p=0.273
2Wk - 3Mth: HR=0.76 (95% CI 0.68, 0.85), p<0.001
3Mth+: HR=1.36 (95% CI 1.28, 1.45), p<0.001

55-64 vs ≥75

0 - 2Wk: HR=0.87 (95% CI 0.76, 1.01), p=0.063
2Wk - 1Mth: HR=0.76 (95% CI 0.67, 0.85), p<0.001
1Mth - 3Mth: HR=0.96 (95% CI 0.86, 1.07), p=0.452
3Mth - 9Mth: HR=0.97 (95% CI 0.86, 1.09), p=0.623
9Mth+: HR=1.14 (95% CI 1.07, 1.21), p<0.001

65-74 vs ≥75

0 - 1Mth: HR=0.81 (95% CI 0.75, 0.89), p<0.001
1Mth - 9Mth: HR=0.92 (95% CI 0.86, 0.99), p=0.032
9Mth - 1.5Yr: HR=1.19 (95% CI 1.07, 1.33), p=0.002
1.5Yr - 2Yr: HR=1.00 (95% CI 0.86, 1.17), p=0.998
2Yr - 7.5Yr: HR=1.00 (95% CI 0.94, 1.08), p=0.894
7.5Yr+: HR=1.13 (95% CI 1.04, 1.23), p=0.005

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	49937	44814	36242	29047	13346	4699	1366
55-64	113266	101738	82308	65566	30603	11176	2518
65-74	173242	154742	124150	97410	42397	13636	2281
≥75	146635	128595	98558	72769	24083	4637	354

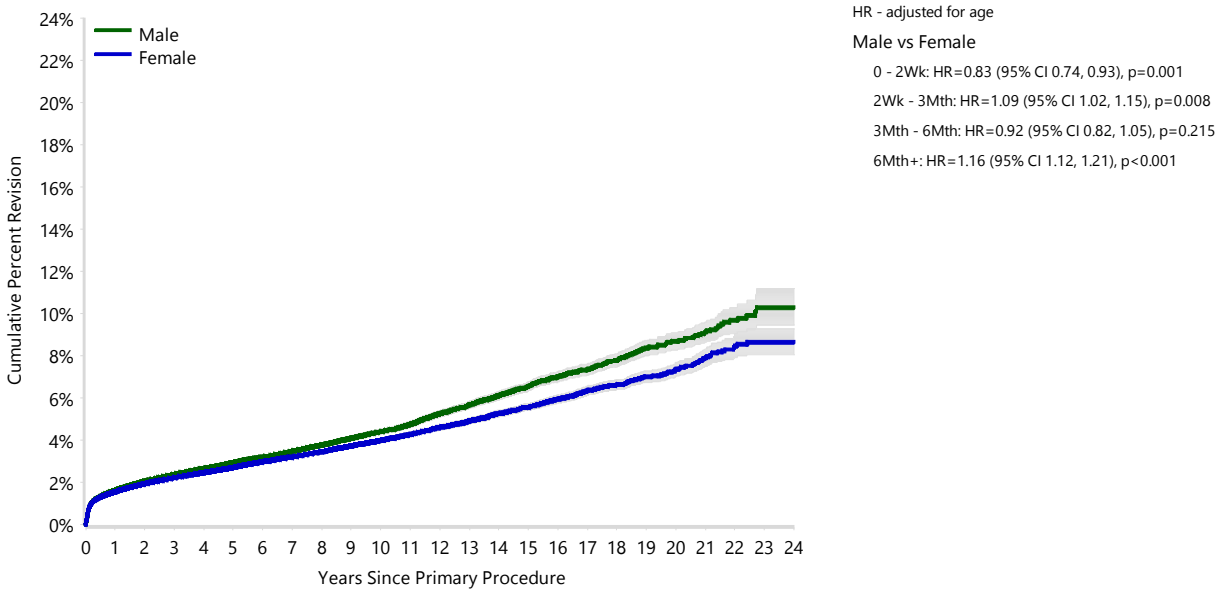
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT18 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**7703**	**220749**	**1.6 (1.6, 1.7)**	**2.4 (2.3, 2.5)**	**2.9 (2.9, 3.0)**	**4.4 (4.3, 4.5)**	**6.6 (6.4, 6.8)**	**8.7 (8.3, 9.1)**
	<55	1083	28069	1.5 (1.4, 1.7)	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	4.6 (4.3, 4.9)	6.9 (6.4, 7.5)	9.7 (8.7, 10.8)
	55-64	2043	57398	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.8 (2.6, 2.9)	4.2 (4.0, 4.4)	6.5 (6.1, 6.9)	8.5 (7.9, 9.2)
	65-74	2633	77303	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.8 (2.7, 2.9)	4.3 (4.1, 4.4)	6.2 (5.9, 6.6)	8.2 (7.6, 8.9)
	≥75	1944	57979	1.8 (1.7, 2.0)	2.6 (2.5, 2.8)	3.2 (3.1, 3.4)	4.7 (4.5, 5.0)	6.9 (6.4, 7.5)	7.9 (6.9, 9.1)
Female		**8456**	**262331**	**1.6 (1.5, 1.6)**	**2.2 (2.2, 2.3)**	**2.7 (2.6, 2.8)**	**4.0 (3.9, 4.1)**	**5.6 (5.4, 5.7)**	**7.4 (7.0, 7.7)**
	<55	968	21868	1.8 (1.6, 2.0)	2.8 (2.6, 3.0)	3.5 (3.2, 3.8)	5.3 (4.9, 5.7)	7.3 (6.8, 7.9)	9.7 (8.7, 10.7)
	55-64	1995	55868	1.5 (1.4, 1.7)	2.2 (2.1, 2.4)	2.8 (2.6, 2.9)	4.2 (4.0, 4.4)	5.8 (5.5, 6.1)	7.9 (7.3, 8.5)
	65-74	3028	95939	1.5 (1.4, 1.5)	2.1 (2.0, 2.2)	2.6 (2.5, 2.7)	3.8 (3.7, 4.0)	5.5 (5.3, 5.8)	7.1 (6.7, 7.7)
	≥75	2465	88656	1.6 (1.5, 1.7)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	3.6 (3.5, 3.8)	4.8 (4.5, 5.1)	5.3 (4.9, 5.8)
TOTAL		**16159**	**483080**						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

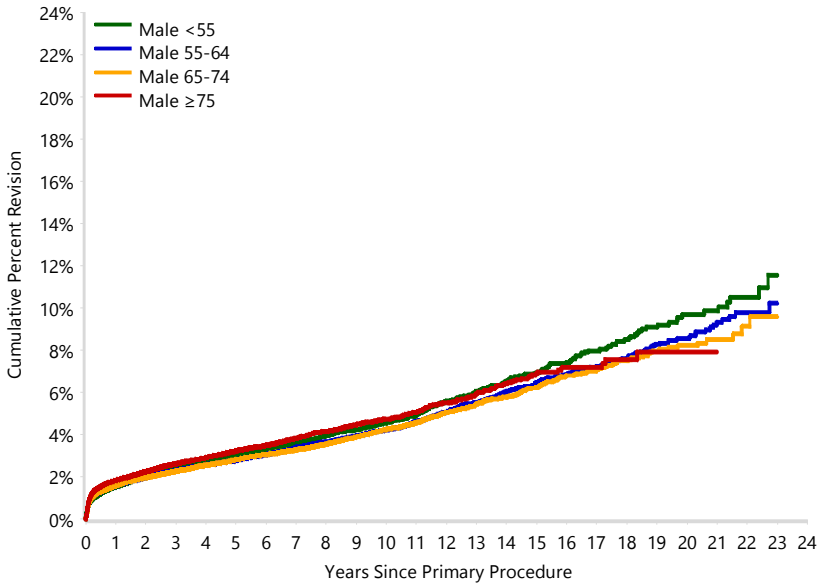
Figure HT8 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	220749	196264	154920	119183	47896	14226	2816
Female	262331	233625	186338	145609	62533	19922	3703

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT9 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis OA)



Male <55 vs Male ≥75

0 - 2Wk: HR=1.22 (95% CI 0.96, 1.55), p=0.104

2Wk - 3Mth: HR=0.67 (95% CI 0.58, 0.78), p<0.001

3Mth+: HR=1.05 (95% CI 0.96, 1.14), p=0.302

Male 55-64 vs Male ≥75

Entire Period: HR=0.89 (95% CI 0.84, 0.95), p<0.001

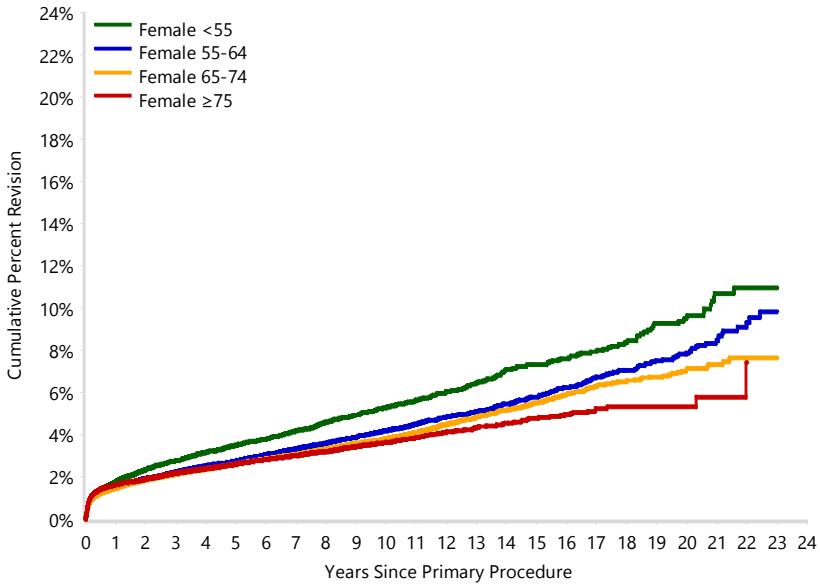
Male 65-74 vs Male ≥75

Entire Period: HR=0.88 (95% CI 0.83, 0.93), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<55**	28069	25245	20423	16333	7145	2321	679
	55-64	57398	51450	41254	32549	14529	4932	1178
	65-74	77303	69036	55290	43180	18289	5626	865
	≥75	57979	50533	37953	27121	7933	1347	94

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT10 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis OA)



Female <55 vs Female ≥75
- 0 - 2Wk: HR=1.10 (95% CI 0.86, 1.42), p=0.452
- 2Wk - 3Mth: HR=0.92 (95% CI 0.78, 1.08), p=0.290
- 3Mth+: HR=1.68 (95% CI 1.53, 1.83), p<0.001

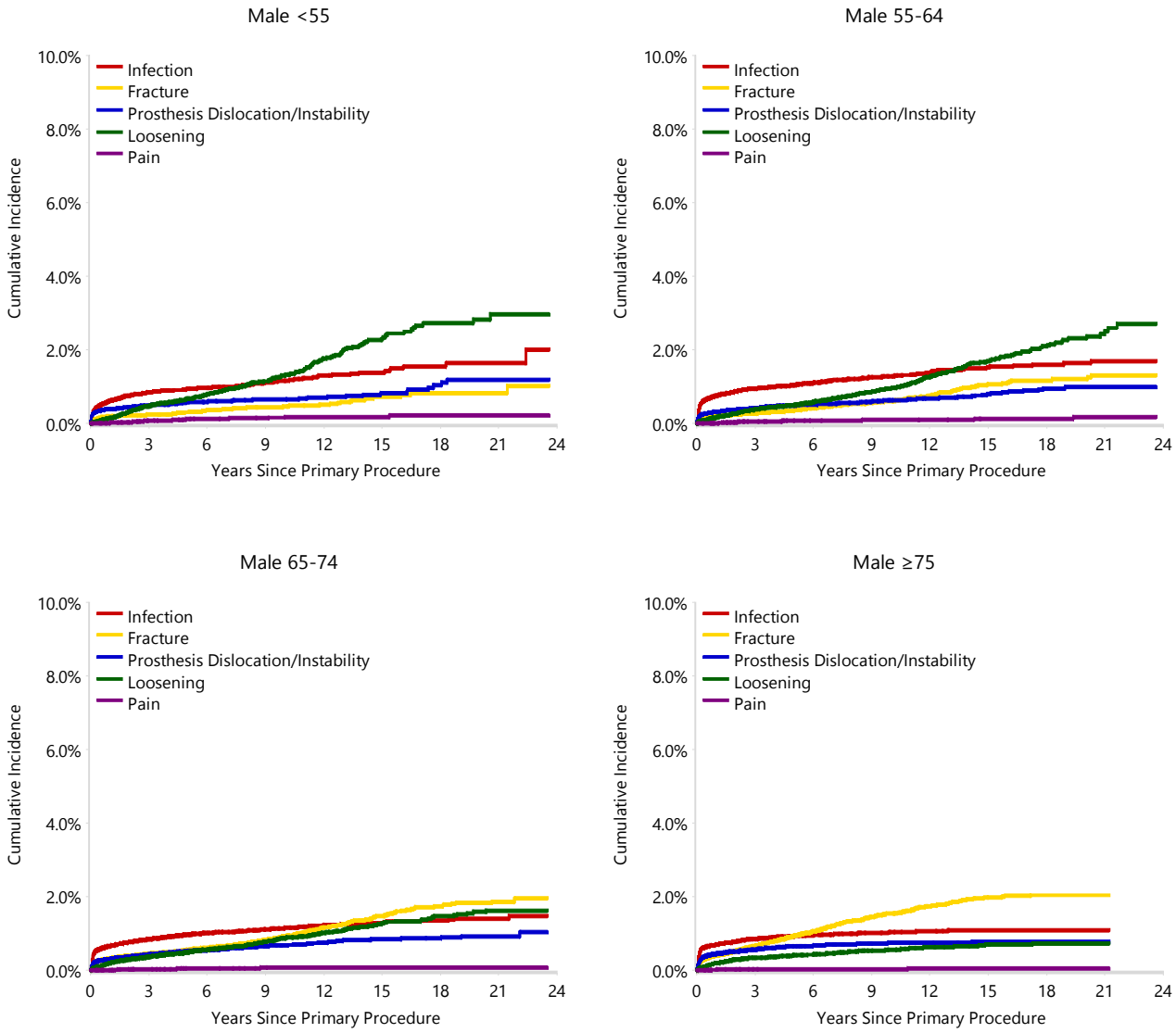
Female 55-64 vs Female ≥75
- 0 - 2Wk: HR=0.87 (95% CI 0.72, 1.06), p=0.167
- 2Wk - 1Mth: HR=0.75 (95% CI 0.63, 0.88), p<0.001
- 1Mth - 2Yr: HR=1.15 (95% CI 1.05, 1.26), p=0.003
- 2Yr - 2.5Yr: HR=0.87 (95% CI 0.64, 1.17), p=0.343
- 2.5Yr+: HR=1.36 (95% CI 1.24, 1.48), p<0.001

Female 65-74 vs Female ≥75
- 0 - 1Mth: HR=0.81 (95% CI 0.72, 0.90), p<0.001
- 1Mth - 3Mth: HR=0.99 (95% CI 0.87, 1.13), p=0.935
- 3Mth - 6Mth: HR=0.95 (95% CI 0.80, 1.14), p=0.602
- 6Mth+: HR=1.18 (95% CI 1.10, 1.26), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female <55	21868	19569	15819	12714	6201	2378	687
55-64	55868	50288	41054	33017	16074	6244	1340
65-74	95939	85706	68860	54230	24108	8010	1416
≥75	88656	78062	60605	45648	16150	3290	260

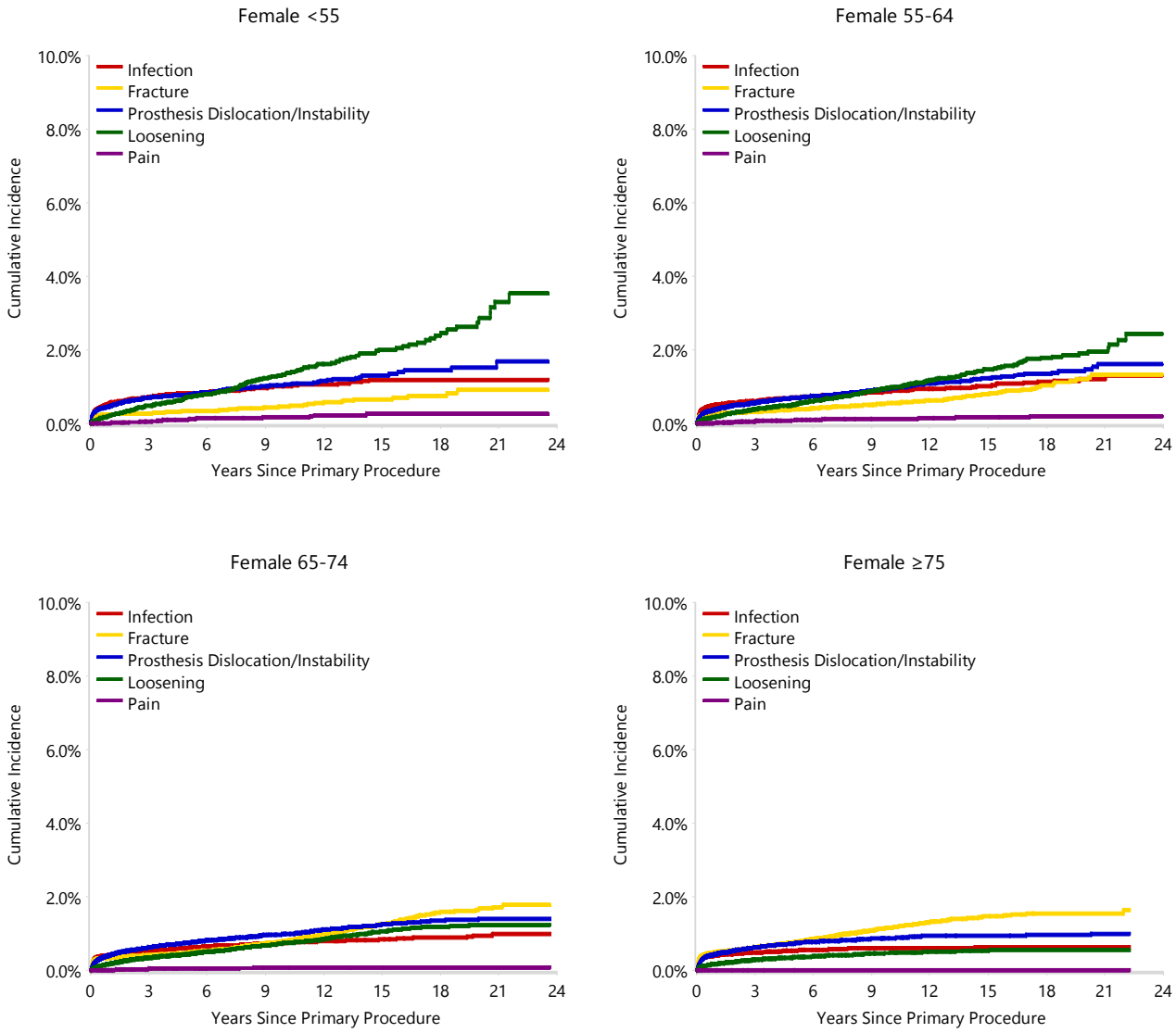
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT11 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT12 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT13 Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)

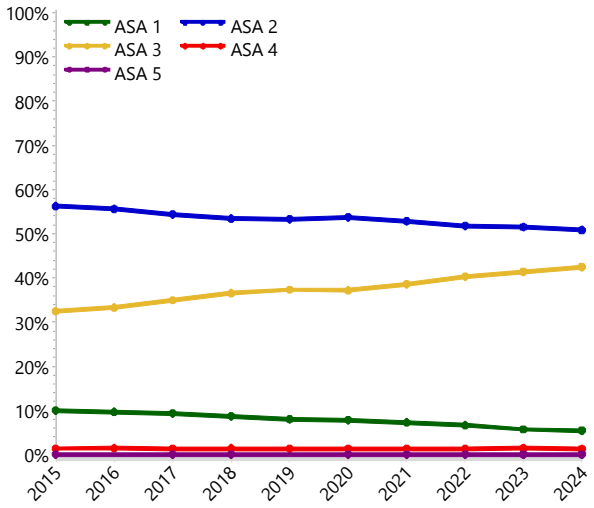
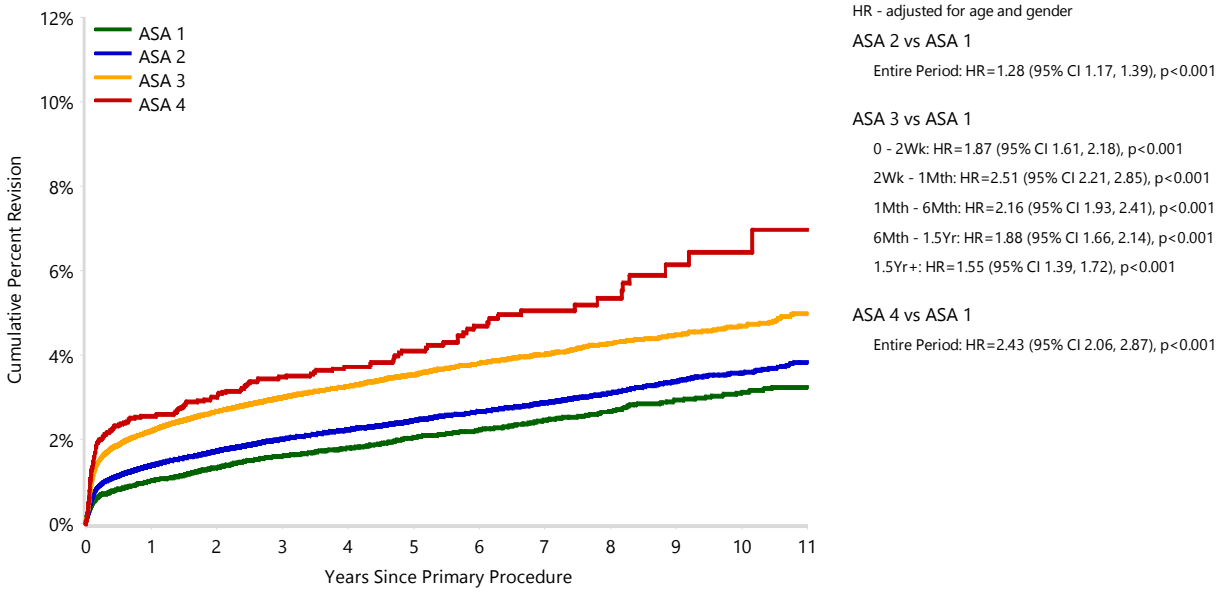


Table HT19 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1	612	28517	1.0 (0.9, 1.1)	1.3 (1.2, 1.5)	1.6 (1.5, 1.8)	2.0 (1.9, 2.2)	2.5 (2.3, 2.7)	2.9 (2.7, 3.2)	3.2 (2.9, 3.6)
ASA 2	4667	194330	1.4 (1.3, 1.4)	1.7 (1.7, 1.8)	2.0 (1.9, 2.1)	2.4 (2.4, 2.5)	2.9 (2.8, 3.0)	3.4 (3.3, 3.5)	3.8 (3.7, 4.0)
ASA 3	4403	136039	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.0 (2.9, 3.1)	3.5 (3.4, 3.6)	4.0 (3.9, 4.1)	4.5 (4.3, 4.6)	5.0 (4.7, 5.2)
ASA 4	189	4991	2.6 (2.1, 3.0)	3.0 (2.5, 3.5)	3.5 (3.0, 4.1)	4.1 (3.5, 4.8)	5.1 (4.3, 6.0)	6.1 (5.0, 7.4)	7.0 (5.5, 8.9)
ASA 5	1	24	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	14.3 (2.1, 66.6)		
TOTAL	9872	363901							

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

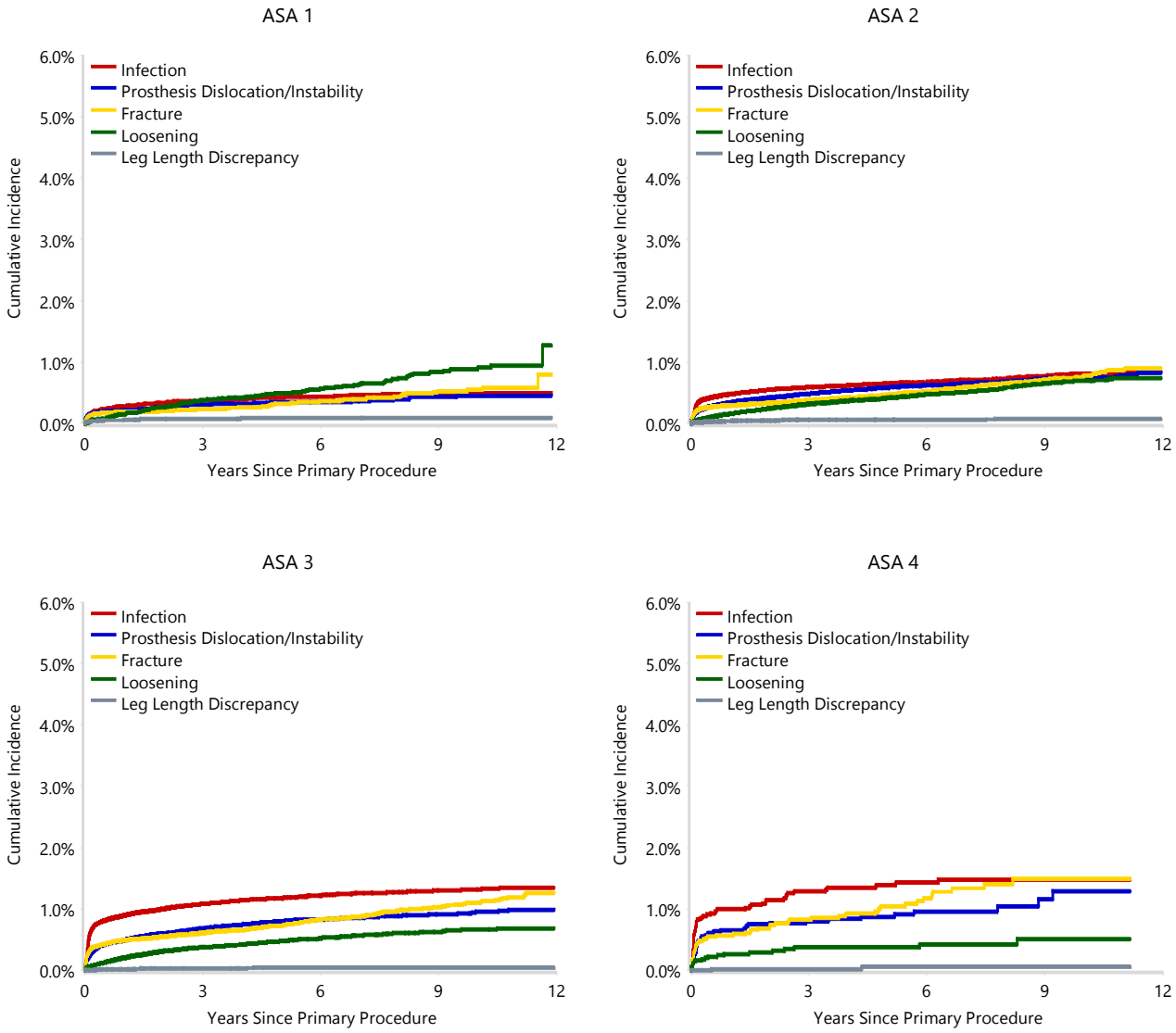
Figure HT14 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1	28517	25896	23411	20911	15791	10635	5478	1255
ASA 2	194330	169751	147200	127390	90494	57006	27692	5584
ASA 3	136039	113972	95084	78919	51479	28925	12558	2255
ASA 4	4991	4097	3330	2668	1592	828	347	67

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Excludes ASA 5 patients due to low numbers

Figure HT15 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)



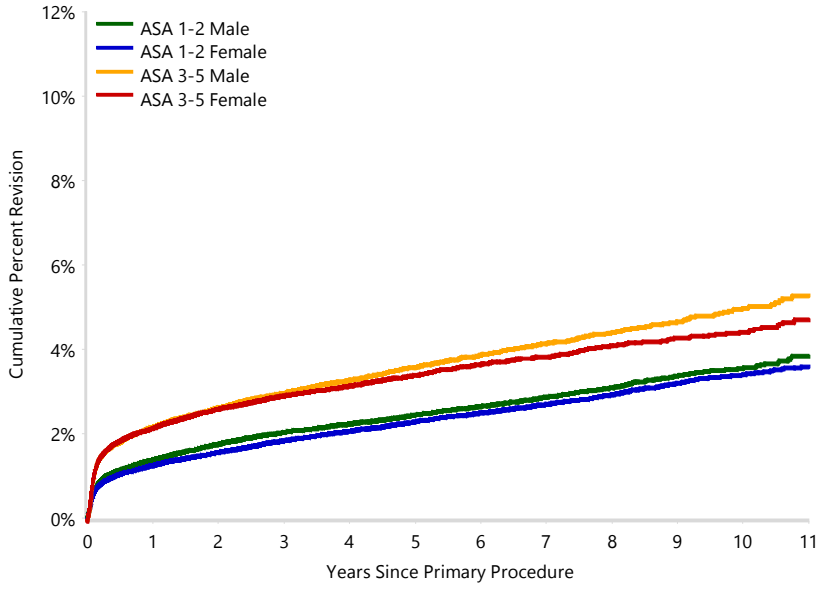
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT20 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Gender (Primary Diagnosis OA)

ASA Score	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	2514	102701	1.4 (1.3, 1.5)	2.1 (2.0, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.0)	3.4 (3.2, 3.6)	3.9 (3.6, 4.1)
	Female	2765	120146	1.3 (1.2, 1.4)	1.9 (1.8, 2.0)	2.3 (2.2, 2.4)	2.7 (2.6, 2.9)	3.3 (3.1, 3.4)	3.6 (3.5, 3.8)
ASA 3-5	Male	2176	65416	2.2 (2.1, 2.3)	3.0 (2.9, 3.2)	3.6 (3.5, 3.8)	4.2 (4.0, 4.4)	4.7 (4.5, 5.0)	5.3 (5.0, 5.7)
	Female	2417	75638	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	3.5 (3.3, 3.6)	3.9 (3.8, 4.1)	4.4 (4.2, 4.6)	4.8 (4.5, 5.1)
TOTAL		9872	363901						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT16 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Gender (Primary Diagnosis OA)



HR - adjusted for age

ASA 1-2 Male vs ASA 1-2 Female
Entire Period: HR=1.04 (95% CI 0.98, 1.10), p=0.165

ASA 1-2 Male vs ASA 3-5 Male
0 - 2Wk: HR=0.62 (95% CI 0.52, 0.74), p<0.001
2Wk - 1Mth: HR=0.52 (95% CI 0.46, 0.59), p<0.001
1Mth - 3Mth: HR=0.60 (95% CI 0.53, 0.68), p<0.001
3Mth+: HR=0.71 (95% CI 0.65, 0.76), p<0.001

ASA 1-2 Female vs ASA 3-5 Female
0 - 2Wk: HR=0.58 (95% CI 0.50, 0.68), p<0.001
2Wk - 1Mth: HR=0.49 (95% CI 0.43, 0.55), p<0.001
1Mth - 3Mth: HR=0.56 (95% CI 0.50, 0.62), p<0.001
3Mth - 9Mth: HR=0.61 (95% CI 0.53, 0.69), p<0.001
9Mth - 1.5Yr: HR=0.71 (95% CI 0.61, 0.83), p<0.001
1.5Yr - 2Yr: HR=0.74 (95% CI 0.60, 0.91), p=0.005
2Yr+: HR=0.85 (95% CI 0.77, 0.94), p=0.001

ASA 3-5 Male vs ASA 3-5 Female
0 - 3Mth: HR=0.97 (95% CI 0.90, 1.06), p=0.541
3Mth - 6Mth: HR=0.81 (95% CI 0.68, 0.96), p=0.017
6Mth+: HR=1.16 (95% CI 1.06, 1.26), p=0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	102701	90384	68502	49086	31298	15226	3065
	Female	120146	105263	79799	57199	36343	17944	3774
ASA 3-5	Male	65416	54723	37702	24239	13346	5675	1026
	Female	75638	63365	43895	28839	16412	7232	1296

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

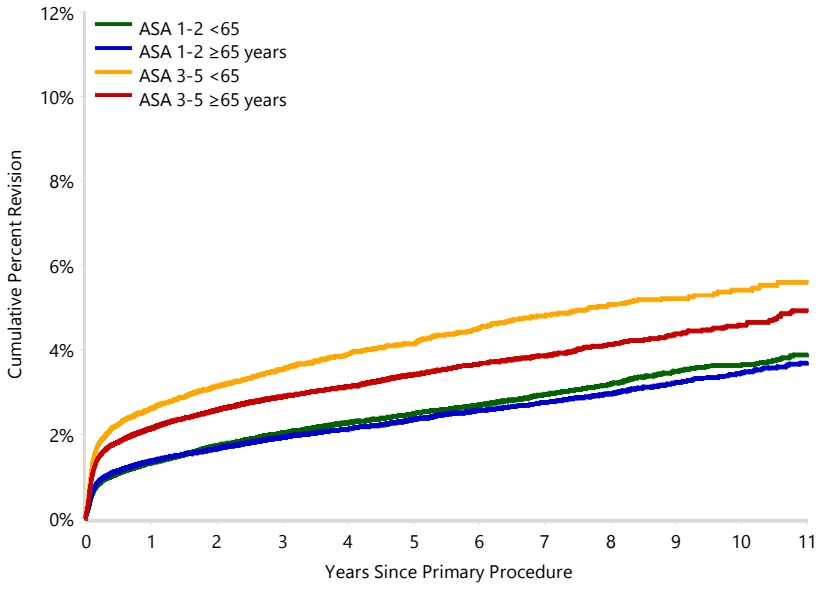
Primary Total Hip Replacement

Table HT21 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Age (Primary Diagnosis OA)

ASA Score	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	2295	92705	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.1)	3.5 (3.3, 3.6)	3.9 (3.7, 4.1)
	≥65	2984	130142	1.3 (1.3, 1.4)	1.9 (1.8, 2.0)	2.3 (2.2, 2.4)	2.7 (2.6, 2.8)	3.2 (3.1, 3.3)	3.7 (3.5, 3.9)
ASA 3-5	<65	1248	32307	2.6 (2.4, 2.8)	3.5 (3.3, 3.7)	4.1 (3.9, 4.4)	4.8 (4.5, 5.1)	5.2 (4.9, 5.5)	5.6 (5.2, 6.0)
	≥65	3345	108747	2.1 (2.0, 2.2)	2.9 (2.7, 3.0)	3.4 (3.3, 3.5)	3.8 (3.7, 4.0)	4.3 (4.2, 4.5)	4.9 (4.6, 5.2)
TOTAL		9872	363901						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT17 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Age (Primary Diagnosis OA)



HR - adjusted for age and gender

ASA 1-2 <65 vs ASA 1-2 ≥65 years
Entire Period: HR=0.91 (95% CI 0.85, 0.99), p=0.018

ASA 1-2 <65 vs ASA 3-5 <65
0 - 2Wk: HR=0.52 (95% CI 0.43, 0.62), p<0.001
2Wk - 1Mth: HR=0.41 (95% CI 0.35, 0.49), p<0.001
1Mth - 3Mth: HR=0.51 (95% CI 0.43, 0.60), p<0.001
3Mth - 6Mth: HR=0.52 (95% CI 0.43, 0.63), p<0.001
6Mth - 9Mth: HR=0.56 (95% CI 0.44, 0.70), p<0.001
9Mth - 8.5Yr: HR=0.74 (95% CI 0.67, 0.81), p<0.001
8.5Yr+: HR=0.79 (95% CI 0.55, 1.15), p=0.220

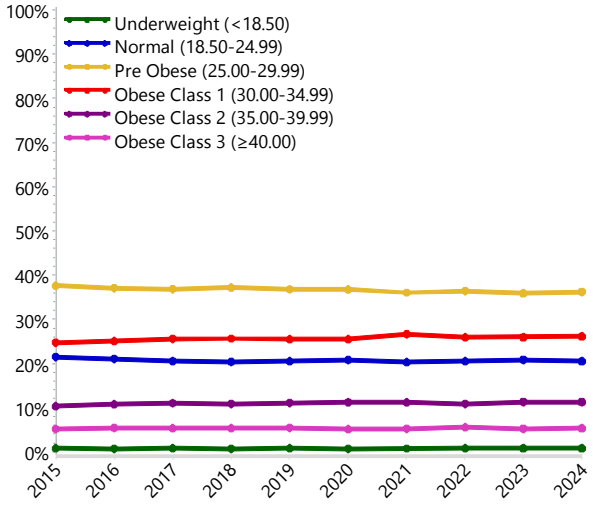
ASA 1-2 ≥65 years vs ASA 3-5 ≥65 years
0 - 2Wk: HR=0.68 (95% CI 0.59, 0.78), p<0.001
2Wk - 1Mth: HR=0.51 (95% CI 0.46, 0.57), p<0.001
1Mth - 3Mth: HR=0.59 (95% CI 0.53, 0.65), p<0.001
3Mth - 2.5Yr: HR=0.71 (95% CI 0.65, 0.77), p<0.001
2.5Yr+: HR=0.86 (95% CI 0.78, 0.94), p=0.001

ASA 3-5 <65 vs ASA 3-5 ≥65 years
0 - 2Wk: HR=1.21 (95% CI 1.02, 1.45), p=0.031
2Wk - 1Mth: HR=0.99 (95% CI 0.85, 1.15), p=0.882
1Mth - 3Mth: HR=1.00 (95% CI 0.86, 1.18), p=0.959
3Mth+: HR=1.06 (95% CI 0.95, 1.18), p=0.283

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	92705	81914	62554	45484	29834	15071	3208
	≥65	130142	113733	85747	60801	37807	18099	3631
ASA 3-5	<65	32307	27131	19255	13140	7902	3696	710
	≥65	108747	90957	62342	39938	21856	9211	1612

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT18 Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



Note: BMI has not been presented for patients aged ≤19 years

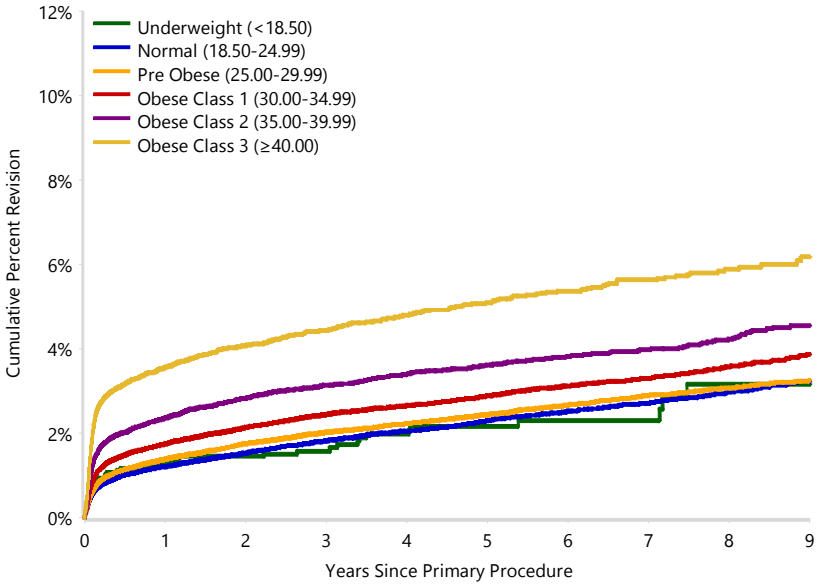
Primary Total Hip Replacement

Table HT22 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight	46	2376	1.3 (0.9, 1.9)	1.4 (1.0, 2.0)	1.6 (1.1, 2.2)	2.0 (1.4, 2.7)	2.2 (1.6, 3.0)	2.3 (1.7, 3.2)	3.2 (2.2, 4.6)
Normal	1353	66122	1.2 (1.1, 1.3)	1.5 (1.4, 1.6)	1.8 (1.7, 1.9)	2.1 (1.9, 2.2)	2.3 (2.2, 2.4)	2.7 (2.6, 2.9)	3.2 (3.0, 3.5)
Pre Obese	2589	117221	1.4 (1.3, 1.5)	1.8 (1.7, 1.8)	2.0 (1.9, 2.1)	2.2 (2.1, 2.3)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.3 (3.1, 3.4)
Obese Class 1	2170	82450	1.7 (1.7, 1.8)	2.1 (2.0, 2.2)	2.4 (2.3, 2.6)	2.7 (2.5, 2.8)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)	3.9 (3.7, 4.1)
Obese Class 2	1168	35311	2.4 (2.2, 2.5)	2.8 (2.7, 3.0)	3.1 (3.0, 3.3)	3.4 (3.2, 3.6)	3.6 (3.4, 3.8)	4.0 (3.7, 4.2)	4.6 (4.2, 4.9)
Obese Class 3	801	17026	3.6 (3.3, 3.8)	4.1 (3.8, 4.4)	4.4 (4.1, 4.8)	4.8 (4.5, 5.2)	5.1 (4.7, 5.5)	5.6 (5.2, 6.1)	6.2 (5.7, 6.7)
TOTAL	8127	320506							

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure HT19 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



HR - adjusted for age and gender

Underweight (<18.50) vs Normal (18.50-24.99)
Entire Period: HR=0.99 (95% CI 0.74, 1.32), p=0.929

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=1.06 (95% CI 0.99, 1.13), p=0.082

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
0 - 3Mth: HR=1.45 (95% CI 1.32, 1.58), p<0.001
3Mth+: HR=1.16 (95% CI 1.06, 1.26), p<0.001

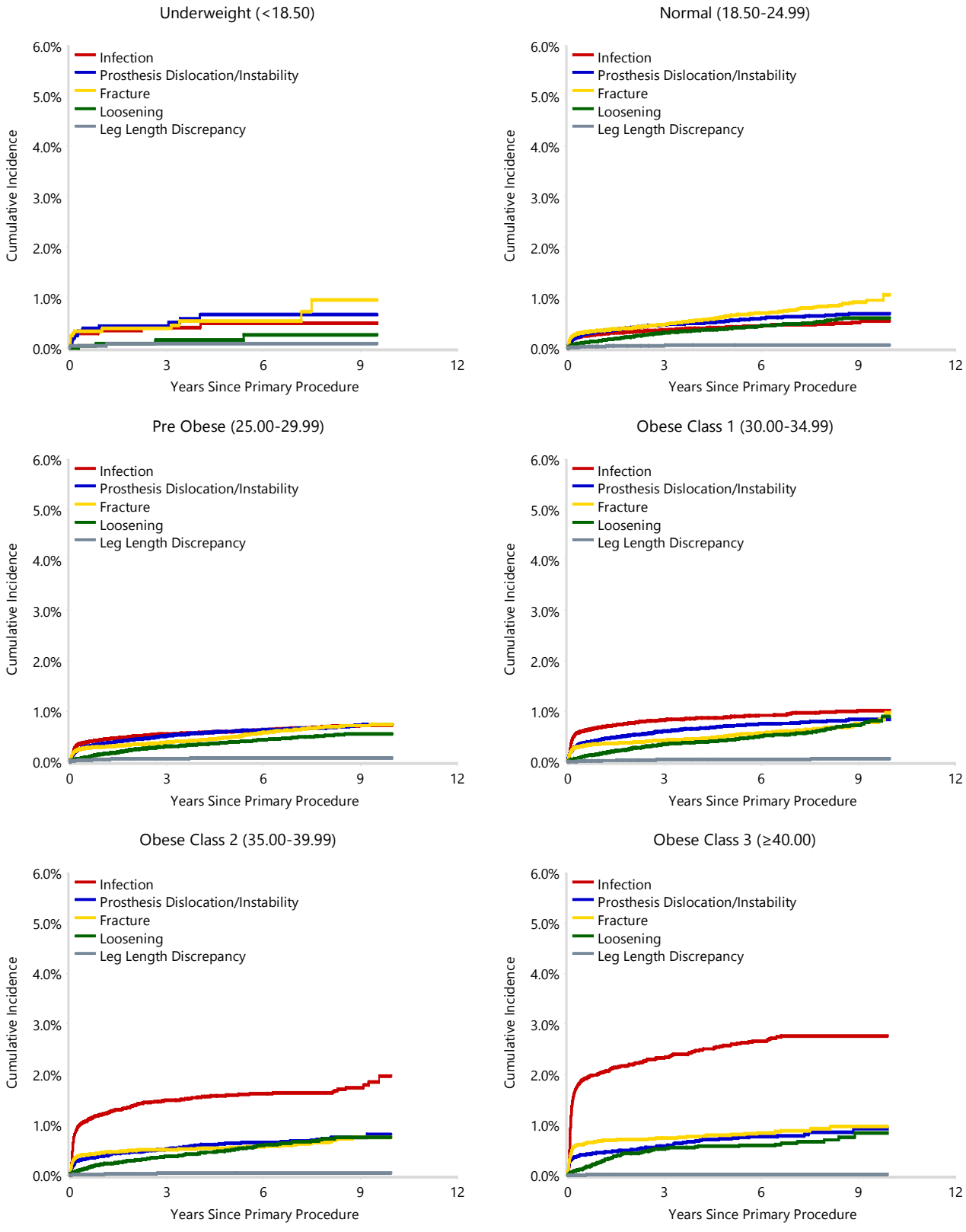
Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
0 - 3Mth: HR=2.07 (95% CI 1.87, 2.30), p<0.001
3Mth - 6Mth: HR=1.28 (95% CI 1.01, 1.63), p=0.043
6Mth - 1.5Yr: HR=1.56 (95% CI 1.33, 1.84), p<0.001
1.5Yr+: HR=1.19 (95% CI 1.04, 1.36), p=0.013

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
0 - 3Mth: HR=3.36 (95% CI 3.01, 3.76), p<0.001
3Mth - 6Mth: HR=1.76 (95% CI 1.32, 2.35), p<0.001
6Mth - 1.5Yr: HR=1.81 (95% CI 1.47, 2.23), p<0.001
1.5Yr+: HR=1.47 (95% CI 1.25, 1.74), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight	2376	1992	1642	1306	1033	805	401	99
Normal	66122	56278	47061	39131	31571	24981	12980	3564
Pre Obese	117221	99858	84098	70295	57118	45559	23812	6520
Obese Class 1	82450	69833	58594	48805	39144	31138	16168	4325
Obese Class 2	35311	29691	24804	20742	16728	13257	6882	1784
Obese Class 3	17026	14181	11947	9888	8028	6460	3334	906

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure HT20 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses. BMI has not been presented for patients aged ≤19 years

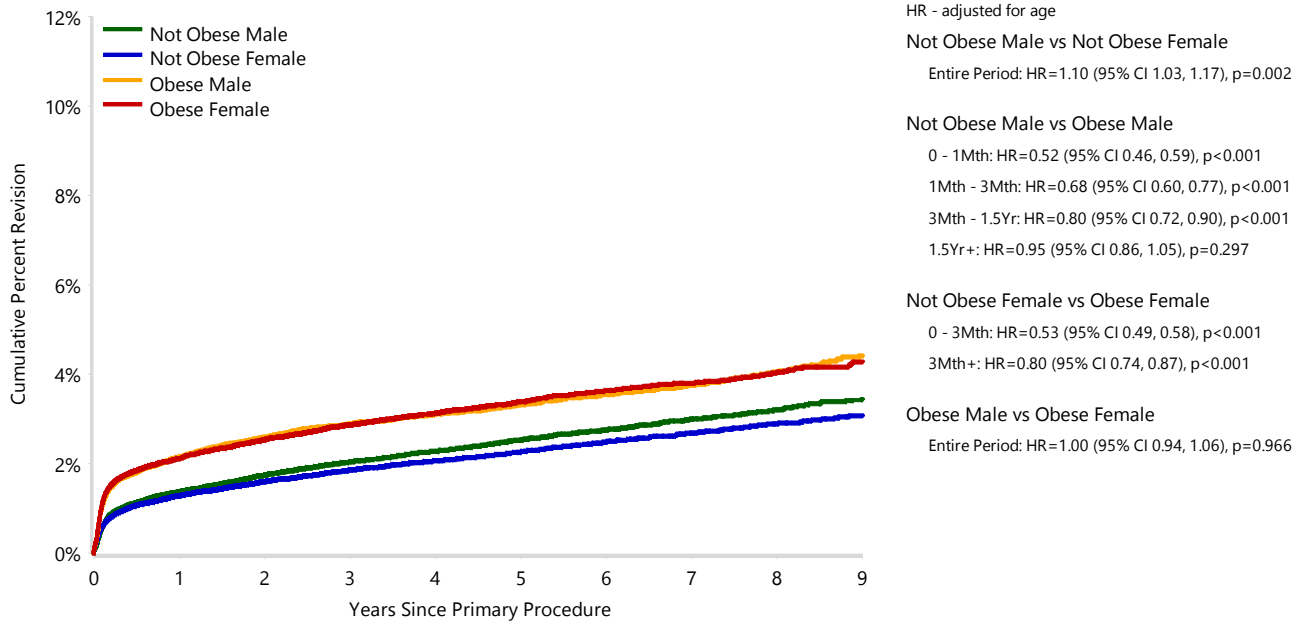
Primary Total Hip Replacement

Table HT23 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Gender (Primary Diagnosis OA)

BMI Category	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Not Obese	Male	1907	84070	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.5 (2.4, 2.7)	3.0 (2.8, 3.1)	3.4 (3.3, 3.6)
	Female	2083	101695	1.3 (1.2, 1.4)	1.9 (1.8, 2.0)	2.3 (2.2, 2.4)	2.7 (2.6, 2.8)	3.1 (2.9, 3.2)
Obese	Male	1977	64435	2.2 (2.0, 2.3)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)	3.7 (3.6, 3.9)	4.4 (4.2, 4.7)
	Female	2164	70372	2.1 (2.0, 2.2)	2.9 (2.7, 3.0)	3.4 (3.2, 3.5)	3.8 (3.6, 4.0)	4.3 (4.1, 4.5)
TOTAL		8131	320572					

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure HT21 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Gender (Primary Diagnosis OA)



HR - adjusted for age

Not Obese Male vs Not Obese Female

Entire Period: HR=1.10 (95% CI 1.03, 1.17), p=0.002

Not Obese Male vs Obese Male

0 - 1Mth: HR=0.52 (95% CI 0.46, 0.59), p<0.001

1Mth - 3Mth: HR=0.68 (95% CI 0.60, 0.77), p<0.001

3Mth - 1.5Yr: HR=0.80 (95% CI 0.72, 0.90), p<0.001

1.5Yr+: HR=0.95 (95% CI 0.86, 1.05), p=0.297

Not Obese Female vs Obese Female

0 - 3Mth: HR=0.53 (95% CI 0.49, 0.58), p<0.001

3Mth+: HR=0.80 (95% CI 0.74, 0.87), p<0.001

Obese Male vs Obese Female

Entire Period: HR=1.00 (95% CI 0.94, 1.06), p=0.966

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	Male	84070	71835	50429	32465	17024	4662	1
	Female	101695	86327	60327	38892	20176	5523	3
Obese	Male	64435	54355	37890	24182	12459	3318	1
	Female	70372	59363	41555	26676	13927	3698	4

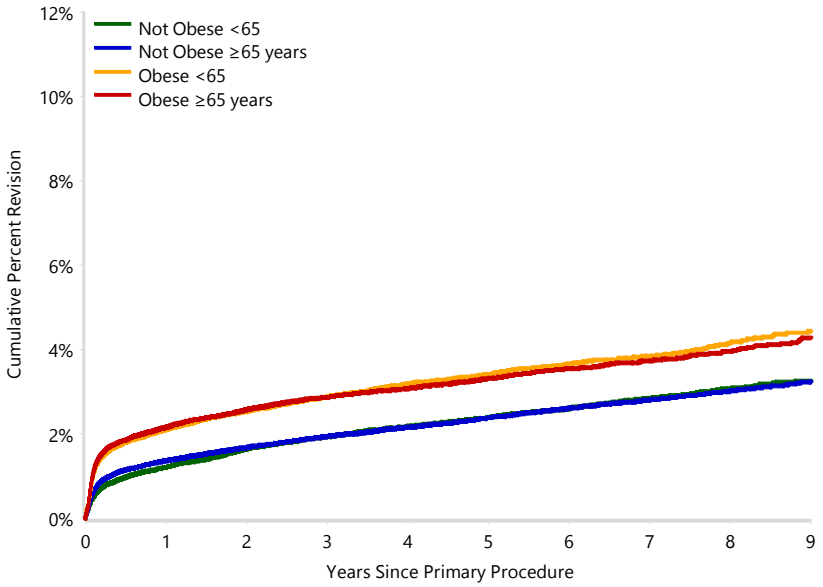
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Table HT24 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Age (Primary Diagnosis OA)

BMI Category	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Not Obese	<65	1249	56937	1.2 (1.1, 1.3)	1.9 (1.8, 2.1)	2.4 (2.2, 2.5)	2.9 (2.7, 3.0)	3.2 (3.0, 3.5)
	≥65	2741	128828	1.4 (1.3, 1.4)	1.9 (1.9, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.2 (3.1, 3.4)
Obese	<65	1678	53349	2.1 (2.0, 2.2)	2.9 (2.7, 3.0)	3.4 (3.2, 3.6)	3.8 (3.7, 4.0)	4.4 (4.2, 4.7)
	≥65	2463	81458	2.2 (2.1, 2.3)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)	3.7 (3.6, 3.9)	4.3 (4.1, 4.5)
TOTAL		8131	320572					

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure HT22 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Age (Primary Diagnosis OA)



HR - adjusted for age and gender

Not Obese <65 vs Not Obese ≥65 years
Entire Period: HR=0.98 (95% CI 0.89, 1.07), p=0.608

Not Obese <65 vs Obese <65
0 - 2Wk: HR=0.62 (95% CI 0.51, 0.76), p<0.001
2Wk - 1Mth: HR=0.39 (95% CI 0.33, 0.47), p<0.001
1Mth - 3Mth: HR=0.51 (95% CI 0.43, 0.59), p<0.001
3Mth+: HR=0.89 (95% CI 0.81, 0.97), p=0.007

Not Obese ≥65 years vs Obese ≥65 years
0 - 2Wk: HR=0.68 (95% CI 0.58, 0.79), p<0.001
2Wk - 1Mth: HR=0.47 (95% CI 0.42, 0.53), p<0.001
1Mth - 3Mth: HR=0.57 (95% CI 0.51, 0.64), p<0.001
3Mth+: HR=0.87 (95% CI 0.81, 0.93), p<0.001

Obese <65 vs Obese ≥65 years
Entire Period: HR=1.00 (95% CI 0.92, 1.09), p=0.964

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	<65	56937	49289	35595	23898	13216	3849	2
	≥65	128828	108873	75161	47459	23984	6336	2
Obese	<65	53349	45409	32298	21244	11685	3274	2
	≥65	81458	68309	47147	29614	14701	3742	3

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

The analysis of prosthesis fixation was performed for prosthesis combinations using only modern bearing surfaces with recorded use in 2024. These bearing surfaces include mixed ceramic/mixed ceramic and all femoral head materials used in conjunction with cross-linked polyethylene (XLPE). A small proportion of THR procedures in 2024 use other bearing surface combinations (2.8%), however, these have been excluded from further analysis.

There is no difference in the rate of revision for cemented compared to hybrid fixation. Cementless fixation has a higher rate of revision than hybrid fixation for the first month, no difference at 1-9 months and a higher rate of revision from 9 months to 3 years. From 3 years to 6.5 years, cementless fixation has a lower rate of revision compared to hybrid fixation, and after this time, cementless fixation has a higher rate of revision. Cementless fixation has a higher rate of revision than cemented fixation for the first month and after this time there is no difference (Table HT25 and Figure HT25).

The outcome with respect to fixation varies with age.

For patients aged <55 years, cemented fixation showed no difference when the rate of revision is compared to cementless and hybrid fixation. For patients aged 55–64 years there is a higher rate of revision in the first month for cementless fixation compared to hybrid fixation and after this time cementless fixation has a lower rate of revision. Cementless fixation has a higher rate of revision compared to hybrid fixation in the first 3 months for patients aged 65–74 years. After this time, there is no difference. Cementless fixation has a higher rate of revision for patients aged ≥75 years compared to hybrid and cemented fixation for all time periods. There is no difference between cemented and hybrid fixation for patients aged ≥75 years (Table HT26 to Figure HT29).

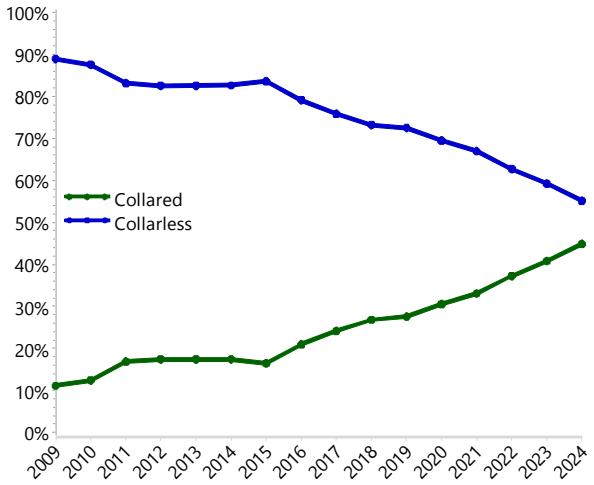
Collared and Collarless Cementless Stems

Some cementless femoral stems offer a choice of components with and without a collar. There has been a steady increase in the use of collared cementless stems since 2015, with many prostheses having a short follow-up. Collared stems make up 26.8% of modern cementless stems, the majority of which are tapered wedge designs (Figure HT23). A comparison of collared stems has been made to all others without a collar. The cumulative percent revision at 15 years is 4.8% for collared stems and 6.1% for collarless stems. Collarless stems have a higher rate of revision compared to collared stems (Table HT27 and Figure HT30). Collarless stems have a higher rate of revision for fracture and loosening (Figure HT31). The types of revision are presented in Table HT28.

An additional analysis was undertaken to determine the effect of surgical approach on the outcome for collared versus collarless stems. For the lateral and posterior approaches, collarless stems have a higher rate of revision for the first 3 months, with no difference after this time (Table HT29, Figure HT32, Table HT30 and Figure HT33). For the anterior approach, collarless stems have a higher rate of revision for the entire period (Table HT31 and Figure HT34).

The outcome of cementless femoral components with and without collar use are listed in Table HT32 and Table HT33.

Figure HT23 Primary Total Conventional Hip Replacement with Cementless Stems by Collar Use (Primary Diagnosis OA)



Mini Stems

A mini stem is a short cementless femoral stem where fixation is designed to be entirely metaphyseal. These stems may enable femoral neck sparing. Mini stems were first used in 2009 and there have been 12,511 procedures using a mini stem prosthesis undertaken for osteoarthritis. This represents 2.6% of all primary total conventional hip procedures. There are 1,869 procedures recorded in 2024 using a mini stem prosthesis. This is an increase of 17.4% compared to 2023. The annual use of mini stems is shown in Figure HT24.

The 9 year cumulative percent revision for primary total conventional hip replacement using a mini stem is 2.8% compared to 4.0% for other cementless femoral stems. Mini stems have a reduced rate of revision from 2 years onwards, with no difference before this time point (Table HT34 and Figure HT35).

Patients aged <65 years have a lower rate of revision in the first month only compared to patients aged ≥65 years when a mini stem is used. From 1.5 years onwards, patients aged ≥65 years with a mini stem have a lower rate of revision compared to patients aged ≥65 years with other cementless femoral stems (Table HT35 and Figure HT36).

Obesity is a risk factor for revision when a mini stem is used (Table HT36 and Figure HT37).

The reasons for revision and type of revision are shown in Figure HT38 and Table HT37. Mini stems have an initial higher rate of revision for loosening compared with other cementless femoral stems. From 1 year onwards there is a lower rate of revision for loosening compared to other cementless femoral stems (Table HT38 and Figure HT39). Similarly, mini stems have an initial higher rate of revision for fracture (in the first 3 months) compared to other cementless femoral stems, but from 3 months onwards, mini stems have a lower rate of revision for fracture than other cementless femoral stems (Table HT28 and Figure HT40).

There were 6 different mini stem prostheses used in 2024. Rates of revision vary depending on the type of prosthesis used (Table HT40).

Femoral Stems with Exchangeable Necks

A femoral stem with an exchangeable neck has a separate neck that connects proximally to the stem. There were 10 procedures reported in 2024. Due to the very small utilisation of these prostheses, the analyses have been removed from the Annual Report and appear in the Supplementary Report 'Prostheses with No or Minimal Use'.

Detailed information on femoral stems with exchangeable neck is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Figure HT24 Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)

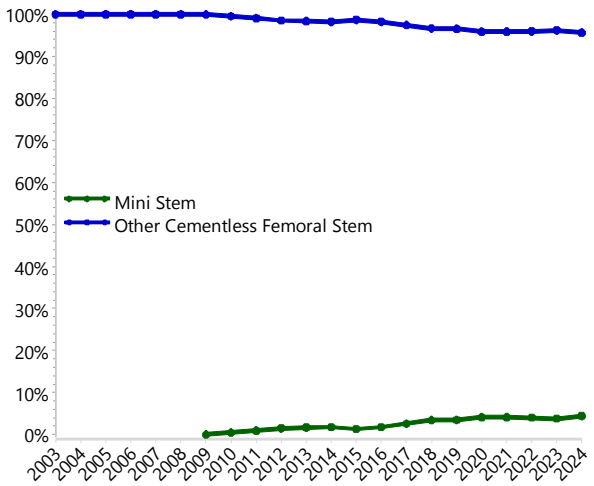
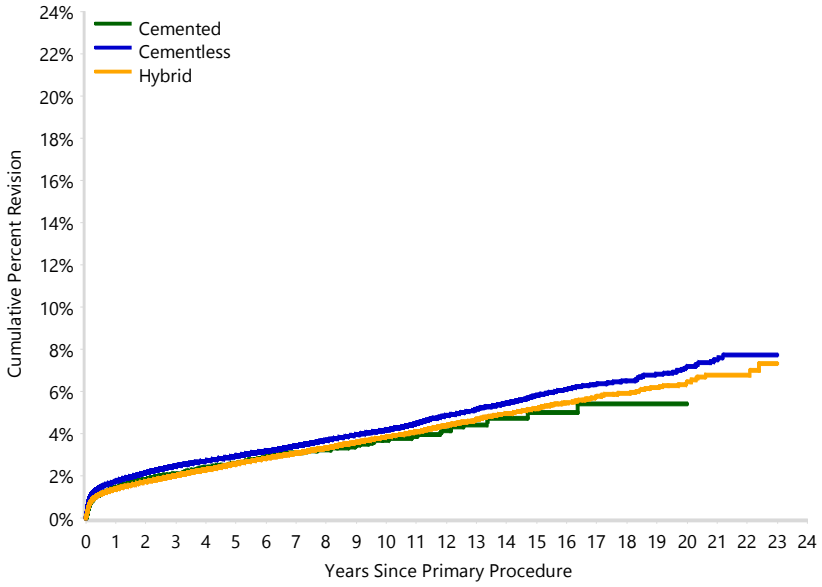


Table HT25 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	260	8545	1.5 (1.2, 1.7)	2.1 (1.8, 2.4)	2.6 (2.3, 3.0)	3.7 (3.3, 4.2)	5.0 (4.1, 6.1)	5.4 (4.3, 6.8)
Cementless	8856	273589	1.8 (1.7, 1.8)	2.5 (2.4, 2.5)	2.9 (2.9, 3.0)	4.2 (4.1, 4.3)	5.8 (5.6, 6.0)	7.2 (6.8, 7.6)
Hybrid	5046	169440	1.4 (1.3, 1.4)	2.0 (2.0, 2.1)	2.6 (2.5, 2.7)	3.9 (3.7, 4.0)	5.2 (5.0, 5.4)	6.5 (6.1, 6.8)
TOTAL	14162	451574						

Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces
Restricted to modern prostheses

Figure HT25 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)



HR - adjusted for age and gender

Cemented vs Hybrid

Entire Period: HR=0.99 (95% CI 0.87, 1.12), p=0.885

Cementless vs Cemented

0 - 2Wk: HR=1.96 (95% CI 1.64, 2.35), p<0.001
2Wk - 1Mth: HR=1.31 (95% CI 1.12, 1.52), p<0.001
1Mth+: HR=1.05 (95% CI 0.92, 1.19), p=0.466

Cementless vs Hybrid

0 - 2Wk: HR=1.95 (95% CI 1.70, 2.23), p<0.001
2Wk - 1Mth: HR=1.30 (95% CI 1.17, 1.43), p<0.001
1Mth - 3Mth: HR=1.08 (95% CI 0.99, 1.18), p=0.085
3Mth - 9Mth: HR=1.07 (95% CI 0.97, 1.19), p=0.186
9Mth - 3Yr: HR=1.12 (95% CI 1.04, 1.21), p=0.002
3Yr - 3.5Yr: HR=0.81 (95% CI 0.67, 0.98), p=0.029
3.5Yr - 6.5Yr: HR=0.86 (95% CI 0.78, 0.94), p=0.001
6.5Yr+: HR=1.09 (95% CI 1.00, 1.19), p=0.045

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	8545	7927	6668	5402	2206	333	56
Cementless	273589	240571	186935	141857	52259	12842	1777
Hybrid	169440	151738	121007	93625	39049	11483	1775

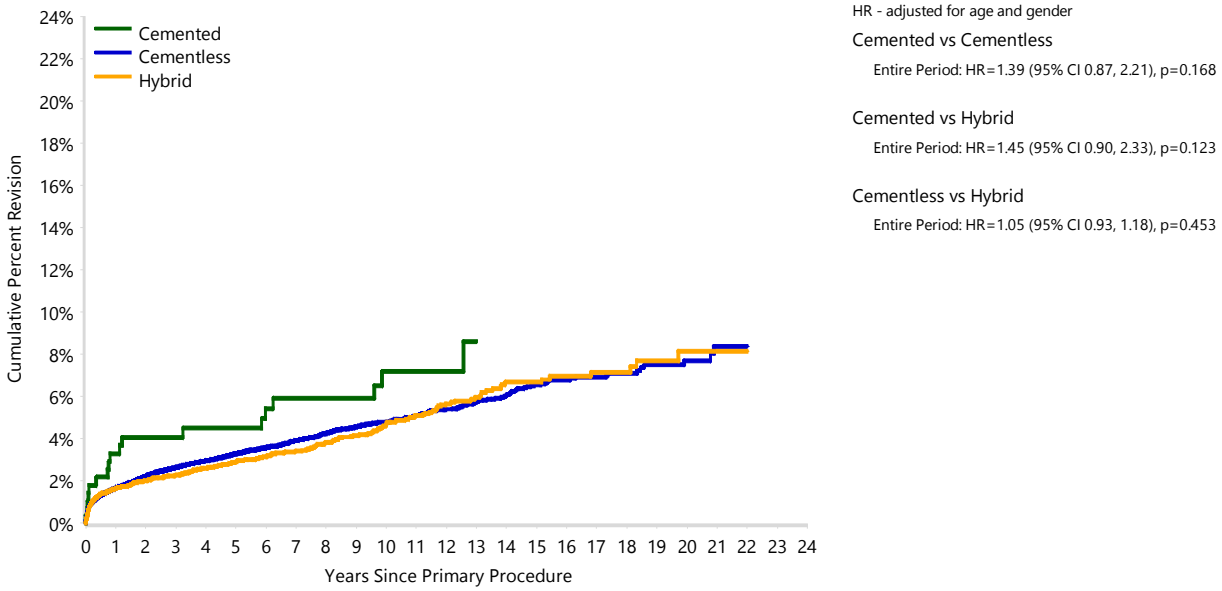
Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces
Restricted to modern prostheses

Table HT26 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age and Fixation (Primary Diagnosis OA)

Age	Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55		**1706**	**45837**	**1.7 (1.6, 1.8)**	**2.6 (2.4, 2.7)**	**3.2 (3.0, 3.4)**	**4.8 (4.5, 5.0)**	**6.6 (6.2, 7.0)**	**7.8 (7.1, 8.6)**
	Cemented	18	279	3.3 (1.7, 6.3)	4.1 (2.3, 7.2)	4.5 (2.6, 7.8)	7.2 (4.5, 11.4)		
	Cementless	1358	36740	1.7 (1.5, 1.8)	2.6 (2.5, 2.8)	3.3 (3.1, 3.5)	4.8 (4.5, 5.1)	6.5 (6.1, 7.0)	7.7 (6.9, 8.6)
	Hybrid	330	8818	1.6 (1.4, 1.9)	2.3 (2.0, 2.6)	2.9 (2.5, 3.3)	4.7 (4.1, 5.3)	6.7 (5.8, 7.6)	8.1 (6.7, 9.8)
55-64		**3414**	**104903**	**1.6 (1.5, 1.7)**	**2.3 (2.2, 2.4)**	**2.8 (2.7, 2.9)**	**4.1 (3.9, 4.2)**	**5.5 (5.3, 5.8)**	**7.0 (6.6, 7.5)**
	Cemented	32	848	1.8 (1.1, 3.0)	2.6 (1.7, 3.9)	3.0 (2.0, 4.4)	3.7 (2.5, 5.3)	4.8 (3.2, 7.0)	
	Cementless	2398	77513	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.7 (2.6, 2.9)	3.9 (3.7, 4.1)	5.3 (5.0, 5.6)	6.6 (6.0, 7.2)
	Hybrid	984	26542	1.5 (1.4, 1.7)	2.2 (2.0, 2.4)	2.8 (2.6, 3.1)	4.5 (4.2, 4.8)	6.1 (5.7, 6.6)	7.9 (7.1, 8.7)
65-74		**4968**	**162806**	**1.5 (1.5, 1.6)**	**2.2 (2.1, 2.3)**	**2.7 (2.6, 2.8)**	**3.9 (3.8, 4.0)**	**5.4 (5.1, 5.6)**	**6.6 (6.2, 7.1)**
	Cemented	90	2516	1.5 (1.1, 2.1)	2.2 (1.7, 2.8)	2.7 (2.1, 3.4)	4.2 (3.3, 5.2)	5.5 (4.2, 7.2)	
	Cementless	3098	100932	1.7 (1.6, 1.8)	2.3 (2.3, 2.4)	2.8 (2.7, 2.9)	3.9 (3.8, 4.1)	5.6 (5.3, 5.9)	7.1 (6.4, 7.9)
	Hybrid	1780	59358	1.2 (1.1, 1.3)	1.9 (1.8, 2.0)	2.5 (2.3, 2.6)	3.7 (3.5, 3.9)	5.1 (4.8, 5.4)	6.2 (5.6, 6.7)
≥75		**4074**	**138028**	**1.7 (1.6, 1.8)**	**2.3 (2.3, 2.4)**	**2.8 (2.7, 2.9)**	**4.0 (3.8, 4.1)**	**5.4 (5.1, 5.7)**	**6.0 (5.6, 6.5)**
	Cemented	120	4902	1.2 (1.0, 1.6)	1.9 (1.5, 2.3)	2.4 (2.0, 2.9)	3.2 (2.6, 3.8)	4.6 (2.8, 7.6)	
	Cementless	2002	58404	2.1 (2.0, 2.3)	2.8 (2.7, 2.9)	3.3 (3.1, 3.4)	4.6 (4.4, 4.8)	6.9 (6.3, 7.5)	7.6 (6.7, 8.6)
	Hybrid	1952	74722	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.5 (2.4, 2.7)	3.6 (3.4, 3.8)	4.5 (4.2, 4.8)	5.1 (4.6, 5.6)
TOTAL		**14162**	**451574**						

Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces. Restricted to modern prostheses

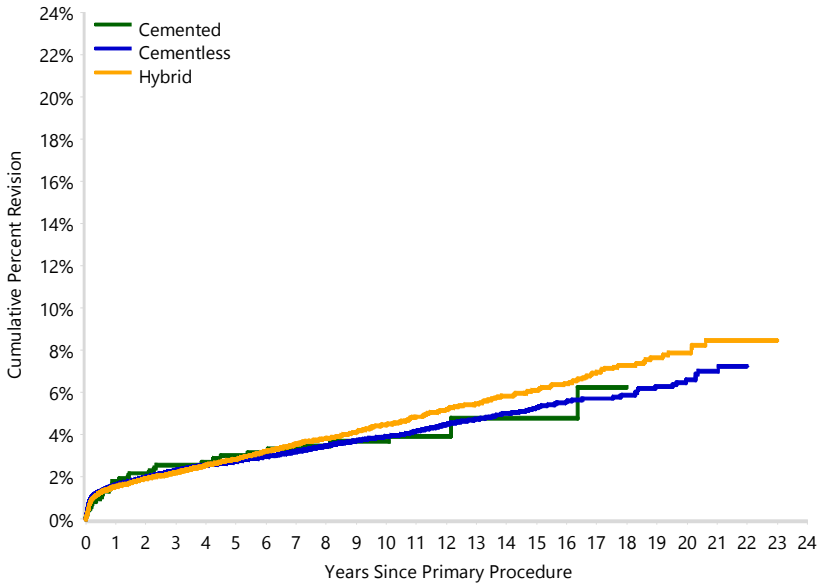
Figure HT26 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged <55 Years by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	279	254	232	217	141	20	5
Cementless	36740	32636	25674	20024	8095	2171	419
Hybrid	8818	7958	6574	5275	2319	734	200

Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces. Restricted to modern prostheses

Figure HT27 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged 55–64 Years by Fixation (Primary Diagnosis OA)



HR - adjusted for age and gender

Cemented vs Cementless

Entire Period: HR=0.99 (95% CI 0.70, 1.41), p=0.960

Cemented vs Hybrid

Entire Period: HR=0.88 (95% CI 0.62, 1.26), p=0.488

Cementless vs Hybrid

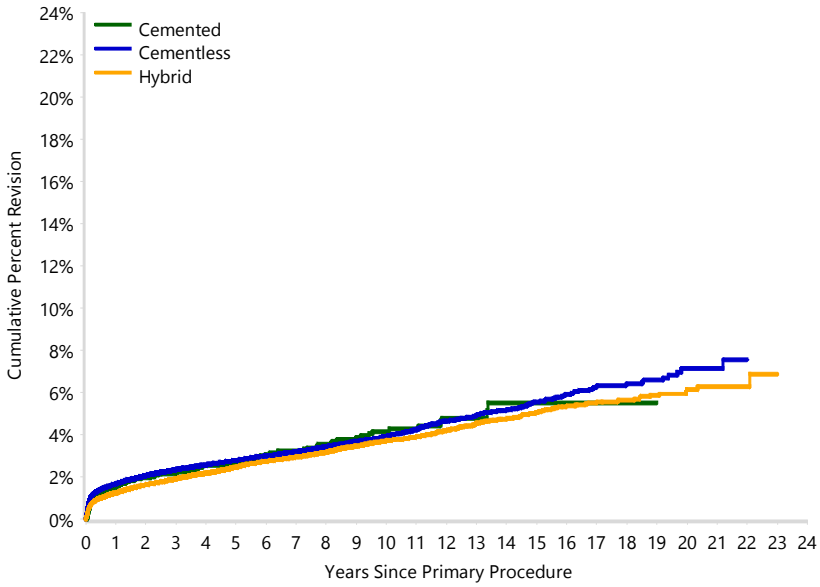
0 - 1Mth: HR=1.50 (95% CI 1.23, 1.83), p<0.001

1Mth+: HR=0.82 (95% CI 0.76, 0.89), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	848	806	711	656	401	83	17
Cementless	77513	68791	54243	41998	16909	4781	782
Hybrid	26542	24083	19796	15869	7685	2759	567

Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces
Restricted to modern prostheses

Figure HT28 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged 65–74 Years by Fixation (Primary Diagnosis OA)



HR - adjusted for age and gender

Cemented vs Hybrid

Entire Period: HR=1.12 (95% CI 0.90, 1.38), p=0.313

Cementless vs Cemented

Entire Period: HR=1.01 (95% CI 0.82, 1.24), p=0.958

Cementless vs Hybrid

0 - 2Wk: HR=2.23 (95% CI 1.75, 2.86), p<0.001

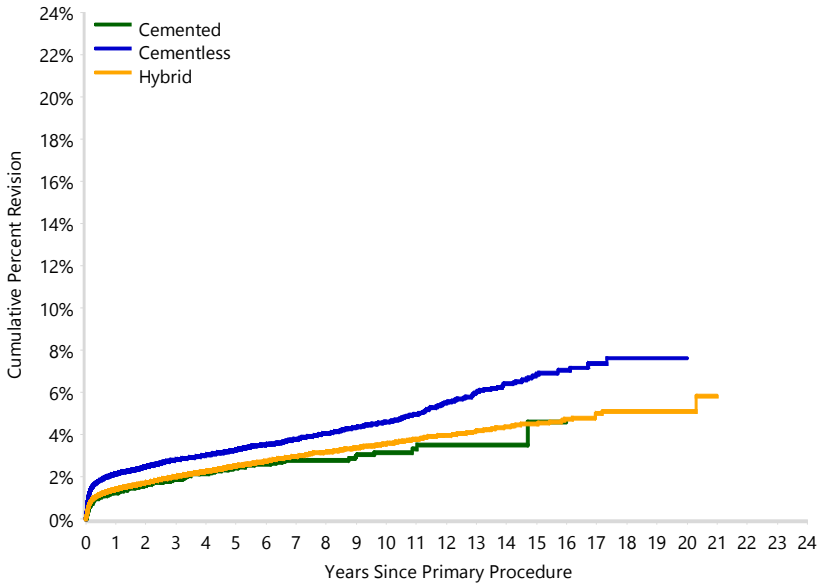
2Wk - 3Mth: HR=1.31 (95% CI 1.17, 1.47), p<0.001

3Mth+: HR=0.99 (95% CI 0.93, 1.07), p=0.889

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	2516	2386	2109	1792	861	153	28
Cementless	100932	88785	69168	52538	19307	4649	517
Hybrid	59358	53757	43990	35035	16419	5554	834

Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces
Restricted to modern prostheses

Figure HT29 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged ≥75 Years by Fixation (Primary Diagnosis OA)



HR - adjusted for age and gender

Cemented vs Hybrid

Entire Period: HR=0.92 (95% CI 0.76, 1.10), p=0.352

Cementless vs Cemented

0 - 2Wk: HR=2.58 (95% CI 1.96, 3.40), p<0.001

2Wk+: HR=1.39 (95% CI 1.15, 1.67), p<0.001

Cementless vs Hybrid

0 - 2Wk: HR=2.37 (95% CI 1.91, 2.93), p<0.001

2Wk - 1Mth: HR=1.58 (95% CI 1.35, 1.84), p<0.001

1Mth+: HR=1.21 (95% CI 1.13, 1.31), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	4902	4481	3616	2737	803	77	6
Cementless	58404	50359	37850	27297	7948	1241	59
Hybrid	74722	65940	50647	37446	12626	2436	174

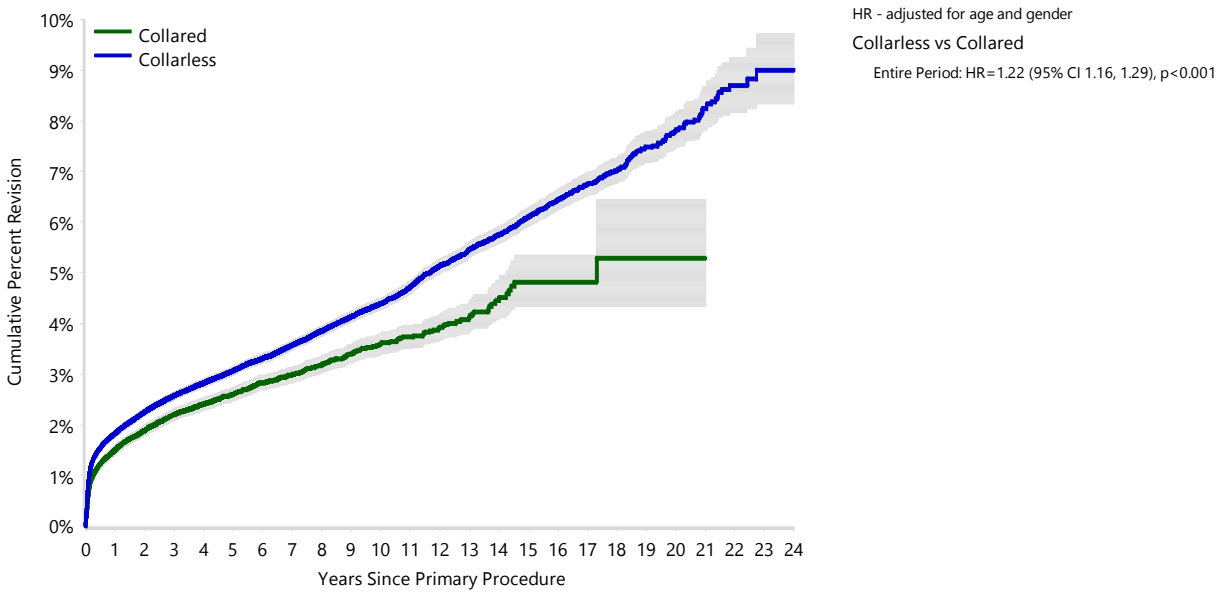
Note: Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces
Restricted to modern prostheses

Table HT27 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)

Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Collared	1824	76852	1.5 (1.4, 1.6)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	3.4 (3.2, 3.6)	4.8 (4.3, 5.3)	5.3 (4.3, 6.4)
Collarless	7740	210403	1.8 (1.8, 1.9)	2.6 (2.5, 2.6)	3.1 (3.0, 3.1)	4.1 (4.0, 4.2)	6.1 (5.9, 6.3)	7.8 (7.5, 8.2)
TOTAL	9564	287255						

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded.

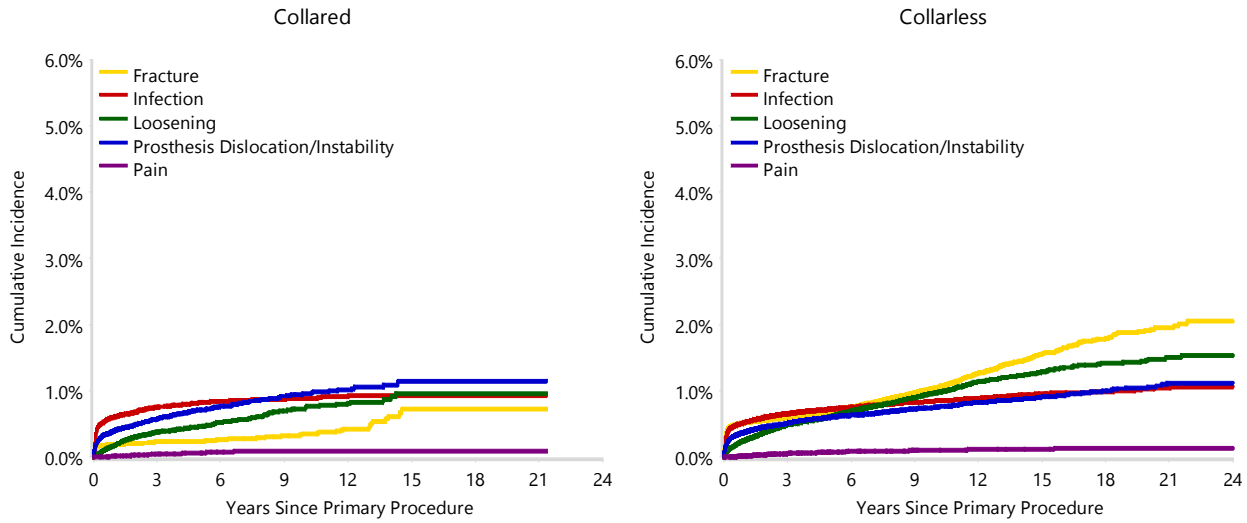
Figure HT30 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Collared	76852	62868	42157	27916	9543	900	88
Collarless	210403	190255	155722	123657	64678	16150	3220

Note: Restricted to modern prostheses

Figure HT31 Cumulative Incidence Revision Diagnosis of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table HT28 Cementless Primary Total Conventional Hip Replacement by Type of Revision and Stem Collar Use (Primary Diagnosis OA)

Type of Revision	Collared			Collarless		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Femoral Component	429	0.6	23.5	3065	1.5	39.6
Head/Insert	703	0.9	38.5	1782	0.8	23.0
Acetabular Component	321	0.4	17.6	1335	0.6	17.2
THR (Femoral/Acetabular)	183	0.2	10.0	646	0.3	8.3
Head Only	79	0.1	4.3	443	0.2	5.7
Cement Spacer	57	0.1	3.1	243	0.1	3.1
Minor Components	19	0.0	1.0	126	0.1	1.6
Insert Only	21	0.0	1.2	59	0.0	0.8
Removal of Prostheses	7	0.0	0.4	25	0.0	0.3
Reinsertion of Components	2	0.0	0.1	9	0.0	0.1
Bipolar Head and Femoral	3	0.0	0.2	2	0.0	0.0
Total Femoral				3	0.0	0.0
Bipolar Only				1	0.0	0.0
Head/Neck				1	0.0	0.0
N Revision	**1824**	**2.4**	**100.0**	**7740**	**3.7**	**100.0**
N Primary	**76852**			**210403**		

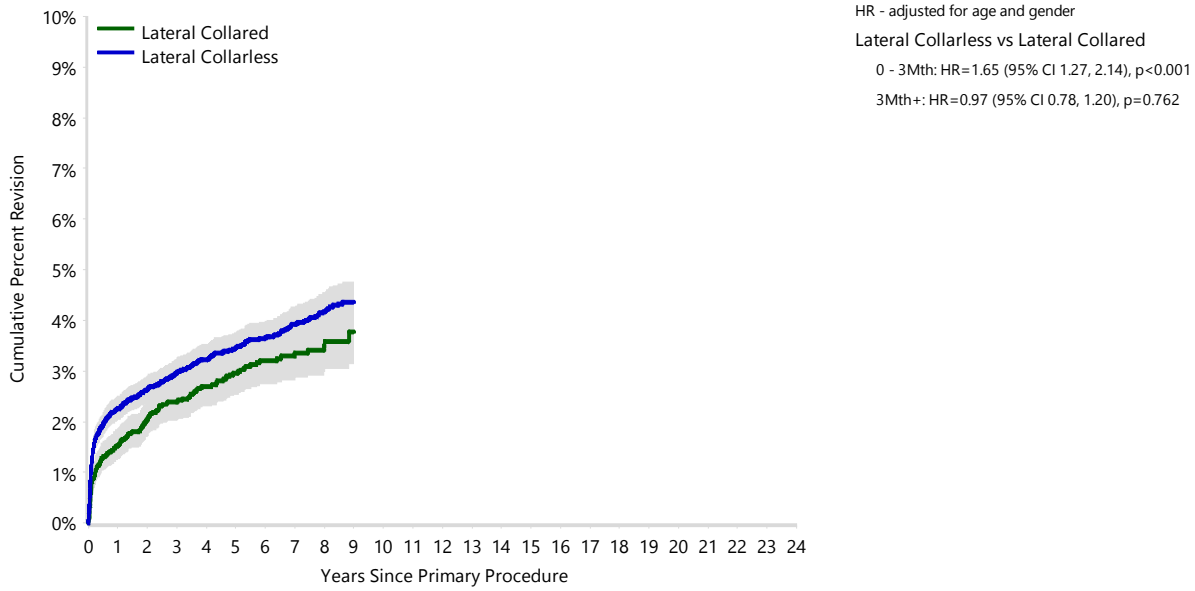
Note: Restricted to modern prostheses

Table HT29 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Lateral Approach and Stem Collar Use (Primary Diagnosis OA)

Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Lateral	Collared	187	7000	1.5 (1.3, 1.9)	2.4 (2.0, 2.8)	3.0 (2.5, 3.4)	3.3 (2.9, 3.9)	3.5 (3.0, 4.1)
	Collarless	584	16706	2.3 (2.0, 2.5)	3.0 (2.7, 3.3)	3.5 (3.2, 3.8)	3.9 (3.6, 4.3)	4.2 (3.8, 4.5)
TOTAL		771	23706					

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

Figure HT32 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Lateral Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Lateral	Collared	7000	6020	4383	3058	1732	1105
	Collarless	16706	15069	12168	9293	5967	4047

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

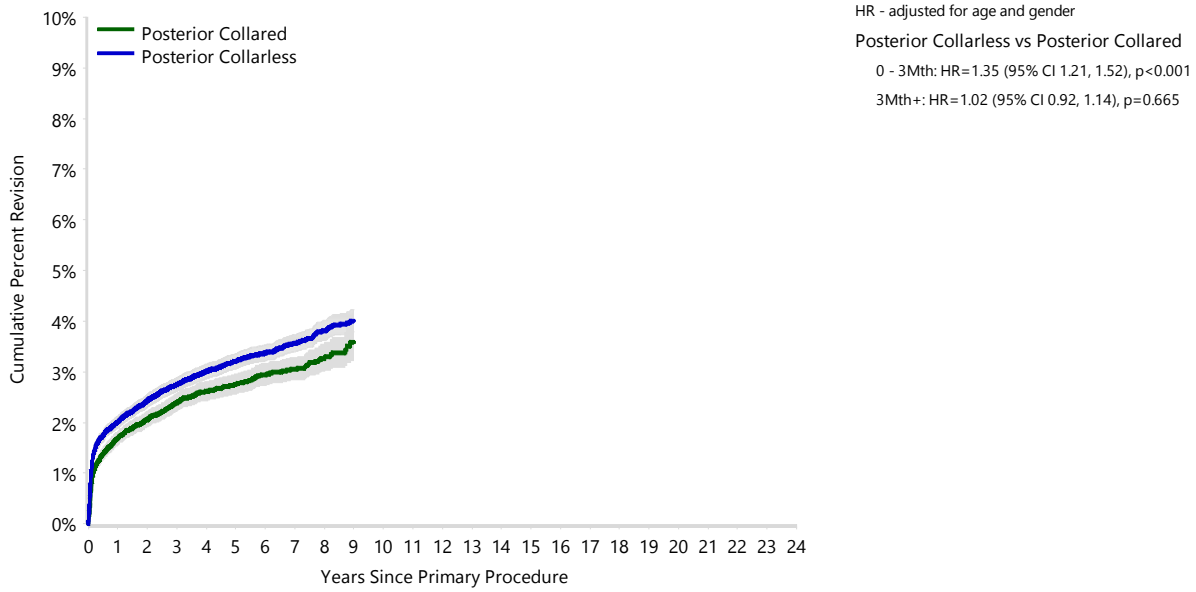
Primary Total Hip Replacement

Table HT30 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Posterior Approach and Stem Collar Use (Primary Diagnosis OA)

Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Posterior	Collared	888	37572	1.7 (1.6, 1.8)	2.4 (2.2, 2.6)	2.8 (2.6, 3.0)	3.1 (2.8, 3.3)	3.3 (3.0, 3.5)
	Collarless	2003	68346	2.0 (1.9, 2.1)	2.8 (2.6, 2.9)	3.2 (3.1, 3.4)	3.6 (3.4, 3.7)	3.8 (3.6, 4.0)
TOTAL		2891	105918					

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

Figure HT33 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Posterior Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Posterior	Collared	37572	30380	19333	11412	5430	2953
	Collarless	68346	58284	40980	26408	14022	8504

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

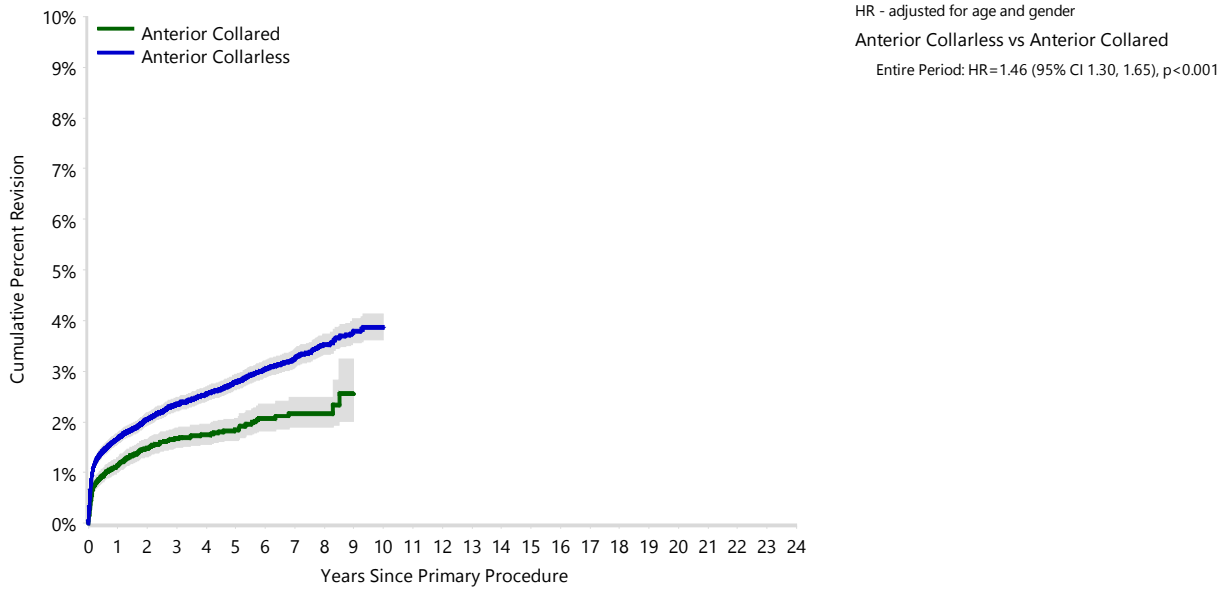
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Table HT31 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Anterior Approach and Stem Collar Use (Primary Diagnosis OA)

Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Anterior	Collared	336	22294	1.1 (1.0, 1.3)	1.7 (1.5, 1.9)	1.8 (1.6, 2.1)	2.2 (1.9, 2.5)	2.2 (1.9, 2.5)
	Collarless	1530	57046	1.7 (1.6, 1.8)	2.3 (2.2, 2.5)	2.8 (2.6, 2.9)	3.2 (3.1, 3.4)	3.5 (3.3, 3.7)
TOTAL		1866	79340					

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

Figure HT34 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Anterior Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Anterior	Collared	22294	16733	9029	4496	1640	757
	Collarless	57046	50238	37993	25824	14121	8852

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only procedures with a known surgical approach have been included

Table HT32 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Cementless Femoral Component and Stem Collar Use (Primary Diagnosis OA)

Femoral Component	Stem Collar Use	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
AMIStem H	Collared	45	2659	1.3 (1.0, 1.9)	2.0 (1.5, 2.7)	2.2 (1.6, 3.1)		
	Collarless	191	6814	1.5 (1.2, 1.8)	2.0 (1.7, 2.4)	2.9 (2.4, 3.3)	3.6 (3.1, 4.2)	3.7 (3.2, 4.3)
CORAIL	Collared	1245	44536	1.5 (1.4, 1.6)	2.3 (2.1, 2.4)	2.7 (2.5, 2.9)	3.1 (2.9, 3.3)	3.3 (3.1, 3.5)
	Collarless	1368	23769	1.7 (1.5, 1.9)	2.6 (2.4, 2.8)	3.3 (3.1, 3.5)	4.0 (3.7, 4.2)	4.4 (4.2, 4.7)
EVOK	Collared	29	934	2.9 (2.0, 4.3)	3.7 (2.5, 5.3)			
	Collarless	40	1009	2.2 (1.5, 3.3)	4.0 (2.9, 5.5)	4.5 (3.3, 6.1)	4.5 (3.3, 6.1)	4.5 (3.3, 6.1)
HACTIV	Collared	70	1495	3.0 (2.3, 4.1)	4.3 (3.3, 5.5)	4.8 (3.8, 6.2)	6.8 (5.1, 9.1)	
	Collarless	47	1338	2.2 (1.5, 3.1)	2.8 (2.1, 3.9)	3.2 (2.4, 4.4)	3.5 (2.6, 4.7)	3.9 (2.9, 5.2)
Metafix	Collared	230	14325	1.2 (1.0, 1.4)	1.8 (1.6, 2.1)	2.0 (1.7, 2.3)	2.1 (1.8, 2.5)	2.1 (1.8, 2.5)
	Collarless	237	7638	1.8 (1.6, 2.2)	2.7 (2.3, 3.1)	3.0 (2.6, 3.4)	3.5 (3.0, 4.0)	3.8 (3.3, 4.3)
Origin	Collared	35	1899	1.8 (1.2, 2.5)	2.2 (1.5, 3.2)			
	Collarless	122	2947	2.6 (2.1, 3.2)	3.5 (2.9, 4.3)	4.2 (3.5, 5.0)	4.7 (3.9, 5.6)	5.4 (4.4, 6.6)
Paragon	Collared	47	3271	1.3 (1.0, 1.8)	1.6 (1.2, 2.3)			
	Collarless	77	3695	1.7 (1.4, 2.2)	2.1 (1.7, 2.6)	2.1 (1.7, 2.6)	2.5 (1.7, 3.7)	2.5 (1.7, 3.7)
Polarstem	Collared	47	2851	1.6 (1.2, 2.2)	2.0 (1.5, 2.7)	2.0 (1.5, 2.7)		
	Collarless	585	21905	1.8 (1.6, 2.0)	2.2 (2.0, 2.4)	2.6 (2.4, 2.8)	2.9 (2.6, 3.1)	3.0 (2.8, 3.3)
Quadra-P	Collared	12	839	1.5 (0.8, 2.8)	2.0 (1.0, 3.7)			
	Collarless	14	935	1.5 (0.8, 2.6)	1.9 (1.1, 3.3)	1.9 (1.1, 3.3)		
Other (1)		0	1					
TOTAL		4441	142860					

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only prostheses with >500 procedures each have been included

Table HT33 Comparisons of Revision Rates of Primary Total Conventional Hip Replacement by Cementless Femoral Component and Stem Collar Use

Diagnosis/Outcome	Comparison	Hazard Ratio - adjusted for age and gender
Primary Diagnosis OA/All Cause Revision	AMIStem H Collared vs AMIStem H Collarless	Entire Period: HR=0.95 (95% CI 0.68, 1.33), p=0.770
Primary Diagnosis OA/All Cause Revision	CORAIL Collared vs CORAIL Collarless	0 - 6Mth: HR=0.96 (95% CI 0.84, 1.11), p=0.609
Primary Diagnosis OA/All Cause Revision		6Mth - 1.5Yr: HR=0.76 (95% CI 0.62, 0.94), p=0.009
Primary Diagnosis OA/All Cause Revision		1.5Yr - 2Yr: HR=0.65 (95% CI 0.45, 0.94), p=0.021
Primary Diagnosis OA/All Cause Revision		2Yr - 2.5Yr: HR=0.96 (95% CI 0.66, 1.41), p=0.847
Primary Diagnosis OA/All Cause Revision		2.5Yr - 5.5Yr: HR=0.62 (95% CI 0.52, 0.75), p<0.001
Primary Diagnosis OA/All Cause Revision		5.5Yr+: HR=0.46 (95% CI 0.39, 0.55), p<0.001
Primary Diagnosis OA/All Cause Revision	HACTIV Collared vs HACTIV Collarless	0 - 1Mth: HR=0.73 (95% CI 0.35, 1.53), p=0.408
Primary Diagnosis OA/All Cause Revision		1Mth - 3Mth: HR=2.73 (95% CI 0.99, 7.53), p=0.051
Primary Diagnosis OA/All Cause Revision		3Mth+: HR=2.13 (95% CI 1.27, 3.55), p=0.003
Primary Diagnosis OA/All Cause Revision	Metafix Collared vs Metafix Collarless	Entire Period: HR=0.64 (95% CI 0.53, 0.77), p<0.001
Primary Diagnosis OA/All Cause Revision	Origin Collared vs Origin Collarless	Entire Period: HR=0.60 (95% CI 0.41, 0.88), p=0.009
Primary Diagnosis OA/All Cause Revision	Paragon Collared vs Paragon Collarless	Entire Period: HR=0.79 (95% CI 0.55, 1.15), p=0.216
Primary Diagnosis OA/All Cause Revision	Polarstem Collared vs Polarstem Collarless	Entire Period: HR=0.88 (95% CI 0.65, 1.19), p=0.409

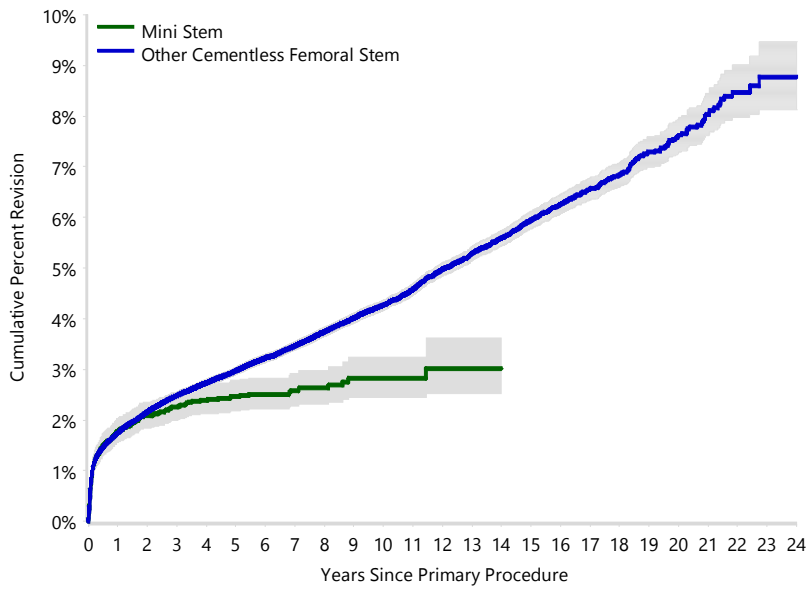
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only prostheses with >500 procedures each have been included

Table HT34 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	281	12511	1.8 (1.5, 2.0)	2.3 (2.0, 2.5)	2.5 (2.2, 2.8)	2.8 (2.5, 3.3)		
Other Cementless Femoral Stem	9312	275304	1.7 (1.7, 1.8)	2.5 (2.4, 2.5)	3.0 (2.9, 3.0)	4.0 (3.9, 4.1)	5.9 (5.8, 6.1)	7.6 (7.3, 8.0)
TOTAL	9593	287815						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT35 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)



HR - adjusted for age and gender

Mini Stem vs Other Cementless Femoral Stem

0 - 1Mth: HR=0.96 (95% CI 0.78, 1.18), p=0.703

1Mth - 3Mth: HR=1.06 (95% CI 0.82, 1.36), p=0.679

3Mth - 6Mth: HR=1.20 (95% CI 0.83, 1.72), p=0.329

6Mth - 9Mth: HR=0.73 (95% CI 0.42, 1.27), p=0.265

9Mth - 2Yr: HR=0.88 (95% CI 0.66, 1.18), p=0.388

2Yr+: HR=0.39 (95% CI 0.28, 0.54), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	12511	10401	7258	4496	1312	3	0
Other Cementless Femoral Stem	275304	243222	191022	147386	73039	17066	3314

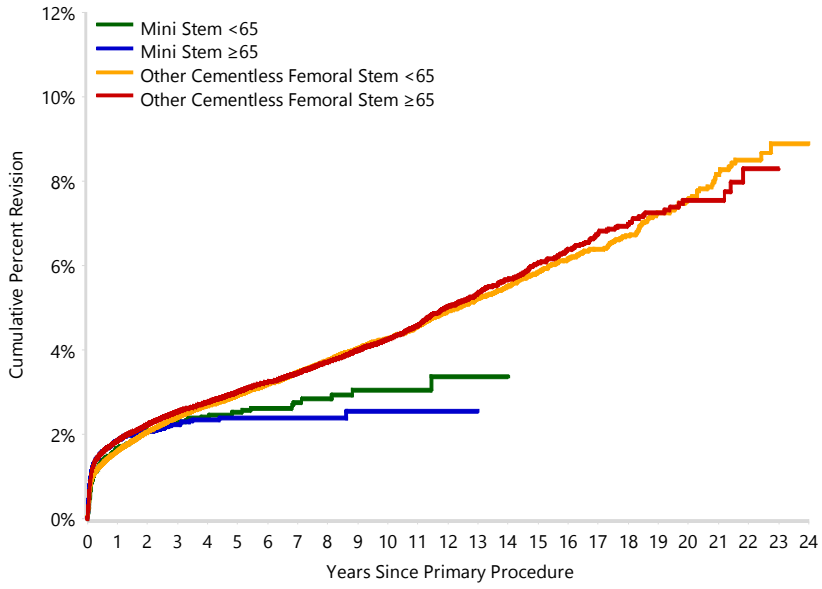
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT35 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and Age (Primary Diagnosis OA)

Stem Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	<65	133	5641	1.7 (1.4, 2.1)	2.3 (1.9, 2.7)	2.5 (2.1, 3.0)	3.1 (2.5, 3.7)		
	≥65	148	6870	1.8 (1.6, 2.2)	2.2 (1.9, 2.6)	2.4 (2.0, 2.8)	2.6 (2.1, 3.1)		
Other Cementless Femoral Stem	<65	4027	115520	1.6 (1.5, 1.7)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	4.0 (3.9, 4.2)	5.8 (5.6, 6.1)	7.6 (7.2, 8.1)
	≥65	5285	159784	1.8 (1.8, 1.9)	2.5 (2.5, 2.6)	3.0 (2.9, 3.1)	4.0 (3.9, 4.1)	6.1 (5.8, 6.3)	7.6 (7.0, 8.1)
TOTAL		9593	287815						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT36 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and Age (Primary Diagnosis OA)



HR - adjusted for gender

Mini Stem <65 vs Mini Stem ≥65
0 - 1Mth: HR=0.63 (95% CI 0.42, 0.96), p=0.030
1Mth+: HR=1.25 (95% CI 0.97, 1.62), p=0.080

Mini Stem <65 vs Other Cementless Femoral Stem <65
Entire Period: HR=0.84 (95% CI 0.71, 1.00), p=0.048

Mini Stem ≥65 vs Other Cementless Femoral Stem ≥65
0 - 3Mth: HR=0.92 (95% CI 0.77, 1.10), p=0.339
3Mth - 1.5Yr: HR=0.99 (95% CI 0.81, 1.21), p=0.953
1.5Yr - 2.5Yr: HR=0.46 (95% CI 0.33, 0.64), p<0.001
2.5Yr - 3.5Yr: HR=0.48 (95% CI 0.34, 0.68), p<0.001
3.5Yr - 4Yr: HR=0.38 (95% CI 0.25, 0.57), p<0.001
4Yr+: HR=0.38 (95% CI 0.28, 0.53), p<0.001

Other Cementless Femoral Stem <65
vs Other Cementless Femoral Stem ≥65
0 - 2Wk: HR=0.90 (95% CI 0.78, 1.03), p=0.114
2Wk - 3Mth: HR=0.79 (95% CI 0.73, 0.85), p<0.001
3Mth+: HR=1.08 (95% CI 1.02, 1.13), p=0.005

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	<65	5641	4806	3502	2334	786	0	0
	≥65	6870	5595	3756	2162	526	3	0
Other Cementless Femoral Stem	<65	115520	103199	82457	65200	35078	9810	2335
	≥65	159784	140023	108565	82186	37961	7256	979

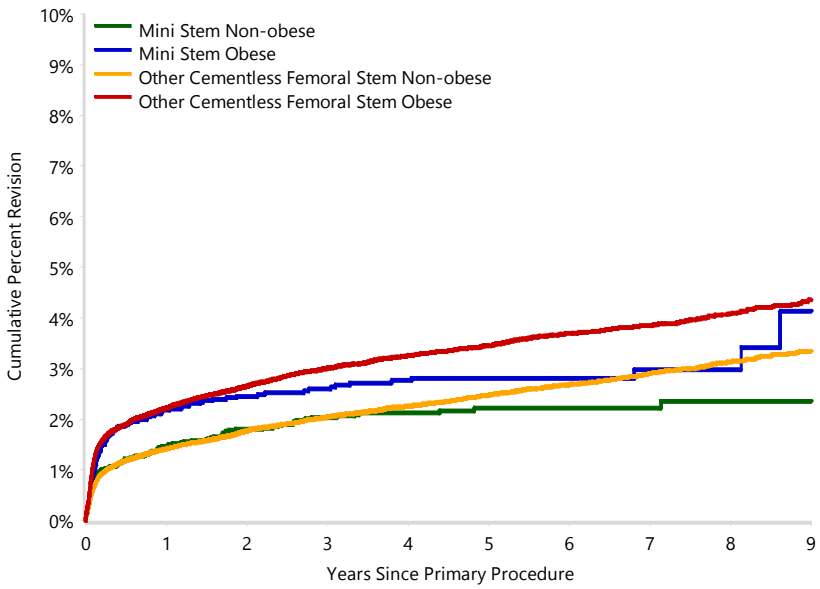
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT36 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and BMI Category (Primary Diagnosis OA)

Stem Type	BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Mini Stem	Non-obese	123	6473	1.5 (1.2, 1.8)	2.0 (1.7, 2.4)	2.2 (1.8, 2.7)	2.2 (1.8, 2.7)	2.4 (1.9, 2.9)
	Obese	120	4670	2.2 (1.8, 2.6)	2.6 (2.2, 3.1)	2.8 (2.3, 3.4)	3.0 (2.4, 3.6)	4.1 (2.7, 6.3)
Other Cementless Femoral Stem	Non-obese	2476	110165	1.4 (1.3, 1.5)	2.0 (2.0, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)
	Obese	2668	84494	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	3.5 (3.3, 3.6)	3.8 (3.7, 4.0)	4.3 (4.1, 4.6)
TOTAL		5387	205802					

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT37 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and BMI Category (Primary Diagnosis OA)



HR - adjusted for age and gender

Mini Stem Non-obese vs Mini Stem Obese
Entire Period: HR=0.73 (95% CI 0.57, 0.94), p=0.013

Mini Stem Non-obese vs
Other Cementless Femoral Stem Non-obese
0 - 2Wk: HR=1.39 (95% CI 0.90, 2.13), p=0.133
2Wk+: HR=0.84 (95% CI 0.69, 1.03), p=0.089

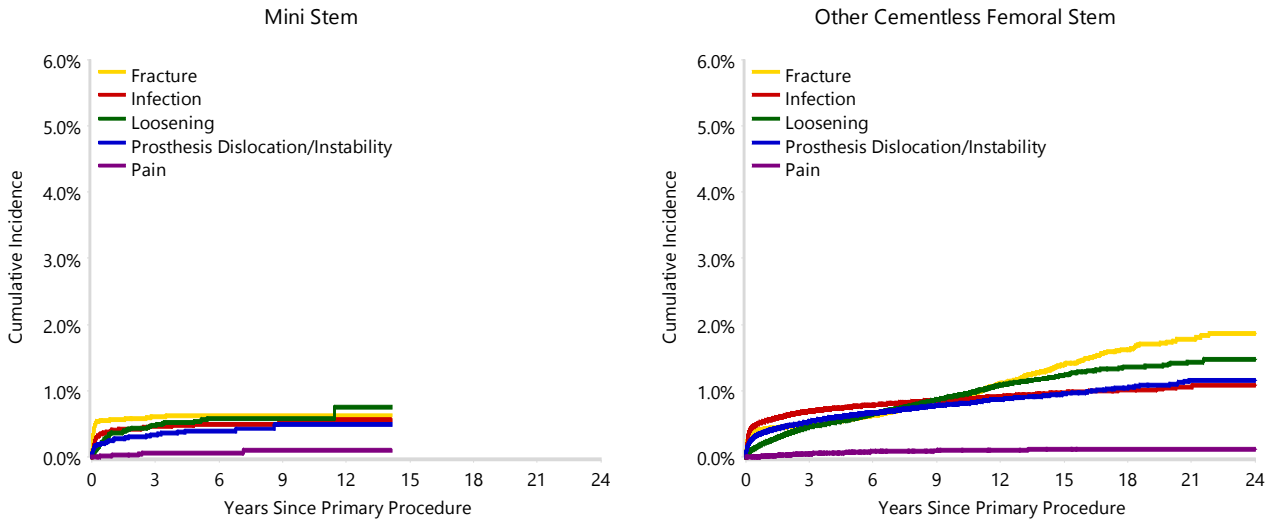
Mini Stem Obese vs
Other Cementless Femoral Stem Obese
Entire Period: HR=0.86 (95% CI 0.71, 1.03), p=0.098

Other Cementless Femoral Stem Non-obese vs
Other Cementless Femoral Stem Obese
0 - 3Mth: HR=0.59 (95% CI 0.54, 0.64), p<0.001
3Mth - 6Mth: HR=0.85 (95% CI 0.70, 1.04), p=0.106
6Mth - 1.5Yr: HR=0.71 (95% CI 0.62, 0.81), p<0.001
1.5Yr+: HR=0.88 (95% CI 0.79, 0.97), p=0.011

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Mini Stem	Non-obese	6473	5300	3487	1911	770	167
	Obese	4670	3782	2500	1365	538	76
Other Cementless Femoral Stem	Non-obese	110165	93711	65911	43100	23182	6361
	Obese	84494	70985	49407	31857	16820	4540

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT38 Cumulative Incidence Revision Diagnosis of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)



Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT37 Cementless Primary Total Conventional Hip Replacement by Type of Revision and Stem Type (Primary Diagnosis OA)

Type of Revision	Mini Stem			Other Cementless Femoral Stem		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Femoral Component	119	1.0	42.3	3384	1.2	36.3
Head/Insert	47	0.4	16.7	2443	0.9	26.2
Acetabular Component	45	0.4	16.0	1618	0.6	17.4
THR (Femoral/Acetabular)	29	0.2	10.3	806	0.3	8.7
Head Only	32	0.3	11.4	492	0.2	5.3
Cement Spacer	5	0.0	1.8	295	0.1	3.2
Minor Components	2	0.0	0.7	143	0.1	1.5
Other	2	0.0	0.7	131	0.0	1.4
N Revision	**281**	**2.2**	**100.0**	**9312**	**3.4**	**100.0**
N Primary	**12511**			**275304**		

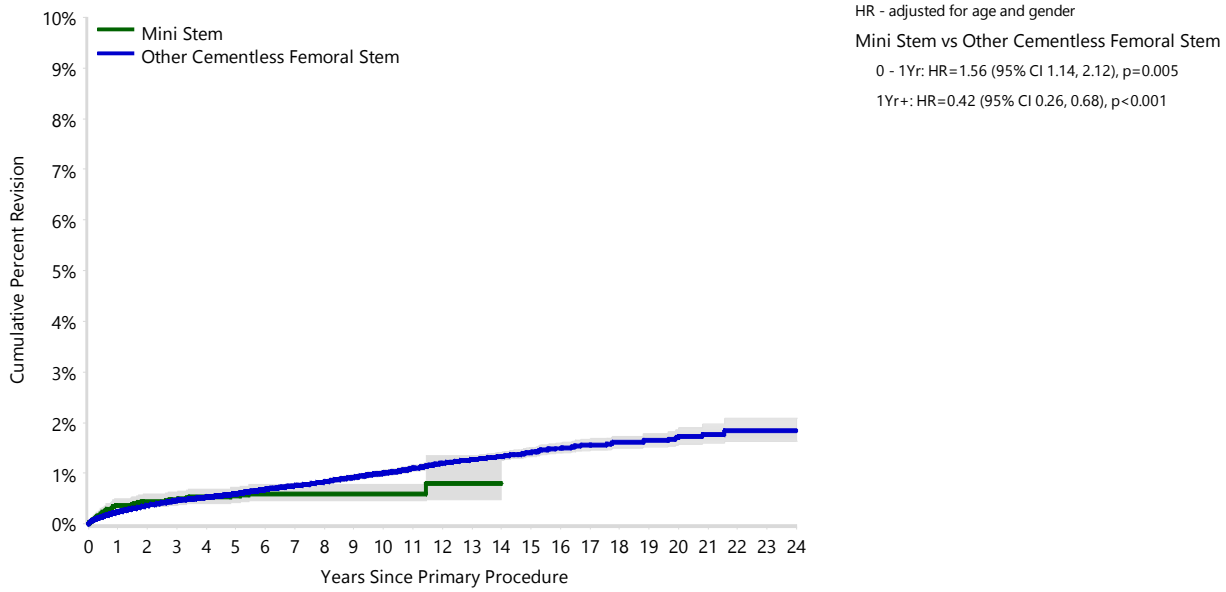
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT38 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Loosening)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	60	12511	0.4 (0.3, 0.5)	0.5 (0.4, 0.6)	0.6 (0.4, 0.7)	0.6 (0.5, 0.8)		
Other Cementless Femoral Stem	1926	275304	0.2 (0.2, 0.3)	0.5 (0.4, 0.5)	0.6 (0.6, 0.6)	1.0 (1.0, 1.1)	1.4 (1.3, 1.5)	1.7 (1.6, 1.9)
TOTAL	1986	287815						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT39 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	12511	10401	7258	4496	994	3	0
Other Cementless Femoral Stem	275304	243222	191022	147386	58073	17066	3314

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

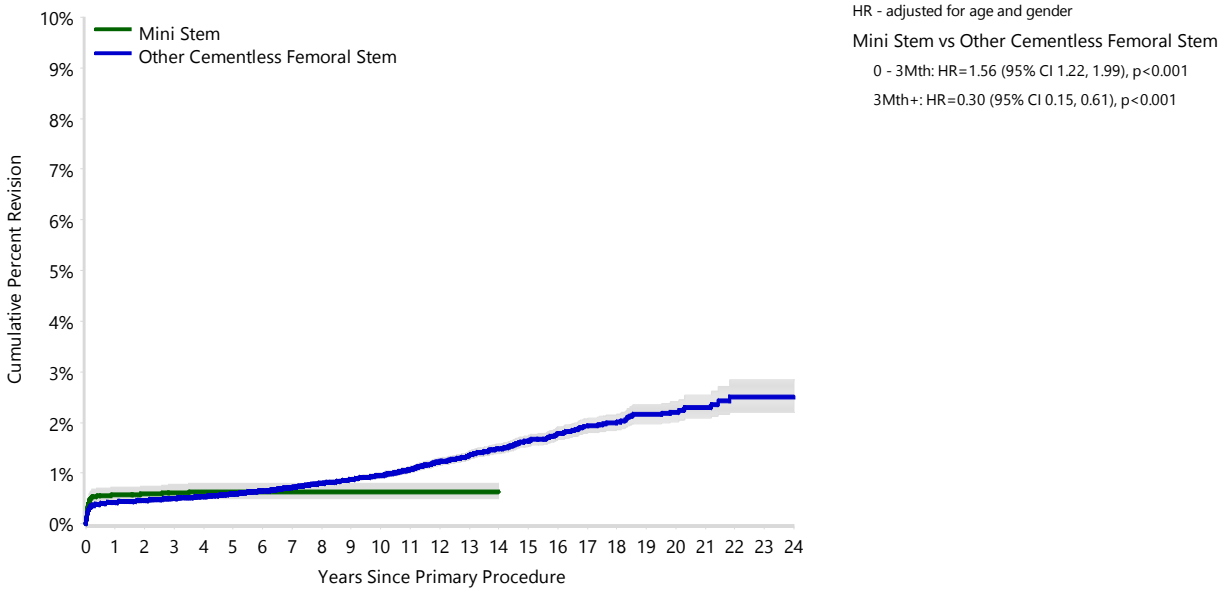
Primary Total Hip Replacement

Table HT39 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Fracture)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	75	12511	0.6 (0.4, 0.7)	0.6 (0.5, 0.8)	0.6 (0.5, 0.8)	0.6 (0.5, 0.8)		
Other Cementless Femoral Stem	2117	275304	0.4 (0.4, 0.5)	0.5 (0.5, 0.5)	0.6 (0.6, 0.6)	1.0 (0.9, 1.0)	1.6 (1.5, 1.7)	2.2 (2.0, 2.4)
TOTAL	2192	287815						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT40 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	12511	10401	7258	4496	994	3	0
Other Cementless Femoral Stem	275304	243222	191022	147386	58073	17066	3314

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT40 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Mini Stem Femoral Component (Primary Diagnosis OA)

Femoral Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Exacta RS	0	8						
MiniHip	48	1445	2.4 (1.7, 3.3)	3.0 (2.2, 4.0)	3.3 (2.5, 4.4)	3.6 (2.7, 4.8)		
MiniMax	23	386	4.9 (3.2, 7.6)	6.0 (4.0, 8.9)	6.0 (4.0, 8.9)			
Nanos	13	686	1.2 (0.6, 2.3)	1.5 (0.8, 2.7)	1.5 (0.8, 2.7)	1.8 (1.0, 3.1)		
Optimys	70	3159	1.7 (1.3, 2.2)	2.2 (1.7, 2.8)	2.5 (2.0, 3.2)	2.8 (2.1, 3.7)		
Taperloc Microplasty	127	6827	1.5 (1.3, 1.9)	2.0 (1.6, 2.4)	2.1 (1.8, 2.5)	3.3 (2.1, 5.3)		
TOTAL	281	12511						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Primary Total Hip Replacement

Bearing Surface

Bearing surface is a combination of the material used for the femoral head and the acetabular insert or cup. There are 3 femoral head materials (metal, ceramic, and ceramicised metal) and 4 acetabular articular surface materials (XLPE, non XLPE, ceramic, and metal). Metal/metal bearing surfaces include large head sizes >32mm and head sizes ≤32mm. The following analyses comprises all bearing surface combinations including those with no recorded use in 2024. XLPE is classified as ultra-high molecular weight polyethylene that has been irradiated by high dose (≥50kGy) gamma or electron beam radiation.

During the last 10 years, there has been an increase in the use of ceramic/XLPE bearing surfaces, while both ceramic/ceramic and metal/XLPE have decreased. The proportional use of bearing surfaces over time are shown in Figure HT41.

The change in use of head sizes with the 3 most common bearing surfaces (ceramic/ceramic, ceramic/XLPE and metal/XLPE) is shown in Figure HT42, Figure HT43 and Figure HT44. In 2024, head sizes >32mm are the most frequently used for all bearing couples.

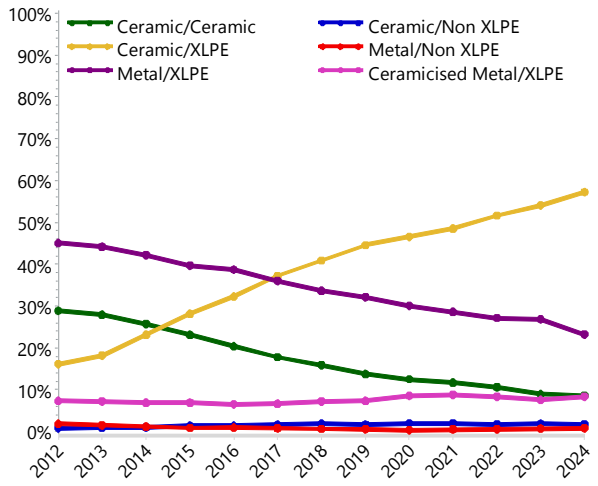
Comparison of Bearing Surfaces

There are 10 bearing surfaces, 8 of which have been used in >5,000 procedures. Comparing the rates of revision for these bearings, ceramicised metal/XLPE has the lowest rate of revision at 20 years. However, the results should be interpreted with caution as this bearing is a single company product, used with a small number of femoral stem and acetabular component combinations. This may have a confounding effect, making it unclear if the lower rate of revision is an effect of the bearing surface or reflects the limited combinations of femoral and acetabular prostheses.

Ceramic/ceramic has a lower rate of revision compared to Ceramic/XLPE from 2 weeks to 3 months and a higher rate of revision from 9 months onwards. Similarly, when compared to ceramic/XLPE, metal/XLPE also has an early lower rate of revision (until 3 months), but after 6 months there is a higher rate of revision (Table HT41 and Figure HT45).

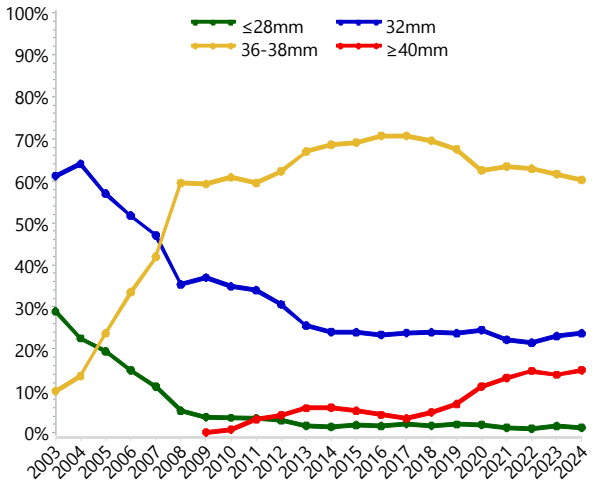
Detailed information on the analysis of metal/metal and metal/ceramic bearing surfaces are available in the supplementary reports 'Metal/Metal Bearing Surface in Total Conventional Hip Arthroplasty' and 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Figure HT41 Proportion of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



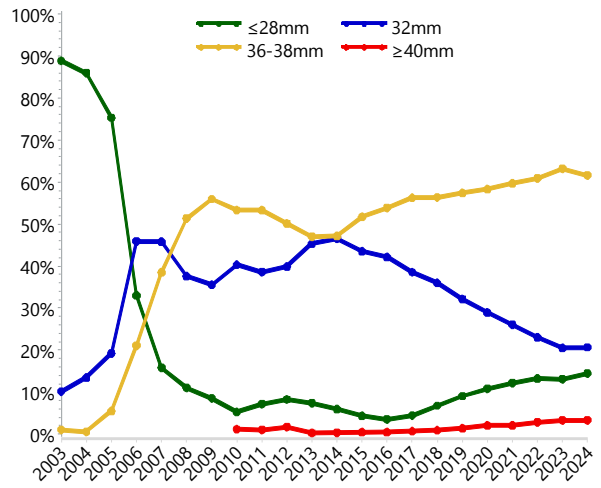
Note: Restricted to modern prostheses

Figure HT42 Ceramic/Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



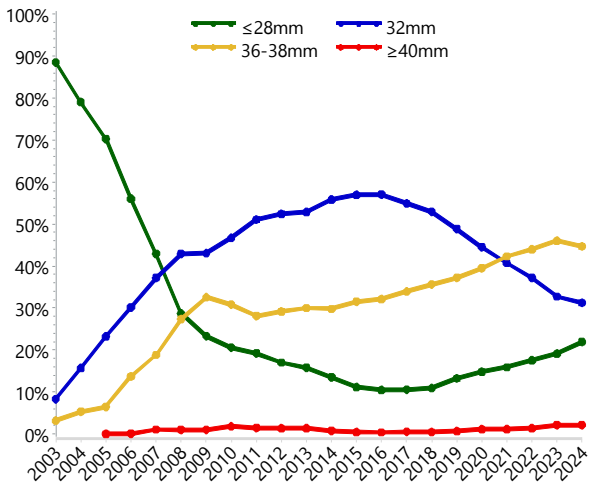
Note: Restricted to modern prostheses

Figure HT43 Ceramic/XPLE Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure HT44 Metal/XPLE Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



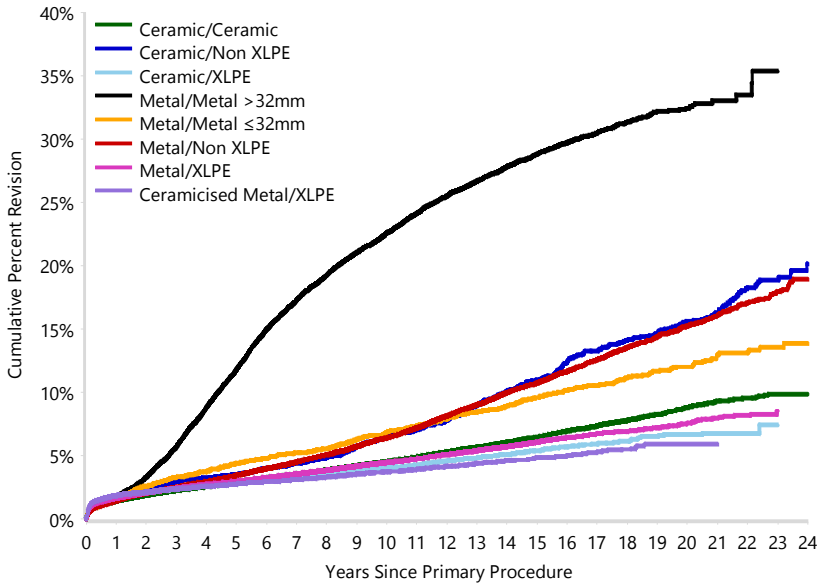
Note: Restricted to modern prostheses

Table HT41 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic	5437	114611	1.4 (1.4, 1.5)	2.3 (2.2, 2.4)	2.9 (2.8, 3.0)	4.5 (4.4, 4.7)	6.5 (6.3, 6.7)	8.8 (8.5, 9.2)
Ceramic/Non XLPE	799	11499	1.8 (1.5, 2.0)	3.0 (2.7, 3.3)	3.5 (3.2, 3.9)	6.6 (6.0, 7.2)	11.0 (10.1, 11.9)	15.6 (14.4, 16.9)
Ceramic/XLPE	5456	191223	1.7 (1.6, 1.7)	2.4 (2.3, 2.5)	2.8 (2.8, 2.9)	4.0 (3.9, 4.1)	5.4 (5.2, 5.7)	6.7 (6.2, 7.2)
Ceramic/Metal	31	299	1.7 (0.7, 4.0)	3.7 (2.1, 6.6)	4.4 (2.6, 7.4)	8.3 (5.7, 12.2)	11.4 (8.1, 15.9)	
Metal/Metal >32mm	3931	14424	1.7 (1.5, 1.9)	5.7 (5.3, 6.1)	11.8 (11.3, 12.3)	22.6 (21.9, 23.3)	28.8 (28.0, 29.6)	32.5 (31.5, 33.4)
Metal/Metal ≤32mm	520	5143	1.6 (1.3, 2.0)	3.3 (2.9, 3.8)	4.4 (3.9, 5.0)	6.8 (6.2, 7.6)	9.6 (8.8, 10.5)	12.0 (11.0, 13.1)
Metal/Non XLPE	3348	36447	1.4 (1.3, 1.6)	2.5 (2.3, 2.7)	3.5 (3.3, 3.7)	6.4 (6.1, 6.7)	10.8 (10.4, 11.2)	15.3 (14.7, 15.8)
Metal/XLPE	8572	217882	1.7 (1.6, 1.7)	2.4 (2.3, 2.5)	3.0 (2.9, 3.1)	4.5 (4.4, 4.6)	6.1 (5.9, 6.2)	7.6 (7.3, 7.9)
Ceramicised Metal/Non XLPE	61	316	1.6 (0.7, 3.8)	3.6 (2.0, 6.4)	3.9 (2.2, 6.8)	12.2 (8.7, 16.9)	21.2 (16.3, 27.2)	31.2 (24.5, 39.3)
Ceramicised Metal/XLPE	1301	41361	1.9 (1.7, 2.0)	2.4 (2.2, 2.5)	2.8 (2.6, 2.9)	3.7 (3.5, 4.0)	4.8 (4.5, 5.2)	5.9 (5.3, 6.5)
TOTAL	29456	633205						

Note: Excludes 292 procedures with an unknown bearing surface, 1 procedure with a ceramicised metal/ceramic bearing surface, and 8 procedures with a metal/ceramic bearing surface.

Figure HT45 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



HR - adjusted for age and gender

Ceramic/Ceramic vs Ceramic/XLPE

0 - 2Wk: HR=0.96 (95% CI 0.84, 1.09), p=0.525
2Wk - 3Mth: HR=0.74 (95% CI 0.68, 0.80), p<0.001
3Mth - 9Mth: HR=0.90 (95% CI 0.80, 1.01), p=0.063
9Mth - 2.5Yr: HR=1.16 (95% CI 1.07, 1.26), p<0.001
2.5Yr+: HR=1.35 (95% CI 1.27, 1.42), p<0.001

Ceramic/Non XLPE vs Ceramic/XLPE

0 - 3Mth: HR=0.94 (95% CI 0.79, 1.13), p=0.518
3Mth - 8Yr: HR=1.57 (95% CI 1.40, 1.76), p<0.001
8Yr+: HR=3.59 (95% CI 3.19, 4.04), p<0.001

Metal/Metal ≤32mm vs Ceramic/XLPE

0 - 2Wk: HR=1.17 (95% CI 0.72, 1.89), p=0.532
2Wk - 6Mth: HR=0.66 (95% CI 0.48, 0.91), p=0.010
6Mth+: HR=2.07 (95% CI 1.87, 2.28), p<0.001

Metal/Non XLPE vs Ceramic/XLPE

0 - 3Mth: HR=0.75 (95% CI 0.67, 0.85), p<0.001
3Mth - 6Mth: HR=0.99 (95% CI 0.78, 1.26), p=0.954
6Mth - 1.5Yr: HR=1.65 (95% CI 1.45, 1.88), p<0.001
1.5Yr - 3Yr: HR=1.54 (95% CI 1.34, 1.76), p<0.001
3Yr - 8Yr: HR=2.20 (95% CI 2.02, 2.40), p<0.001
8Yr+: HR=3.40 (95% CI 3.16, 3.66), p<0.001

Metal/XLPE vs Ceramic/XLPE

0 - 2Wk: HR=0.95 (95% CI 0.85, 1.07), p=0.394
2Wk - 1Mth: HR=1.13 (95% CI 1.04, 1.23), p=0.005
1Mth - 3Mth: HR=0.99 (95% CI 0.91, 1.07), p=0.737
3Mth - 3Yr: HR=1.12 (95% CI 1.06, 1.18), p<0.001
3Yr+: HR=1.24 (95% CI 1.17, 1.31), p<0.001

Ceramicised Metal/XLPE vs Ceramic/XLPE

0 - 3Mth: HR=1.16 (95% CI 1.05, 1.27), p=0.002
3Mth+: HR=0.83 (95% CI 0.77, 0.90), p<0.001

Metal/Metal >32mm vs Ceramic/XLPE

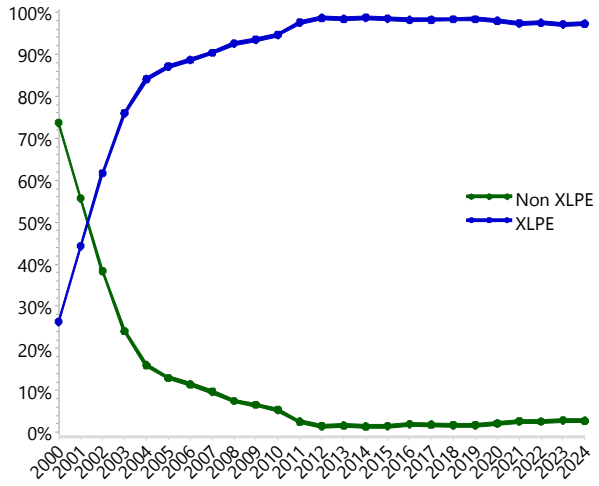
0 - 2Wk: HR=1.24 (95% CI 0.94, 1.65), p=0.132
2Wk - 1Mth: HR=0.45 (95% CI 0.31, 0.65), p<0.001
1Mth - 3Mth: HR=0.69 (95% CI 0.52, 0.92), p=0.010
3Mth - 9Mth: HR=1.20 (95% CI 0.94, 1.54), p=0.144
9Mth - 1.5Yr: HR=3.13 (95% CI 2.65, 3.71), p<0.001
1.5Yr - 2Yr: HR=4.95 (95% CI 4.11, 5.96), p<0.001
2Yr - 11Yr: HR=10.48 (95% CI 9.90, 11.09), p<0.001
11Yr+: HR=4.66 (95% CI 4.24, 5.13), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic	114611	108892	98951	88144	54363	21062	6019
Ceramic/Non XLPE	11499	10490	8760	7126	3924	2288	1177
Ceramic/XLPE	191223	163266	118949	83965	24624	5830	926
Metal/Metal >32mm	14424	14063	13212	11972	9298	6384	629
Metal/Metal ≤32mm	5143	5022	4841	4653	4020	3050	1339
Metal/Non XLPE	36447	34925	32329	29622	21301	12653	5076
Metal/XLPE	217882	201897	172790	144132	72096	23528	4284
Ceramicised Metal/XLPE	41361	36888	29950	23315	11085	3364	471

Note: Only bearing surfaces with >5,000 procedures have been listed

Cross-linked Polyethylene (XLPE)
XLPE has been used in 392,457 procedures. This includes 62,243 procedures that have XLPE with the addition of an antioxidant. In 2024, when polyethylene is used as a bearing surface in primary total conventional hip procedures, the proportion using XLPE is 97.2% (Figure HT46).

Figure HT46 Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



XLPE has a lower rate of revision compared to non XLPE after 6 months (Table HT42 and Figure HT47). The difference increases with time and at 20 years the cumulative percent revision is 6.9% for XLPE and 17.8% for non XLPE.

At 20 years the cumulative percent revision of total conventional hip replacement with XLPE is 6.9% compared to 17.8% for non XLPE.

The cumulative incidence of loosening and prosthesis dislocation/instability at 20 years is 1.0% and 1.2% for XLPE, compared to 4.9% and 1.3% for non XLPE, respectively (Figure HT48).

For non XLPE, there is no difference in the rate of revision between head sizes <32mm and 32mm. Head sizes >32mm are rarely used with non XLPE (Table HT42 and Figure HT49). The use of XLPE has been associated with an increased use of larger head sizes when compared to non XLPE. Head sizes ≥32mm have been used in 84.0% of XLPE procedures and in only 10.6% of non XLPE procedures.

For XLPE, 32mm has a lower rate of revision than <32mm after 1.5 years. When compared to >32mm head size, 32mm has a lower rate of revision after 1 month (Table HT42 and Figure HT50). Procedures using non XLPE have a higher incidence of loosening, fracture and infection regardless of head size (Figure HT51). XLPE and non XLPE are combined with three different femoral head bearing surfaces: ceramic, metal, and ceramicised metal. Within each bearing surface, XLPE has a lower rate of revision than non XLPE (Figure HT52).

XLPE + Antioxidant
Acetabular components that have both XLPE and XLPE with antioxidant have been compared. There has been a 0.8% increase in procedures using antioxidant compared to 2023. Non XLPE has a higher rate of revision compared to XLPE + antioxidant after 6 months. XLPE has a higher rate of revision compared to XLPE + antioxidant after 9 months (Table HT43 and Figure HT53). The reasons for revision are shown in Table HT44 and Figure HT54.

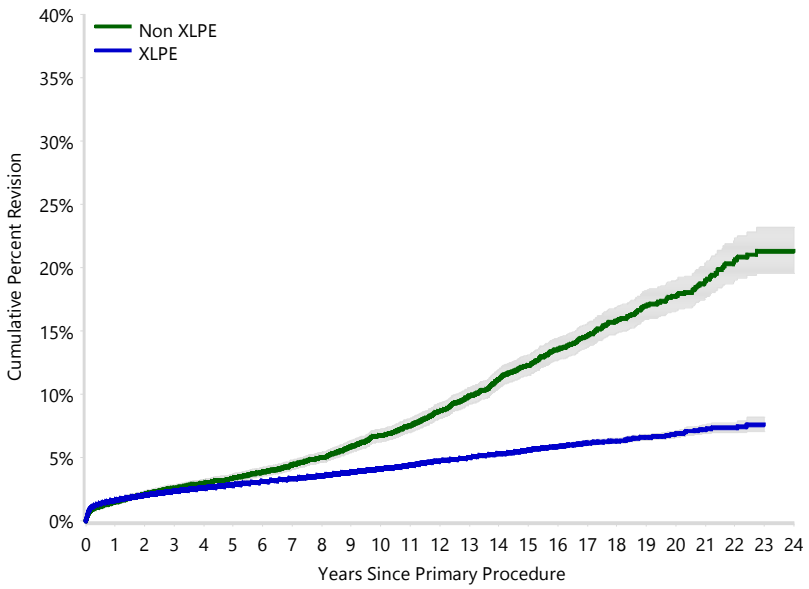
Primary Total Hip Replacement

Table HT42 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type and Head Size (Primary Diagnosis OA)

Polyethylene Type	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE		**1171**	**16034**	**1.5 (1.3, 1.7)**	**2.6 (2.3, 2.9)**	**3.4 (3.1, 3.7)**	**6.7 (6.2, 7.2)**	**12.3 (11.5, 13.1)**	**17.8 (16.6, 19.0)**
	<32mm	1074	14330	1.5 (1.3, 1.7)	2.6 (2.3, 2.8)	3.4 (3.1, 3.8)	6.8 (6.3, 7.3)	12.5 (11.7, 13.3)	18.0 (16.8, 19.3)
	32mm	95	1671	1.9 (1.3, 2.7)	2.7 (2.0, 3.6)	3.2 (2.5, 4.2)	6.1 (4.8, 7.7)	10.0 (7.9, 12.6)	
	>32mm	2	33	0.0 (0.0, 0.0)	8.0 (2.1, 28.5)	8.0 (2.1, 28.5)			
XLPE		**12367**	**392457**	**1.7 (1.6, 1.7)**	**2.3 (2.3, 2.4)**	**2.8 (2.8, 2.9)**	**4.1 (4.0, 4.2)**	**5.6 (5.5, 5.7)**	**6.9 (6.6, 7.2)**
	<32mm	2383	62641	1.6 (1.5, 1.7)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.3 (4.1, 4.5)	6.0 (5.7, 6.2)	7.3 (6.9, 7.7)
	32mm	4575	145567	1.6 (1.5, 1.7)	2.3 (2.2, 2.3)	2.7 (2.6, 2.8)	3.9 (3.8, 4.0)	5.2 (4.9, 5.4)	6.0 (5.6, 6.5)
	>32mm	5409	184242	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	4.3 (4.1, 4.4)	5.8 (5.5, 6.1)	7.4 (6.4, 8.5)
TOTAL		**13538**	**408491**						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT47 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



HR - adjusted for age and gender

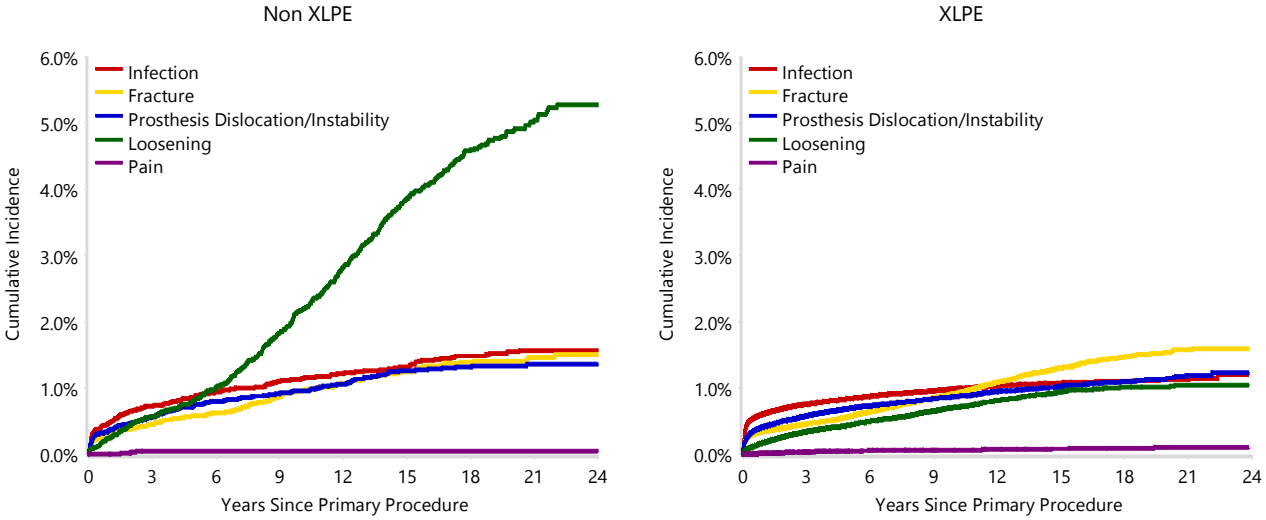
Non XLPE vs XLPE

0 - 3Mth: HR=0.84 (95% CI 0.72, 0.99), p=0.039
3Mth - 6Mth: HR=0.71 (95% CI 0.47, 1.07), p=0.100
6Mth - 1.5Yr: HR=1.59 (95% CI 1.31, 1.93), p<0.001
1.5Yr - 6.5Yr: HR=1.64 (95% CI 1.44, 1.86), p<0.001
6.5Yr - 8.5Yr: HR=2.71 (95% CI 2.21, 3.32), p<0.001
8.5Yr - 13.5Yr: HR=3.57 (95% CI 3.13, 4.07), p<0.001
13.5Yr+: HR=5.04 (95% CI 4.23, 6.01), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	16034	14503	11927	9830	5963	3183	1028
XLPE	392457	345699	268448	203223	78346	21417	3546

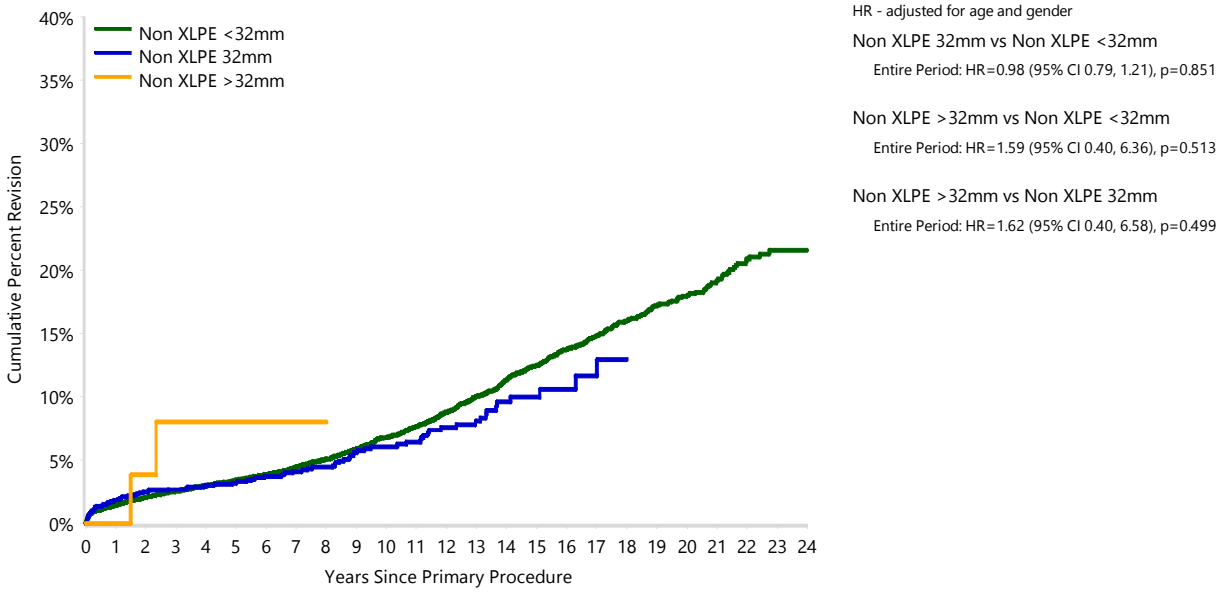
Note: Restricted to modern prostheses

Figure HT48 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

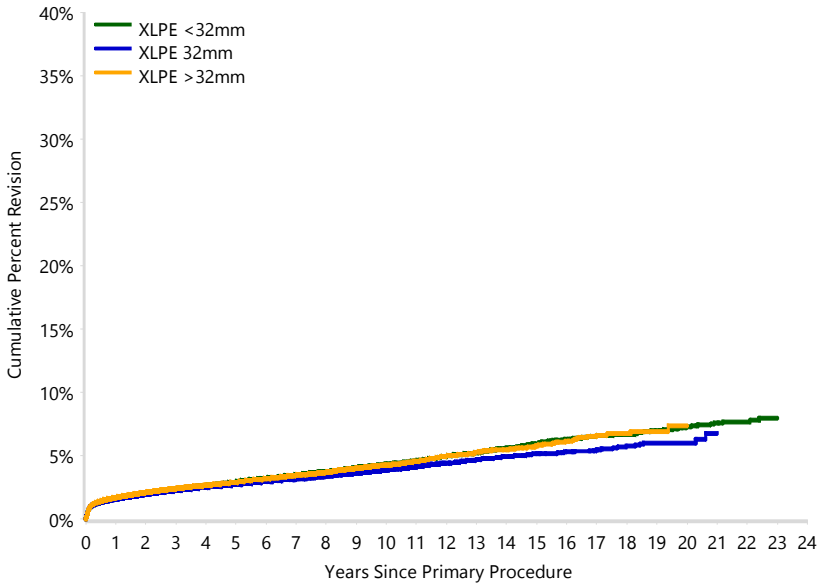
Figure HT49 Cumulative Percent Revision of Primary Total Conventional Hip Replacement using Non XLPE by Head Size (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	<32mm	14330	12894	10527	8627	5382	3033	1012
	32mm	1671	1581	1381	1195	577	149	16
	>32mm	33	28	19	8	4	1	0

Note: Restricted to modern prostheses

Figure HT50 Cumulative Percent Revision of Primary Total Conventional Hip Replacement using XLPE by Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

XLPE <32mm vs XLPE 32mm

0 - 1Mth: HR=0.97 (95% CI 0.86, 1.09), p=0.585

1Mth - 1.5Yr: HR=1.08 (95% CI 0.99, 1.18), p=0.069

1.5Yr+: HR=1.19 (95% CI 1.11, 1.27), p<0.001

XLPE >32mm vs XLPE <32mm

Entire Period: HR=0.97 (95% CI 0.92, 1.02), p=0.226

XLPE >32mm vs XLPE 32mm

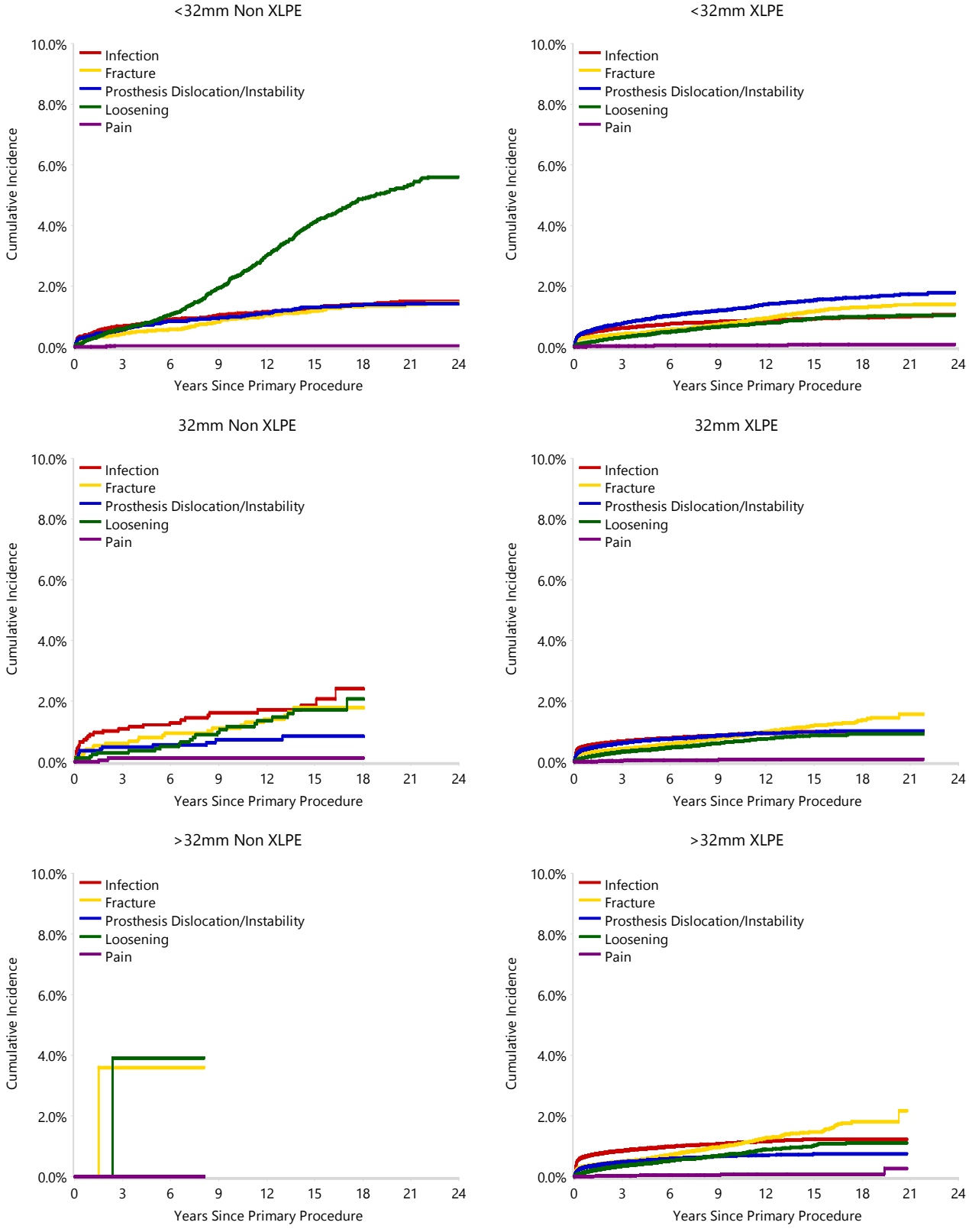
0 - 1Mth: HR=0.94 (95% CI 0.87, 1.02), p=0.164

1Mth+: HR=1.11 (95% CI 1.06, 1.16), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	<32mm	62641	55176	44040	35467	21821	10699	3035
	32mm	145567	133308	111737	89084	32880	6482	384
	>32mm	184242	157212	112671	78672	23645	4236	127

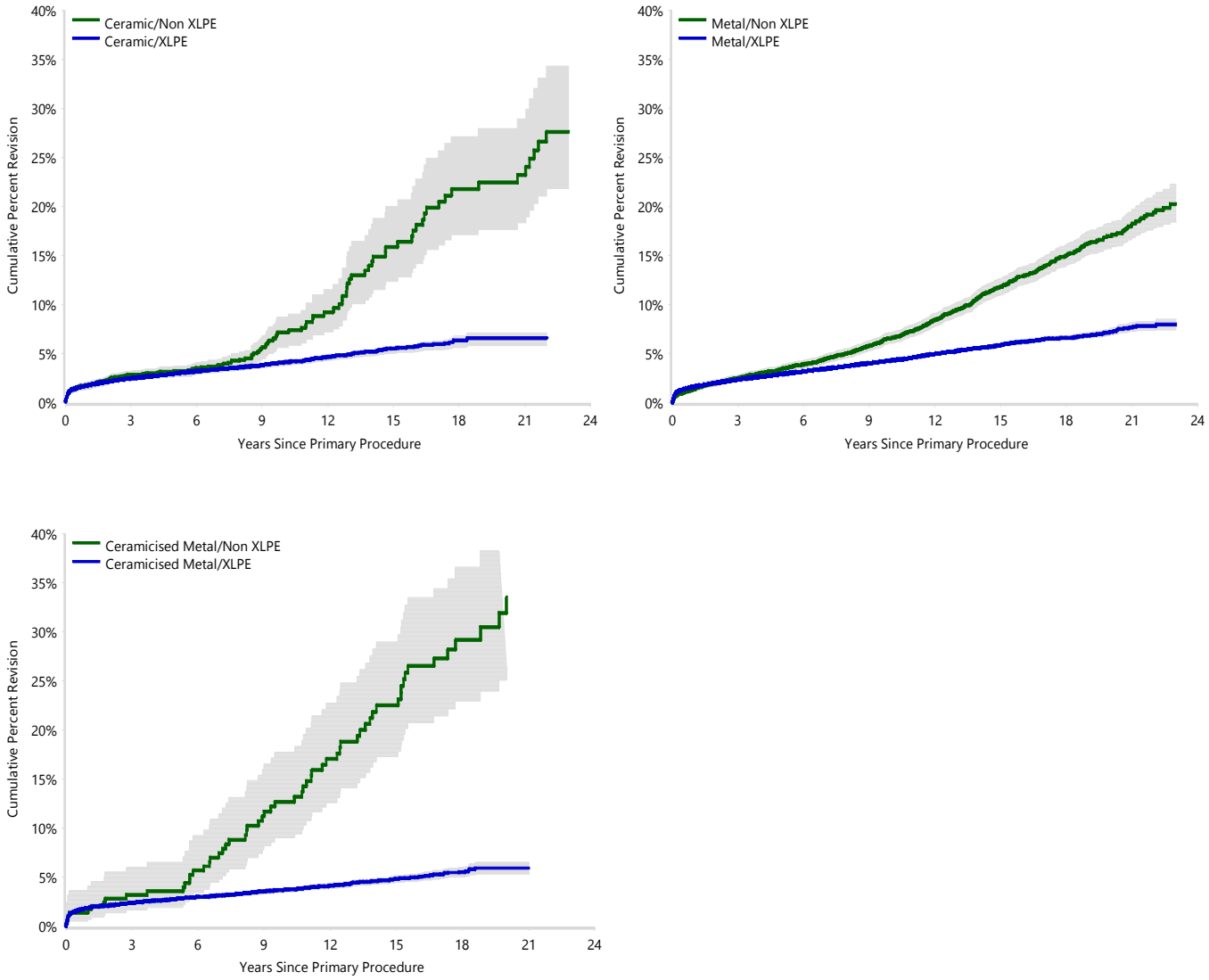
Note: Restricted to modern prostheses

Figure HT51 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Head Size and Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure HT52 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Surface and Polyethylene Type (Primary Diagnosis OA)



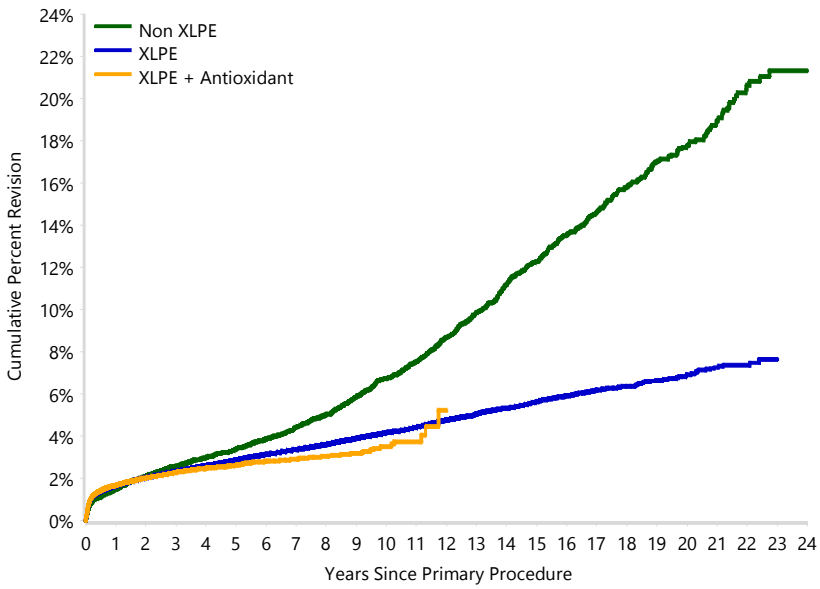
Note: Restricted to modern prostheses

Table HT43 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	1171	16034	1.5 (1.3, 1.7)	2.6 (2.3, 2.9)	3.4 (3.1, 3.7)	6.7 (6.2, 7.2)	12.3 (11.5, 13.1)	17.8 (16.6, 19.0)
XLPE	10981	330214	1.6 (1.6, 1.7)	2.3 (2.3, 2.4)	2.9 (2.8, 2.9)	4.2 (4.1, 4.3)	5.6 (5.5, 5.8)	6.9 (6.6, 7.2)
XLPE + Antioxidant	1386	62243	1.7 (1.6, 1.8)	2.3 (2.2, 2.4)	2.6 (2.5, 2.8)	3.5 (3.2, 3.9)		
TOTAL	13538	408491						

Note: Restricted to modern prostheses

Figure HT53 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



HR - adjusted for age and gender

Non XLPE vs XLPE

0 - 9Mth: HR=0.89 (95% CI 0.77, 1.02), p=0.087
9Mth - 7Yr: HR=1.67 (95% CI 1.50, 1.86), p<0.001
7Yr - 12Yr: HR=3.12 (95% CI 2.74, 3.55), p<0.001
12Yr+: HR=4.69 (95% CI 4.06, 5.42), p<0.001

Non XLPE vs XLPE + Antioxidant

0 - 9Mth: HR=0.88 (95% CI 0.76, 1.02), p=0.084
9Mth - 4Yr: HR=1.77 (95% CI 1.50, 2.08), p<0.001
4Yr - 7Yr: HR=3.10 (95% CI 2.35, 4.10), p<0.001
7Yr - 12Yr: HR=5.05 (95% CI 3.90, 6.53), p<0.001
12Yr+: HR=7.61 (95% CI 5.83, 9.95), p<0.001

XLPE vs XLPE + Antioxidant

0 - 1Yr: HR=0.99 (95% CI 0.93, 1.06), p=0.837
1Yr - 4Yr: HR=1.16 (95% CI 1.03, 1.30), p=0.013
4Yr+: HR=1.62 (95% CI 1.30, 2.03), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	16034	14503	11927	9830	5963	3183	1028
XLPE	330214	295814	239151	187968	77352	21417	3546
XLPE + Antioxidant	62243	49885	29297	15255	994	0	0

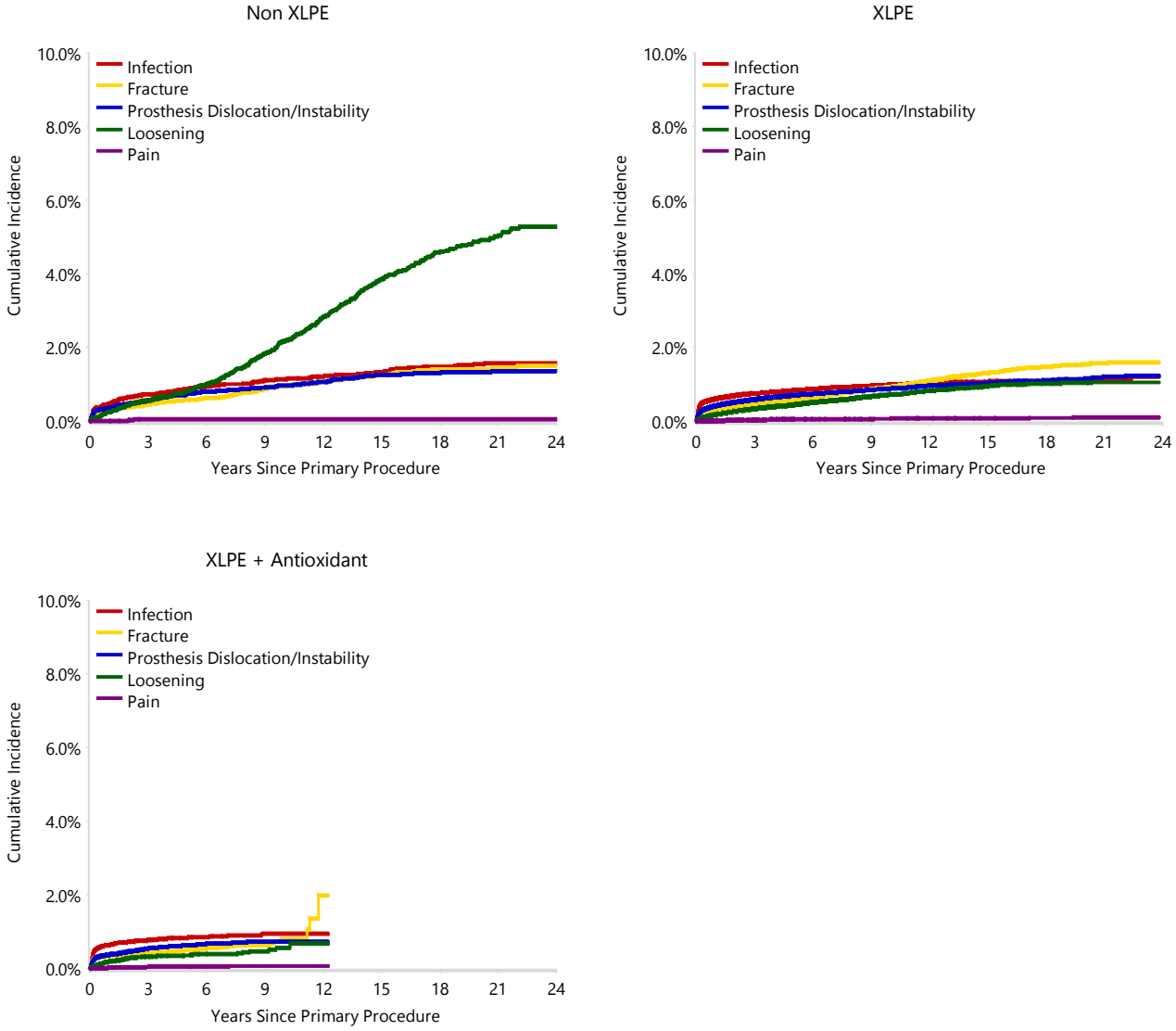
Note: Restricted to modern prostheses

Table HT44 Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA, Follow-up Limited to 13.3 Years)

Revision Diagnosis	Non XLPE			XLPE			XLPE + Antioxidant		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	167	1.0	18.1	2877	0.9	26.9	464	0.7	33.5
Fracture	141	0.9	15.3	2494	0.8	23.3	272	0.4	19.6
Prosthesis Dislocation/Instability	148	0.9	16.1	2470	0.7	23.1	322	0.5	23.2
Loosening	349	2.2	37.9	1834	0.6	17.2	185	0.3	13.3
Pain	7	0.0	0.8	168	0.1	1.6	23	0.0	1.7
Leg Length Discrepancy	7	0.0	0.8	154	0.0	1.4	37	0.1	2.7
Malposition	4	0.0	0.4	139	0.0	1.3	32	0.1	2.3
Implant Breakage Stem	9	0.1	1.0	92	0.0	0.9	5	0.0	0.4
Lysis	45	0.3	4.9	69	0.0	0.6	1	0.0	0.1
Incorrect Sizing	3	0.0	0.3	54	0.0	0.5	6	0.0	0.4
Implant Breakage Acetabular Insert	4	0.0	0.4	41	0.0	0.4	5	0.0	0.4
Metal Related Pathology	4	0.0	0.4	40	0.0	0.4	3	0.0	0.2
Wear Acetabular Insert	18	0.1	2.0	30	0.0	0.3	1	0.0	0.1
Implant Breakage Acetabular	2	0.0	0.2	22	0.0	0.2	3	0.0	0.2
Heterotopic Bone	2	0.0	0.2	18	0.0	0.2	2	0.0	0.1
Tumour	1	0.0	0.1	11	0.0	0.1	1	0.0	0.1
Implant Breakage Head				4	0.0	0.0			
Wear Acetabulum	2	0.0	0.2	4	0.0	0.0			
Synovitis				1	0.0	0.0			
Wear Head				1	0.0	0.0			
Other	8	0.0	0.9	161	0.0	1.5	24	0.0	1.7
N Revision	**921**	**5.7**	**100.0**	**10684**	**3.2**	**100.0**	**1386**	**2.2**	**100.0**
N Primary	**16034**			**330214**			**62243**		

Note: Restricted to modern prostheses
Restricted to revisions within 13.3 years for all groups to allow a time-matched comparison of revisions

Figure HT54 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

Ceramic/Ceramic Bearings

Ceramic/ceramic bearings have been used in 74,168 primary total conventional hip replacement procedures undertaken for osteoarthritis. This is the third most common bearing. This analysis has been restricted to procedures with mixed ceramic femoral heads and mixed ceramic acetabular bearing surfaces. In 2024, mixed ceramic accounted for 100.0% of all procedures with a ceramic/ceramic bearing surface.

Head Size

To evaluate the effect of head size, an analysis was undertaken comparing four head size groups (≤28mm, 32mm, 36–38mm, and ≥40mm). Head sizes 36mm and 38mm have been combined in this analysis. The proportional use of head sizes of mixed ceramic/mixed ceramic over time is shown in Figure HT55.

Mixed ceramic heads with head sizes 36-38mm have a higher rate of revision than ≥40mm heads. When compared to 32mm head sizes, there is no difference in the rate of revision for ≤28mm, 36–38mm and ≥40mm head sizes over the entire period (Table HT45 and Figure HT56).

At 1 year, the cumulative incidence of prosthesis dislocation/instability is 1.5% for head sizes ≤28mm compared to 0.3% for 32mm, 0.3% for 36–38mm, and 0.1% for head sizes ≥40mm (Figure HT57).

Figure HT55 Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)

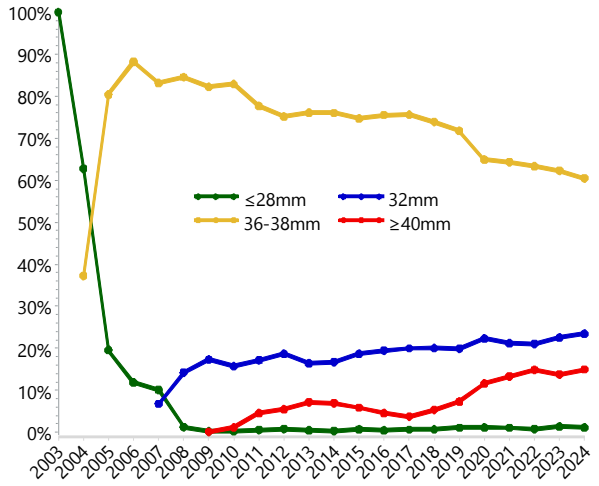
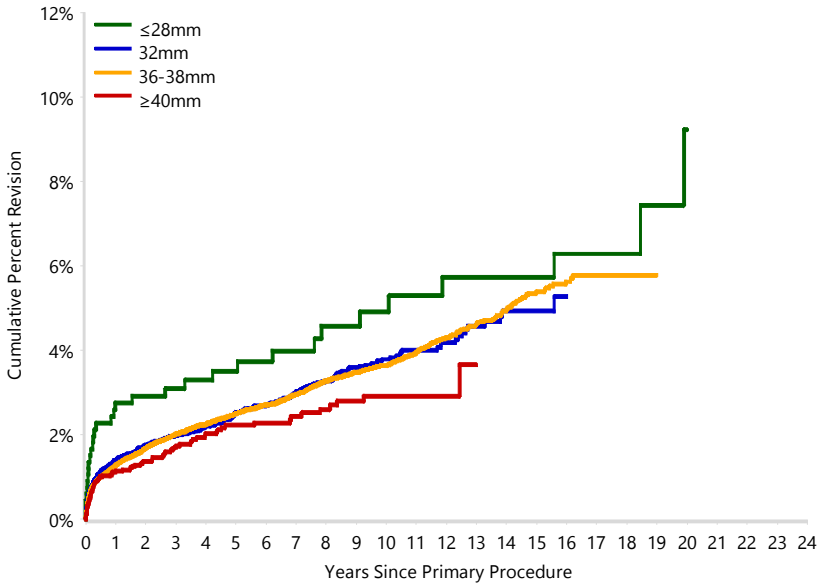


Table HT45 Cumulative Percent Revision of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)

Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤28mm	32	665	2.8 (1.7, 4.3)	3.1 (2.0, 4.8)	3.5 (2.3, 5.3)	4.9 (3.3, 7.2)	5.7 (3.9, 8.4)	9.2 (5.5, 15.3)
32mm	332	11375	1.4 (1.2, 1.6)	2.0 (1.7, 2.3)	2.5 (2.2, 2.8)	3.8 (3.4, 4.3)	4.9 (4.2, 5.7)	
36-38mm	1342	42579	1.3 (1.2, 1.4)	2.0 (1.9, 2.2)	2.5 (2.3, 2.7)	3.6 (3.4, 3.8)	5.4 (5.0, 5.8)	
≥40mm	89	4498	1.1 (0.8, 1.5)	1.7 (1.3, 2.2)	2.2 (1.8, 2.8)	2.9 (2.3, 3.7)		
TOTAL	1795	59117						

Note: Restricted to modern prostheses

Figure HT56 Cumulative Percent Revision of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

≤28mm vs 32mm

Entire Period: HR=1.32 (95% CI 0.92, 1.91), p=0.135

36-38mm vs 32mm

Entire Period: HR=0.99 (95% CI 0.87, 1.13), p=0.910

≥40mm vs 32mm

Entire Period: HR=0.80 (95% CI 0.62, 1.02), p=0.077

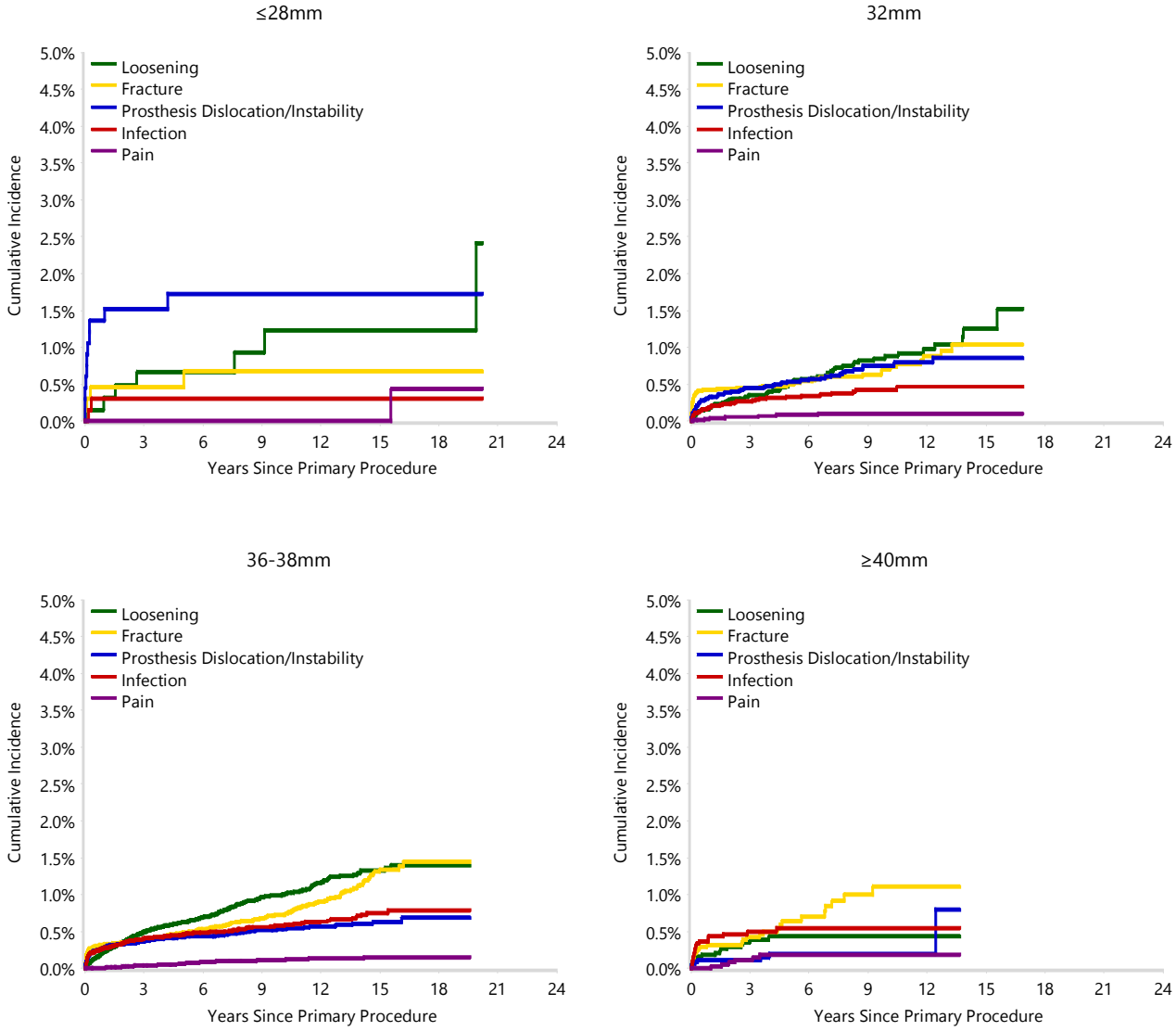
36-38mm vs ≥40mm

Entire Period: HR=1.24 (95% CI 1.00, 1.54), p=0.050

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤28mm	665	604	519	429	252	174	48
32mm	11375	10348	8605	6817	2463	436	0
36-38mm	42579	39704	34282	28662	11856	2628	14
≥40mm	4498	3881	2756	1753	597	3	0

Note: Restricted to modern prostheses

Figure HT57 Cumulative Incidence Revision Diagnosis of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Acetabular Size and Femoral Head Size

This year there is an analysis of the combination of acetabular and femoral head size used in total conventional hip replacement. In this analysis, all modern bearing surfaces are combined. Acetabular size has been categorised <52mm, 52mm or >52mm according to the outer diameter.

When an acetabular component with outer diameter of <52mm is used, the rate of revision decreases as head size increases (Table HT46 and Figure HT58).

For acetabular size 52mm there is a higher rate of revision for heads size <32mm compared to 32mm after 2.5 years and after 1 year compared to head size >32mm. There is no revision rate difference between head sizes 32mm and >32mm with this acetabular size (Table HT46 and Figure HT59).

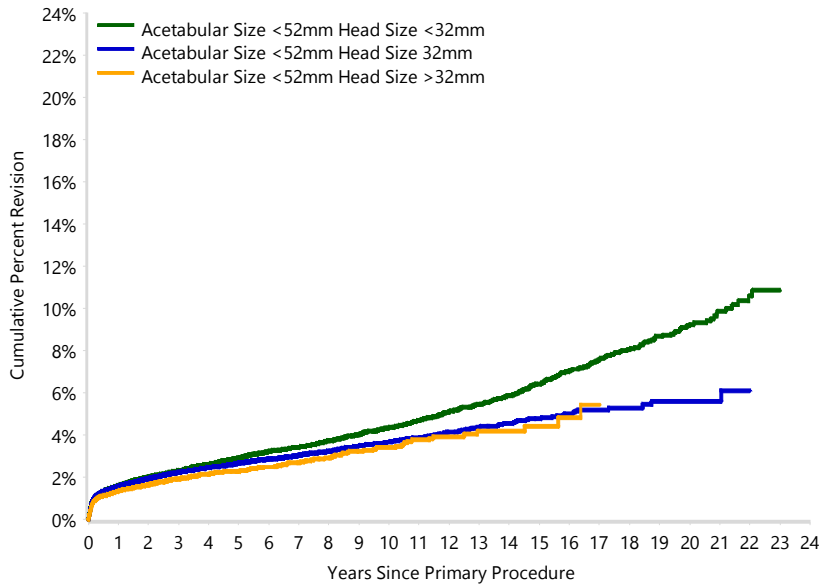
Where acetabular diameter is >52mm there is a higher rate of revision when femoral heads <32mm are used compared to both 32mm and >32mm, but there is no difference when head size 32mm is compared to >32mm (Table HT46 and Figure HT60).

Table HT46 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size and Head Size (Primary Diagnosis OA)

Acetabular Size	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size <52mm	<32mm	1379	34438	1.6 (1.5, 1.8)	2.3 (2.2, 2.5)	2.9 (2.7, 3.1)	4.4 (4.1, 4.6)	6.4 (6.0, 6.9)	9.3 (8.5, 10.0)
	32mm	2154	76712	1.6 (1.5, 1.7)	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.7 (3.5, 3.9)	4.8 (4.5, 5.1)	5.6 (5.0, 6.3)
	>32mm	509	23538	1.4 (1.2, 1.5)	1.9 (1.7, 2.1)	2.3 (2.1, 2.5)	3.4 (3.0, 3.8)	4.4 (3.7, 5.3)	
Acetabular Size 52mm	<32mm	633	15190	1.2 (1.0, 1.4)	1.9 (1.7, 2.2)	2.5 (2.3, 2.8)	4.4 (4.0, 4.8)	6.7 (6.1, 7.3)	8.9 (8.1, 9.8)
	32mm	1152	35661	1.4 (1.3, 1.6)	2.1 (1.9, 2.2)	2.5 (2.3, 2.7)	3.7 (3.5, 3.9)	5.1 (4.7, 5.4)	6.4 (5.7, 7.2)
	>32mm	1651	59397	1.5 (1.4, 1.6)	2.2 (2.0, 2.3)	2.6 (2.5, 2.8)	3.9 (3.7, 4.1)	5.1 (4.7, 5.4)	
Acetabular Size >52mm	<32mm	1626	30319	1.8 (1.6, 1.9)	2.7 (2.5, 2.9)	3.5 (3.3, 3.7)	5.5 (5.2, 5.8)	8.3 (7.9, 8.8)	10.4 (9.8, 11.0)
	32mm	2185	56351	1.6 (1.5, 1.8)	2.3 (2.2, 2.4)	2.9 (2.7, 3.0)	4.2 (4.0, 4.4)	5.7 (5.4, 6.0)	7.0 (6.5, 7.5)
	>32mm	4861	151260	1.7 (1.6, 1.8)	2.4 (2.4, 2.5)	3.0 (2.9, 3.1)	4.3 (4.2, 4.5)	6.2 (5.9, 6.4)	7.7 (7.0, 8.5)
TOTAL		16150	482866						

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT58 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size <52mm and Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

Acetabular Size <52mm Head Size <32mm vs
Acetabular Size <52mm Head Size 32mm

0 - 3Mth: HR=1.02 (95% CI 0.91, 1.15), p=0.751
3Mth - 1.5Yr: HR=1.15 (95% CI 0.99, 1.34), p=0.071
1.5Yr - 4Yr: HR=1.09 (95% CI 0.93, 1.29), p=0.293
4Yr - 4.5Yr: HR=1.97 (95% CI 1.28, 3.03), p=0.002
4.5Yr - 5Yr: HR=1.09 (95% CI 0.69, 1.74), p=0.705
5Yr - 7.5Yr: HR=1.35 (95% CI 1.07, 1.69), p=0.010
7.5Yr - 12Yr: HR=1.51 (95% CI 1.23, 1.86), p<0.001
12Yr+: HR=2.29 (95% CI 1.67, 3.14), p<0.001

Acetabular Size <52mm Head Size <32mm vs
Acetabular Size <52mm Head Size >32mm

Entire Period: HR=1.34 (95% CI 1.21, 1.49), p<0.001

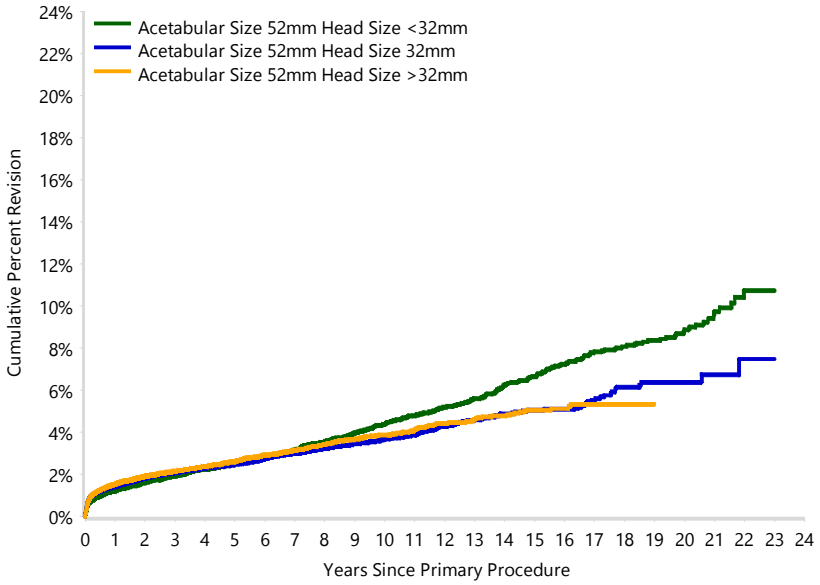
Acetabular Size <52mm Head Size 32mm vs
Acetabular Size <52mm Head Size >32mm

Entire Period: HR=1.12 (95% CI 1.01, 1.23), p=0.024

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size <52mm	<32mm	34438	30681	24734	20019	11392	5003	1239
	32mm	76712	68229	53494	39997	12703	2705	330
	>32mm	23538	19076	12836	8840	1930	321	1

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT59 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size 52mm by Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

Acetabular Size 52mm Head Size 32mm vs
Acetabular Size 52mm Head Size <32mm

0 - 6Mth: HR=1.25 (95% CI 1.03, 1.51), p=0.023
6Mth - 9Mth: HR=0.73 (95% CI 0.44, 1.20), p=0.213
9Mth - 2.5Yr: HR=0.96 (95% CI 0.78, 1.18), p=0.680
2.5Yr+: HR=0.64 (95% CI 0.56, 0.73), p<0.001

Acetabular Size 52mm Head Size >32mm vs
Acetabular Size 52mm Head Size <32mm

0 - 1Mth: HR=1.17 (95% CI 0.95, 1.45), p=0.139
1Mth - 3Mth: HR=1.47 (95% CI 1.16, 1.86), p=0.001
3Mth - 6Mth: HR=1.33 (95% CI 0.98, 1.79), p=0.067
6Mth - 9Mth: HR=0.97 (95% CI 0.62, 1.53), p=0.905
9Mth - 1Yr: HR=1.14 (95% CI 0.76, 1.70), p=0.536
1Yr - 5.5Yr: HR=0.83 (95% CI 0.71, 0.97), p=0.018
5.5Yr+: HR=0.59 (95% CI 0.50, 0.69), p<0.001

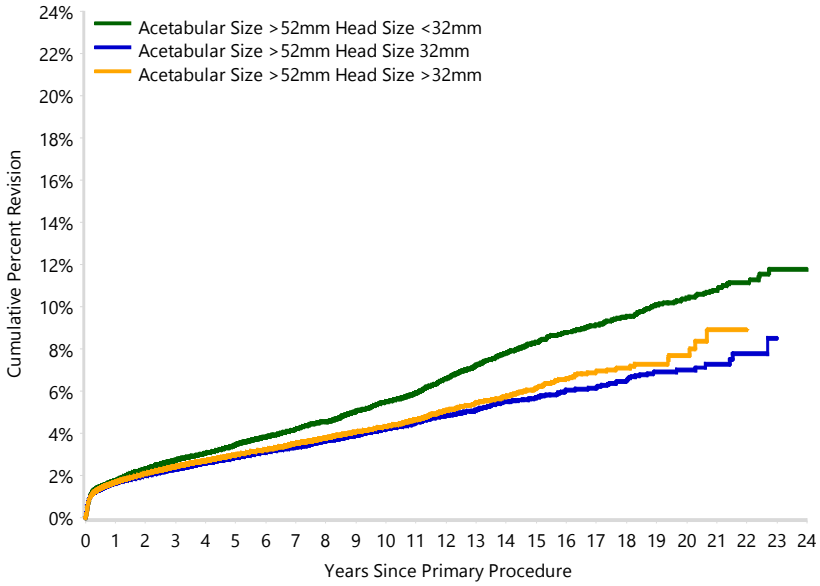
Acetabular Size 52mm Head Size >32mm vs
Acetabular Size 52mm Head Size 32mm

Entire Period: HR=1.03 (95% CI 0.96, 1.12), p=0.381

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size 52mm	<32mm	15190	13467	10926	8943	5841	3151	916
	32mm	35661	33467	29440	24498	10653	2787	346
	>32mm	59397	51749	39056	28760	9797	1839	13

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT60 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size >52mm by Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

Acetabular Size >52mm Head Size <32mm vs
Acetabular Size >52mm Head Size 32mm

0 - 3Mth: HR=1.14 (95% CI 1.02, 1.28), p=0.026
3Mth - 1Yr: HR=1.00 (95% CI 0.83, 1.19), p=0.960
1Yr - 1.5Yr: HR=1.61 (95% CI 1.28, 2.04), p<0.001
1.5Yr - 7.5Yr: HR=1.40 (95% CI 1.26, 1.56), p<0.001
7.5Yr+: HR=1.63 (95% CI 1.46, 1.83), p<0.001

Acetabular Size >52mm Head Size <32mm vs
Acetabular Size >52mm Head Size >32mm

0 - 3Mth: HR=1.09 (95% CI 0.97, 1.21), p=0.140
3Mth - 6Mth: HR=0.87 (95% CI 0.65, 1.14), p=0.308
6Mth - 1Yr: HR=1.02 (95% CI 0.81, 1.28), p=0.899
1Yr - 1.5Yr: HR=1.54 (95% CI 1.22, 1.94), p<0.001
1.5Yr - 4.5Yr: HR=1.21 (95% CI 1.06, 1.38), p=0.005
4.5Yr+: HR=1.55 (95% CI 1.42, 1.70), p<0.001

Acetabular Size >52mm Head Size >32mm vs
Acetabular Size >52mm Head Size 32mm

Entire Period: HR=1.05 (95% CI 1.00, 1.10), p=0.065

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size <52mm	<32mm	34438	30681	24734	20019	11392	5003	1239
	32mm	76712	68229	53494	39997	12703	2705	330
	>32mm	23538	19076	12836	8840	1930	321	1

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Primary Total Hip Replacement

Constrained Acetabular Prostheses

Constrained acetabular prostheses have a mechanism to lock the femoral head into the acetabular component. Although often considered revision components, there have been 1,062 procedures using constrained acetabular prostheses for primary total conventional hip replacement. Of these, 837 procedures were constrained acetabular inserts and 225 procedures were constrained cups. There were 84 procedures reported in 2024. This is an increase of 29.2% compared to 2023. The most commonly used constrained prostheses are presented in Table HT47.

Constrained acetabular prostheses are proportionally used more frequently for fractured neck of femur, tumour, failed internal fixation, and fracture/dislocation compared to all other acetabular components (Table HT48).

When all diagnoses are included (Table HT49 and Figure HT61), and when used only for osteoarthritis (Table HT50), constrained acetabular prostheses have a higher rate of revision compared to other acetabular prostheses (Table HT53). Gender and age are not risk factors for revision (Table HT51 to Table HT53). The small number of cemented acetabular constrained prostheses and the low number of revisions make it difficult to compare outcomes of these devices based on acetabular fixation.

Table HT47 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Component (All Diagnoses)

Constrained Prosthesis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
G7/G7	12	197	5.6 (3.0, 10.1)	6.3 (3.5, 11.2)				
PINNACLE/PINNACLE	10	147	5.0 (2.4, 10.2)	6.6 (3.5, 12.3)	7.9 (4.3, 14.6)			
Trabecular Metal (Shell)/Longevity	5	94	2.2 (0.6, 8.6)	4.6 (1.7, 11.7)	6.4 (2.6, 14.9)	6.4 (2.6, 14.9)		
Trident (Cup)	11	174	6.3 (3.4, 11.4)	6.3 (3.4, 11.4)				
Trident (Shell)/Trident	14	194	5.0 (2.6, 9.4)	5.7 (3.1, 10.5)	7.6 (4.3, 13.1)			
Other Constrained Prosthesis	22	256	4.4 (2.4, 8.0)	8.7 (5.4, 13.7)	11.9 (7.8, 18.0)			
TOTAL	74	1062						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT48 Primary Total Conventional Hip Replacement by Primary Diagnosis and Acetabular Type

Primary Diagnosis	Constrained Prosthesis		Other Acetabular Prosthesis	
	N	%	N	%
Osteoarthritis	404	38.0	482676	87.6
Fractured Neck Of Femur	285	26.8	31185	5.7
Osteonecrosis	40	3.8	17691	3.2
Developmental Dysplasia	26	2.4	7609	1.4
Rheumatoid Arthritis	9	0.8	3988	0.7
Tumour	124	11.7	2687	0.5
Other Inflammatory Arthritis	4	0.4	2139	0.4
Failed Internal Fixation	126	11.9	2002	0.4
Fracture/Dislocation	37	3.5	779	0.1
Arthrodesis Takedown	3	0.3	86	0.0
Other	4	0.4	111	0.0
TOTAL	1062	100.0	550953	100.0

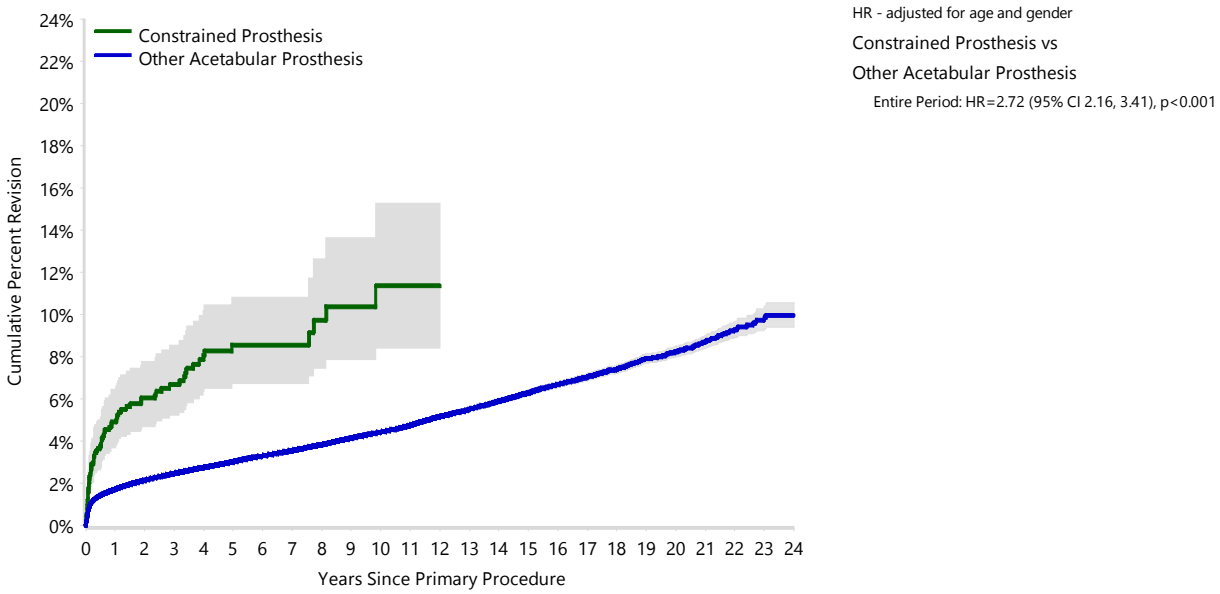
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT49 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (All Diagnoses)

Acetabular Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	74	1062	4.9 (3.7, 6.5)	6.7 (5.2, 8.5)	8.6 (6.7, 10.8)	11.4 (8.4, 15.3)		
Other Acetabular Prosthesis	19394	550953	1.7 (1.7, 1.8)	2.5 (2.4, 2.5)	3.0 (3.0, 3.1)	4.4 (4.4, 4.5)	6.3 (6.2, 6.4)	8.3 (8.0, 8.5)
TOTAL	19468	552015						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT61 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	1062	791	531	313	85	21	4
Other Acetabular Prosthesis	550953	486790	383551	295373	121949	37816	7391

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Primary Total Hip Replacement

Table HT50 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis OA)

Acetabular Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	21	404	2.6 (1.4, 4.8)	4.5 (2.8, 7.3)	5.9 (3.7, 9.1)	8.0 (4.9, 13.0)		
Other Acetabular Prosthesis	16138	482676	1.6 (1.6, 1.6)	2.3 (2.3, 2.3)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	6.0 (5.9, 6.1)	7.9 (7.7, 8.2)
TOTAL	16159	483080						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT51 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)

Acetabular Type	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	Male	10	148	3.6 (1.5, 8.5)	6.4 (3.2, 12.6)	9.1 (4.9, 16.7)			
	Female	11	256	2.0 (0.8, 4.8)	3.5 (1.7, 6.8)	4.1 (2.1, 7.9)	7.0 (3.6, 13.6)		
TOTAL		21	404						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT52 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Acetabular Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	<70	7	96	2.2 (0.5, 8.4)	6.2 (2.6, 14.4)	7.7 (3.5, 16.6)	10.5 (4.9, 21.9)		
	≥70	14	308	2.7 (1.4, 5.4)	4.0 (2.2, 7.1)	5.3 (3.0, 9.1)			
TOTAL		21	404						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT53 Comparisons of Primary Total Conventional Hip Replacement using Constrained Acetabular Components (Primary Diagnosis OA)

Comparison	HR - adjusted for age and gender
Constrained Prosthesis vs Other Acetabular Prosthesis	Entire Period: HR=1.90 (95% CI 1.24, 2.92), p=0.003
Constrained Prosthesis Female vs Constrained Prosthesis Male	Entire Period: HR=0.59 (95% CI 0.25, 1.39), p=0.225
Constrained Prosthesis ≥70 vs Constrained Prosthesis <70	Entire Period: HR=0.70 (95% CI 0.28, 1.75), p=0.446

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

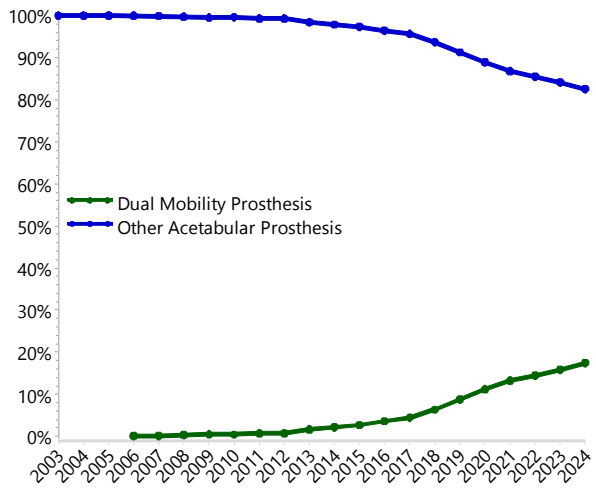
Dual Mobility Acetabular Prostheses
Dual mobility prostheses have a femoral head which moves within a polyethylene component, which also moves within a fixed acetabular shell.

There are 41,636 primary total conventional hip replacement procedures using dual mobility prostheses. This is an increase of 12.1% (n=8,494) since 2023. There has been an increase in annual use of dual mobility prostheses since 2012 (Figure HT62).

The commonly used dual mobility prostheses are presented in Table HT54. Compared to other acetabular prostheses, dual mobility acetabular prostheses are proportionally used more frequently for fractured neck of femur, tumour, and failed internal fixation (Table HT55).

When all diagnoses are included, dual mobility prostheses have a higher rate of revision compared to other acetabular prostheses (Table HT56 and Figure HT63).

Figure HT62 Primary Total Conventional Hip Replacement by Dual Mobility (All Diagnoses)



Note: Restricted to modern prostheses

In 2024, dual mobility prostheses are used in 6.1% of primary total hip procedures for osteoarthritis. For the diagnosis of osteoarthritis, there is no difference in the overall rate of revision when dual mobility prostheses are used (Table HT57 and Table HT62). Dual mobility prostheses have a lower rate of revision for dislocation/instability compared to all other acetabular prostheses (Table HT58 and Table HT62).

The reasons for revision for dual mobility and other acetabular components are shown in Figure HT64

Males have a higher risk of revision than females when dual mobility prostheses are used for a diagnosis of osteoarthritis (Table HT59 and Table HT62). However, age is not a risk factor for revision (Table HT60 and Table HT62).

The most common reasons for males and females when dual mobility prostheses are used are fracture and infection (Figure HT65).

The majority of dual mobility prostheses are inserted with cementless acetabular fixation. However, there is no difference in the rate of revision when types of acetabular fixation are compared (Table HT61 and Table HT62).

There is no difference in the rate of revision when dual mobility prostheses are compared to other acetabular prostheses for each surgical approach (Table HT63 and Figure HT66 to Figure HT68).

Primary Total Hip Replacement

Table HT54 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Component (All Diagnoses)

Dual Mobility Insert	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
2M	29	555	2.6 (1.5, 4.3)	4.2 (2.8, 6.3)	4.6 (3.0, 6.8)	8.4 (5.0, 13.8)		
Active Articulation	248	9677	2.0 (1.7, 2.3)	2.8 (2.4, 3.2)	3.1 (2.8, 3.6)			
Avantage	21	488	3.8 (2.4, 6.0)	4.5 (2.9, 7.0)	5.6 (3.6, 8.8)			
BI-MENTUM	41	1537	2.4 (1.7, 3.4)	3.2 (2.3, 4.4)				
G7	10	685						
MDM (Dual Mobility)	200	8325	2.0 (1.7, 2.3)	2.6 (2.2, 3.0)	3.3 (2.8, 4.0)	4.8 (3.8, 6.0)		
MobiliT CUP	4	219	2.0 (0.7, 5.2)					
Novae E	21	877	1.2 (0.6, 2.2)	1.9 (1.2, 3.2)	2.3 (1.4, 4.0)	5.7 (3.2, 9.9)		
OR30	0	159	0.0 (0.0, 0.0)					
Polarcup	60	1511	2.3 (1.6, 3.2)	3.7 (2.8, 4.8)	4.2 (3.2, 5.5)	6.0 (4.3, 8.3)		
Restoration	231	5714	2.5 (2.1, 2.9)	3.4 (2.9, 3.9)	4.2 (3.7, 4.8)	5.7 (4.6, 6.9)		
Saturne	48	1868	1.4 (0.9, 2.0)	2.3 (1.7, 3.2)	3.0 (2.2, 4.1)			
SignaSure	23	1050	2.0 (1.3, 3.1)	3.4 (2.0, 5.7)				
Trinity	114	6310	1.4 (1.1, 1.7)	2.0 (1.6, 2.4)	2.5 (2.0, 3.1)			
Versafit	87	2626	2.4 (1.9, 3.1)	3.3 (2.7, 4.2)	3.8 (3.0, 4.7)			
Other (4)	1	35	2.9 (0.4, 19.1)	2.9 (0.4, 19.1)				
TOTAL	**1138**	**41636**						

Note: All procedures using metal/metal prostheses have been excluded
Only prostheses with >50 procedures have been listed
Restricted to modern prostheses

Table HT55 Primary Total Conventional Hip Replacement by Primary Diagnosis and Acetabular Mobility

Primary Diagnosis	Dual Mobility Prosthesis		Other Acetabular Prosthesis	
	N	Col%	N	Col%
Osteoarthritis	29463	70.8	453617	88.9
Fractured Neck Of Femur	7670	18.4	23800	4.7
Osteonecrosis	1709	4.1	16022	3.1
Developmental Dysplasia	878	2.1	6757	1.3
Rheumatoid Arthritis	211	0.5	3786	0.7
Tumour	784	1.9	2027	0.4
Other Inflammatory Arthritis	141	0.3	2002	0.4
Failed Internal Fixation	525	1.3	1603	0.3
Fracture/Dislocation	215	0.5	601	0.1
Arthrodesis Takedown	17	0.0	72	0.0
Other	23	0.1	92	0.0
TOTAL	**41636**	**100.0**	**510379**	**100.0**

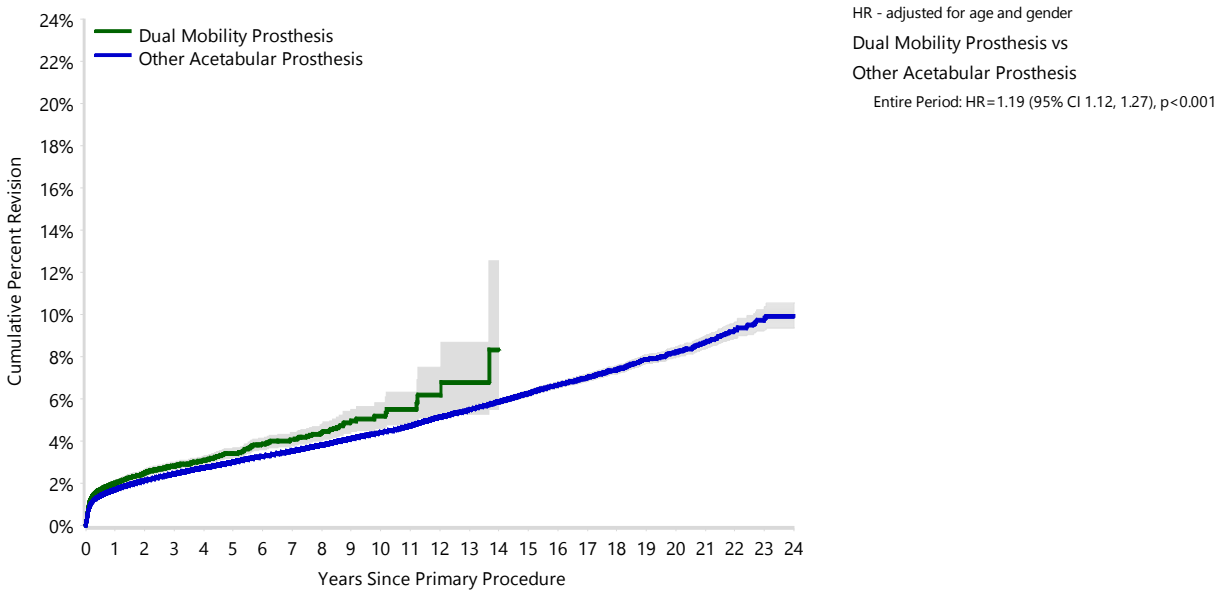
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT56 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (All Diagnoses)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	1138	41636	2.0 (1.9, 2.2)	2.8 (2.6, 3.0)	3.4 (3.2, 3.7)	5.2 (4.6, 5.8)		
Other Acetabular Prosthesis	18330	510379	1.7 (1.7, 1.7)	2.5 (2.4, 2.5)	3.0 (3.0, 3.1)	4.4 (4.3, 4.5)	6.3 (6.1, 6.4)	8.2 (8.0, 8.5)
TOTAL	19468	552015						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT63 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	41636	31487	17205	7874	626	34	0
Other Acetabular Prosthesis	510379	456094	366877	287812	121408	37803	7395

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Primary Total Hip Replacement

Table HT57 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	671	29463	1.6 (1.5, 1.8)	2.3 (2.1, 2.5)	2.9 (2.6, 3.1)	4.3 (3.7, 5.1)		
Other Acetabular Prosthesis	15488	453617	1.6 (1.6, 1.6)	2.3 (2.3, 2.3)	2.8 (2.8, 2.9)	4.2 (4.1, 4.2)	6.0 (5.9, 6.1)	7.9 (7.7, 8.2)
TOTAL	**16159**	**483080**						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT58 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA, Revision for Prosthesis Dislocation/Instability)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	97	29463	0.2 (0.2, 0.3)	0.3 (0.3, 0.4)	0.5 (0.4, 0.6)	0.5 (0.4, 0.6)		
Other Acetabular Prosthesis	3344	453617	0.4 (0.4, 0.4)	0.6 (0.5, 0.6)	0.7 (0.7, 0.7)	0.9 (0.9, 0.9)	1.1 (1.1, 1.2)	1.4 (1.3, 1.5)
TOTAL	**3441**	**483080**						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT59 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)

Acetabular Mobility	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs
Dual Mobility Prosthesis	Male	282	10823	1.9 (1.6, 2.1)	2.6 (2.3, 3.0)	3.3 (2.9, 3.8)	5.3 (4.1, 6.9)
	Female	389	18640	1.5 (1.4, 1.7)	2.1 (1.9, 2.4)	2.6 (2.3, 2.9)	3.8 (3.1, 4.6)
TOTAL		**671**	**29463**				

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT60 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Acetabular Mobility	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs
Dual Mobility Prosthesis	<70	283	11631	1.7 (1.5, 2.0)	2.4 (2.2, 2.8)	3.0 (2.6, 3.4)	4.0 (3.3, 4.8)
	≥70	388	17832	1.6 (1.4, 1.8)	2.2 (2.0, 2.5)	2.8 (2.5, 3.1)	4.7 (3.7, 5.9)
TOTAL		**671**	**29463**				

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT61 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Acetabular Fixation (Primary Diagnosis OA)

Acetabular Mobility	Acetabular Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	Cementless	654	29005	1.6 (1.5, 1.8)	2.3 (2.1, 2.5)	2.9 (2.6, 3.1)	4.3 (3.7, 5.0)		
	Cemented	17	458	2.0 (1.1, 3.8)	2.7 (1.5, 4.9)	3.9 (2.1, 6.9)			
TOTAL		671	29463						

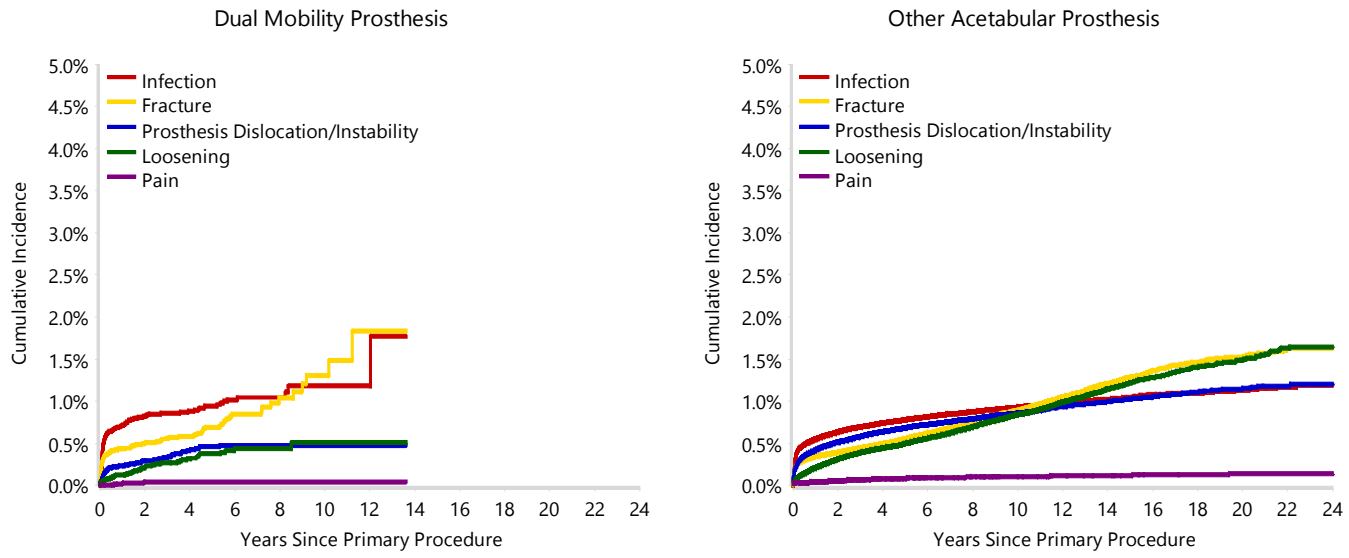
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT62 Comparisons of Revision Rates of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)

Diagnosis/Outcome	Comparison	HR - adjusted for age and gender
All Cause Revision	Dual Mobility Prosthesis vs Other Acetabular Prosthesis	Entire Period: HR=1.06 (95% CI 0.98, 1.14), p=0.150
Revision for Prosthesis Dislocation/Instability	Dual Mobility Prosthesis vs Other Acetabular Prosthesis	Entire Period: HR=0.60 (95% CI 0.49, 0.73), p<0.001
All Cause Revision	Dual Mobility Prosthesis Female vs Dual Mobility Prosthesis Male	Entire Period: HR=0.80 (95% CI 0.68, 0.93), p=0.003
	Dual Mobility Prosthesis ≥70 vs Dual Mobility Prosthesis <70	Entire Period: HR=0.94 (95% CI 0.81, 1.10), p=0.445
	Dual Mobility Prosthesis Cemented vs Dual Mobility Prosthesis Cementless	Entire Period: HR=1.61 (95% CI 1.00, 2.62), p=0.052

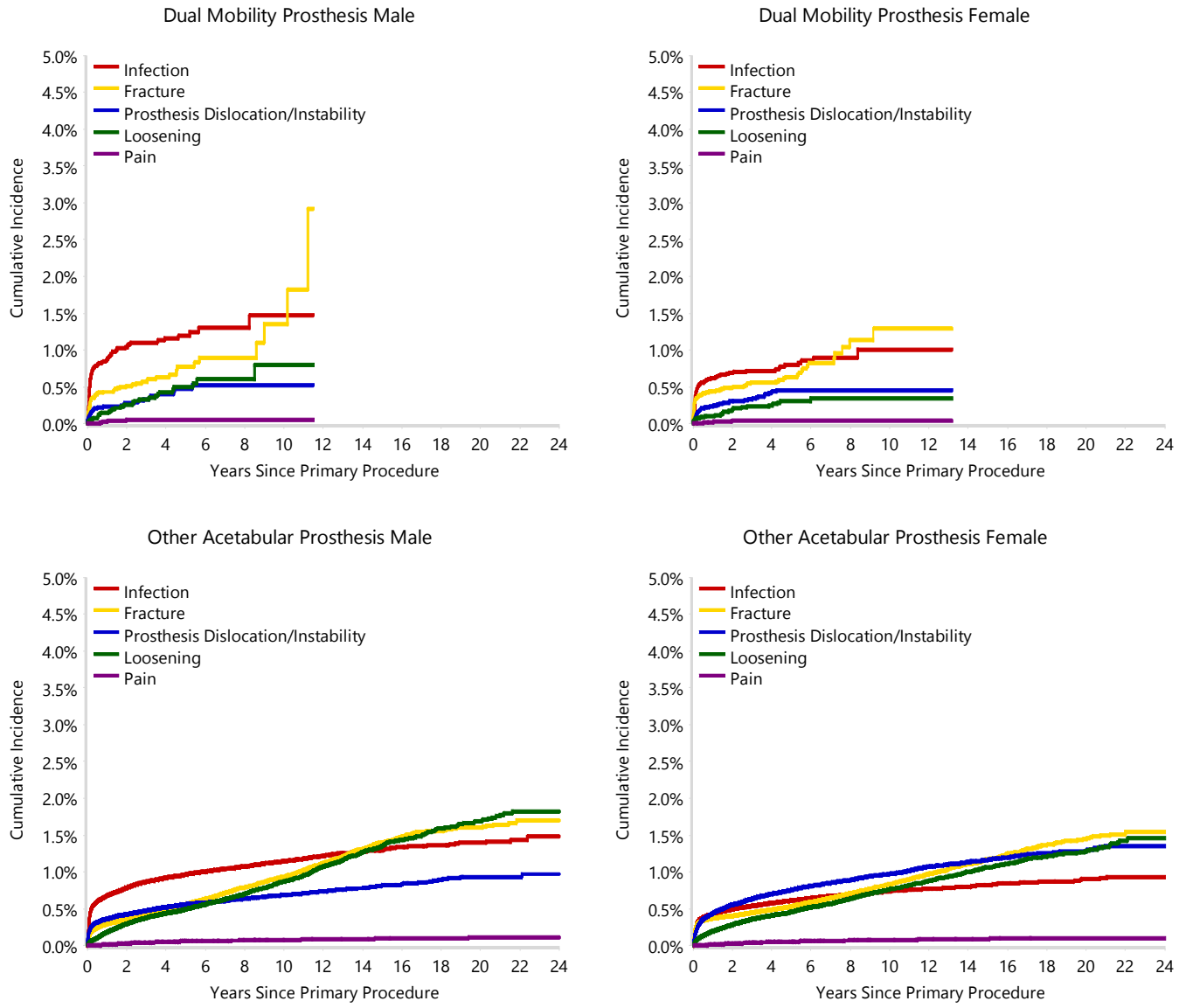
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT64 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)



Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT65 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Mobility and Gender (Primary Diagnosis OA)



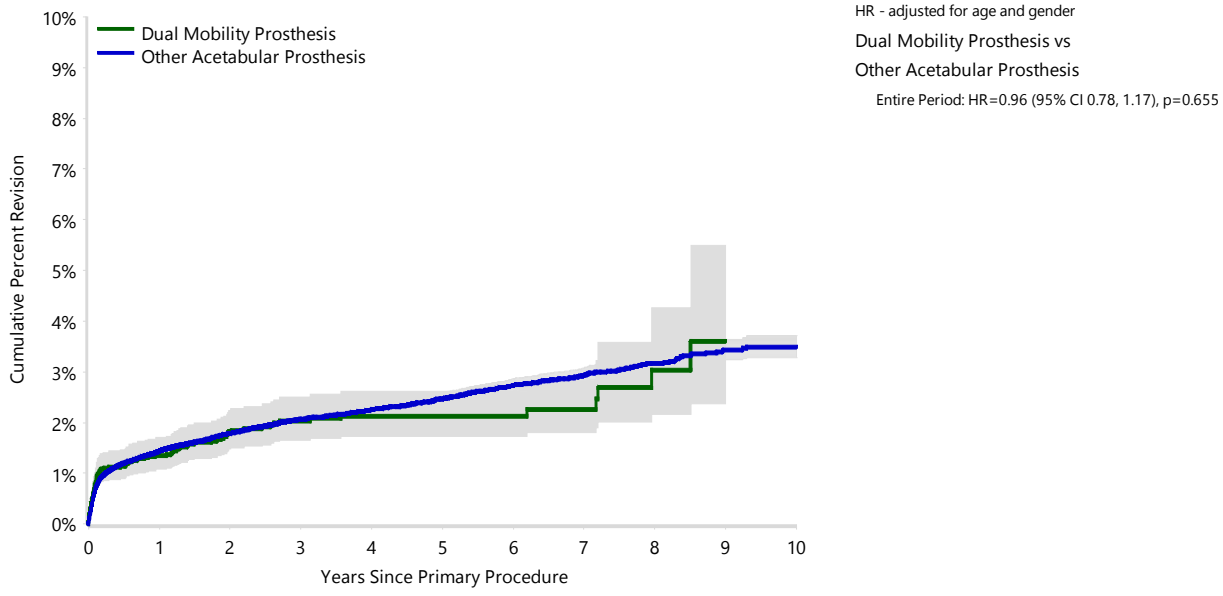
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT63 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)

Surgical Approach	Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Anterior	Dual Mobility Prosthesis	102	5528	1.4 (1.1, 1.7)	2.0 (1.7, 2.5)	2.1 (1.7, 2.6)	3.0 (2.2, 4.3)	
	Other Acetabular Prosthesis	2097	93864	1.4 (1.4, 1.5)	2.1 (2.0, 2.2)	2.5 (2.4, 2.6)	3.2 (3.0, 3.3)	3.5 (3.3, 3.7)
Lateral	Dual Mobility Prosthesis	74	2362	2.4 (1.8, 3.1)	2.8 (2.2, 3.6)	3.5 (2.7, 4.5)	5.0 (3.8, 6.7)	
	Other Acetabular Prosthesis	1244	40016	1.9 (1.8, 2.0)	2.6 (2.5, 2.8)	3.1 (3.0, 3.3)	3.8 (3.6, 4.1)	
Posterior	Dual Mobility Prosthesis	450	20735	1.6 (1.5, 1.8)	2.3 (2.1, 2.6)	3.0 (2.7, 3.3)	3.5 (3.0, 4.1)	
	Other Acetabular Prosthesis	4382	163472	1.8 (1.7, 1.8)	2.5 (2.4, 2.5)	2.9 (2.8, 3.0)	3.6 (3.5, 3.7)	4.1 (3.9, 4.4)
TOTAL		8349	325977					

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses.

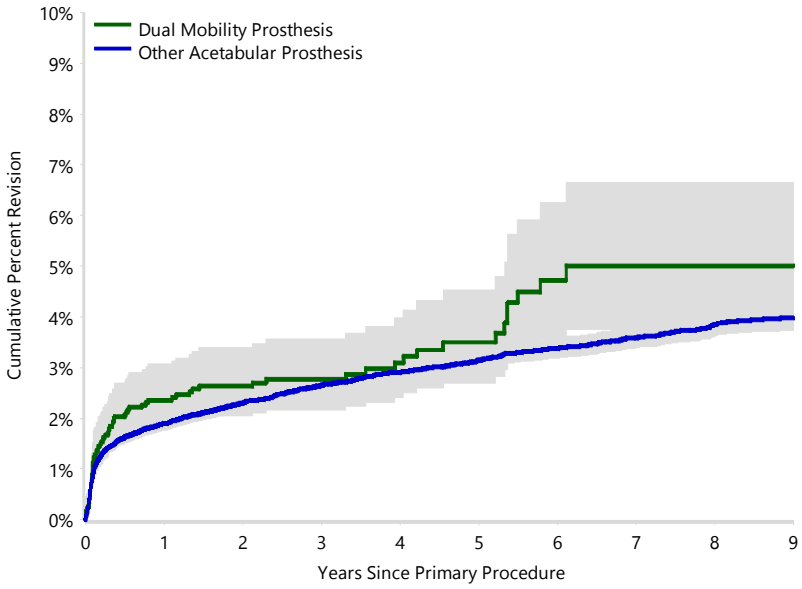
Figure HT66 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Anterior Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	5528	4203	2333	1130	269	2
Other Acetabular Prosthesis	93864	79082	54906	34711	10529	51

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses.

Figure HT67 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Lateral Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)

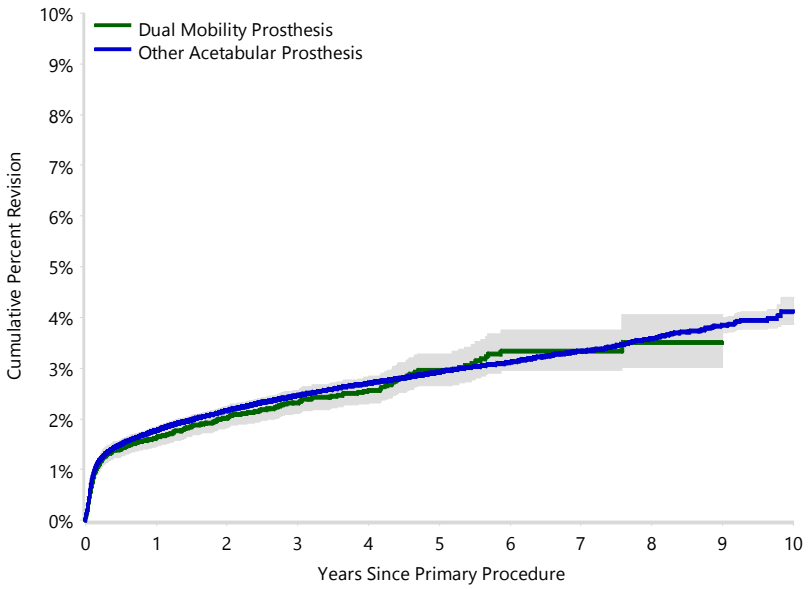


HR - adjusted for age and gender
Dual Mobility Prosthesis vs
Other Acetabular Prosthesis
Entire Period: HR=1.23 (95% CI 0.97, 1.55), p=0.090

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	2362	1898	1092	556	110	0
Other Acetabular Prosthesis	40016	35971	28483	21059	8540	17

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses.

Figure HT68 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Posterior Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)



HR - adjusted for age and gender
Dual Mobility Prosthesis vs
Other Acetabular Prosthesis
Entire Period: HR=0.97 (95% CI 0.88, 1.07), p=0.578

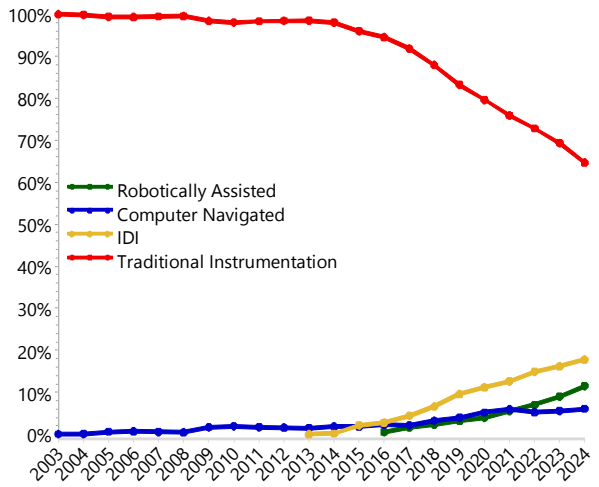
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	20735	15562	8141	3254	420	2
Other Acetabular Prosthesis	163472	140059	99296	64742	20115	53

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses.

SURGEON ASSISTIVE TOOLS (SAT)

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of hip replacements, have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 64.6% of primary hip procedures in 2024. The increase in use of each assistive tool is shown in Figure HT69. Results for primary total hip replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016. Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

Figure HT69 Primary Total Conventional Hip Replacement by Surgeon Assistive Tools (Primary Diagnosis OA)



Computer Navigation

There have been 13,995 primary total hip replacement procedures using computer navigation. In 2024, computer navigation was used in 6.1% of all primary total hip replacement procedures.

When adjusted for age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume there is no difference in the rate of revision when procedures using computer navigation are compared to procedures using traditional instrumentation (Table HT64, Figure HT70 and Figure HT71).

Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years or ≥65 years when computer navigation is used compared to traditional instrumentation (Table HT65 and Figure HT72).

The outcomes of four prosthesis combinations used with computer navigation and traditional instrumentation with >1,000 procedures in each group are shown in Table HT66 and Table HT67.

Image Derived Instrumentation (IDI)

IDI is the use of custom-made preparation and/or alignment guides derived from images by 3D printing specifically for each patient, to facilitate accurate placement of acetabular and femoral components.

There have been 35,436 primary total hip replacement procedures undertaken using IDI since 2013. In 2024, IDI was used in 17.8% of all primary total hip replacement procedures.

When procedures using IDI are compared to procedures using traditional instrumentation, adjusting for age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, IDI usage has a lower rate of revision (Table HT68 and Figure HT73). There is a decreased proportion of revision for dislocation/instability when IDI is used (Figure HT74).

Using the same adjustments, for patients aged ≥65 years where IDI is used, there is a lower rate of revision compared to traditional instrumentation, while a lower rate of revision is only for the first 3 months with IDI for patients aged <65 years (Table HT69 and Figure HT75).

The outcomes of 2 prosthesis combinations used with IDI and with traditional instrumentation, and that has >2,000 procedures in each group, are shown in Table HT70 and Table HT71.

Robotic Assistance

Robotic assistance has been recorded for 16,784 total hip replacements since 2016. In 2024, robotic assistance was used in 11.5% of all primary total hip replacement procedures. There are 4 robotic systems that are used with a small number of prostheses, and many of these systems have limited follow-up.

When adjusted for age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation until 1.5 years, after which time robotic assistance has a higher rate of revision (Table HT72 and Figure HT76). There are increased proportions of revisions for infection and fracture using robotic assistance (Figure HT77). Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years or for patients aged ≥65 years when robotic assistance is used compared to traditional instrumentation (Table HT73 and Figure HT78).

The outcomes of three prosthesis combinations used with robotic assistance and traditional instrumentation with >1,000 procedures in each group are shown in Table HT74 and Table HT75.

Surgeon Assistive Tools Compared

Total conventional hip procedures since 2016 for osteoarthritis using XLPE with the use of assistive tools and adjusted for age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume are compared in Table HT76 and Figure HT79.

Procedures using robotic assistance have a higher rate of revision compared to where IDI is used.

Prosthesis-Specific Analysis

There are two prosthesis combinations using XLPE that have used at least three different assistive methods that have over 1,000 procedures in each group. The analyses for these two prostheses have been adjusted for age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

There is no difference in the rate of revision when the Accolade II/Trident (Shell) combination is used with robotic assistance compared to when computer navigation is used, and when compared to procedures using traditional instrumentation (Table HT77 and Figure HT80).

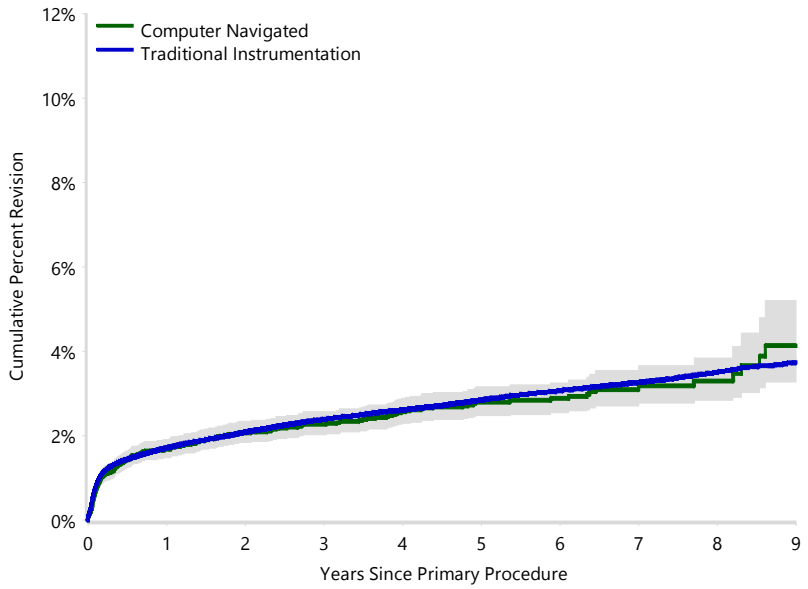
The Exeter V40/Trident (Shell) combination also shows no difference when procedures using any of the three types of assistive tools are compared (Table HT78 and Figure HT81).

Table HT64 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	321	13995	1.7 (1.5, 1.9)	2.3 (2.0, 2.6)	2.8 (2.5, 3.2)	3.1 (2.7, 3.5)	4.1 (3.3, 5.2)
Traditional Instrumentation	6574	247345	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.8 (2.8, 2.9)	3.3 (3.2, 3.4)	3.7 (3.6, 3.8)
TOTAL	6895	261340					

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT70 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Traditional Instrumentation vs Computer Navigated

Entire Period: HR=1.05 (95% CI 0.94, 1.17), p=0.425

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	13995	11169	6900	3272	1212	256
Traditional Instrumentation	247345	215137	157078	104718	55776	14750

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT71 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnoses OA)

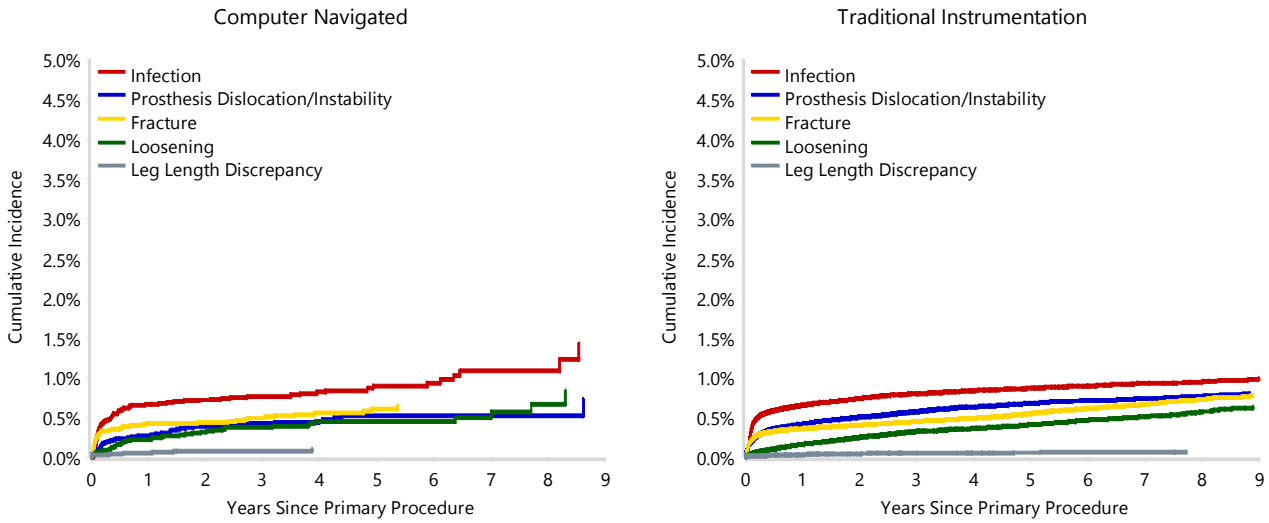
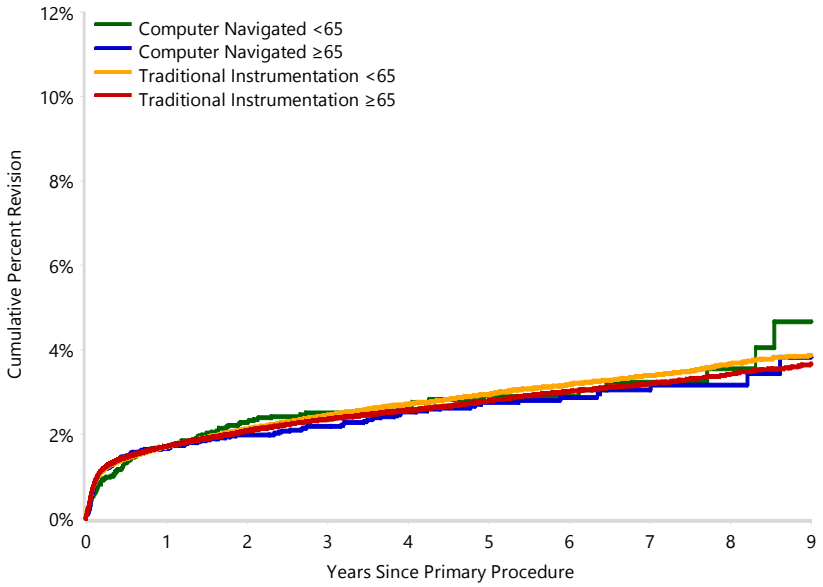


Table HT65 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	<65	108	4453	1.7 (1.4, 2.1)	2.5 (2.0, 3.1)	2.9 (2.4, 3.6)	3.2 (2.6, 4.1)	4.7 (3.2, 6.9)
	≥65	213	9542	1.7 (1.4, 2.0)	2.2 (1.9, 2.5)	2.7 (2.4, 3.2)	3.0 (2.6, 3.6)	3.8 (2.9, 5.1)
Traditional Instrumentation	<65	2340	83504	1.7 (1.6, 1.8)	2.4 (2.3, 2.6)	2.9 (2.8, 3.1)	3.4 (3.2, 3.5)	3.9 (3.7, 4.1)
	≥65	4234	163841	1.7 (1.7, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.9)	3.2 (3.1, 3.3)	3.7 (3.5, 3.8)
TOTAL		6895	261340					

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT72 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Computer Navigated <65
vs Traditional Instrumentation <65
Entire Period: HR= 0.96 (95% CI 0.79, 1.16), p=0.676

Computer Navigated ≥65
vs Traditional Instrumentation ≥65
Entire Period: HR=0.95 (95% CI 0.83, 1.09), p=0.493

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	<65	4453	3580	2221	1069	414	89
	≥65	9542	7589	4679	2203	798	167
Traditional Instrumentation	<65	83504	73550	55221	38269	21724	6088
	≥65	163841	141587	101857	66449	34052	8662

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT66 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Accolade II/Trident (Shell)	Computer Navigated	47	1855	2.0 (1.5, 2.8)	2.3 (1.7, 3.1)	2.5 (1.9, 3.4)	2.7 (2.0, 3.7)	2.7 (2.0, 3.7)	3.6 (2.1, 5.9)
	Traditional Instrumentation	289	11485	1.8 (1.6, 2.1)	2.2 (1.9, 2.5)	2.4 (2.1, 2.7)	2.7 (2.4, 3.0)	2.9 (2.6, 3.3)	3.2 (2.8, 3.7)
CORAIL/PINNACLE	Computer Navigated	29	1584	1.2 (0.7, 1.8)	1.3 (0.8, 2.0)	1.5 (1.0, 2.3)	2.3 (1.5, 3.6)	3.2 (1.9, 5.3)	4.8 (2.7, 8.3)
	Traditional Instrumentation	1072	36775	1.6 (1.5, 1.8)	2.1 (1.9, 2.2)	2.4 (2.3, 2.6)	2.9 (2.7, 3.1)	3.3 (3.1, 3.5)	4.0 (3.7, 4.2)
Exeter V40/Trident (Shell)	Computer Navigated	38	1700	1.3 (0.9, 2.0)	1.6 (1.1, 2.4)	1.9 (1.3, 2.7)	2.3 (1.7, 3.2)	2.6 (1.9, 3.6)	2.6 (1.9, 3.6)
	Traditional Instrumentation	914	40757	1.3 (1.2, 1.4)	1.6 (1.5, 1.8)	1.9 (1.7, 2.0)	2.3 (2.1, 2.4)	2.7 (2.5, 2.9)	3.1 (2.9, 3.4)
Taperloc/G7	Computer Navigated	25	1047	2.2 (1.4, 3.3)	2.4 (1.6, 3.6)	2.4 (1.6, 3.6)	2.6 (1.8, 3.9)		
	Traditional Instrumentation	132	5181	2.0 (1.7, 2.4)	2.2 (1.9, 2.7)	2.6 (2.2, 3.1)	2.8 (2.3, 3.3)	3.0 (2.5, 3.6)	3.1 (2.6, 3.8)
TOTAL		2546	100384						

Note: Restricted to modern prostheses.
Only prosthesis combinations with >1,000 procedures in both groups have been listed.

Table HT67 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prothesis Combination	Comparison	HR – adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
Accolade II/Trident (Shell)	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=1.10 (95% CI 0.78, 1.56), p=0.581
CORAIL/PINNACLE	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=0.88 (95% CI 0.59, 1.30), p=0.518
Exeter V40/Trident (Shell)	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=0.98 (95% CI 0.64, 1.50), p=0.923
Taperloc/G7	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=1.06 (95% CI 0.68, 1.65), p=0.792

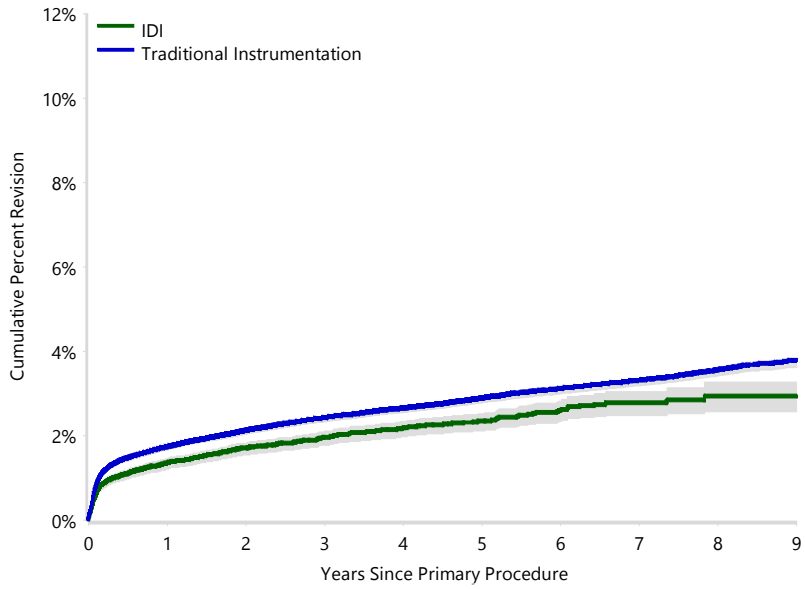
Note: Restricted to modern prostheses.
Only prosthesis combinations with >1,000 procedures in both groups have been listed.

Table HT68 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	630	34719	1.3 (1.2, 1.5)	1.9 (1.8, 2.1)	2.3 (2.1, 2.5)	2.8 (2.5, 3.1)	2.9 (2.6, 3.3)	2.9 (2.6, 3.3)
Traditional Instrumentation	6574	247345	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.8 (2.8, 2.9)	3.3 (3.2, 3.4)	3.5 (3.4, 3.6)	3.7 (3.6, 3.8)
TOTAL	7204	282064						

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT73 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

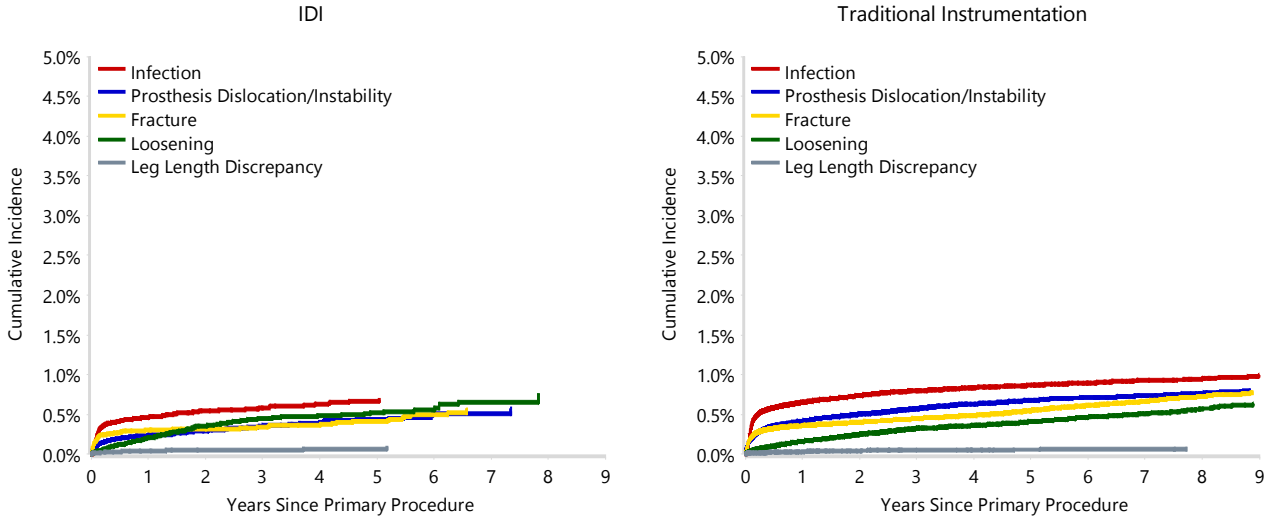
IDI vs Traditional Instrumentation

Entire Period: HR= 0.91 (95% CI 0.83, 0.99), p=0.025

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	34719	26778	14592	6740	2061	956	376
Traditional Instrumentation	247345	215137	157078	104718	55776	33843	14750

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Figure HT74 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



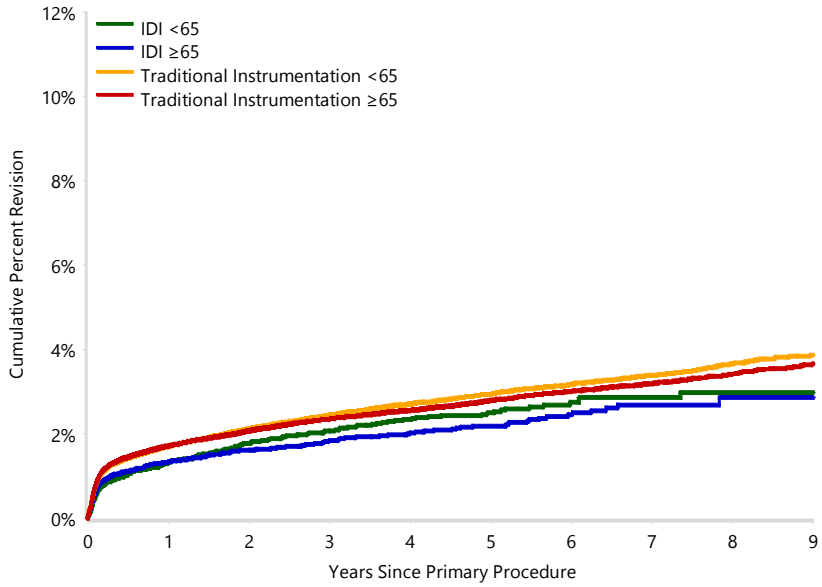
Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT69 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	<65	268	13775	1.3 (1.1, 1.5)	2.1 (1.8, 2.4)	2.5 (2.2, 2.8)	2.9 (2.5, 3.3)	3.0 (2.5, 3.5)	3.0 (2.5, 3.5)
	≥65	362	20944	1.3 (1.2, 1.5)	1.8 (1.6, 2.1)	2.2 (1.9, 2.5)	2.7 (2.3, 3.1)	2.9 (2.4, 3.4)	2.9 (2.4, 3.4)
Traditional Instrumentation	<65	2340	83504	1.7 (1.6, 1.8)	2.4 (2.3, 2.6)	2.9 (2.8, 3.1)	3.4 (3.2, 3.5)	3.7 (3.5, 3.8)	3.9 (3.7, 4.1)
	≥65	4234	163841	1.7 (1.7, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.9)	3.2 (3.1, 3.3)	3.4 (3.3, 3.5)	3.7 (3.5, 3.8)
TOTAL		7204	282064						

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT75 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

IDI <65 vs Traditional Instrumentation <65
0-3 Mth: HR=0.80 (95% CI 0.66, 0.96), p=0.019
3Mth+: HR=1.10 (95% CI 0.93, 1.31), p=0.250

IDI≥65 vs Traditional Instrumentation ≥65
Entire Period: HR=0.88 (95% CI 0.79, 0.98), p=0.026

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	<65	13775	10891	6177	2964	978	453	188
	≥65	20944	15887	8415	3776	1083	503	188
Traditional Instrumentation	<65	83504	73550	55221	38269	21724	13650	6088
	≥65	163841	141587	101857	66449	34052	20193	8662

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT70 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Metafix/Trinity	IDI	217	11623	1.3 (1.1, 1.5)	1.7 (1.5, 2.0)	2.0 (1.7, 2.3)	2.3 (2.0, 2.7)	2.8 (2.4, 3.3)	2.8 (2.4, 3.3)
	Traditional Instrumentation	176	7909	1.5 (1.2, 1.8)	1.9 (1.6, 2.2)	2.2 (1.9, 2.5)	2.4 (2.1, 2.8)	2.7 (2.3, 3.1)	2.9 (2.4, 3.6)
Taper Fit/Trinity	IDI	50	2589	1.4 (1.0, 1.9)	1.6 (1.2, 2.3)	2.0 (1.5, 2.7)	2.5 (1.8, 3.4)	2.7 (1.9, 3.6)	
	Traditional Instrumentation	57	2503	1.5 (1.1, 2.1)	2.0 (1.5, 2.6)	2.2 (1.7, 2.9)	2.6 (2.0, 3.4)	2.8 (2.1, 3.7)	3.2 (2.2, 4.5)
TOTAL		500	24624						

Note: Restricted to modern prostheses.
Only prosthesis combinations with >2,000 procedures in both groups have been listed.
Restricted to procedures with known gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Table HT71 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prothesis Combination	Comparison	HR – adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
Metafix/Trinity	IDI vs Traditional Instrumentation	Entire Period: HR=0.93 (95% CI 0.76, 1.14), p=0.483
Taper Fit/Trinity	IDI vs Traditional Instrumentation	Entire Period: HR=0.77 (95% CI 0.52, 1.15), p=0.201

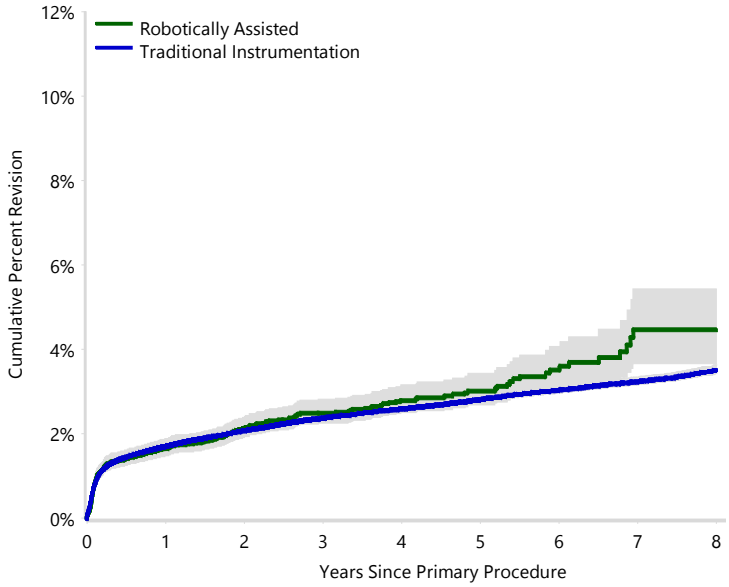
Note: Restricted to modern prostheses.
Only prosthesis combinations with >2,000 procedures in both groups have been listed.

Table HT72 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	365	16657	1.7 (1.5, 1.9)	2.5 (2.2, 2.8)	3.0 (2.7, 3.4)	3.5 (3.1, 4.1)	4.5 (3.7, 5.4)	4.5 (3.7, 5.4)
Traditional Instrumentation	5906	229057	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.8 (2.8, 2.9)	3.1 (3.0, 3.1)	3.3 (3.2, 3.4)	3.5 (3.4, 3.6)
TOTAL	6271	245714						

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT76 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Robotically Assisted vs Traditional Instrumentation

0 - 3Mth: HR=1.02 (95% CI 0.89, 1.18), p=0.755

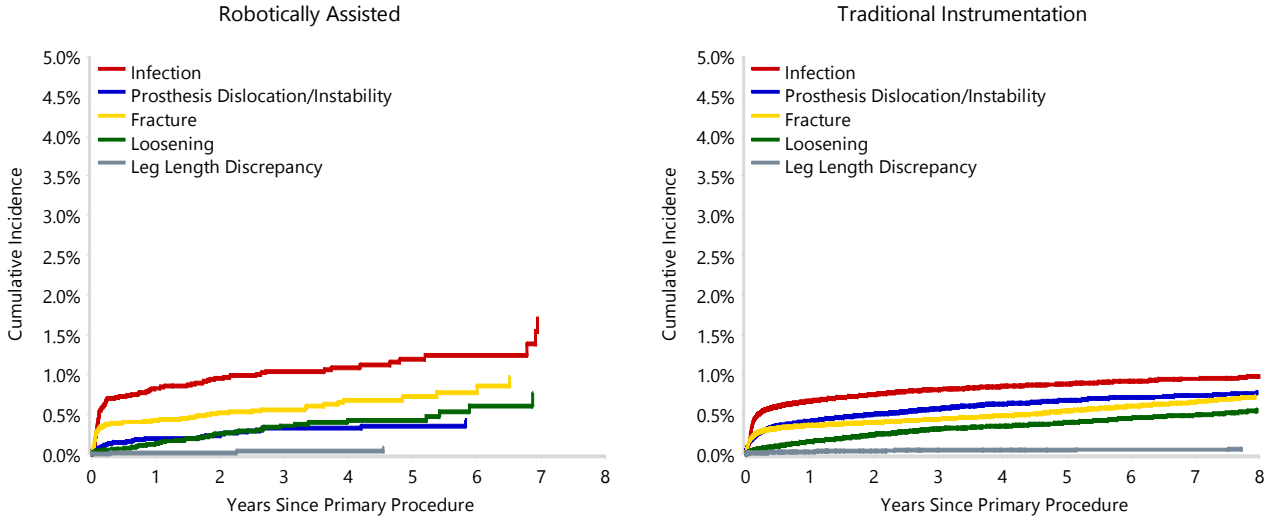
3Mth – 1.5Yrs: HR=0.81 (95% CI 0.64, 1.02), p=0.078

1.5Yr+: HR=1.45 (95% CI 1.16, 1.80), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	16657	11556	5279	2112	1160	515	116
Traditional Instrumentation	229057	197284	139795	88144	63315	40062	18611

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Figure HT77 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnoses OA)



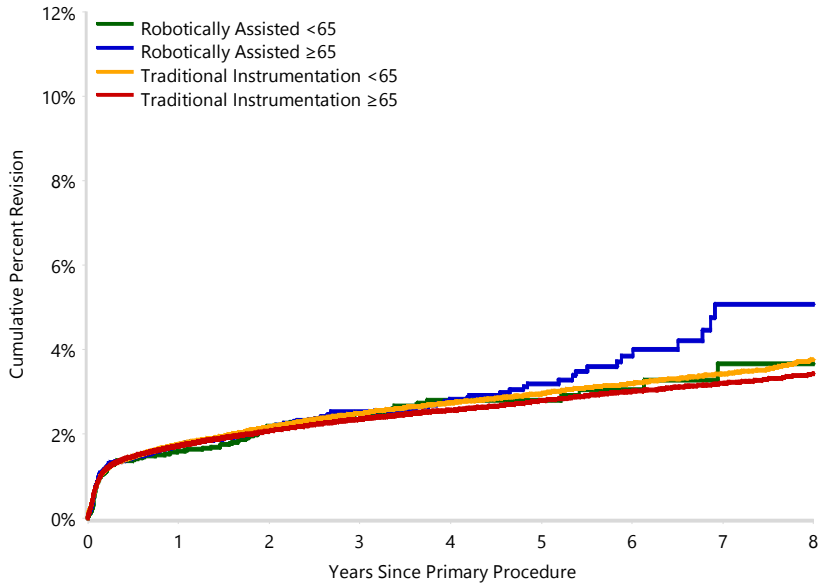
Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT73 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	<65	126	5919	1.6 (1.3, 2.0)	2.5 (2.1, 3.0)	2.8 (2.3, 3.4)	3.1 (2.5, 3.8)	3.7 (2.7, 4.9)	3.7 (2.7, 4.9)
	≥65	239	10738	1.7 (1.5, 2.0)	2.5 (2.2, 2.9)	3.2 (2.7, 3.8)	3.9 (3.2, 4.7)	5.1 (3.9, 6.6)	5.1 (3.9, 6.6)
Traditional Instrumentation	<65	2106	76889	1.7 (1.7, 1.8)	2.5 (2.4, 2.6)	2.9 (2.8, 3.1)	3.2 (3.1, 3.3)	3.4 (3.3, 3.6)	3.7 (3.6, 3.9)
	≥65	3800	152168	1.7 (1.6, 1.8)	2.3 (2.3, 2.4)	2.8 (2.7, 2.9)	3.0 (2.9, 3.1)	3.2 (3.1, 3.3)	3.4 (3.3, 3.5)
TOTAL		6271	245714						

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT78 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Robotically Assisted <65
vs Traditional Instrumentation <65

Entire Period: HR=0.96 (95% CI 0.80, 1.15), p=0.677

Robotically Assisted ≥65
vs Traditional Instrumentation ≥65

Entire Period: HR=1.11 (95% CI 0.97, 1.26), p=0.131

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	<65	5919	4226	2063	878	502	235	51
	≥65	10738	7330	3216	1234	658	280	65
Traditional Instrumentation	<65	76889	67031	48815	31980	23752	15526	7510
	≥65	152168	130253	90980	56164	39563	24536	11101

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT74 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Accolade II/Trident (Shell)	Robotically Assisted	113	4743	1.7 (1.4, 2.2)	2.7 (2.2, 3.3)	3.0 (2.4, 3.7)	3.0 (2.4, 3.7)	4.0 (2.7, 5.8)	
	Traditional Instrumentation	277	10695	1.9 (1.6, 2.1)	2.5 (2.2, 2.8)	2.8 (2.5, 3.2)	2.9 (2.6, 3.3)	3.1 (2.7, 3.5)	3.4 (3.0, 4.0)
Accolade II/Trident/Tritanium (Shell)	Robotically Assisted	78	2011	2.4 (1.9, 3.2)	3.6 (2.9, 4.5)	4.0 (3.2, 5.0)	4.6 (3.6, 5.8)	5.0 (3.8, 6.6)	5.0 (3.8, 6.6)
	Traditional Instrumentation	58	1718	2.0 (1.4, 2.8)	3.0 (2.3, 4.0)	3.5 (2.7, 4.6)	3.8 (2.9, 4.9)	4.1 (3.2, 5.4)	4.1 (3.2, 5.4)
Exeter V40/Trident (Shell)	Robotically Assisted	56	3341	1.2 (0.9, 1.7)	1.7 (1.3, 2.3)	2.3 (1.7, 3.2)	2.7 (1.8, 3.8)	4.0 (2.4, 6.6)	4.0 (2.4, 6.6)
	Traditional Instrumentation	836	37821	1.3 (1.2, 1.4)	1.9 (1.7, 2.0)	2.3 (2.1, 2.4)	2.5 (2.4, 2.7)	2.7 (2.5, 2.9)	2.9 (2.7, 3.2)
TOTAL		1418	60329						

Note: Restricted to modern prostheses
Restricted to prosthesis combinations with >1,000 procedures in both groups

Table HT75 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prothesis Combination	Comparison	HR – adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
Accolade II/Trident (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.07 (95% CI 0.83, 1.37), p=0.624
Accolade II/Trident/Tritanium (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.34 (95% CI 0.94, 1.93), p=0.110
Exeter V40/Trident (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=0.96 (95% CI 0.73, 1.27), p=0.770

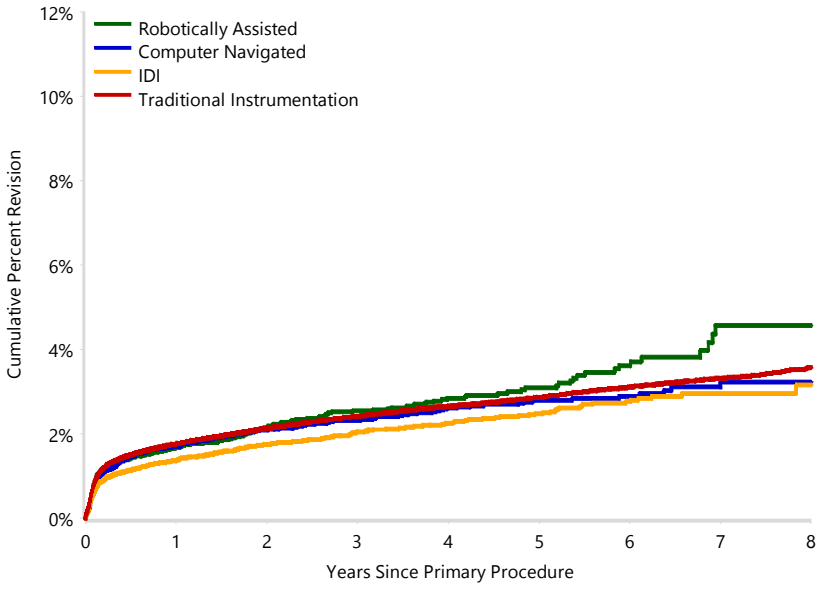
Note: Restricted to modern prostheses.
Only prosthesis combinations with >1,000 procedures in both groups have been listed.

Table HT76 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	362	16466	1.7 (1.5, 1.9)	2.5 (2.3, 2.8)	3.1 (2.7, 3.5)	3.6 (3.1, 4.2)	4.6 (3.7, 5.6)	4.6 (3.7, 5.6)
Computer Navigated	283	12411	1.7 (1.5, 2.0)	2.3 (2.1, 2.6)	2.8 (2.5, 3.2)	2.9 (2.5, 3.3)	3.1 (2.7, 3.6)	3.2 (2.8, 3.8)
IDI	460	24493	1.4 (1.2, 1.5)	2.1 (1.9, 2.3)	2.5 (2.2, 2.7)	2.8 (2.5, 3.1)	3.0 (2.6, 3.3)	3.2 (2.7, 3.7)
Traditional Instrumentation	5112	197301	1.8 (1.7, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 2.9)	3.1 (3.0, 3.2)	3.3 (3.2, 3.4)	3.6 (3.5, 3.7)
TOTAL	6217	250671						

Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.
Restricted to procedures with known age, gender, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT79 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Computer Navigated vs IDI
Entire Period: HR=1.13 (95% CI 0.97, 1.31), p=0.119

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=0.97 (95% CI 0.86, 1.10), p=0.652

IDI vs Traditional Instrumentation
0 - 3Mth: HR=0.84 (95% CI 0.74, 0.97), p=0.014
3Mth+: HR=1.01 (95% CI 0.88, 1.16), p=0.874

Robotically Assisted vs Computer Navigated
Entire Period: HR=1.12 (95% CI 0.96, 1.31), p=0.156

Robotically Assisted vs IDI
Entire Period: HR=1.26 (95% CI 1.10, 1.45), p=0.001

Robotically Assisted vs Traditional Instrumentation
0 - 3Mth: HR=1.02 (95% CI 0.89, 1.18), p=0.763
3Mths-1.5Yrs: HR=0.84 (95% CI 0.66, 1.07), p=0.157
1.5Yrs+: HR=1.56 (95% CI 1.25, 1.95), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	16466	11374	5107	1975	1054	444	91
Computer Navigated	12411	9793	5979	2762	1669	865	391
IDI	24493	18530	9662	4399	2486	1206	385
Traditional Instrumentation	197301	168713	117302	72061	50604	31391	14179

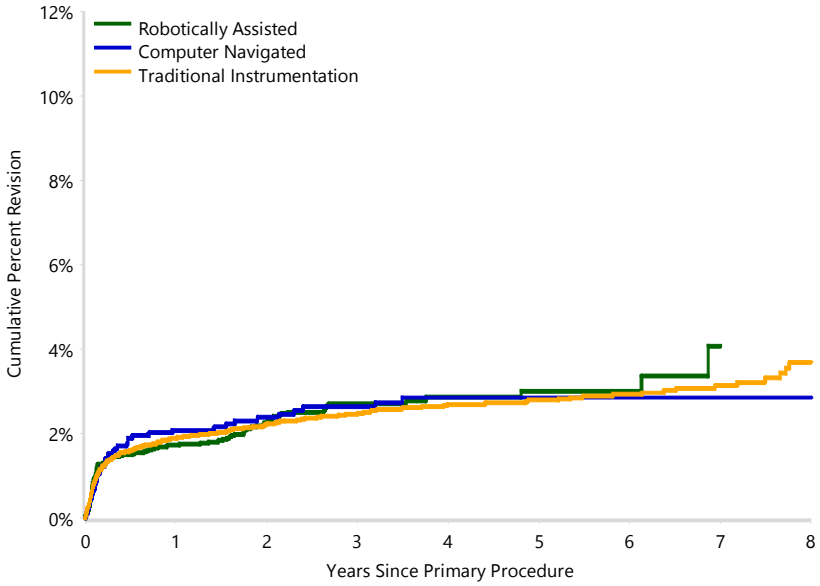
Note: All procedures using metal/metal prostheses have been excluded.
Restricted to modern prostheses.

Table HT77 Cumulative Percent Revision of Accolade II/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	111	4662	1.7 (1.4, 2.1)	2.7 (2.2, 3.3)	3.0 (2.4, 3.7)	3.0 (2.4, 3.7)	4.1 (2.7, 6.1)	
Computer Navigated	44	1723	2.1 (1.5, 2.9)	2.6 (2.0, 3.6)	2.9 (2.1, 3.8)	2.9 (2.1, 3.8)	2.9 (2.1, 3.8)	2.9 (2.1, 3.8)
Traditional Instrumentation	261	10188	1.9 (1.6, 2.2)	2.5 (2.2, 2.8)	2.8 (2.5, 3.2)	2.9 (2.6, 3.3)	3.1 (2.7, 3.6)	3.7 (3.1, 4.4)
TOTAL	416	16573						

Note: Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.
Excludes 3 procedures using IDI.

Figure HT80 Cumulative Percent Revision of Accolade II/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Robotically Assisted vs Traditional Instrumentation
Entire Period: HR=1.14 (95% CI 0.88, 1.46), p=0.319

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=1.14 (95% CI 0.81, 1.59), p=0.462

Robotically Assisted vs Computer Navigated
Entire Period: HR=1.00 (95% CI 0.70, 1.43), p=0.997

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	4662	3673	1763	589	310	103	6
Computer Navigated	1723	1472	1002	453	291	134	58
Traditional Instrumentation	10188	8678	6029	3450	2292	1394	583

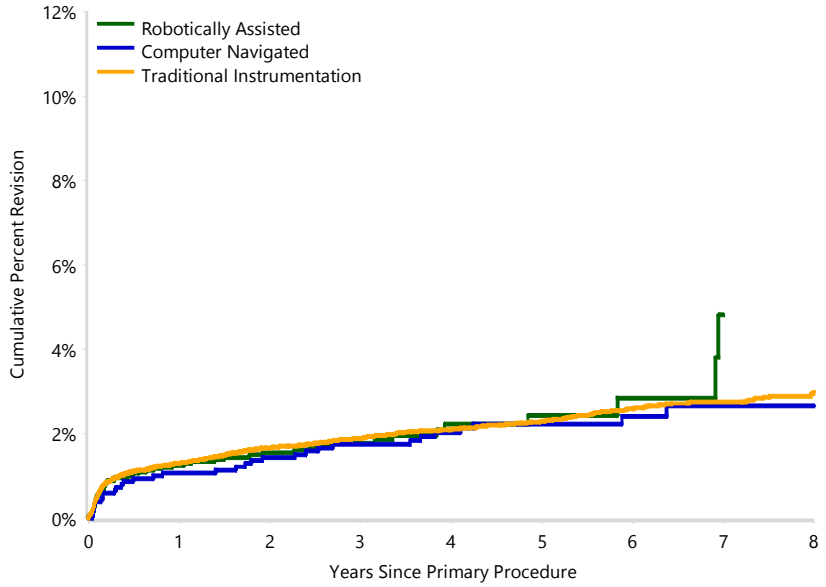
Note: Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.
Excludes 3 procedures using IDI.

Table HT78 Cumulative Percent Revision of Exeter V40/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	56	3268	1.3 (0.9, 1.7)	1.8 (1.3, 2.4)	2.4 (1.8, 3.4)	2.8 (1.9, 4.2)	4.8 (2.6, 8.8)	
Computer Navigated	32	1497	1.1 (0.7, 1.8)	1.8 (1.2, 2.6)	2.2 (1.6, 3.2)	2.4 (1.7, 3.5)	2.7 (1.8, 3.8)	2.7 (1.8, 3.8)
Traditional Instrumentation	734	34011	1.3 (1.2, 1.4)	1.9 (1.7, 2.1)	2.3 (2.1, 2.5)	2.6 (2.4, 2.8)	2.7 (2.5, 3.0)	3.0 (2.7, 3.3)
TOTAL	822	38776						

Note: Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.
Excludes 5 procedures using IDI.

Figure HT81 Cumulative Percent Revision of Exeter V40/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Robotically Assisted vs Traditional Instrumentation
Entire Period: HR=1.01 (95% CI 0.77, 1.34), p=0.921

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=1.04 (95% CI 0.68, 1.60), p=0.840

Robotically Assisted vs Computer Navigated
Entire Period: HR=0.97 (95% CI 0.60, 1.57), p=0.903

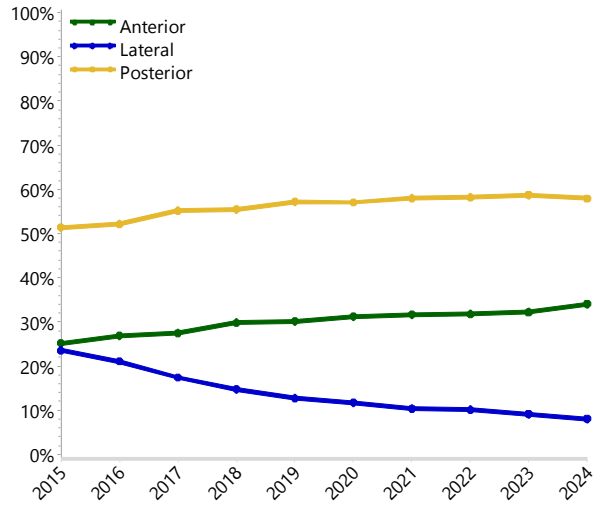
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	3268	2399	1124	416	219	91	22
Computer Navigated	1497	1423	1195	756	508	293	120
Traditional Instrumentation	34011	30170	22031	13967	9765	6008	2776

Note: Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.
Excludes 5 procedures using IDI.

SURGICAL APPROACH

Collection of surgical approach data began in 2015 and the outcome of 99,392 anterior, 42,378 lateral, and 184,207 posterior total conventional hip replacement procedures for osteoarthritis can be compared. The proportional use of anterior, lateral and posterior approaches over time is shown in Figure HT82.

Figure HT82 Primary Total Conventional Hip Replacement by Approach (Primary Diagnosis OA)



The anterior approach is used more often in younger patients than the posterior and lateral approaches, and in a higher proportion of patients with lower BMI and ASA scores (Table HT79 to Table HT81).

The following analyses were performed with hazard ratios adjusted for age, gender, ASA score, BMI category, femoral fixation, and head size. When compared to the anterior approach, the lateral and posterior approaches have a higher rate of revision. The lateral approach also has a higher rate of revision compared to the posterior approach (Table HT82 and Figure HT83). There are also differences in the types of revision and reasons for revision between the approaches.

Major Revisions

The posterior approach has a lower rate of major revision compared to the anterior approach and the lateral approach. There is no difference between the lateral and anterior approaches (Table HT83 and Figure HT84).

Reasons for Revision

The most common reasons for revision of primary total hip replacement in the first 10 years include loosening, fracture, infection, and dislocation/instability (Figure HT85).

Revision for Loosening

The posterior approach has a lower rate of revision for loosening compared to the lateral approach and to the anterior approach. There is a higher rate of revision for loosening with the anterior approach compared to the lateral approach (Table HT84 and Figure HT86).

Revision for Fracture

The anterior approach also has a higher rate of revision for fracture in the first 3 months when compared to both the lateral approach and to the posterior approach. After this time, the anterior approach has a lower rate of revision compared to both of the other surgical approaches. There is no difference when the posterior approach is compared to the lateral approach (Table HT85 and Figure HT87).

Revision for Infection

There is a lower rate of revision for infection for the anterior approach compared to both the posterior approach and lateral approach. There is no difference between the posterior and lateral approaches (Table HT86 and Figure HT88).

Revision for Dislocation/Instability

The anterior approach has a lower rate of revision for dislocation/instability compared to both the posterior approach and the lateral approach. There is no difference when the posterior is compared to the lateral approach (Table HT87 and Figure HT89).

Table HT79 Primary Total Conventional Hip Replacement by Age and Surgical Approach (Primary Diagnosis OA)

Age	Anterior		Lateral		Posterior	
	N	%	N	%	N	%
<55	12105	12.2	4179	9.9	18326	9.9
55-64	25177	25.3	9633	22.7	42444	23.0
65-74	35985	36.2	15384	36.3	66249	36.0
≥75	26125	26.3	13182	31.1	57188	31.0
TOTAL	**99392**	**100.0**	**42378**	**100.0**	**184207**	**100.0**

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT80 Primary Total Conventional Hip Replacement by BMI Category and Surgical Approach (Primary Diagnosis OA)

BMI Category	Anterior		Lateral		Posterior	
	N	%	N	%	N	%
Underweight	740	0.8	310	0.8	1311	0.7
Normal	23343	23.9	7836	19.2	34418	19.2
Pre Obese	38621	39.5	14297	35.1	63308	35.3
Obese Class 1	23534	24.1	10898	26.7	47347	26.4
Obese Class 2	8266	8.5	5025	12.3	21705	12.1
Obese Class 3	3212	3.3	2412	5.9	11272	6.3
TOTAL	**97716**	**100.0**	**40778**	**100.0**	**179361**	**100.0**

Note: All procedures using metal/metal prostheses have been excluded
BMI has not been presented for patients aged ≤19 years
Restricted to modern prostheses

Table HT81 Primary Total Conventional Hip Replacement by ASA Score and Surgical Approach (Primary Diagnosis OA)

ASA Score	Anterior		Lateral		Posterior	
	N	%	N	%	N	%
ASA 1	9897	10.0	2932	6.9	11924	6.5
ASA 2	55480	55.9	21877	51.7	95382	51.8
ASA 3	32892	33.1	16844	39.8	73849	40.1
ASA 4	991	1.0	621	1.5	2798	1.5
ASA 5	5	0.0	3	0.0	12	0.0
TOTAL	**99265**	**100.0**	**42277**	**100.0**	**183965**	**100.0**

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

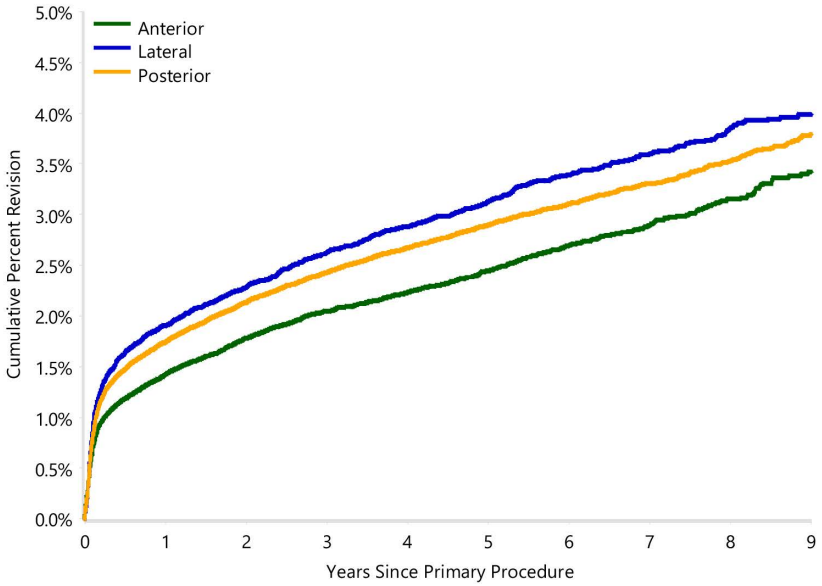
Primary Total Hip Replacement

Table HT82 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	10 Yrs
Anterior	2141	97620	1.4 (1.4, 1.5)	2.0 (2.0, 2.1)	2.4 (2.3, 2.6)	2.9 (2.8, 3.0)	3.2 (3.0, 3.3)	3.4 (3.2, 3.6)
Lateral	1247	40702	1.9 (1.8, 2.0)	2.6 (2.5, 2.8)	3.1 (2.9, 3.3)	3.6 (3.4, 3.8)	3.9 (3.6, 4.1)	4.0 (3.7, 4.2)
Posterior	4639	179165	1.7 (1.7, 1.8)	2.4 (2.4, 2.5)	2.9 (2.8, 3.0)	3.3 (3.2, 3.4)	3.5 (3.4, 3.7)	3.8 (3.6, 3.9)
TOTAL	8027	317487						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA Score, BMI category or head size

Figure HT83 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size.

Lateral vs Anterior
Entire Period: HR= HR=1.22 (1.14, 1.31),p<0.001

Posterior vs Anterior
Entire Period: HR=1.13 (1.07, 1.19),p<0.001

Posterior vs Lateral
Entire Period: HR=0.92 (0.87, 0.98),p=0.014

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

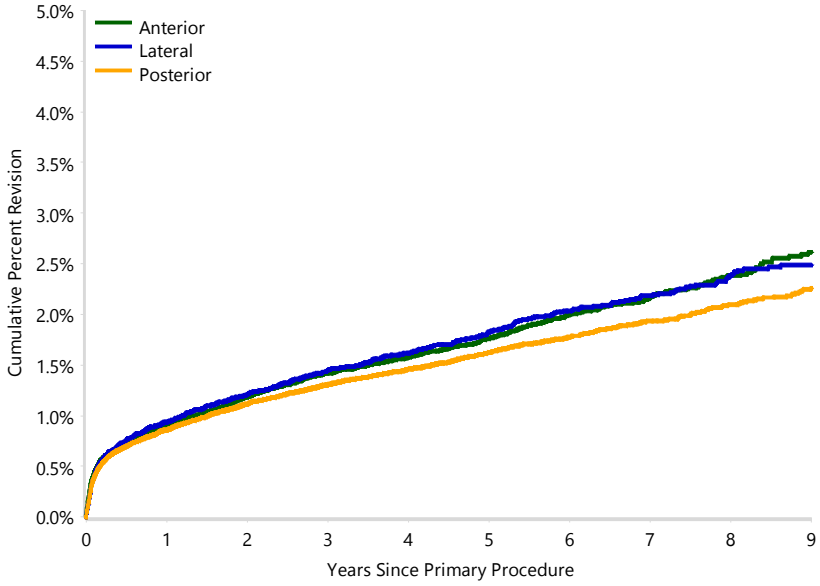
Note: All procedures using metal/metal prostheses have been excluded
Excludes procedures with unknown ASA score, BMI category or head size
Due to low numbers, ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined
Restricted to modern prostheses

Table HT83 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Major Revisions)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	1520	97620	0.9 (0.8, 1.0)	1.4 (1.3, 1.5)	1.8 (1.7, 1.9)	2.2 (2.0, 2.3)	2.4 (2.2, 2.5)	2.6 (2.4, 2.8)
Lateral	726	40702	0.9 (0.9, 1.0)	1.5 (1.3, 1.6)	1.8 (1.7, 2.0)	2.2 (2.0, 2.4)	2.4 (2.2, 2.6)	2.5 (2.3, 2.7)
Posterior	2558	179165	0.9 (0.8, 0.9)	1.3 (1.3, 1.4)	1.6 (1.6, 1.7)	1.9 (1.9, 2.0)	2.1 (2.0, 2.2)	2.3 (2.1, 2.4)
TOTAL	4804	317487						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA Score, BMI category or head size

Figure HT84 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Major Revisions)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size.

Lateral vs Anterior
Entire Period: HR=1.00 (95% CI 0.91, 1.09),p=0.986

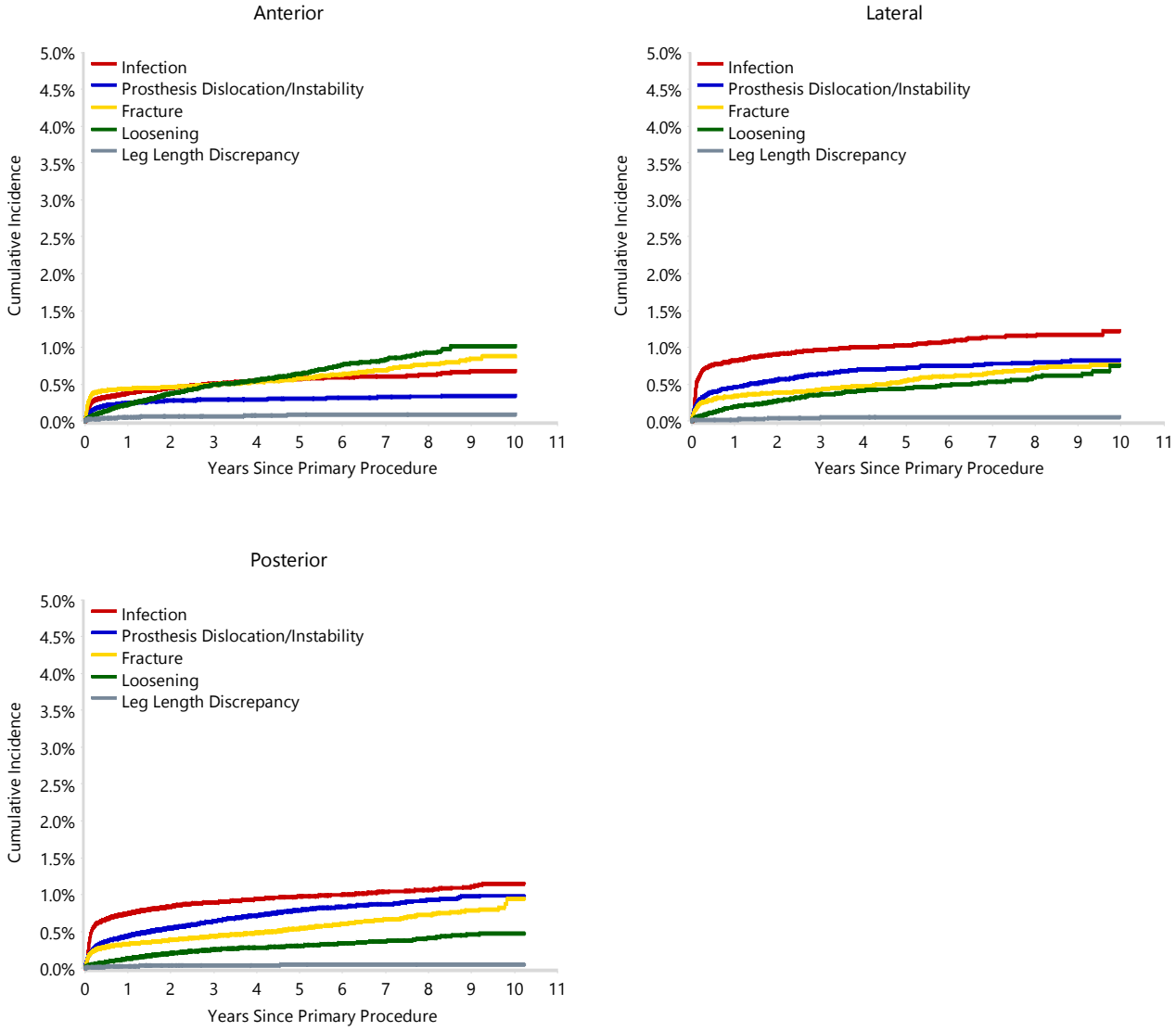
Posterior vs Anterior
Entire Period: HR=0.89 (95% CI 0.84, 0.96),p<0.001

Posterior vs Lateral
Entire Period: HR=0.89 (95% CI 0.82, 0.97),p=0.008

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA Score, BMI category or head size
Due to low numbers ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined

Figure HT85 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)



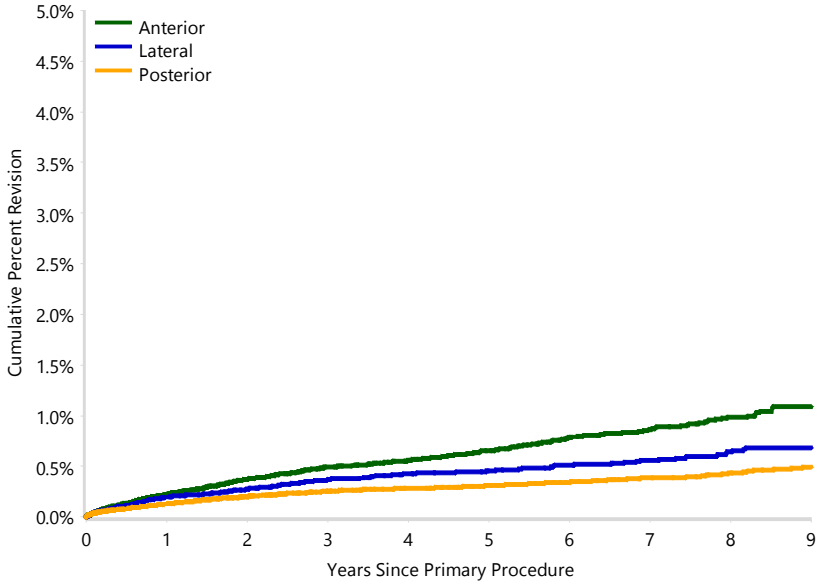
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT84 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Loosening)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	539	97620	0.2 (0.2, 0.3)	0.5 (0.4, 0.5)	0.7 (0.6, 0.7)	0.9 (0.8, 0.9)	1.0 (0.9, 1.1)	1.1 (1.0, 1.2)
Lateral	184	40702	0.2 (0.2, 0.2)	0.4 (0.3, 0.4)	0.5 (0.4, 0.5)	0.6 (0.5, 0.7)	0.6 (0.5, 0.8)	0.7 (0.6, 0.8)
Posterior	486	179165	0.1 (0.1, 0.1)	0.3 (0.2, 0.3)	0.3 (0.3, 0.3)	0.4 (0.3, 0.4)	0.4 (0.4, 0.5)	0.5 (0.4, 0.6)
TOTAL	1209	317487						

Note: All procedures using metal/metal prostheses have been excluded
Excludes procedures with unknown ASA score, BMI category or head size
Restricted to modern prostheses

Figure HT86 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Loosening)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size

Lateral vs Posterior
Entire Period: HR=1.45 (95% CI 1.22, 1.71),p<0.001

Anterior vs Posterior
Entire Period: HR=1.93 (95% CI 1.70, 2.19),p<0.001

Anterior vs Lateral
Entire Period: HR=1.33 (95% CI 1.12, 1.58),p=0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

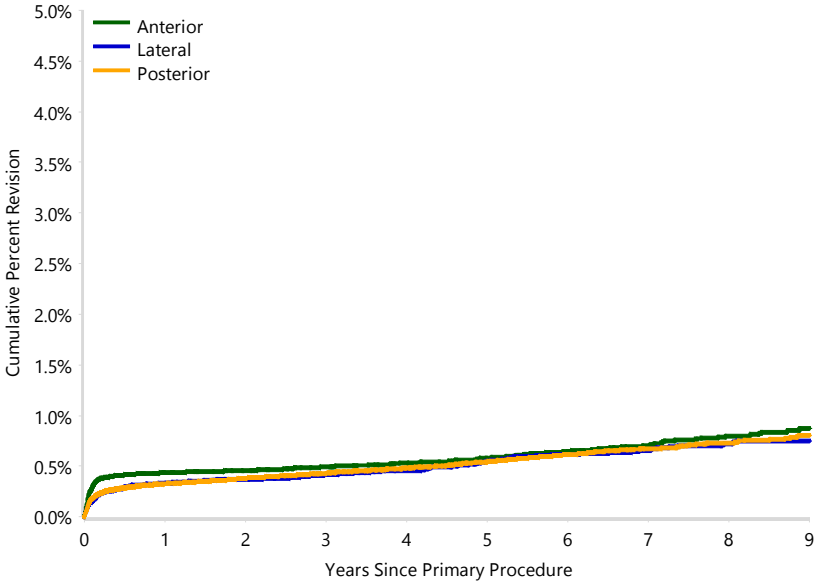
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA Score, BMI category or head size
Due to low numbers ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined

Table HT85 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Fracture)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	546	97620	0.4 (0.4, 0.5)	0.5 (0.4, 0.5)	0.6 (0.5, 0.6)	0.7 (0.6, 0.8)	0.8 (0.7, 0.9)	0.9 (0.8, 1.0)
Lateral	219	40702	0.3 (0.3, 0.4)	0.4 (0.4, 0.5)	0.5 (0.5, 0.6)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	0.7 (0.6, 0.9)
Posterior	889	179165	0.3 (0.3, 0.4)	0.4 (0.4, 0.5)	0.5 (0.5, 0.6)	0.7 (0.6, 0.7)	0.7 (0.7, 0.8)	0.8 (0.7, 0.9)
TOTAL	1654	317487						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA score, BMI category or head size

Figure HT87 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Fracture)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size

Posterior vs Lateral
Entire Period: HR=1.04 (95% CI 0.90, 1.21),p=0.615

Anterior vs Lateral
0-3Mth: HR=1.63 (95% CI 1.35, 1.95),p<0.001
3Mth+: HR=0.76 (95% CI 0.61, 0.93),p=0.008

Anterior vs Posterior
0-3Mth: HR=1.56 (95% CI 1.36, 1.79),p<0.001
3Mth+: HR=0.73 (95% CI 0.61, 0.87),p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

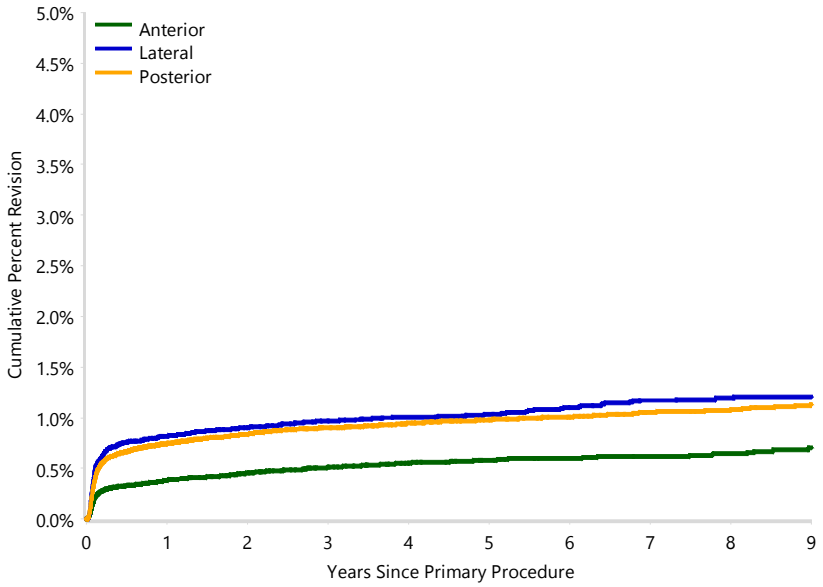
Note: All procedures using metal/metal prostheses have been excluded
Excludes procedures with unknown ASA Score, BMI category or head size
Due to low numbers ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined
Restricted to modern prostheses

Table HT86 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Infection)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	499	97620	0.4 (0.3, 0.4)	0.5 (0.5, 0.6)	0.6 (0.5, 0.6)	0.6 (0.6, 0.7)	0.6 (0.6, 0.7)	0.7 (0.6, 0.8)
Lateral	419	40702	0.8 (0.7, 0.9)	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)	1.2 (1.1, 1.3)	1.2 (1.1, 1.3)	1.2 (1.1, 1.3)
Posterior	1617	179165	0.7 (0.7, 0.8)	0.9 (0.9, 0.9)	1.0 (0.9, 1.0)	1.1 (1.0, 1.1)	1.1 (1.0, 1.1)	1.1 (1.1, 1.2)
TOTAL	2535	317487						

Note: All procedures using metal/metal prostheses have been excluded
Excludes procedures with unknown ASA score, BMI category or head size
Restricted to modern prostheses

Figure HT88 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Infection)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size

Lateral vs Anterior
Entire Period: HR=1.63 (95% CI 1.43, 1.87),p<0.001

Posterior vs Anterior
Entire Period: HR=1.49 (95% CI 1.34, 1.65),p<0.001

Posterior vs Lateral
Entire Period: HR=0.91 (95% CI 0.82, 1.01),p=0.085

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

Note: All procedures using metal/metal prostheses have been excluded
Excludes procedures with unknown ASA Score, BMI category or head size
Due to low numbers ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined
Restricted to modern prostheses

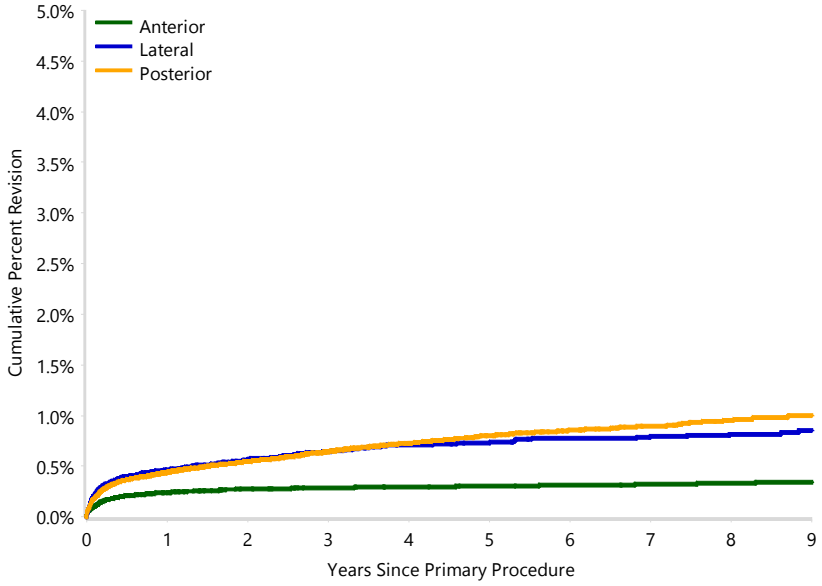
Primary Total Hip Replacement

Table HT87 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Dislocation/Instability)

Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	274	97620	0.2 (0.2, 0.3)	0.3 (0.3, 0.3)	0.3 (0.3, 0.3)	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)
Lateral	281	40702	0.5 (0.4, 0.5)	0.7 (0.6, 0.7)	0.7 (0.6, 0.8)	0.8 (0.7, 0.9)	0.8 (0.7, 0.9)	0.9 (0.7, 1.0)
Posterior	1230	179165	0.4 (0.4, 0.5)	0.6 (0.6, 0.7)	0.8 (0.8, 0.9)	0.9 (0.8, 1.0)	1.0 (0.9, 1.0)	1.0 (0.9, 1.1)
TOTAL	1785	317487						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA score, BMI category or head size

Figure HT89 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Dislocation/Instability)



HR - adjusted for age, gender, ASA score and BMI category, femoral fixation and head size

Lateral vs Anterior
- 0-2wk: HR=1.64 (95% CI 1.15, 2.36),p=0.007
- 2wk-1Mth: HR=2.49 (95% CI 1.74, 3.58),p<0.001
- 1Mth-6Mth: HR=1.83 (95% CI 1.40, 2.40),p<0.001
- 6Mth+: HR=3.03 (95% CI 2.30, 3.99),p<0.001

Posterior vs Anterior
- 0-3Mth: HR=1.72 (95% CI 1.45, 2.05),p<0.001
- 3Mth-9Mth: HR=2.12 (95% CI 1.62, 2.78),p<0.001
- 9Mth+: HR=4.35 (95% CI 3.41, 5.55),p<0.001

Posterior vs Lateral
- Entire Period: HR=1.10 (95% CI 0.96, 1.25),p=0.158

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	97620	81667	55860	34722	17184	10194	4289
Lateral	40702	36303	28171	20403	12135	7911	3654
Posterior	179165	151002	103508	64720	32266	18947	8124

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
Excludes procedures with unknown ASA Score, BMI category or head size
Due to low numbers ASA score 1–2 and 3–5 have been combined
Due to low numbers BMI category underweight and normal have been combined

OUTCOME FOR FRACTURED NECK OF FEMUR

There have been 31,470 primary total conventional hip replacement procedures undertaken for a diagnosis of fractured neck of femur.

The cumulative percent revision of primary total conventional hip replacement for fractured neck of femur is 10.5% at 20 years (Table HT88 and Figure HT90).

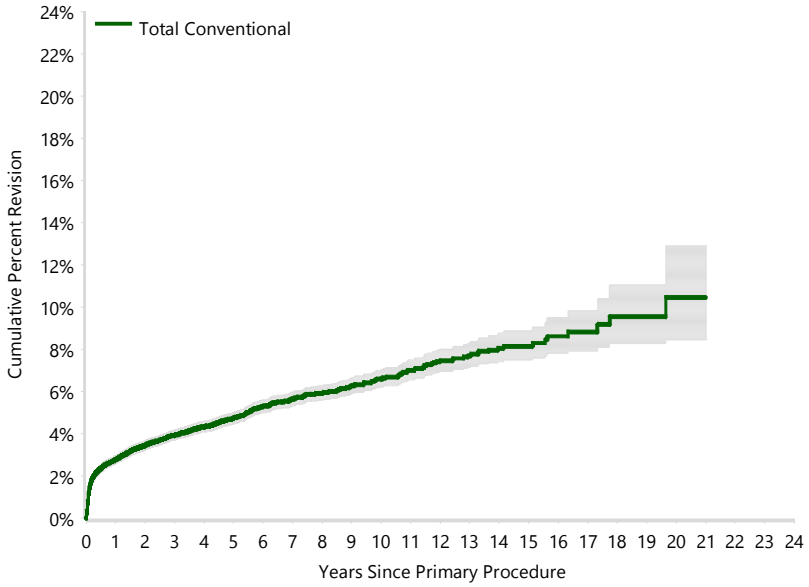
At 20 years, the cumulative percent survival of patients is 22.7% (Table HT89 and Figure HT91). This compares to the cumulative percent revision of 7.9% at 20 years when the diagnosis is osteoarthritis, which has a cumulative percent survival of 44.6% of patients at 20 years.

Table HT88 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	1435	31470	2.8 (2.6, 3.0)	3.9 (3.7, 4.2)	4.8 (4.5, 5.0)	6.6 (6.2, 7.0)	8.2 (7.5, 8.9)	10.5 (8.5, 12.9)
TOTAL	**1435**	**31470**						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT90 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	31470	25985	18538	12519	3560	705	86

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

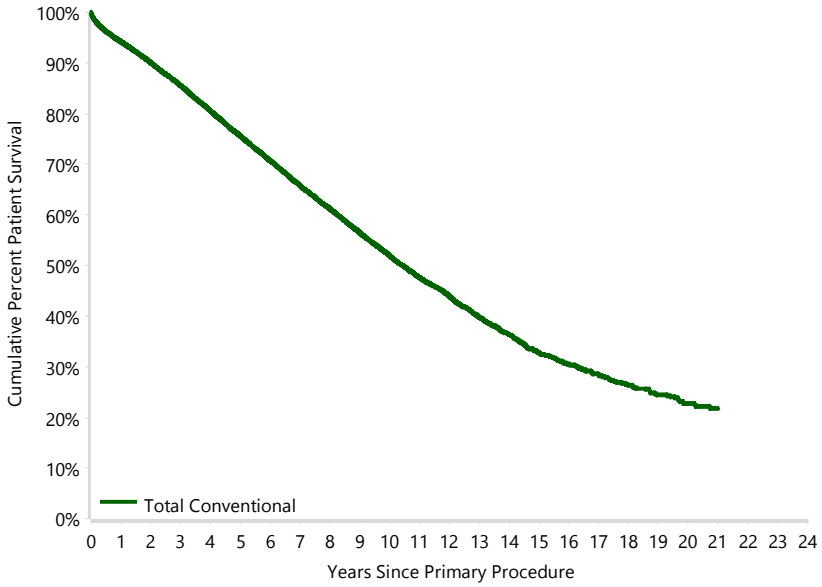
Primary Total Hip Replacement

Table HT89 Cumulative Percent Survival of Patients with Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Class	N Deceased	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	9375	31470	94.2 (93.9, 94.4)	85.5 (85.0, 85.9)	75.5 (75.0, 76.1)	51.9 (51.0, 52.8)	32.8 (31.5, 34.0)	22.7 (20.7, 24.8)
TOTAL	9375	31470						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT91 Cumulative Percent Survival of Patients with Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	31470	25985	18538	12519	3560	705	86

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Reasons for Revision

Prosthesis dislocation/instability is the most common reason for revision, followed by fracture, infection, and loosening (Table HT90 and Figure HT92).

Type of Revision

The most common type of revision is femoral component only, followed by head and insert, acetabular only, and total hip replacement (femoral/acetabular) (Table HT91).

Table HT90 Primary Total Conventional Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Prosthesis Dislocation/Instability	474	33.0
Fracture	425	29.6
Infection	276	19.2
Loosening	181	12.6
Leg Length Discrepancy	13	0.9
Pain	10	0.7
Implant Breakage Stem	7	0.5
Malposition	7	0.5
Implant Breakage Acetabular Insert	7	0.5
Lysis	6	0.4
Tumour	5	0.3
Implant Breakage Acetabular	5	0.3
Metal Related Pathology	3	0.2
Incorrect Sizing	2	0.1
Heterotopic Bone	1	0.1
Wear Head	1	0.1
Other	12	0.8
TOTAL	1435	100.0

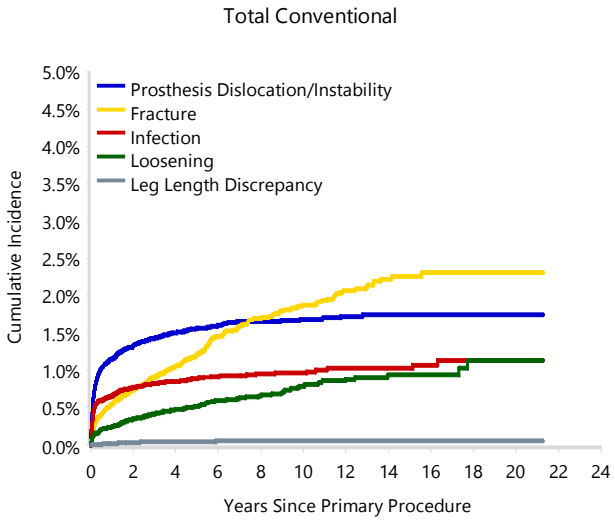
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT91 Primary Total Conventional Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Femoral Component	531	37.0
Head/Insert	375	26.1
Acetabular Component	220	15.3
THR (Femoral/Acetabular)	154	10.7
Head Only	61	4.3
Cement Spacer	34	2.4
Minor Components	26	1.8
Insert Only	20	1.4
Removal of Prostheses	9	0.6
Total Femoral	3	0.2
Reinsertion of Components	1	0.1
Bipolar Head and Femoral	1	0.1
TOTAL	1435	100.0

Note: Femoral heads are usually replaced when the acetabular component or femoral stem is revised
All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT92 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Primary Total Hip Replacement

Age and Gender

There is a difference in the rate of revision with respect to age with patients aged <55 years having a higher rate of revision compared to patients aged ≥75 years. There are no differences between patients aged ≥75 years and the other two age groups (Table HT92 and Figure HT93). Males have a higher rate of revision compared to females except for the first month (Table HT93 and Figure HT94).

Males aged 75 years and older have a higher rate of revision compared to males aged 65-74 years from one month onwards, with no difference prior to this time. There are no other differences for males aged ≥75 years compared to the other age groups (Table HT93 and Figure HT95).

Females aged <55 years have a higher rate of revision compared to females aged ≥75 years. There are no differences when other age groups are compared to females aged ≥75 (Table HT93 and Figure HT96).

The most common reasons for revision by gender and age are shown in Figure HT97 and Figure HT98.

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. The outcome of 25,249 primary total conventional hip replacement procedures for fractured neck of femur are reported in relation to these scores.

The majority of patients having a primary conventional hip replacement for fracture have an ASA score of 2 or 3, and this has changed little over time (Figure HT99).

When compared to patients with an ASA score of 1, patients with an ASA score of 2, 3 (up to 3.5 years only) and 4 have higher rates of revision (Table HT94 and Figure HT100). The most common reasons for revision for each ASA score are shown in Figure HT101. The difference in the rate of revision is partially due to an increase in revision for dislocation/ instability and infection with increasing ASA score.

There is a larger proportion of fractured neck of femur patients with an ASA score of 3 or 4 than patients with osteoarthritis (Figure HT105).

BMI data have been collected since 2015. The revision outcomes are reported for 16,529 primary total conventional hip replacement procedures for fractured neck of femur.

Over 75% of patients having a hip replacement for fracture are in the normal or pre-obese category, and there has been little change in BMI over time (Table HT92).

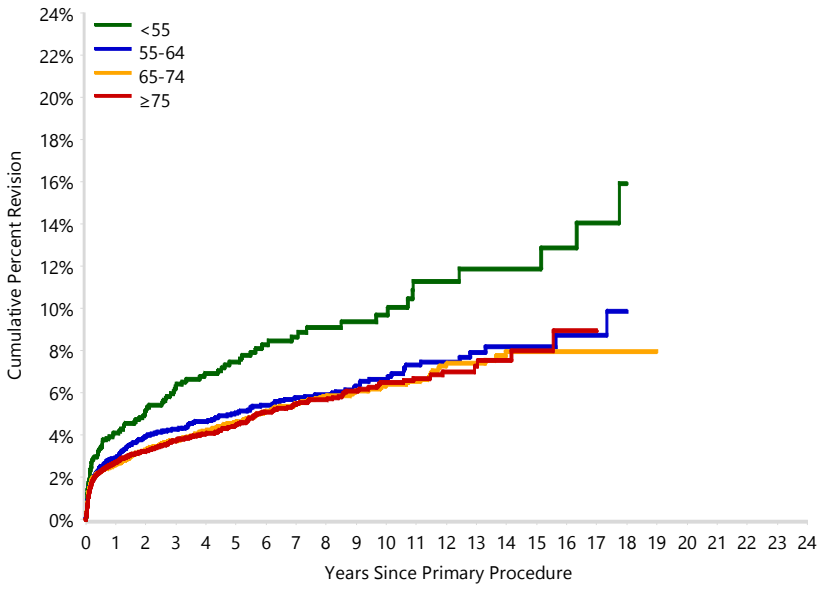
Patients in obese class 2 and 3 have a higher rate of revision compared to patients in the normal BMI class (Table HT96 and Figure HT103). The most common reasons for revision are shown in Figure HT104.

Table HT92 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	105	1372	4.1 (3.2, 5.3)	6.3 (5.0, 7.8)	7.5 (6.0, 9.2)	9.7 (7.8, 11.9)	11.9 (9.4, 15.0)	
55-64	231	4509	2.9 (2.5, 3.5)	4.3 (3.7, 4.9)	5.0 (4.4, 5.8)	6.7 (5.8, 7.7)	8.2 (6.9, 9.7)	
65-74	452	9878	2.6 (2.3, 3.0)	3.7 (3.4, 4.2)	4.6 (4.2, 5.1)	6.4 (5.8, 7.1)	8.0 (6.9, 9.2)	
≥75	647	15711	2.7 (2.5, 3.0)	3.7 (3.4, 4.1)	4.5 (4.1, 4.9)	6.5 (5.9, 7.2)	8.0 (6.7, 9.6)	
TOTAL	1435	31470						

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT93 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

<55 vs ≥75

Entire Period: HR=1.50 (95% CI 1.22, 1.85), p<0.001

55-64 vs ≥75

Entire Period: HR=1.07 (95% CI 0.92, 1.24), p=0.413

65-74 vs ≥75

Entire Period: HR=1.00 (95% CI 0.89, 1.13), p=0.967

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	1372	1118	825	620	258	93	24
55-64	4509	3805	2856	2110	766	200	20
65-74	9878	8345	6149	4383	1387	287	38
≥75	15711	12717	8708	5406	1149	125	4

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

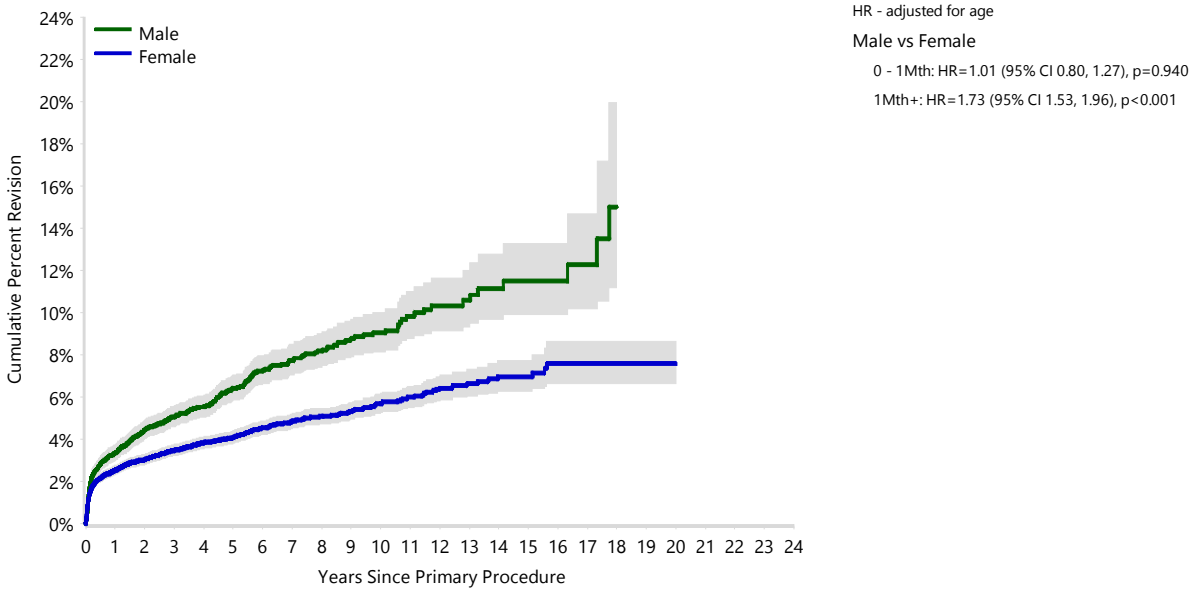
Primary Total Hip Replacement

Table HT93 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**544**	**9500**	**3.4 (3.0, 3.8)**	**5.1 (4.6, 5.6)**	**6.4 (5.9, 7.1)**	**9.0 (8.2, 10.0)**	**11.5 (9.9, 13.3)**	
	<55	56	656	4.6 (3.2, 6.6)	7.3 (5.4, 9.8)	9.0 (6.8, 11.8)	10.2 (7.7, 13.5)	12.1 (8.8, 16.4)	
	55-64	92	1510	3.5 (2.7, 4.6)	5.1 (4.1, 6.5)	6.0 (4.8, 7.5)	7.2 (5.7, 9.0)	11.5 (8.3, 15.8)	
	65-74	154	2817	3.1 (2.5, 3.9)	4.6 (3.9, 5.5)	6.0 (5.1, 7.1)	8.5 (7.0, 10.2)	9.5 (7.6, 11.8)	
	≥75	242	4517	3.3 (2.8, 3.9)	5.0 (4.3, 5.8)	6.5 (5.7, 7.6)	10.9 (9.1, 13.1)		
Female		**891**	**21970**	**2.5 (2.3, 2.8)**	**3.5 (3.2, 3.7)**	**4.1 (3.8, 4.4)**	**5.7 (5.3, 6.2)**	**7.0 (6.3, 7.7)**	**7.6 (6.6, 8.6)**
	<55	49	716	3.6 (2.5, 5.3)	5.4 (3.9, 7.5)	6.1 (4.4, 8.4)	9.2 (6.7, 12.5)	11.7 (8.3, 16.5)	
	55-64	139	2999	2.6 (2.1, 3.3)	3.8 (3.2, 4.6)	4.6 (3.8, 5.5)	6.4 (5.3, 7.7)	6.8 (5.6, 8.3)	
	65-74	298	7061	2.4 (2.1, 2.8)	3.4 (3.0, 3.9)	4.1 (3.6, 4.7)	5.7 (5.0, 6.5)	7.4 (6.2, 8.9)	
	≥75	405	11194	2.5 (2.2, 2.8)	3.3 (3.0, 3.7)	3.8 (3.4, 4.2)	5.2 (4.6, 5.9)	6.2 (5.2, 7.4)	
TOTAL		**1435**	**31470**						

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

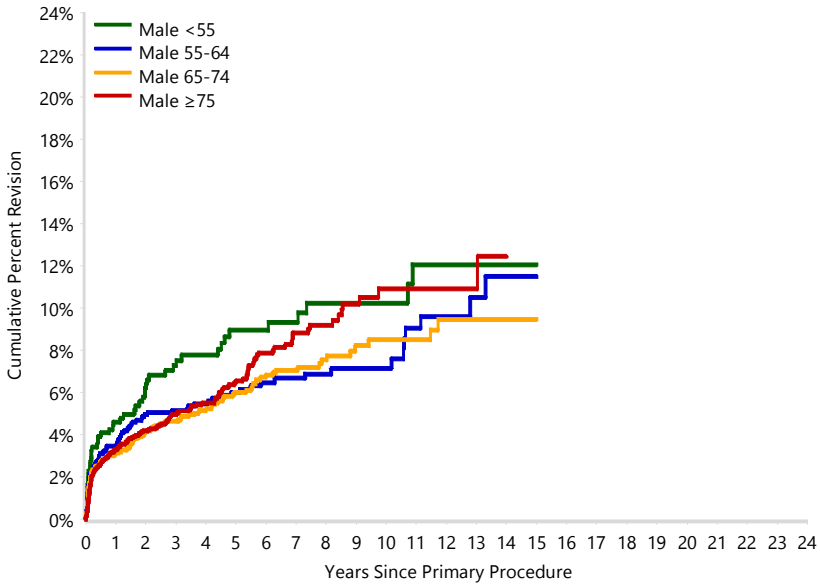
Figure HT94 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	9500	7487	4999	3141	830	168	26
Female	21970	18498	13539	9378	2730	537	60

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT95 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis Fractured NOF)



Male <55 vs Male ≥75

Entire Period: HR=1.24 (95% CI 0.92, 1.66), p=0.155

Male 55-64 vs Male ≥75

0 - 1Mth: HR=1.59 (95% CI 0.96, 2.64), p=0.071

1Mth - 3Mth: HR=0.70 (95% CI 0.40, 1.24), p=0.223

3Mth+: HR=0.85 (95% CI 0.62, 1.15), p=0.283

Male 65-74 vs Male ≥75

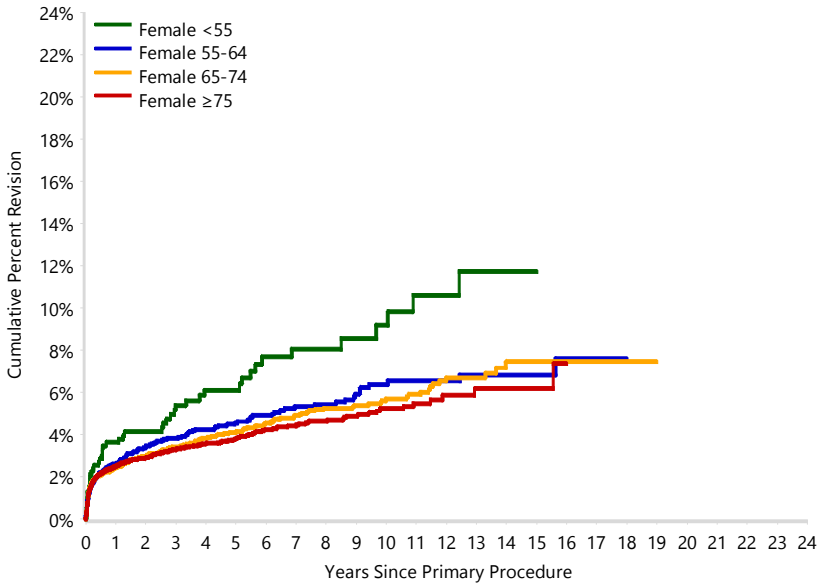
0 - 1Mth: HR=1.36 (95% CI 0.88, 2.11), p=0.165

1Mth+: HR=0.80 (95% CI 0.64, 1.00), p=0.049

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<55**	656	531	392	286	119	45	13
	55-64	1510	1249	903	646	223	44	4
	65-74	2817	2278	1597	1061	285	57	8
	≥75	4517	3429	2107	1148	203	22	1

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT96 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis Fractured NOF)



Female <55 vs Female ≥75
Entire Period: HR=1.73 (95% CI 1.29, 2.33), p<0.001

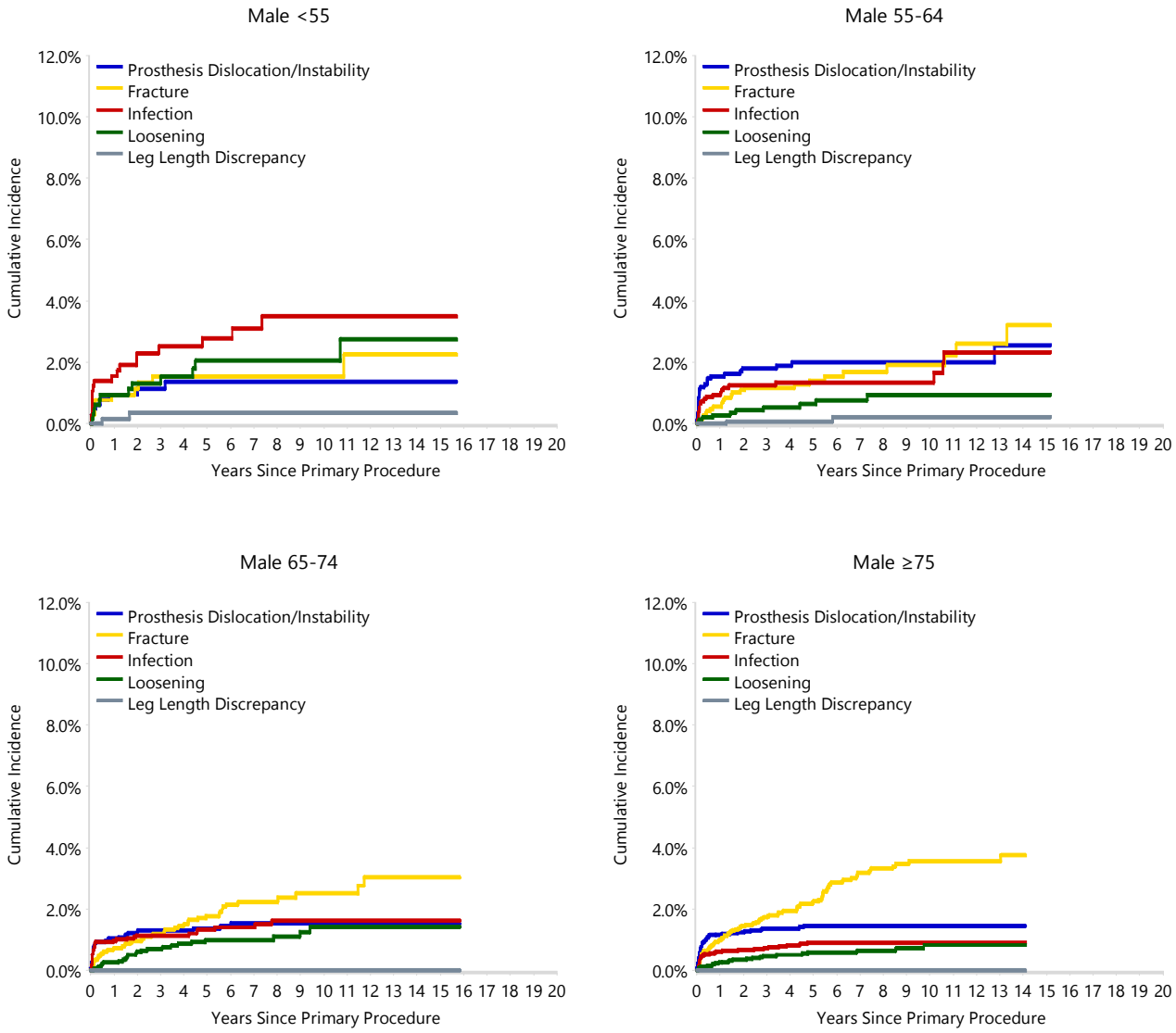
Female 55-64 vs Female ≥75
Entire Period: HR=1.15 (95% CI 0.95, 1.40), p=0.148

Female 65-74 vs Female ≥75
Entire Period: HR=1.07 (95% CI 0.92, 1.24), p=0.366

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	**<55**	716	587	433	334	139	48	11
	55-64	2999	2556	1953	1464	543	156	16
	65-74	7061	6067	4552	3322	1102	230	30
	≥75	11194	9288	6601	4258	946	103	3

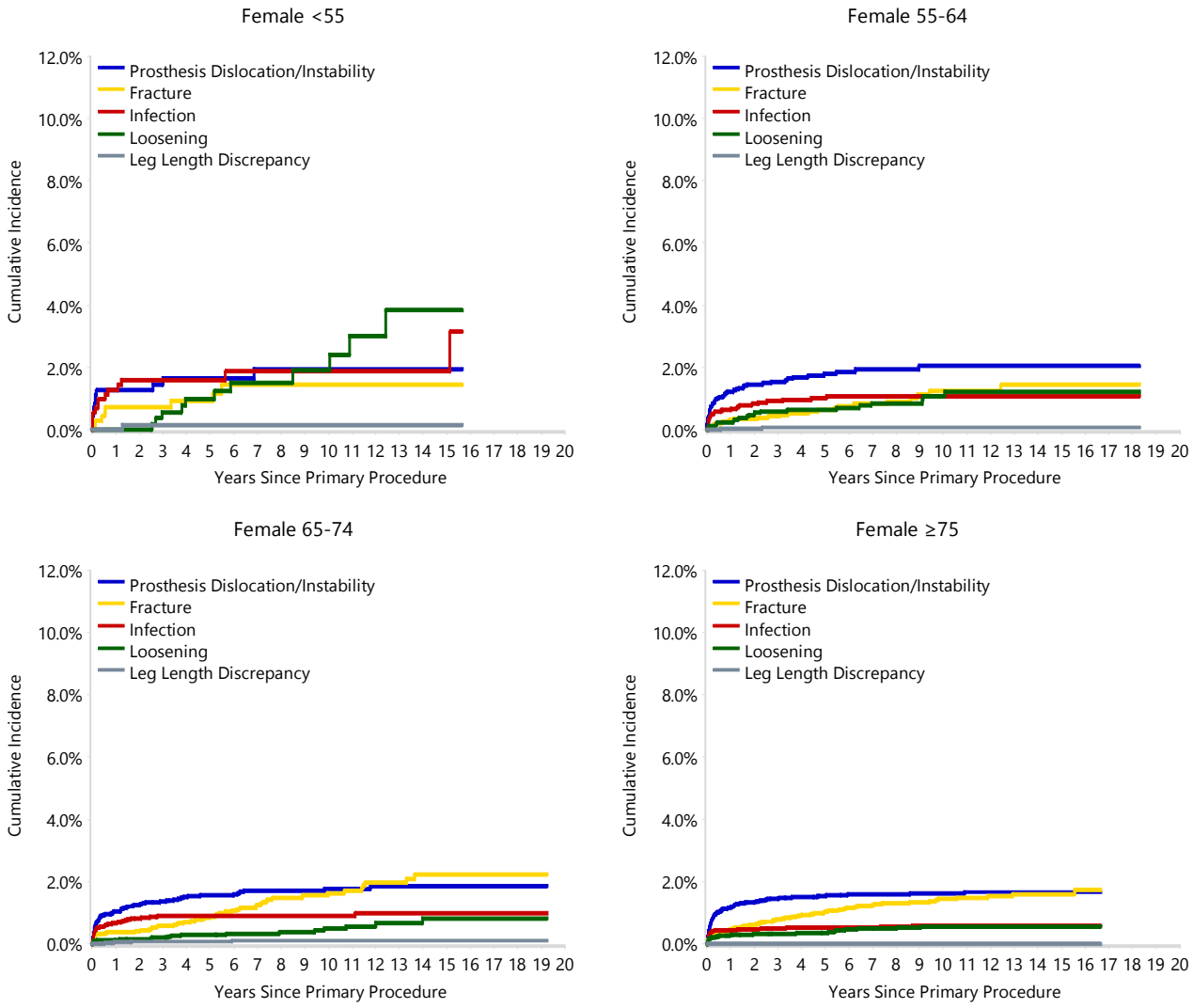
Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT97 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis Fractured NOF)



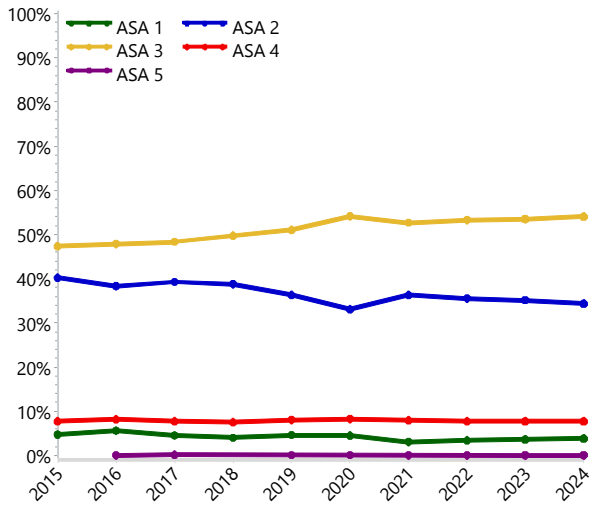
Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT98 **Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis Fractured NOF)**



Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Figure HT99 **Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)**



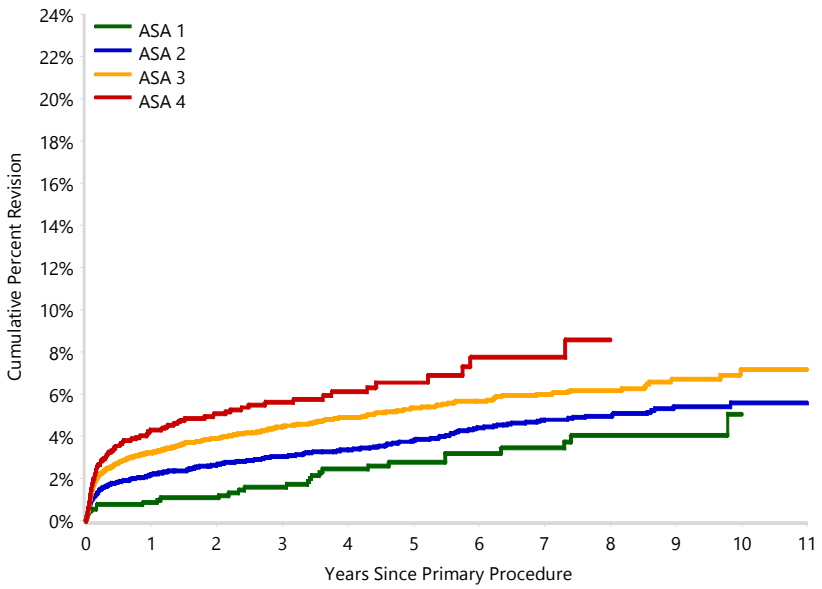
Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses

Table HT94 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	11 Yrs
ASA 1	30	1054	0.9 (0.5, 1.7)	1.1 (0.6, 2.0)	1.6 (1.0, 2.6)	2.4 (1.6, 3.8)	2.8 (1.8, 4.2)	3.4 (2.3, 5.1)	
ASA 2	336	9224	2.2 (1.9, 2.5)	2.7 (2.3, 3.0)	3.0 (2.7, 3.4)	3.4 (3.0, 3.8)	3.8 (3.4, 4.3)	4.8 (4.3, 5.4)	5.6 (4.9, 6.4)
ASA 3	588	12978	3.2 (2.9, 3.6)	3.9 (3.6, 4.3)	4.5 (4.1, 4.9)	4.9 (4.5, 5.4)	5.4 (4.9, 5.9)	6.0 (5.5, 6.6)	7.2 (6.3, 8.2)
ASA 4	99	1980	4.3 (3.5, 5.4)	5.1 (4.1, 6.3)	5.6 (4.6, 6.9)	6.1 (5.0, 7.6)	6.6 (5.3, 8.2)	7.8 (6.0, 10.0)	
ASA 5	0	13	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)					
TOTAL	**1053**	**25249**							

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT100 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

ASA 2 vs ASA 1

Entire Period: HR=1.50 (95% CI 1.03, 2.18), p=0.035

ASA 3 vs ASA 1

0 - 1Mth: HR=2.13 (95% CI 1.39, 3.26), p<0.001

1Mth - 1Yr: HR=2.41 (95% CI 1.60, 3.62), p<0.001

1Yr - 3.5Yr: HR=2.15 (95% CI 1.38, 3.34), p<0.001

3.5Yr+: HR=1.49 (95% CI 0.93, 2.40), p=0.096

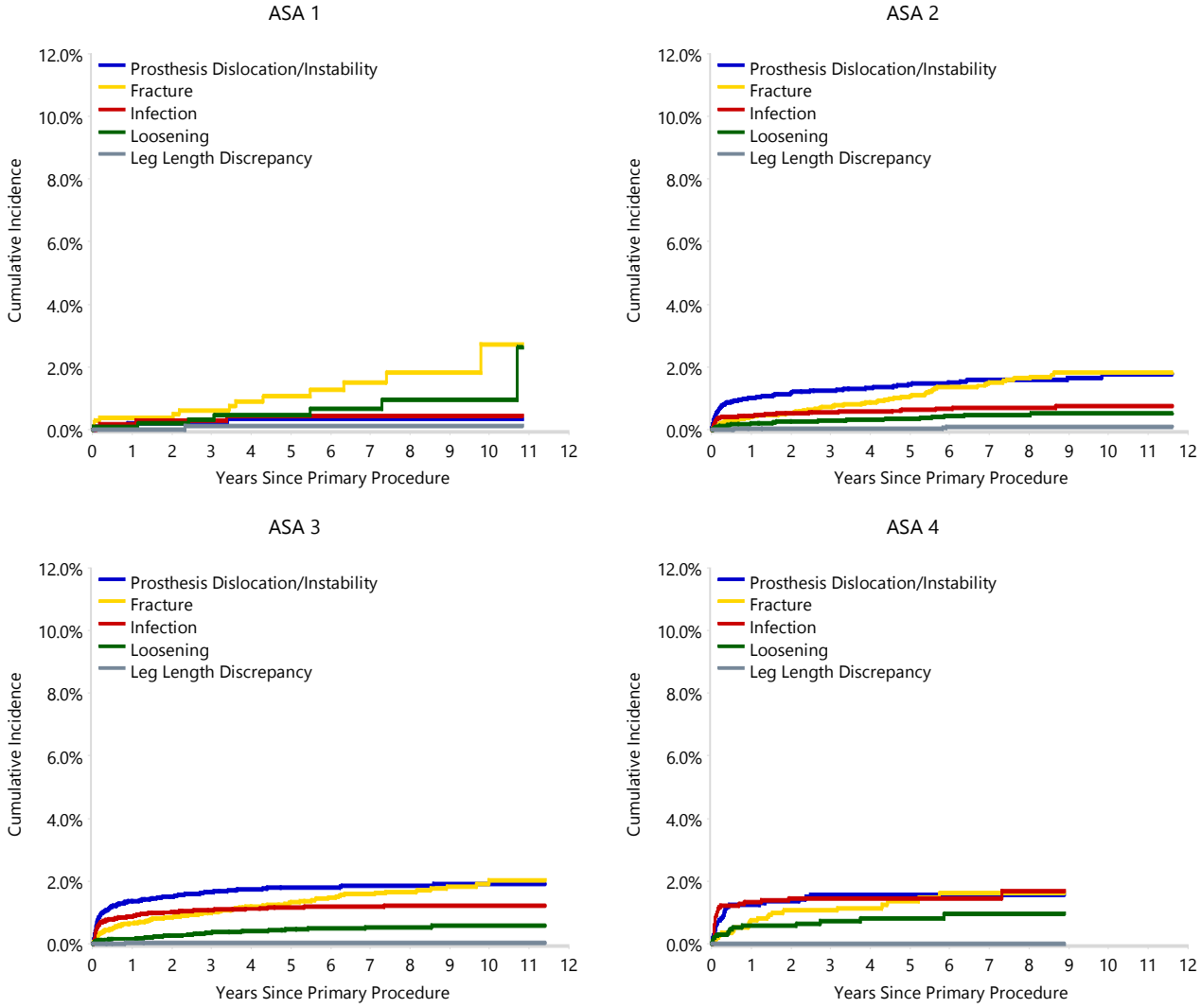
ASA 4 vs ASA 1

Entire Period: HR=2.82 (95% CI 1.86, 4.29), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	11 Yrs
ASA 1	1054	929	820	719	633	526	335	28
ASA 2	9224	7903	6817	5740	4748	3885	2218	167
ASA 3	12978	10289	8331	6573	5040	3711	1830	101
ASA 4	1980	1314	961	702	475	314	129	4

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT101 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)



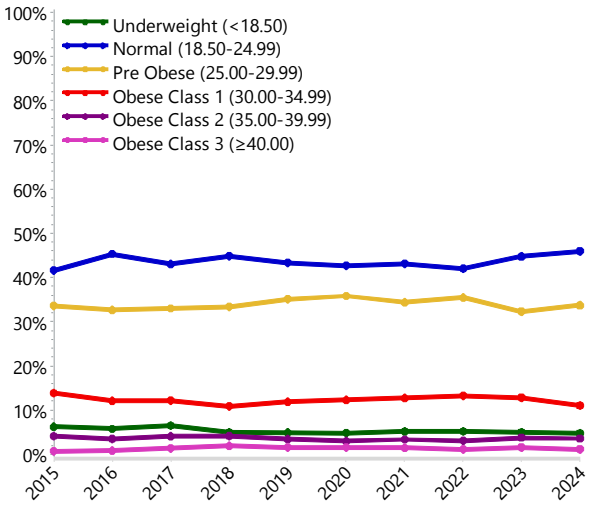
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT95 Primary Total Conventional Hip Replacement by ASA Score and Primary Diagnosis

ASA Score	Fractured Neck of Femur		Osteoarthritis		TOTAL	
	N	Col%	N	Col%	N	Col%
ASA 1	1054	4.2	28517	7.8	29571	7.6
ASA 2	9224	36.5	194330	53.4	203554	52.3
ASA 3	12978	51.4	136039	37.4	149017	38.3
ASA 4	1980	7.8	4991	1.4	6971	1.8
ASA 5	13	0.1	24	0.0	37	0.0
TOTAL	**25249**	**100.0**	**363901**	**100.0**	**389150**	**100.0**

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT102 Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



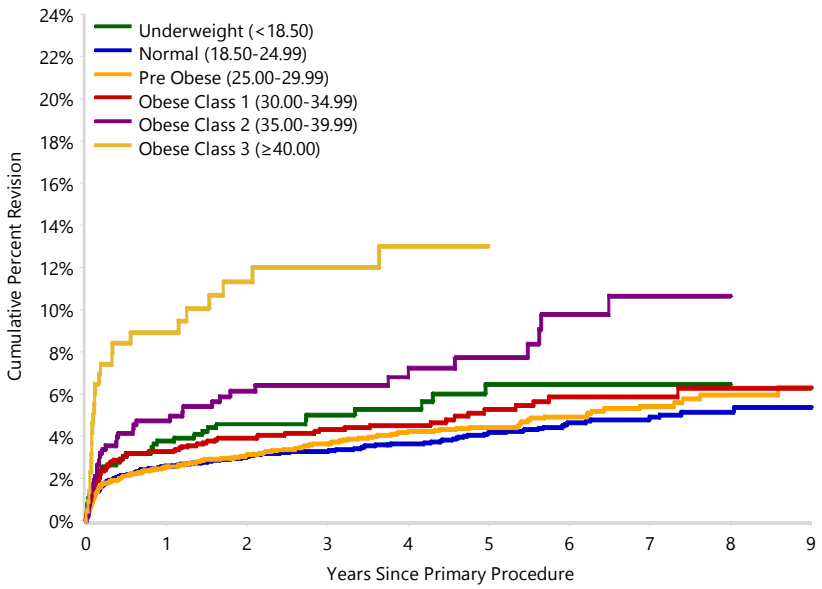
Primary Total Hip Replacement

Table HT96 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	6 Yrs	9 Yrs
Underweight	41	854	3.8 (2.6, 5.4)	4.6 (3.3, 6.3)	5.0 (3.6, 6.9)	5.3 (3.8, 7.3)	6.5 (4.6, 9.0)	
Normal	251	7235	2.6 (2.2, 3.0)	3.0 (2.6, 3.5)	3.3 (2.9, 3.8)	3.7 (3.2, 4.2)	4.6 (4.0, 5.3)	5.4 (4.5, 6.3)
Pre Obese	214	5621	2.6 (2.2, 3.0)	3.1 (2.7, 3.6)	3.6 (3.1, 4.2)	4.2 (3.7, 4.9)	4.9 (4.2, 5.7)	6.3 (5.2, 7.8)
Obese Class 1	90	2017	3.3 (2.6, 4.1)	3.9 (3.1, 4.9)	4.3 (3.5, 5.4)	4.5 (3.6, 5.6)	5.9 (4.7, 7.4)	6.3 (4.9, 8.1)
Obese Class 2	40	578	4.7 (3.2, 6.9)	6.1 (4.4, 8.6)	6.4 (4.6, 8.9)	7.2 (5.2, 10.1)	9.8 (6.9, 13.8)	
Obese Class 3	27	219	8.9 (5.8, 13.6)	11.3 (7.6, 16.6)	12.0 (8.2, 17.5)	13.0 (8.9, 18.9)		
TOTAL	663	16524						

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses. BMI has not been presented for patients aged ≤19 years

Figure HT103 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Underweight (<18.50) vs Normal (18.50-24.99)
Entire Period: HR=1.52 (95% CI 1.09, 2.12), p=0.013

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=1.05 (95% CI 0.87, 1.26), p=0.604

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
Entire Period: HR=1.23 (95% CI 0.96, 1.56), p=0.096

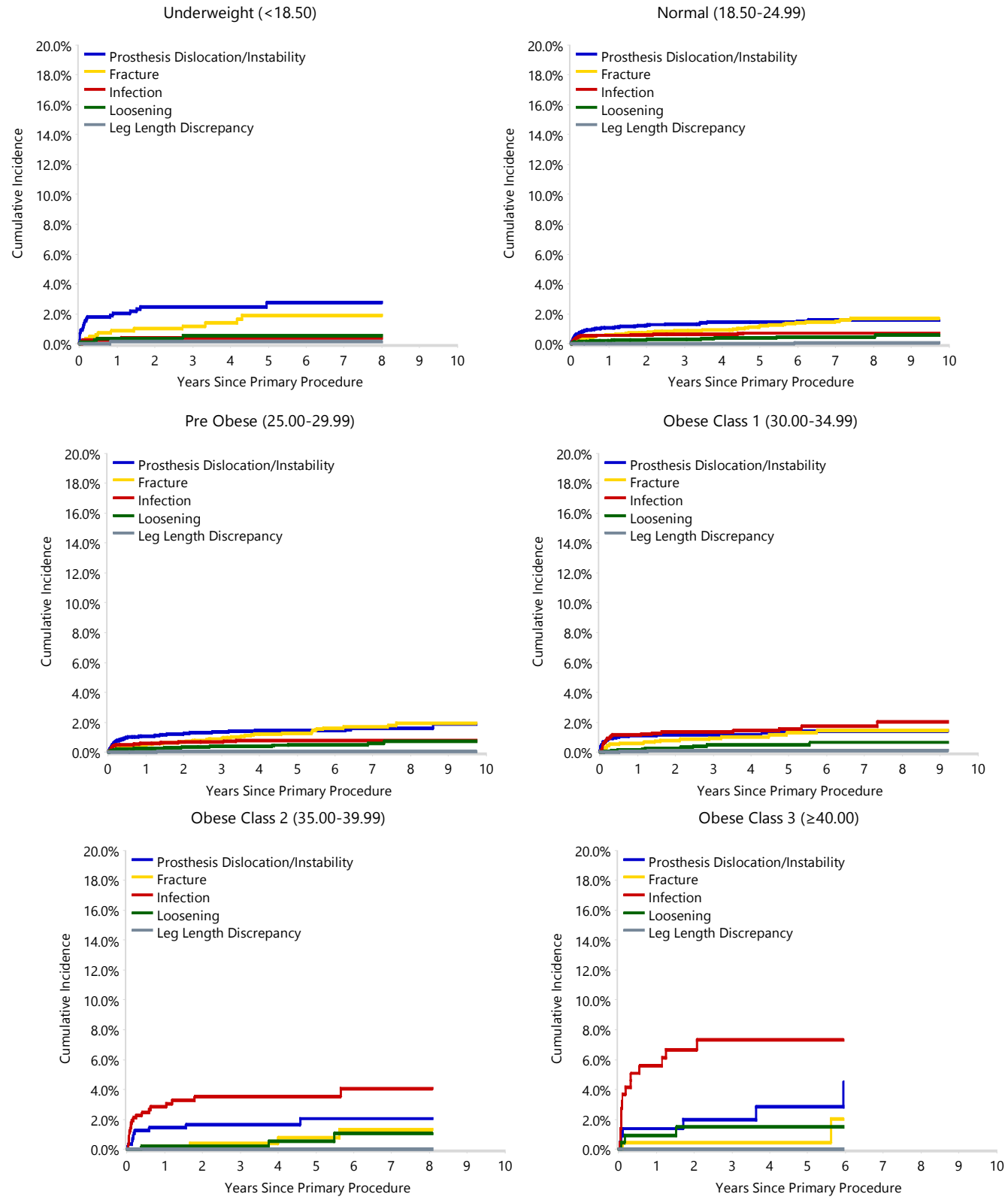
Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
Entire Period: HR=1.98 (95% CI 1.42, 2.77), p<0.001

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
Entire Period: HR=3.68 (95% CI 2.47, 5.48), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	6 Yrs	9 Yrs
Underweight	854	643	515	392	285	136	11
Normal	7235	5695	4557	3564	2734	1368	175
Pre Obese	5621	4505	3679	2856	2187	1098	149
Obese Class 1	2017	1634	1308	1018	771	398	57
Obese Class 2	578	446	354	289	219	117	20
Obese Class 3	219	166	129	106	80	39	0

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure HT104 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Fixation

The analysis for fractured neck of femur and fixation has been performed for modern prostheses with modern bearing surfaces and restricted to mixed ceramic/mixed ceramic and all femoral head materials used in combination with XLPE.

There are 1,678 procedures with cemented fixation, 6,668 with cementless fixation and 21,215 with hybrid fixation. Procedures using cemented fixation do not have a different rate of revision compared to hybrid and cementless fixation. Cementless fixation has a higher rate of revision than hybrid fixation for the first 3 months only, with no difference after this time (Table HT97 and Figure HT105).

There are differences in outcome with respect to fixation and age. For patients aged <70 years, there is no difference in the rate of revision between cemented and cementless fixation. For the first month, cementless fixation has a higher rate of revision than hybrid fixation for this age group. From 1 month onwards, this reverses and hybrid fixation has a higher rate of revision compared to cementless fixation (Table HT98 and Figure HT106).

For patients aged ≥70 years, there is an 86% higher rate of revision for cementless fixation compared to hybrid fixation for the first 3 months.

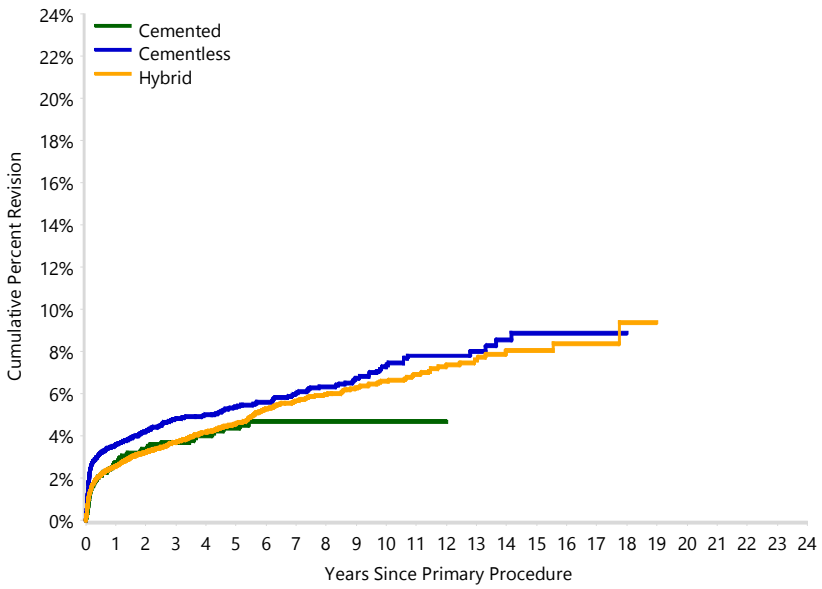
However, for patients aged ≥70 years, cementless fixation has a higher rate of revision than cemented fixation over the entire period, and for the first 3 months compared to hybrid fixation. There is no difference in the rate of revision when hybrid fixation is compared to cemented fixation (Table HT98 and Figure HT107).

Table HT97 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis Fractured NOF)

Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cemented	63	1678	2.8 (2.1, 3.7)	3.4 (2.6, 4.4)	3.7 (2.8, 4.8)	4.4 (3.4, 5.6)	4.7 (3.6, 6.0)	4.7 (3.6, 6.0)
Cementless	361	6668	3.6 (3.2, 4.1)	4.2 (3.7, 4.7)	4.8 (4.3, 5.4)	5.4 (4.8, 6.0)	6.0 (5.4, 6.7)	7.4 (6.5, 8.3)
Hybrid	916	21215	2.6 (2.4, 2.8)	3.2 (3.0, 3.5)	3.7 (3.4, 4.0)	4.6 (4.3, 4.9)	5.7 (5.3, 6.1)	6.6 (6.1, 7.1)
TOTAL	1340	29561						

Note: Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces
Restricted to modern prostheses

Figure HT105 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Cemented vs Hybrid

Entire Period: HR=0.90 (95% CI 0.69, 1.16), p=0.404

Cementless vs Cemented

Entire Period: HR=1.25 (95% CI 0.95, 1.64), p=0.104

Cementless vs Hybrid

0 - 3Mth: HR=1.55 (95% CI 1.30, 1.85), p<0.001

3Mth+: HR=0.86 (95% CI 0.73, 1.02), p=0.092

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cemented	1678	1362	1174	1016	681	411	169
Cementless	6668	5602	4933	4277	3083	2069	958
Hybrid	21215	17468	14682	12158	7964	4884	2026

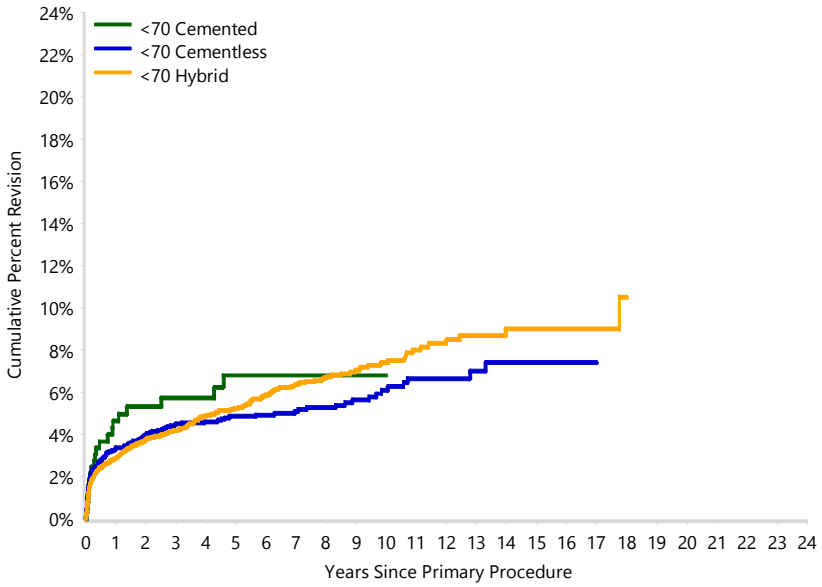
Note: Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces
Restricted to modern prostheses

Table HT98 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age and Fixation (Primary Diagnosis Fractured NOF)

Age	Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70		**501**	**9750**	**3.1 (2.7, 3.4)**	**3.9 (3.5, 4.3)**	**4.3 (3.9, 4.8)**	**5.2 (4.7, 5.7)**	**5.9 (5.4, 6.5)**	**6.9 (6.3, 7.7)**
	Cemented	21	379	4.6 (2.9, 7.5)	5.3 (3.4, 8.3)	5.7 (3.7, 8.9)	6.8 (4.4, 10.4)	6.8 (4.4, 10.4)	6.8 (4.4, 10.4)
	Cementless	142	2870	3.4 (2.8, 4.1)	4.0 (3.3, 4.8)	4.5 (3.8, 5.4)	4.9 (4.1, 5.8)	5.1 (4.3, 6.0)	6.1 (5.1, 7.3)
	Hybrid	338	6501	2.9 (2.5, 3.3)	3.8 (3.3, 4.3)	4.2 (3.7, 4.7)	5.2 (4.7, 5.9)	6.4 (5.7, 7.1)	7.4 (6.5, 8.4)
≥70		**839**	**19811**	**2.7 (2.5, 2.9)**	**3.3 (3.0, 3.5)**	**3.8 (3.5, 4.1)**	**4.6 (4.2, 4.9)**	**5.5 (5.1, 6.0)**	**6.5 (6.0, 7.1)**
	Cemented	42	1299	2.2 (1.5, 3.2)	2.8 (2.0, 3.9)	3.1 (2.3, 4.3)	3.7 (2.7, 5.0)	4.1 (3.0, 5.5)	4.1 (3.0, 5.5)
	Cementless	219	3798	3.8 (3.2, 4.5)	4.4 (3.8, 5.1)	5.1 (4.4, 5.8)	5.8 (5.0, 6.7)	6.8 (5.9, 7.8)	8.6 (7.3, 10.1)
	Hybrid	578	14714	2.4 (2.2, 2.7)	3.0 (2.7, 3.3)	3.5 (3.2, 3.8)	4.3 (3.9, 4.7)	5.3 (4.9, 5.9)	6.2 (5.6, 6.8)
TOTAL		**1340**	**29561**						

Note: Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces
Restricted to modern prostheses

Figure HT106 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged <70 Years by Fixation (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

<70 Cemented vs <70 Cementless

Entire Period: HR=1.31 (95% CI 0.83, 2.08), p=0.246

<70 Cemented vs <70 Hybrid

Entire Period: HR=1.16 (95% CI 0.75, 1.81), p=0.506

<70 Cementless vs <70 Hybrid

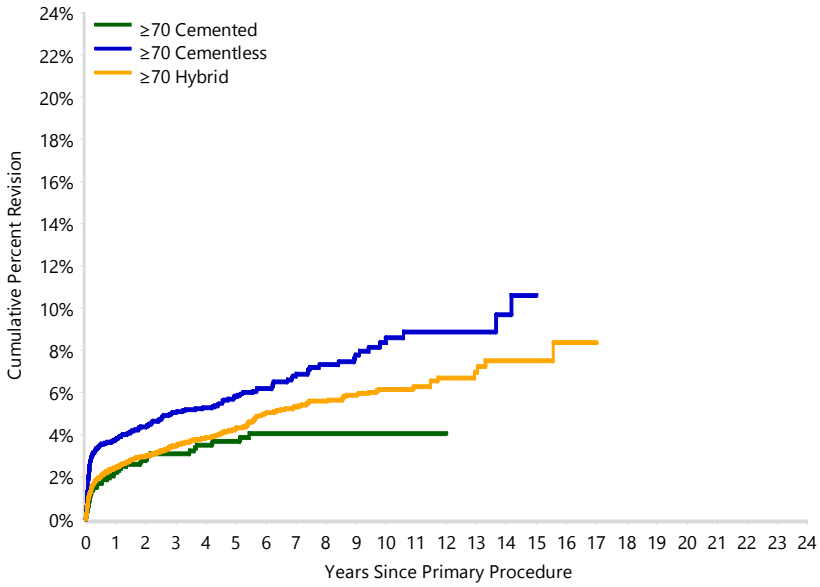
0 - 1Mth: HR=1.44 (95% CI 0.99, 2.11), p=0.056

1Mth+: HR=0.72 (95% CI 0.57, 0.91), p=0.006

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70	**Cemented**	379	290	245	218	162	107	45
	Cementless	2870	2451	2190	1945	1492	1081	564
	Hybrid	6501	5451	4642	3930	2804	1869	884

Note: Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces
Restricted to modern prostheses

Figure HT107 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged ≥70 Years by Fixation (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

≥70 Cementless vs ≥70 Cemented

Entire Period: HR=1.66 (95% CI 1.19, 2.31), p=0.002

≥70 Cementless vs ≥70 Hybrid

0 - 3Mth: HR=1.86 (95% CI 1.49, 2.31), p<0.001

3Mth+: HR=1.03 (95% CI 0.83, 1.28), p=0.794

≥70 Hybrid vs ≥70 Cemented

Entire Period: HR=1.22 (95% CI 0.89, 1.67), p=0.214

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
≥70	Cemented	1299	1072	929	798	519	304	124
	Cementless	3798	3151	2743	2332	1591	988	394
	Hybrid	14714	12017	10040	8228	5160	3015	1142

Note: Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces
Restricted to modern prostheses

Primary Total Hip Replacement

Head Size

When used for fractured neck of femur, there is no difference in the overall rate of revision between head sizes <32mm, 32mm, and >32mm (Table HT99 and Figure HT108). However, there is higher rate of revision for prosthesis dislocation/instability for head size 32mm when compared to >32mm head sizes (Table HT100 and Figure HT109).

Constrained Acetabular Prostheses

When used for fractured neck of femur, there is no difference in the rate of revision for constrained prostheses compared to other acetabular prostheses (Table HT101 and Figure HT110). However, constrained prostheses are used in less than 1% of procedures.

Dual Mobility

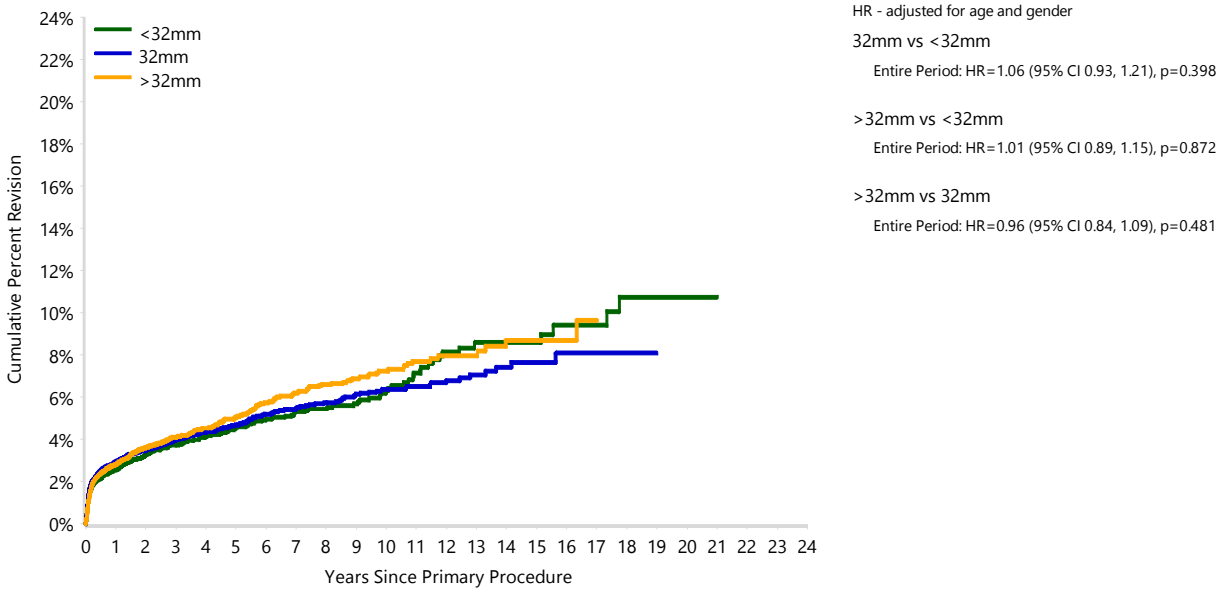
When used for fractured neck of femur, there is a lower rate of revision when dual mobility prostheses are used compared to other acetabular components (Table HT102 and Figure HT111).

Table HT99 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF)

Head Size	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	403	10040	2.6 (2.3, 2.9)	3.3 (2.9, 3.7)	3.7 (3.3, 4.2)	4.6 (4.1, 5.1)	5.3 (4.7, 6.0)	6.3 (5.5, 7.2)
32mm	515	10595	2.9 (2.6, 3.3)	3.5 (3.1, 3.9)	4.0 (3.6, 4.4)	4.7 (4.3, 5.1)	5.5 (5.0, 6.0)	6.4 (5.8, 7.0)
>32mm	516	10810	2.8 (2.5, 3.1)	3.6 (3.2, 4.0)	4.1 (3.7, 4.5)	5.0 (4.6, 5.5)	6.2 (5.6, 6.8)	7.2 (6.5, 8.0)
TOTAL	1434	31445						

Note: All procedures using metal/metal prostheses have been excluded, Restricted to modern prostheses. Excludes 25 procedures with unknown head size

Figure HT108 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	10040	7898	6303	4949	2877	1708	793
32mm	10595	9246	8307	7376	5454	3637	1616
>32mm	10810	8823	7465	6198	4175	2603	1144

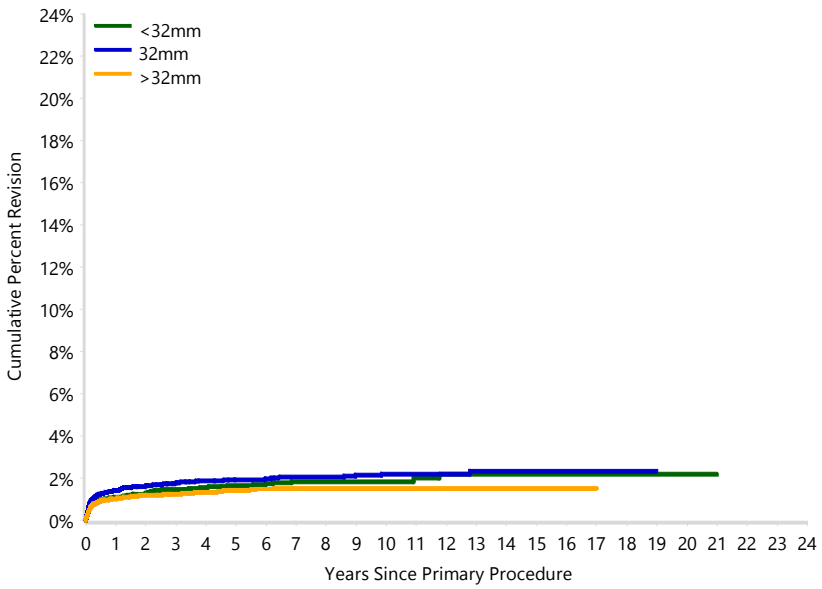
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT100 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)

Head Size	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	141	10040	1.1 (0.9, 1.3)	1.3 (1.1, 1.6)	1.4 (1.2, 1.7)	1.6 (1.4, 2.0)	1.8 (1.5, 2.2)	1.8 (1.5, 2.2)
32mm	196	10595	1.4 (1.2, 1.7)	1.6 (1.4, 1.9)	1.8 (1.5, 2.1)	1.9 (1.7, 2.2)	2.0 (1.8, 2.4)	2.2 (1.9, 2.6)
>32mm	136	10810	1.0 (0.9, 1.2)	1.2 (1.0, 1.4)	1.3 (1.1, 1.5)	1.4 (1.2, 1.7)	1.5 (1.3, 1.8)	1.5 (1.3, 1.8)
TOTAL	473	31445						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT109 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)



HR - adjusted for age and gender

<32mm vs >32mm

Entire Period: HR=1.18 (95% CI 0.93, 1.49), p=0.184

32mm vs <32mm

Entire Period: HR=1.21 (95% CI 0.97, 1.50), p=0.092

32mm vs >32mm

Entire Period: HR=1.42 (95% CI 1.13, 1.78), p=0.002

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	10040	7898	6303	4949	2877	1708	793
32mm	10595	9246	8307	7376	5454	3637	1616
>32mm	10810	8823	7465	6198	4175	2603	1144

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

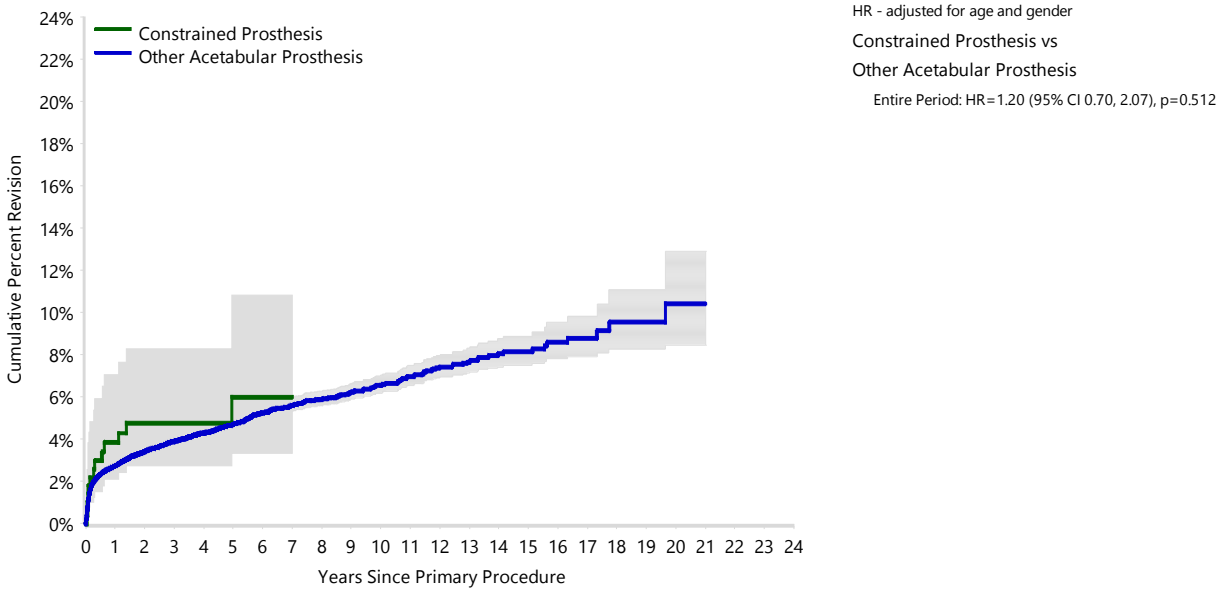
Primary Total Hip Replacement

Table HT101 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis Fractured NOF)

Acetabular Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Constrained Prosthesis	13	285	3.9 (2.1, 7.1)	4.8 (2.7, 8.3)	4.8 (2.7, 8.3)	6.0 (3.3, 10.8)	6.0 (3.3, 10.8)	
Other Acetabular Prosthesis	1422	31185	2.8 (2.6, 3.0)	3.4 (3.2, 3.7)	3.9 (3.7, 4.2)	4.7 (4.5, 5.0)	5.6 (5.3, 6.0)	6.6 (6.2, 7.0)
TOTAL	1435	31470						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT110 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Constrained Prosthesis	285	216	180	135	74	42	17
Other Acetabular Prosthesis	31185	25769	21912	18403	12445	7917	3543

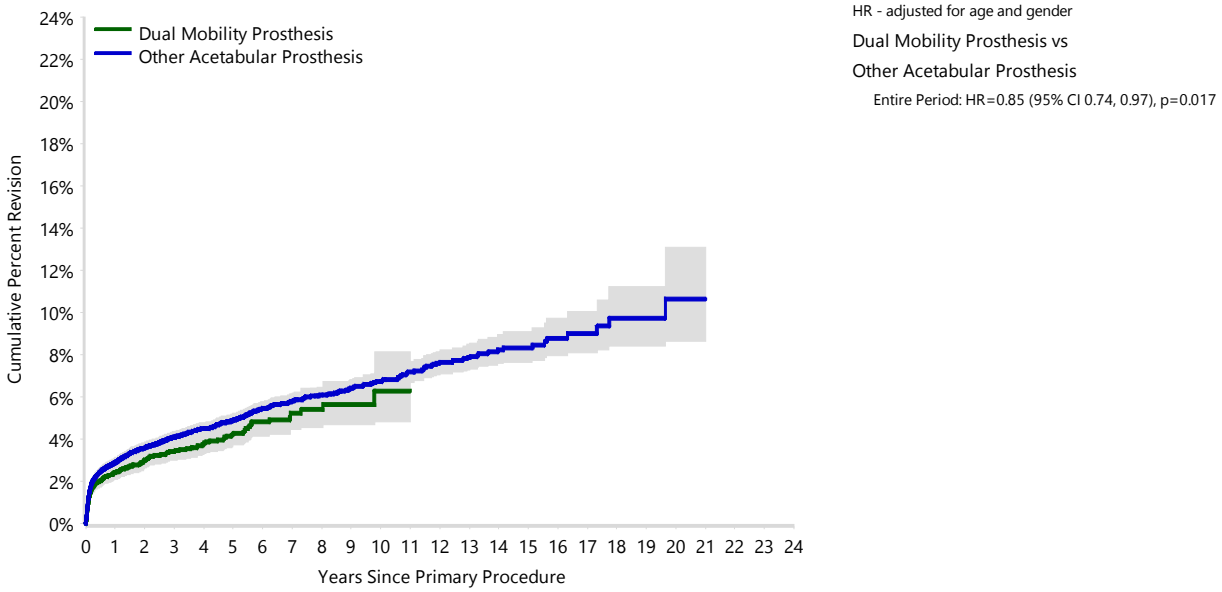
Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Table HT102 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF)

Acetabular Mobility	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	254	7670	2.4 (2.1, 2.8)	3.0 (2.6, 3.5)	3.4 (3.0, 3.9)	4.3 (3.7, 4.9)	5.2 (4.4, 6.2)	6.3 (4.8, 8.2)
Other Acetabular Prosthesis	1181	23800	2.9 (2.7, 3.1)	3.6 (3.4, 3.8)	4.1 (3.8, 4.4)	4.9 (4.6, 5.2)	5.8 (5.5, 6.2)	6.8 (6.3, 7.2)
TOTAL	1435	31470						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT111 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	7670	5815	4397	3196	1485	616	131
Other Acetabular Prosthesis	23800	20170	17695	15342	11034	7343	3429

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

OUTCOME OF TOTAL CONVENTIONAL COMPARED TO PARTIAL HIP REPLACEMENT FOR NECK OF FEMUR FRACTURE

The rate of revision for fractured neck of femur in primary total conventional hip replacement and in primary unipolar monoblock, primary unipolar modular, and primary bipolar partial hip replacement procedures are compared. These comparisons have not considered the competing risk of death, which increases with age.

Unipolar monoblock partial hip replacement (which is now infrequently used) has a lower rate of revision than total conventional hip only up to 1 month.

Unipolar modular partial hip replacement has a lower rate of revision than total conventional hip replacement for the first month but after 1.5 years unipolar modular has a higher rate of revision.

There is no difference in the rate of revision when comparing bipolar partial to total conventional hip replacement (Table HT103 and Figure HT112).

The rates of revision for each type of hip replacement for patients aged <70 years and ≥70 years are provided in Table HT104, Figure HT113 and Figure HT114.

For patients aged <70 years compared to total conventional hip replacement, bipolar partial hip replacement has a higher rate of revision as do unipolar modular procedures after 3 months. There are few unipolar monoblock implants used for this age group. Unipolar monoblock does not have a different rate of revision compared to total conventional hip replacement.

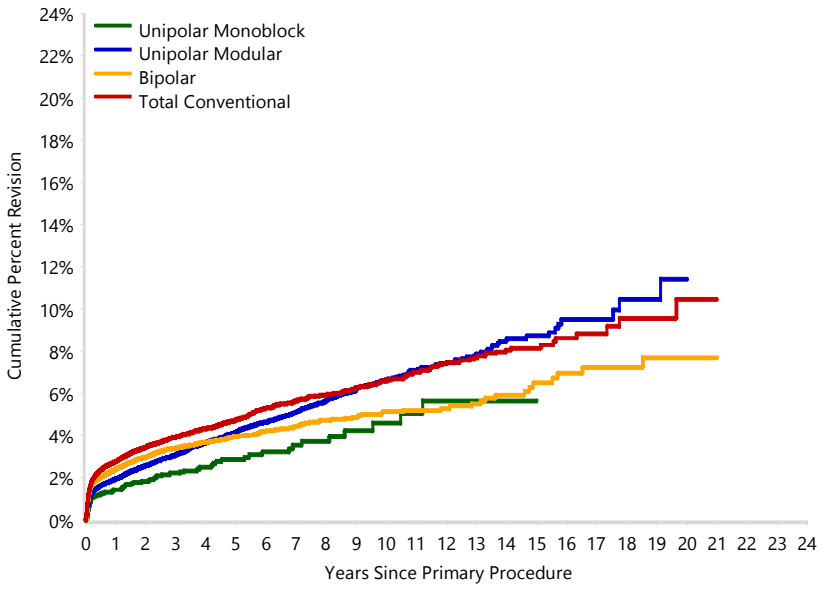
For patients aged ≥70 years, bipolar hip replacement has a lower rate of revision than total conventional hip replacement. Unipolar monoblock implants have a lower rate of revision compared to total conventional hip replacements, while unipolar modular implants have a lower rate of revision compared to total conventional hip replacement for the first 1.5 years, with no difference after this time.

Table HT103 Cumulative Percent Revision of Primary Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	82	3866	1.4 (1.1, 1.9)	1.8 (1.4, 2.4)	2.2 (1.7, 2.8)	2.9 (2.2, 3.7)	3.6 (2.7, 4.6)	4.6 (3.4, 6.2)
Unipolar Modular	1531	49089	2.0 (1.8, 2.1)	2.6 (2.4, 2.7)	3.1 (2.9, 3.3)	4.2 (3.9, 4.4)	5.1 (4.8, 5.4)	6.6 (6.2, 7.1)
Bipolar	1061	36182	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	3.4 (3.2, 3.6)	3.9 (3.7, 4.2)	4.4 (4.1, 4.8)	5.1 (4.7, 5.6)
Total Conventional	1435	31470	2.8 (2.6, 3.0)	3.5 (3.2, 3.7)	3.9 (3.7, 4.2)	4.8 (4.5, 5.0)	5.7 (5.3, 6.0)	6.6 (6.2, 7.0)
TOTAL	4109	120607						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT112 Cumulative Percent Revision of Primary Hip Replacement by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and gender

Unipolar Monoblock vs Total Conventional

0 - 1Mth: HR=0.53 (95% CI 0.32, 0.87), p=0.011
1Mth - 3Mth: HR=0.93 (95% CI 0.61, 1.43), p=0.749
3Mth - 6Mth: HR=0.38 (95% CI 0.12, 1.17), p=0.091
6Mth+: HR=0.91 (95% CI 0.67, 1.25), p=0.579

Unipolar Modular vs Total Conventional

0 - 1Mth: HR=0.77 (95% CI 0.66, 0.88), p<0.001
1Mth - 3Mth: HR=0.99 (95% CI 0.85, 1.15), p=0.893
3Mth - 1.5Yr: HR=0.97 (95% CI 0.84, 1.12), p=0.691
1.5Yr - 3Yr: HR=1.30 (95% CI 1.08, 1.56), p=0.005
3Yr+: HR=1.73 (95% CI 1.51, 1.99), p<0.001

Bipolar vs Total Conventional

Entire Period: HR=1.03 (95% CI 0.95, 1.12), p=0.518

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3866	2468	1963	1540	919	546	233
Unipolar Modular	49089	32943	26055	20216	12002	6952	2934
Bipolar	36182	23182	17191	12809	7002	3882	1528
Total Conventional	31470	25985	22092	18538	12519	7959	3560

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

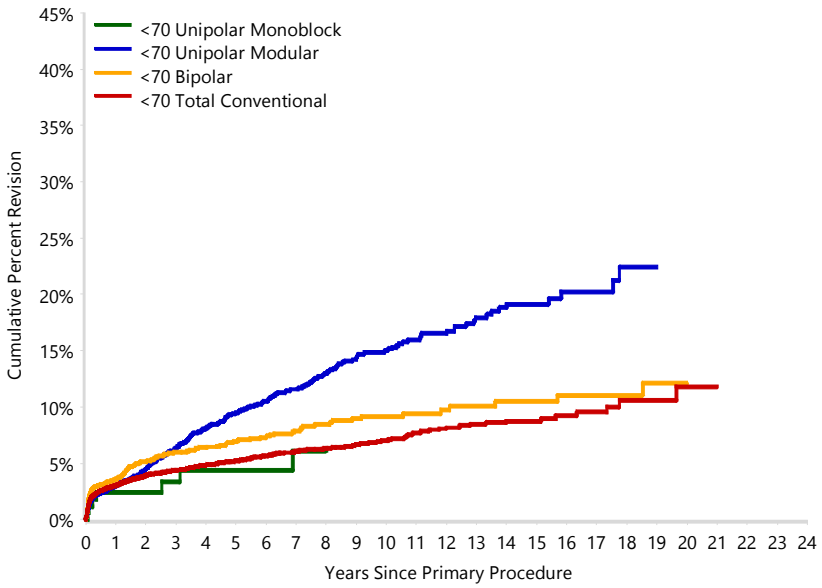
Primary Total Hip Replacement

Table HT104 Cumulative Percent Revision of Primary Hip Replacement by Age and Class (Primary Diagnosis Fractured NOF)

Age	Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70		**1039**	**16917**	**3.1 (2.9, 3.4)**	**4.2 (3.9, 4.5)**	**5.0 (4.6, 5.4)**	**6.3 (5.9, 6.7)**	**7.4 (6.9, 7.9)**	**9.0 (8.4, 9.6)**
	Unipolar Monoblock	11	180	2.4 (0.9, 6.3)	2.4 (0.9, 6.3)	3.4 (1.4, 8.0)	4.4 (1.9, 9.7)	6.1 (2.7, 13.2)	
	Unipolar Modular	293	3225	3.0 (2.4, 3.7)	4.5 (3.8, 5.3)	6.3 (5.4, 7.4)	9.5 (8.3, 10.8)	11.6 (10.2, 13.1)	15.0 (13.3, 16.9)
	Bipolar	189	3225	3.6 (3.0, 4.3)	5.1 (4.4, 6.0)	5.9 (5.1, 7.0)	6.9 (5.9, 8.0)	7.9 (6.7, 9.2)	9.2 (7.8, 10.8)
	Total Conventional	546	10287	3.0 (2.7, 3.4)	3.9 (3.5, 4.3)	4.4 (4.0, 4.8)	5.2 (4.8, 5.7)	6.1 (5.5, 6.6)	7.0 (6.4, 7.7)
≥70		**3070**	**103690**	**2.2 (2.1, 2.3)**	**2.7 (2.6, 2.8)**	**3.1 (3.0, 3.2)**	**3.8 (3.7, 4.0)**	**4.6 (4.4, 4.8)**	**5.5 (5.2, 5.8)**
	Unipolar Monoblock	71	3686	1.4 (1.0, 1.9)	1.8 (1.4, 2.4)	2.1 (1.7, 2.8)	2.8 (2.1, 3.6)	3.3 (2.5, 4.4)	3.6 (2.7, 4.7)
	Unipolar Modular	1238	45864	1.9 (1.8, 2.0)	2.4 (2.3, 2.6)	2.8 (2.6, 3.0)	3.7 (3.4, 3.9)	4.4 (4.1, 4.7)	5.6 (5.1, 6.0)
	Bipolar	872	32957	2.3 (2.1, 2.5)	2.8 (2.6, 3.0)	3.1 (2.9, 3.4)	3.6 (3.3, 3.9)	4.0 (3.7, 4.3)	4.5 (4.1, 5.0)
	Total Conventional	889	21183	2.7 (2.5, 2.9)	3.2 (3.0, 3.5)	3.7 (3.4, 4.0)	4.5 (4.2, 4.9)	5.5 (5.1, 5.9)	6.4 (5.9, 7.0)
TOTAL		**4109**	**120607**						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT113 Cumulative Percent Revision of Primary Hip Replacement in Patients Aged <70 Years by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

<70 Unipolar Monoblock vs
<70 Total Conventional

Entire Period: HR=1.23 (95% CI 0.68, 2.24), p=0.491

<70 Unipolar Modular vs <70 Total Conventional

0 - 3Mth: HR=0.92 (95% CI 0.70, 1.22), p=0.579

3Mth - 2Yr: HR=1.36 (95% CI 1.02, 1.81), p=0.036

2Yr+: HR=3.34 (95% CI 2.73, 4.08), p<0.001

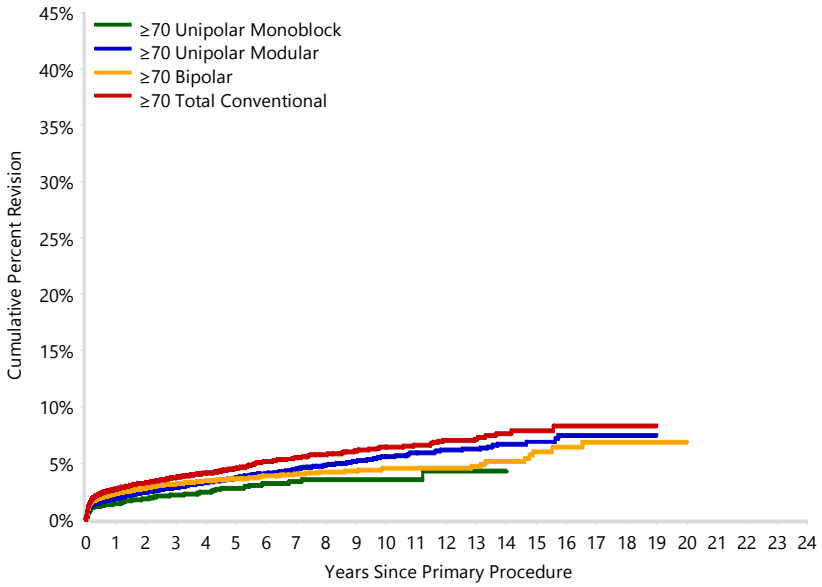
<70 Bipolar vs <70 Total Conventional

Entire Period: HR=1.27 (95% CI 1.08, 1.50), p=0.004

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70	**Unipolar Monoblock**	180	130	112	96	70	54	29
	Unipolar Modular	3225	2422	2058	1768	1309	966	566
	Bipolar	3225	2277	1798	1465	997	715	367
	Total Conventional	10287	8647	7472	6444	4747	3308	1697

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT114 Cumulative Percent Revision of Primary Hip Replacement in Patients Aged ≥70 Years by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for gender

≥70 Unipolar Monoblock vs ≥70 Total Conventional

Entire Period: HR=0.56 (95% CI 0.44, 0.72), p<0.001

≥70 Unipolar Modular vs ≥70 Total Conventional

0 - 3Mth: HR=0.67 (95% CI 0.59, 0.75), p<0.001

3Mth - 1.5Yr: HR=0.76 (95% CI 0.65, 0.90), p<0.001

1.5Yr+: HR=1.01 (95% CI 0.88, 1.16), p=0.925

≥70 Bipolar vs ≥70 Total Conventional

Entire Period: HR=0.79 (95% CI 0.72, 0.87), p<0.001

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
≥70	**Unipolar Monoblock**	3686	2338	1851	1444	849	492	204
	Unipolar Modular	45864	30521	23997	18448	10693	5986	2368
	Bipolar	32957	20905	15393	11344	6005	3167	1161
	Total Conventional	21183	17338	14620	12094	7772	4651	1863

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Primary Total Hip Replacement

Primary Total Resurfacing Hip Replacement

DEMOGRAPHICS

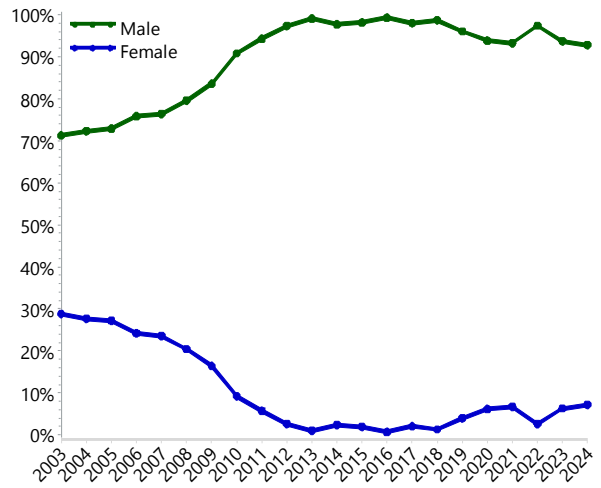
There are 21,173 primary total resurfacing hip replacement procedures. This is an additional 939 procedures compared to the previous report. With the restriction to modern prostheses, 4,365 (20.6%) hip resurfacing procedures have been excluded from the analysis in this year's Annual Report.

For further information on the **closure of the database** please see the Glossary of this report.

In 2024, the number of primary total resurfacing procedures is 5.7% more than in 2023, and 64.5% less than in 2005 when the use of hip resurfacing peaked. Primary total resurfacing hip replacement represents 1.1% of all hip replacements performed in 2024.

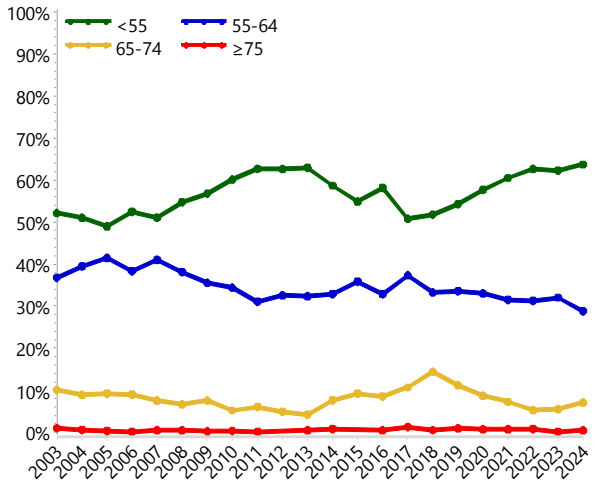
In 2024, 92.8% of primary total resurfacing hip replacements were undertaken in males (Table HT105 and Figure HT115).

Figure HT115 Primary Total Resurfacing Hip Replacement by Gender



The change in usage of primary total resurfacing hip replacement for each age group are provided in Figure HT116.

Figure HT116 Primary Total Resurfacing Hip Replacement by Age



There were only four types of resurfacing prostheses used in 2024, with the Adept the most commonly used. The ReCerf resurfacing head was used for the first time in 2018 (Table HT106).

Table HT105 Age and Gender of Primary Total Resurfacing Hip Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	17392	82.1%	13	84	54	53.1	9.2
Female	3781	17.9%	14	81	52	51.4	8.7
TOTAL	**21173**	**100.0%**	**13**	**84**	**53**	**52.8**	**9.1**

Table HT106 Most Used Resurfacing Heads in Primary Total Resurfacing Hip Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1359	BHR	333	Adept	350	Adept	407	Adept	402	Adept
58	Durom	131	ReCerf	99	BHR	126	ReCerf	160	ReCerf
43	ASR	116	BHR	49	ReCerf	85	BHR	77	BHR
42	Cormet							14	Polymotion
38	Cormet 2000 HAP								
7	Conserve Plus								
10 Most Used									
1547	(6) 100.0%	580	(3) 100.0%	498	(3) 100.0%	618	(3) 100.0%	653	(4) 100.0%

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

Again, this analysis is restricted to modern resurfacing prostheses in current use. The principal diagnosis for primary total resurfacing hip replacement is osteoarthritis (95.7%), followed by developmental dysplasia (2.0%), and osteonecrosis (1.5%).

Primary total resurfacing hip replacement for osteoarthritis has a lower rate of revision compared to developmental dysplasia from 6 months up to 5 years. There is a higher rate of revision for osteonecrosis compared to osteoarthritis (Table HT107 and Figure HT117).

Prosthesis Types

The cumulative percent revision of the three different primary total resurfacing hip prosthesis combinations with >100 procedures is listed in Table HT108.

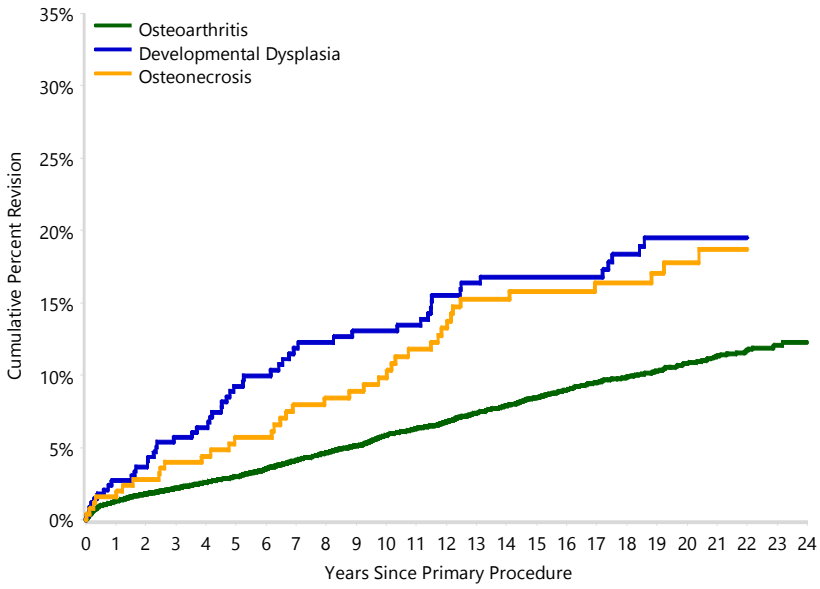
Primary Total Hip Replacement

Table HT107 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	1205	16093	1.3 (1.1, 1.5)	2.2 (2.0, 2.4)	3.0 (2.7, 3.3)	5.8 (5.5, 6.3)	8.4 (8.0, 9.0)	10.8 (10.2, 11.4)
Developmental Dysplasia	52	339	2.7 (1.4, 5.1)	5.7 (3.6, 8.9)	9.2 (6.5, 13.1)	13.0 (9.6, 17.5)	16.8 (12.8, 21.8)	19.5 (15.1, 24.9)
Osteonecrosis	39	254	1.6 (0.6, 4.1)	4.0 (2.2, 7.3)	5.7 (3.4, 9.4)	9.8 (6.6, 14.5)	15.8 (11.6, 21.3)	17.8 (13.2, 23.7)
Other (6)	17	122	2.5 (0.8, 7.4)	3.4 (1.3, 8.7)	6.0 (2.9, 12.3)	12.3 (7.3, 20.4)	14.8 (9.1, 23.5)	
TOTAL	1313	16808						

Note: Only primary diagnoses with >100 procedures have been listed
Restricted to modern prostheses

Figure HT117 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis



HR - adjusted for age and gender

Developmental Dysplasia vs Osteoarthritis

0 - 6Mth: HR=1.16 (95% CI 0.51, 2.64), p=0.714

6Mth - 2.5Yr: HR=2.25 (95% CI 1.22, 4.16), p=0.009

2.5Yr - 5Yr: HR=2.43 (95% CI 1.31, 4.50), p=0.004

5Yr+: HR=0.88 (95% CI 0.59, 1.33), p=0.555

Developmental Dysplasia vs Osteonecrosis

Entire Period: HR=0.70 (95% CI 0.46, 1.07), p=0.098

Osteonecrosis vs Osteoarthritis

Entire Period: HR=1.77 (95% CI 1.28, 2.45), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	16093	15250	13989	12706	10150	7422	3160
Developmental Dysplasia	339	311	278	249	217	184	114
Osteonecrosis	254	245	234	221	187	157	96

Note: Only primary diagnoses with >100 procedures have been listed
Restricted to modern prostheses

Table HT108 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Prosthesis Combination (All Diagnoses)

Head Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Adept	Adept	116	3832	1.2 (0.9, 1.6)	1.9 (1.5, 2.4)	2.4 (1.9, 3.0)	4.7 (3.8, 5.8)	5.9 (4.6, 7.5)	
BHR	BHR	1193	12318	1.4 (1.2, 1.6)	2.5 (2.2, 2.8)	3.4 (3.1, 3.8)	6.4 (6.0, 6.9)	9.2 (8.7, 9.8)	11.5 (10.9, 12.2)
ReCerf	ReCerf	2	643	0.2 (0.0, 1.1)	0.4 (0.1, 1.9)	0.4 (0.1, 1.9)			
Other (2)		2	15						
TOTAL		1313	16808						

Note: Only combinations with >100 procedures have been listed
Restricted to modern prostheses

OUTCOME FOR OSTEOARTHRITIS

The cumulative percent revision at 20 years for primary total resurfacing hip replacement undertaken for osteoarthritis is 10.8% (Table HT109 and Figure HT118).

Reasons for Revision

The main reasons for revision of primary total resurfacing hip replacement are loosening, metal related pathology, and fracture (Table HT110).

Loosening is the most common reason for revision after 12 years.

The five most common reasons for revision are shown in Figure HT119. The cumulative incidence of fracture increases rapidly in the first year. After this time, the incidence increases at a slower rate. The cumulative incidence of loosening increases to become the most common reason for revision after 12 years.

Type of Revision

The most common type of revision for total resurfacing hip replacement is revision of both the femoral and acetabular components. Femoral only revision is much less common and acetabular only revision is rarely undertaken (Table HT111).

Age and Gender

In the first 6 months, patients aged ≥65 years have a higher rate of revision compared to patients aged <55 years and those 55-64 years. Patients aged 55-64 years do not have a different rate of revision compared to patients aged <55 years (Table HT112 and Figure HT120).

Females have a higher rate of revision compared to males (Table HT113 and Figure HT121). Males aged ≥65 years have a higher rate of revision compared to both males aged <55 years and those aged 55-64 years for the first 6 months only. After this time, there is no difference (Table HT113 and Figure HT122). Age is not a risk factor for revision for female patients (Table HT113 and Figure HT123).

Head Size

The rate of revision decreases as the femoral component head size increases. Femoral head sizes ≥55mm have a lower rate of revision compared to all other head size groups. (Table HT114 and Figure HT124). This effect of femoral component head size is evident in both males and females (Table HT115 and Figure HT125).

The reason for revision varies with head size. Head sizes <50mm have a higher cumulative incidence of metal related pathology, loosening, fracture, infection, and lysis compared to head sizes ≥50mm (Figure HT126).

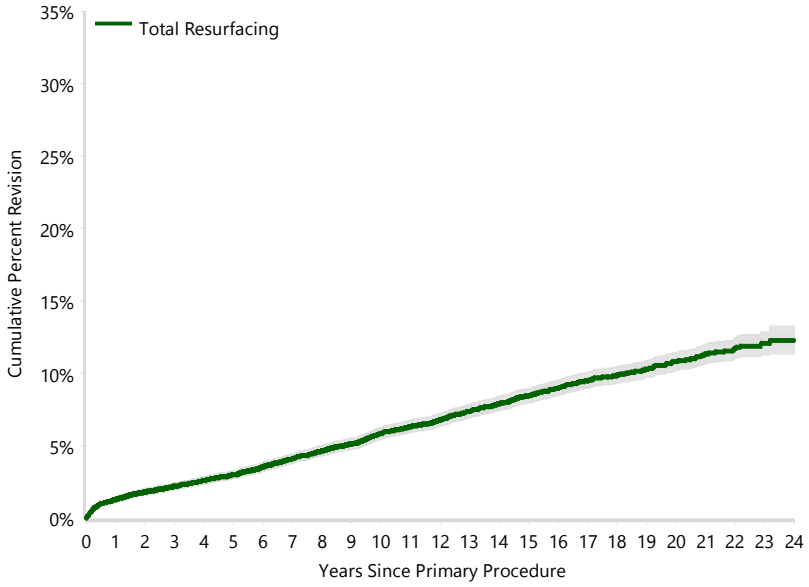
Primary Total Hip Replacement

Table HT109 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)

Hip Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	1205	16093	1.3 (1.1, 1.5)	2.2 (2.0, 2.4)	3.0 (2.7, 3.3)	5.8 (5.5, 6.3)	8.4 (8.0, 9.0)	10.8 (10.2, 11.4)
TOTAL	1205	16093						

Note: Restricted to modern prostheses

Figure HT118 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	16093	15250	13989	12706	10150	7422	3160

Note: Restricted to modern prostheses

Table HT110 Primary Total Resurfacing Hip Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Loosening	304	25.2
Metal Related Pathology	263	21.8
Fracture	246	20.4
Lysis	124	10.3
Infection	78	6.5
Pain	69	5.7
Osteonecrosis	32	2.7
Prosthesis Dislocation/Instability	30	2.5
Malposition	22	1.8
Other	20	1.7
Other (8)	17	1.4
TOTAL	1205	100.0

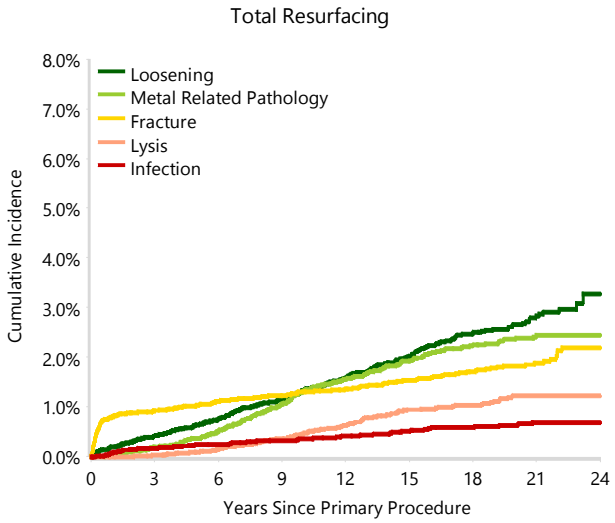
Note: Restricted to modern prostheses

Table HT111 Primary Total Resurfacing Hip Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
THR (Femoral/Acetabular)	809	67.1
Femoral Component	329	27.3
Acetabular Component	32	2.7
Cement Spacer	26	2.2
Removal of Prostheses	7	0.6
Head/Insert	1	0.1
Minor Components	1	0.1
TOTAL	1205	100.0

Note: Restricted to modern prostheses

Figure HT119 Cumulative Incidence Revision Diagnosis of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

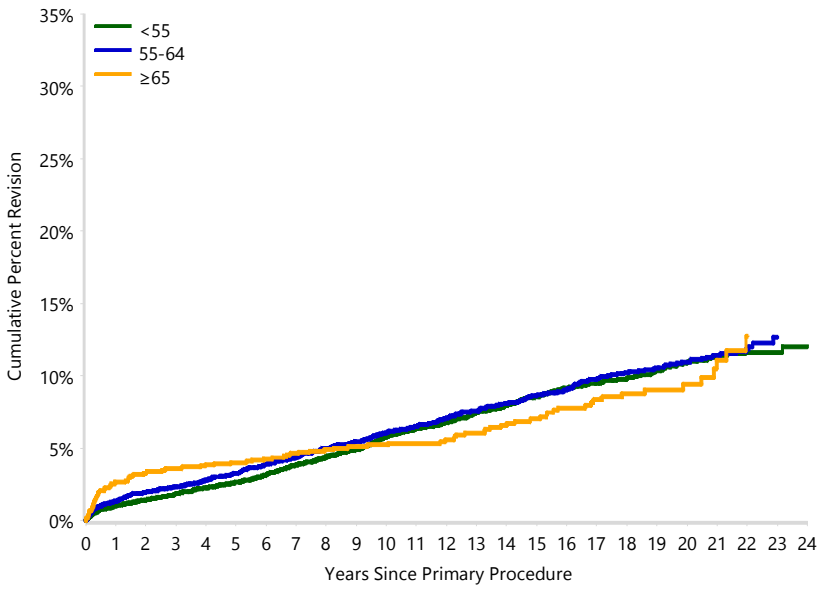
Primary Total Hip Replacement

Table HT112 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	634	8701	1.0 (0.8, 1.3)	1.9 (1.6, 2.2)	2.6 (2.3, 3.0)	5.8 (5.3, 6.4)	8.5 (7.9, 9.3)	10.9 (10.0, 11.8)
55-64	470	5919	1.3 (1.1, 1.7)	2.3 (2.0, 2.8)	3.3 (2.9, 3.8)	6.1 (5.4, 6.8)	8.6 (7.9, 9.5)	11.0 (10.0, 12.0)
≥65	101	1473	2.7 (2.0, 3.7)	3.6 (2.8, 4.7)	4.0 (3.1, 5.2)	5.2 (4.1, 6.6)	7.0 (5.7, 8.7)	9.4 (7.6, 11.7)
TOTAL	1205	16093						

Note: Restricted to modern prostheses

Figure HT120 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)



HR - adjusted for gender

55-64 vs <55

Entire Period: HR=1.06 (95% CI 0.94, 1.20), p=0.308

≥65 vs <55

0 - 3Mth: HR=2.17 (95% CI 1.27, 3.71), p=0.004

3Mth - 6Mth: HR=4.21 (95% CI 2.29, 7.76), p<0.001

6Mth+: HR=0.93 (95% CI 0.73, 1.19), p=0.572

≥65 vs 55-64

0 - 3Mth: HR=2.04 (95% CI 1.19, 3.50), p=0.009

3Mth - 6Mth: HR=3.96 (95% CI 2.14, 7.30), p<0.001

6Mth+: HR=0.88 (95% CI 0.68, 1.13), p=0.298

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	8701	8220	7468	6748	5418	3898	1750
55-64	5919	5649	5227	4777	3871	2895	1186
≥65	1473	1381	1294	1181	861	629	224

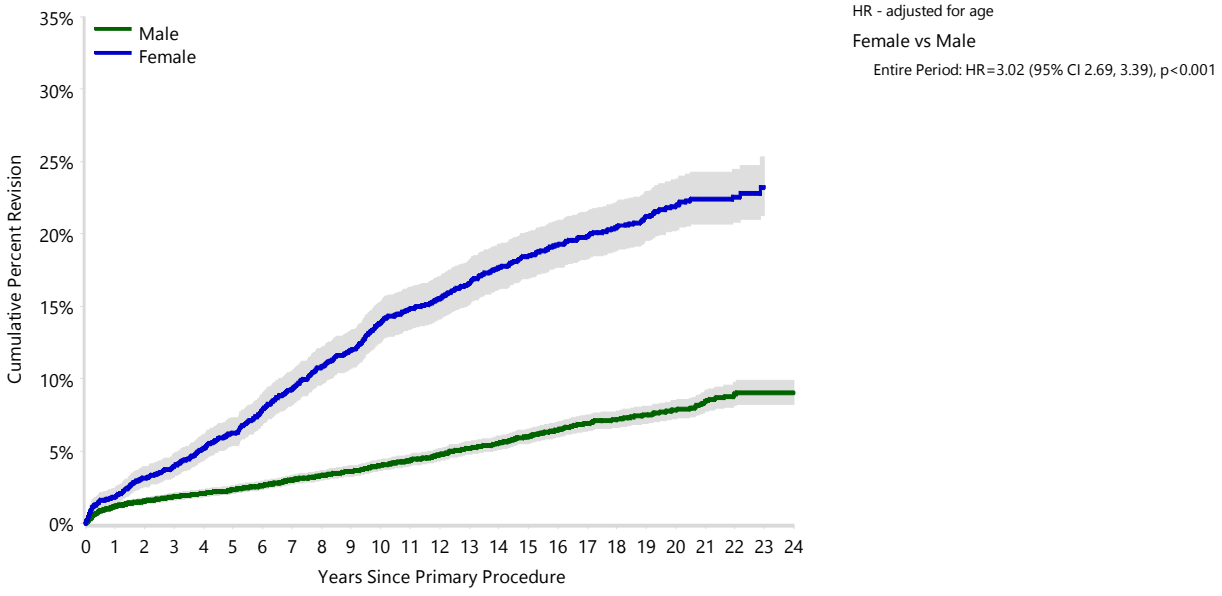
Note: Restricted to modern prostheses

Table HT113 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**704**	**13542**	**1.2 (1.0, 1.4)**	**1.9 (1.6, 2.1)**	**2.3 (2.1, 2.6)**	**4.0 (3.7, 4.4)**	**6.0 (5.5, 6.5)**	**7.9 (7.3, 8.5)**
	<55	350	7235	1.0 (0.8, 1.2)	1.5 (1.3, 1.8)	2.0 (1.7, 2.3)	3.7 (3.3, 4.3)	5.9 (5.3, 6.6)	7.7 (6.9, 8.6)
	55-64	267	4939	1.1 (0.9, 1.5)	1.9 (1.5, 2.3)	2.5 (2.1, 3.0)	4.2 (3.6, 4.8)	6.1 (5.3, 6.9)	7.8 (6.9, 8.9)
	≥65	87	1368	2.7 (1.9, 3.7)	3.5 (2.7, 4.7)	3.9 (3.0, 5.1)	4.9 (3.8, 6.3)	6.3 (5.0, 8.0)	8.9 (7.0, 11.3)
Female		**501**	**2551**	**1.9 (1.4, 2.5)**	**4.0 (3.3, 4.8)**	**6.2 (5.4, 7.3)**	**13.8 (12.5, 15.3)**	**18.5 (16.9, 20.1)**	**21.9 (20.2, 23.7)**
	<55	284	1466	1.4 (0.9, 2.2)	3.4 (2.6, 4.5)	5.6 (4.5, 7.0)	14.0 (12.2, 15.9)	18.5 (16.5, 20.7)	22.0 (19.8, 24.4)
	55-64	203	980	2.4 (1.6, 3.5)	4.7 (3.5, 6.2)	7.2 (5.8, 9.1)	14.2 (12.1, 16.6)	18.9 (16.5, 21.6)	22.6 (19.9, 25.6)
	≥65	14	105	2.9 (0.9, 8.6)	4.8 (2.0, 11.1)	5.8 (2.6, 12.4)	8.7 (4.6, 16.1)	13.3 (7.9, 21.9)	
TOTAL		**1205**	**16093**						

Note: Restricted to modern prostheses

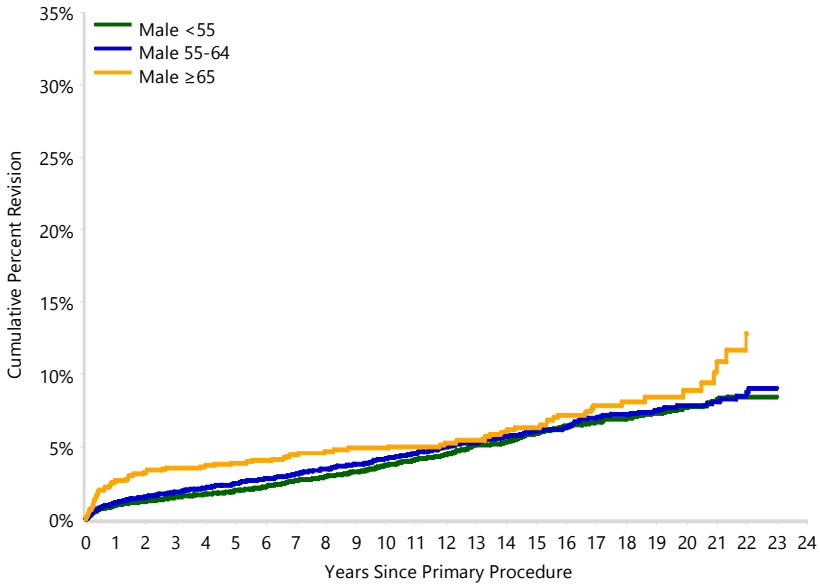
Figure HT121 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	13542	12793	11641	10489	8180	5701	2301
Female	2551	2457	2348	2217	1970	1721	859

Note: Restricted to modern prostheses

Figure HT122 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement in Males by Age (Primary Diagnosis OA)



Male 55-64 vs Male <55

Entire Period: HR=1.07 (95% CI 0.91, 1.25), p=0.418

Male ≥65 vs Male <55

0 - 3Mth: HR=2.14 (95% CI 1.19, 3.85), p=0.010

3Mth - 6Mth: HR=3.87 (95% CI 2.02, 7.43), p<0.001

6Mth+: HR=1.09 (95% CI 0.82, 1.43), p=0.557

Male ≥65 vs Male 55-64

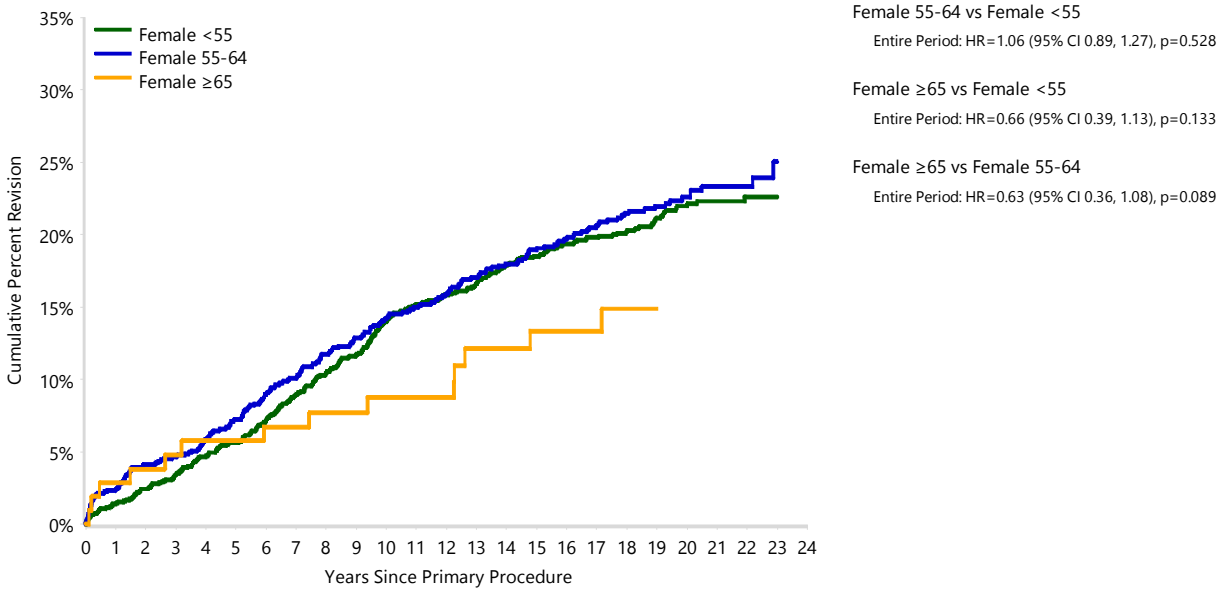
0 - 6Mth: HR=2.56 (95% CI 1.65, 3.97), p<0.001

6Mth+: HR=1.02 (95% CI 0.77, 1.35), p=0.907

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<55**	7235	6808	6118	5485	4300	2909	1258
	55-64	4939	4705	4327	3920	3105	2235	851
	≥65	1368	1280	1196	1084	775	557	192

Note: Restricted to modern prostheses

Figure HT123 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement in Females by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	**<55**	1466	1412	1350	1263	1118	989	492
	55-64	980	944	900	857	766	660	335
	≥65	105	101	98	97	86	72	32

Note: Restricted to modern prostheses

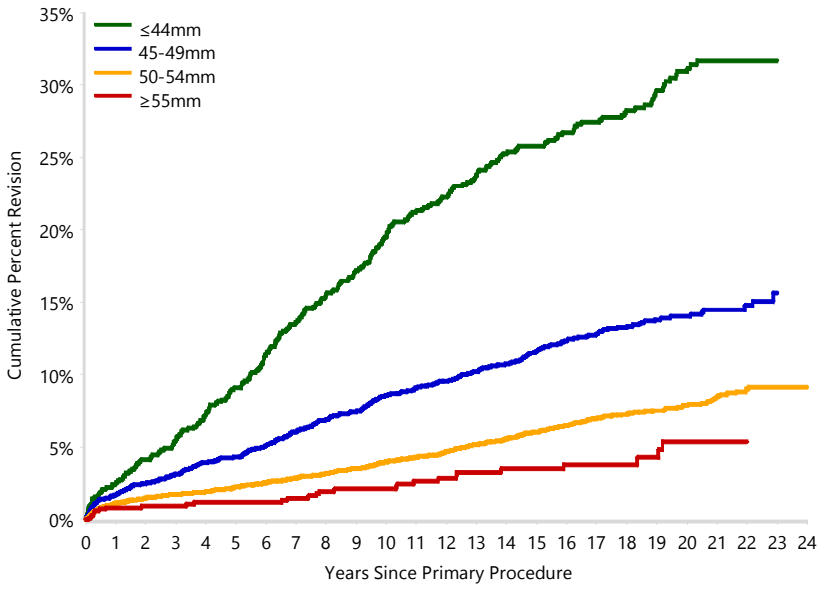
Primary Total Hip Replacement

Table HT114 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)

Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤44mm	251	914	2.5 (1.7, 3.8)	5.5 (4.2, 7.2)	9.1 (7.4, 11.2)	19.5 (17.0, 22.3)	25.8 (23.0, 28.9)	30.9 (27.8, 34.4)
45-49mm	336	3153	1.7 (1.3, 2.2)	3.1 (2.6, 3.8)	4.3 (3.6, 5.1)	8.6 (7.6, 9.7)	11.6 (10.4, 13.0)	14.0 (12.6, 15.6)
50-54mm	590	11042	1.1 (0.9, 1.3)	1.8 (1.5, 2.0)	2.2 (2.0, 2.5)	4.0 (3.6, 4.4)	6.1 (5.6, 6.6)	7.9 (7.3, 8.6)
≥55mm	28	984	0.8 (0.4, 1.6)	0.9 (0.5, 1.8)	1.2 (0.7, 2.2)	2.1 (1.3, 3.4)	3.5 (2.3, 5.3)	5.4 (3.5, 8.3)
TOTAL	1205	16093						

Note: Restricted to modern prostheses

Figure HT124 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)



HR - adjusted for age and gender

≤44mm vs ≥55mm

Entire Period: HR=4.34 (95% CI 2.84, 6.64), p<0.001

45-49mm vs ≥55mm

Entire Period: HR=2.36 (95% CI 1.59, 3.53), p<0.001

50-54mm vs ≥55mm

Entire Period: HR=1.65 (95% CI 1.13, 2.41), p=0.009

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤44mm	914	871	827	770	664	569	279
45-49mm	3153	3005	2781	2548	2069	1584	644
50-54mm	11042	10459	9564	8664	6862	4920	2099
≥55mm	984	915	817	724	555	349	138

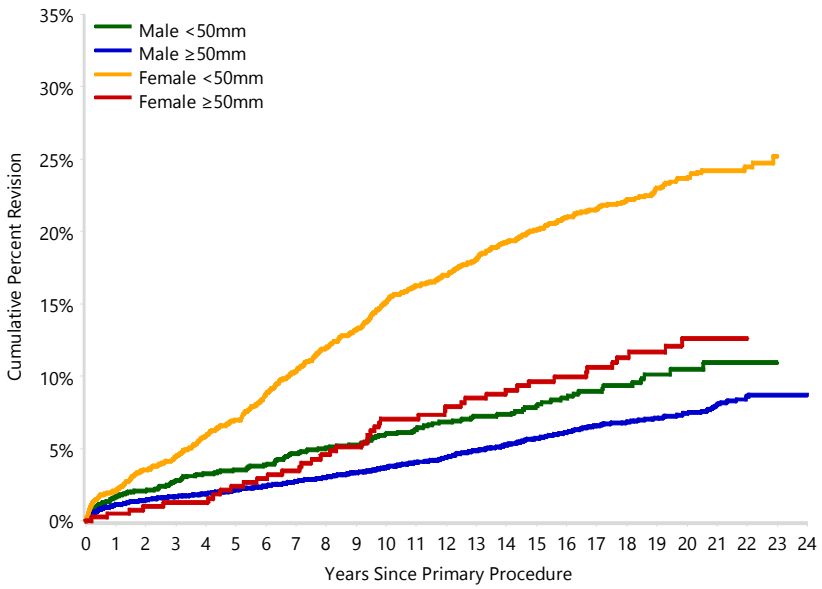
Note: Restricted to modern prostheses

Table HT115 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Femoral Head Size (Primary Diagnosis OA)

Gender	Femoral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**704**	**13542**	**1.2 (1.0, 1.4)**	**1.9 (1.6, 2.1)**	**2.3 (2.1, 2.6)**	**4.0 (3.7, 4.4)**	**6.0 (5.5, 6.5)**	**7.9 (7.3, 8.5)**
	<50mm	129	1907	1.6 (1.2, 2.3)	2.8 (2.1, 3.7)	3.5 (2.8, 4.5)	6.0 (4.9, 7.3)	7.9 (6.6, 9.5)	10.5 (8.6, 12.7)
	≥50mm	575	11635	1.1 (0.9, 1.3)	1.7 (1.5, 2.0)	2.1 (1.9, 2.4)	3.7 (3.3, 4.1)	5.7 (5.2, 6.2)	7.5 (6.8, 8.1)
Female		**501**	**2551**	**1.9 (1.4, 2.5)**	**4.0 (3.3, 4.8)**	**6.2 (5.4, 7.3)**	**13.8 (12.5, 15.3)**	**18.5 (16.9, 20.1)**	**21.9 (20.2, 23.7)**
	<50mm	458	2160	2.1 (1.6, 2.8)	4.4 (3.6, 5.4)	7.0 (5.9, 8.1)	15.1 (13.6, 16.7)	20.1 (18.4, 21.9)	23.6 (21.8, 25.7)
	≥50mm	43	391	0.5 (0.1, 2.0)	1.3 (0.5, 3.1)	2.4 (1.2, 4.5)	7.1 (4.9, 10.2)	9.6 (7.0, 13.2)	12.6 (9.5, 16.7)
TOTAL		**1205**	**16093**						

Note: Restricted to modern prostheses

Figure HT125 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Femoral Head Size (Primary Diagnosis OA)



HR - adjusted for age

Male <50mm vs Male ≥50mm

Entire Period: HR=1.44 (95% CI 1.19, 1.75), p<0.001

Male <50mm vs Female <50mm

Entire Period: HR=0.41 (95% CI 0.34, 0.50), p<0.001

Male ≥50mm vs Female ≥50mm

Entire Period: HR=0.61 (95% CI 0.45, 0.83), p=0.001

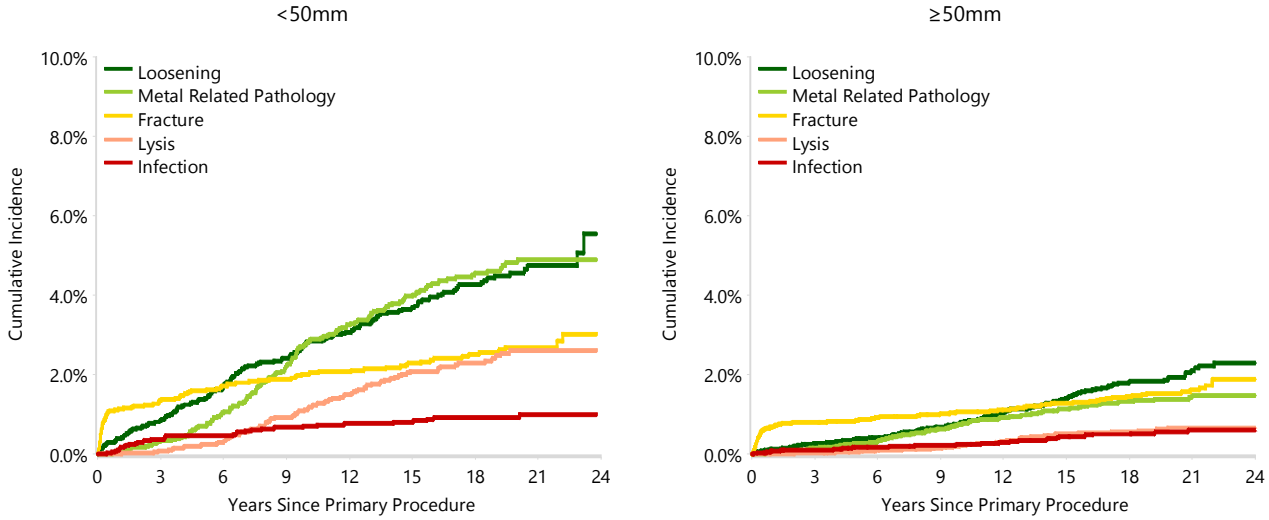
Female <50mm vs Female ≥50mm

Entire Period: HR=2.15 (95% CI 1.58, 2.95), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<50mm**	1907	1805	1634	1462	1097	729	230
	≥50mm	11635	10988	10007	9027	7083	4972	2071
Female	**<50mm**	2160	2071	1974	1856	1636	1424	693
	≥50mm	391	386	374	361	334	297	166

Note: Restricted to modern prostheses

Figure HT126 Cumulative Incidence Revision Diagnosis of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

OUTCOME OF PRIMARY TOTAL RESURFACING COMPARED TO PRIMARY TOTAL CONVENTIONAL HIP REPLACEMENT

The rate of revision for osteoarthritis in primary total resurfacing and primary total conventional hip replacement are compared using only modern prostheses.

Primary total resurfacing has a lower rate of revision than primary total conventional hip replacement in the first month. After 3 months, primary total resurfacing has a higher rate of revision (Table HT116 and Figure HT127).

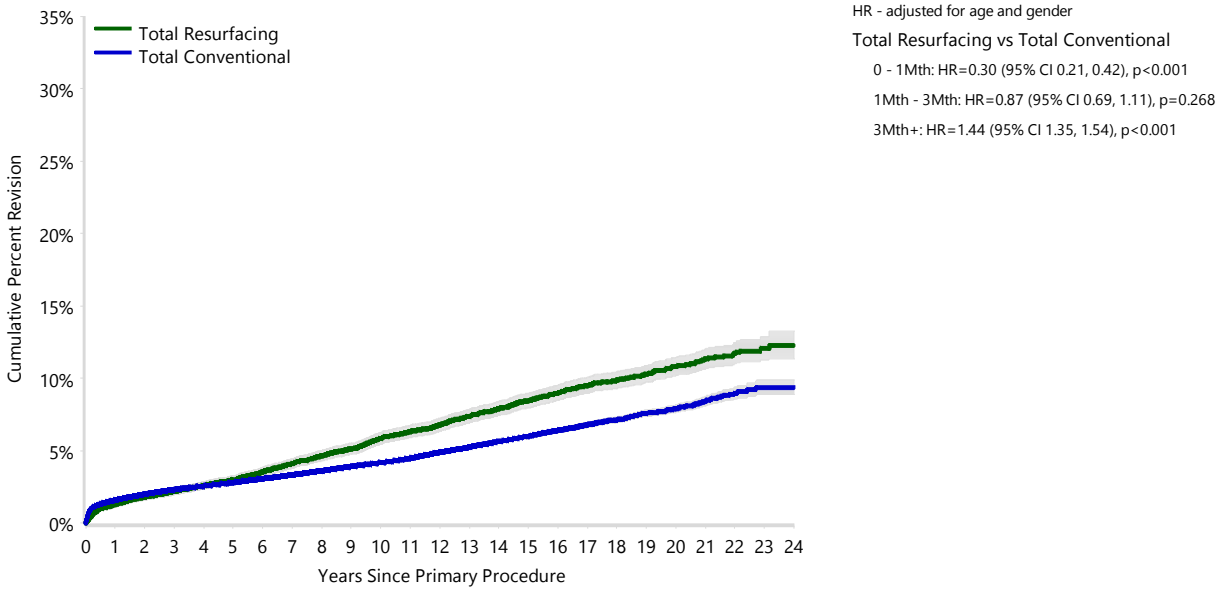
When analysed by gender, females with hip resurfacing have a higher rate of revision than females with total conventional hip replacement. Males with hip resurfacing have a lower rate of revision compared to males with a total conventional hip replacement for the first three months, with no difference after this time (Table HT117 and Figure HT128).

Table HT116 Cumulative Percent Revision of Primary Total Hip Replacement by Class (Primary Diagnosis OA)

Total Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	1205	16093	1.3 (1.1, 1.5)	2.2 (2.0, 2.4)	3.0 (2.7, 3.3)	5.8 (5.5, 6.3)	8.4 (8.0, 9.0)	10.8 (10.2, 11.4)
Total Conventional	16159	483080	1.6 (1.6, 1.6)	2.3 (2.3, 2.3)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	6.0 (5.9, 6.1)	7.9 (7.7, 8.2)
TOTAL	**17364**	**499173**						

Note: All primary total conventional procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT127 Cumulative Percent Revision of Primary Total Hip Replacement by Class (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	16093	15250	13989	12706	10150	7422	3160
Total Conventional	483080	429889	341258	264792	110429	34148	6519

Note: All primary total conventional procedures using metal/metal prostheses have been excluded
Restricted to modern prosthese

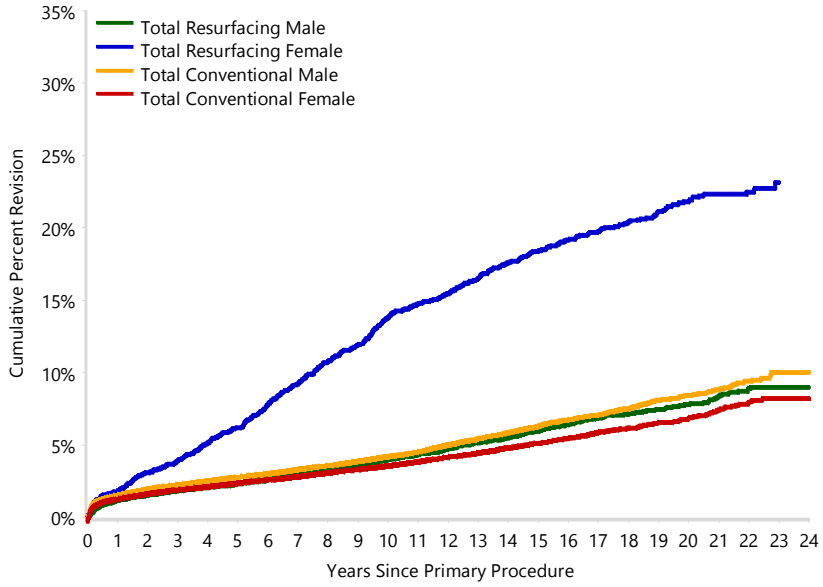
Primary Total Hip Replacement

Table HT117 Cumulative Percent Revision of Primary Total Hip Replacement by Class and Gender (Primary Diagnosis OA)

Total Hip Class	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing		**1205**	**16093**	**1.3 (1.1, 1.5)**	**2.2 (2.0, 2.4)**	**3.0 (2.7, 3.3)**	**5.8 (5.5, 6.3)**	**8.4 (8.0, 9.0)**	**10.8 (10.2, 11.4)**
	Male	704	13542	1.2 (1.0, 1.4)	1.9 (1.6, 2.1)	2.3 (2.1, 2.6)	4.0 (3.7, 4.4)	6.0 (5.5, 6.5)	7.9 (7.3, 8.5)
	Female	501	2551	1.9 (1.4, 2.5)	4.0 (3.3, 4.8)	6.2 (5.4, 7.3)	13.8 (12.5, 15.3)	18.5 (16.9, 20.1)	21.9 (20.2, 23.7)
Total Conventional		**16159**	**483080**	**1.6 (1.6, 1.6)**	**2.3 (2.3, 2.3)**	**2.8 (2.8, 2.9)**	**4.2 (4.1, 4.3)**	**6.0 (5.9, 6.1)**	**7.9 (7.7, 8.2)**
	Male	7703	220749	1.6 (1.6, 1.7)	2.4 (2.3, 2.5)	2.9 (2.9, 3.0)	4.4 (4.3, 4.5)	6.6 (6.4, 6.8)	8.7 (8.3, 9.1)
	Female	8456	262331	1.6 (1.5, 1.6)	2.2 (2.2, 2.3)	2.7 (2.6, 2.8)	4.0 (3.9, 4.1)	5.6 (5.4, 5.7)	7.4 (7.0, 7.7)
TOTAL		**17364**	**499173**						

Note: Restricted to modern prostheses
All primary total conventional procedures using metal/metal prostheses have been excluded

Figure HT128 Cumulative Percent Revision of Primary Total Hip Replacement by Class and Gender (Primary Diagnosis OA)



HR - adjusted for age

Total Resurfacing Male vs Total Resurfacing Female
Entire Period: HR=0.34 (95% CI 0.30, 0.38), p<0.001

Total Resurfacing Male vs Total Conventional Male
0 - 1Mth: HR=0.25 (95% CI 0.16, 0.37), p<0.001
1Mth - 3Mth: HR=0.75 (95% CI 0.56, 0.99), p=0.040
3Mth+: HR=0.97 (95% CI 0.89, 1.06), p=0.468

Total Resurfacing Female vs Total Conventional Female
0 - 1Mth: HR=0.68 (95% CI 0.48, 0.97), p=0.030
1Mth - 6Mth: HR=2.92 (95% CI 2.60, 3.27), p<0.001
6Mth+: HR=3.29 (95% CI 2.99, 3.63), p<0.001

Total Conventional Male vs Total Conventional Female
0 - 2Wk: HR=0.84 (95% CI 0.75, 0.94), p=0.002
2Wk - 3Mth: HR=1.08 (95% CI 1.01, 1.14), p=0.019
3Mth - 6Mth: HR=0.94 (95% CI 0.84, 1.06), p=0.345
6Mth+: HR=1.16 (95% CI 1.12, 1.21), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	Male	13542	12793	11641	10489	8180	5701	2301
	Female	2551	2457	2348	2217	1970	1721	859
Total Conventional	Male	220749	196264	154920	119183	47896	14226	2816
	Female	262331	233625	186338	145609	62533	19922	3703

Note: Restricted to modern prostheses
All primary total conventional procedures using metal/metal prostheses have been excluded

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Knee Replacement

Knee Replacement

Categories of Knee Replacement

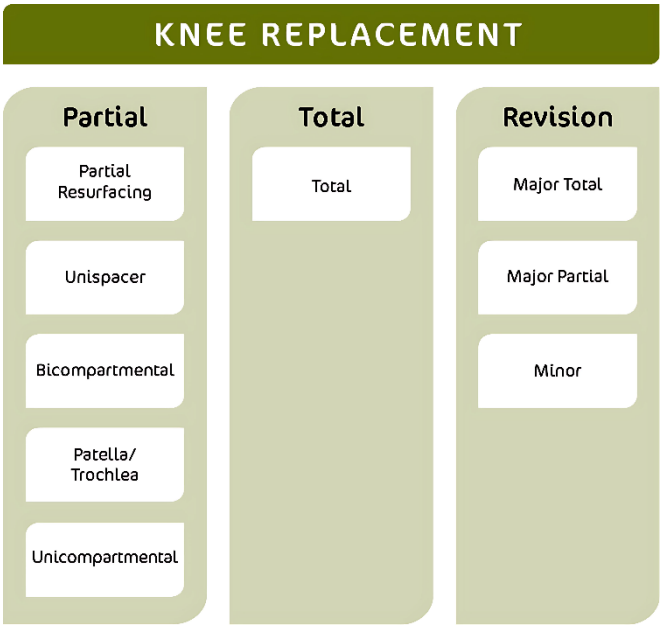
Knee replacement is grouped into three broad categories: primary partial, primary total and revision knee replacement.

A primary replacement is an initial replacement procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface. The patella may or may not be resurfaced as part of a total replacement.

Primary partial knees are subcategorised into classes depending on the type of prosthesis used. The classes of primary partial knee replacement are partial resurfacing, unispacer, bicompartmental, patella/trochlea and unicompartmental. These are defined in the subsequent sections.

Revision knee replacements are re-operations of previous knee replacements where one or more of the prosthetic components are replaced, removed, or one or more components are added. Revisions include re-operations of primary partial, primary total or previous revision procedures. Knee revisions are subcategorised into three classes: major total, major partial, and minor revisions.

Detailed demographic information on knee replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025



Executive Summary Reference Tables

Table K1 and Table K2 index the analyses within this chapter. Variables are listed, and where there is a significant finding for a comparison, a red diamond is shown in the table. New analyses for this year's report are noted with an Asterix. There are hyperlinks to the relevant tables and figures.

Table K1 Indexing Significant Characteristic Comparisons: Partial Knee Replacements

Characteristic	Variable	Patella/Trochlear Knee Osteoarthritis		Unicompartmental Knee Osteoarthritis	
		Significant HR	Figure no.	Significant HR	Figure no.
Patient					
	Age	♦	Figure KP6	♦	Figure KP19
	Gender	♦	Figure KP7	♦	Figure KP20
	Gender by Age	♦	Figure KP8	♦	Figure KP22 Figure KP23
	ASA Score		Figure KP9	♦	Figure KP24
	BMI	♦	Figure KP10		Figure KP26
Prosthesis					
	Surgeon Assistive Tools		Figure KP12	♦	Figure KP31
	Bearing Mobility	NT		♦	Figure KP28
	Fixation	NT		♦	Figure KP30
	Position	NT		♦	Figure KP35
	Position and Mobility	NT		♦	Figure KP36

♦ Significant Hazard Ratio difference between categories where $p<0.05$

NT Not Tested: Insufficient numbers to make statistical comparisons or comparison not relevant

Table K2 Indexing Significant Characteristic Comparisons: Total Knee Replacements

Characteristic	Variable	Total Knee Osteoarthritis		Total Knee All Diagnoses	
		Significant HR	Table/Figure no.	Significant HR	Table/Figure no.
	Diagnosis	NT		♦	Figure KT6
Patient					
	Age	♦	Figure KT9	NT	
	Gender	♦	Figure KT10	NT	
	Gender and Revision for Infection	♦	Figure KT12	NT	
	Gender by Age	♦	Figure KT13 Figure KT14	NT	
	ASA Score	♦	Figure KT15	NT	
	ASA by Gender	♦	Figure KT17	NT	
	ASA by Age*	♦	Figure KT18	NT	
	BMI	♦	Figure KT19	NT	
	BMI by Gender	♦	Figure KT21	NT	
	BMI by Age*	♦	Figure KT22	NT	
Prosthesis					
	Fixed Bearing Type	♦	Figure KT23	NT	
	Bearing Mobility	♦	Figure KT24	NT	
	Stability	♦	Figure KT26 Figure KT31	♦	Figure KT30
	Polyethylene Conformity		Figure KT28	NT	
	Polyethylene Insert Shape and Prosthesis Combinations	♦	Table KT30	NT	
	Patella Component Usage	♦	Figure KT33	NT	
	Patella Type	♦	Figure KT34	NT	
	Patella Component Usage and Prosthesis Combination	♦	Table KT38	NT	
	Patella Component Usage and Stability	♦	Figure KT35 Figure KT36	NT	
	Stability and Fixation	♦	Figure KT38 Figure KT41	NT	
	MPD by Fixation*		Figure KT44		
	Stability and Fixation by Age	♦	Figure KT39 Figure KT42	NT	
	Stability and Fixation by Gender	♦	Figure KT40 Figure KT43	NT	
	Polyethylene Type	♦	Figure KT47	NT	
	Polyethylene Type and Revision Diagnosis	♦	Figure KT49 Figure KT50	NT	
	Polyethylene Type and Age	♦	Figure KT51	NT	
	Polyethylene Type and Prosthesis Combination	♦	Table KT52	NT	
	XLPE by Polyethylene Type	♦	Figure KT52	NT	
	XLPE by Polyethylene Type and Stability*	♦	Table KT55 Table KT57	NT	
	Femoral Bearing Surface	♦	Figure KT54	NT	
	Femoral Bearing Surface and Stability*	♦	Table KT60	NT	

Table K2 ***Cont.***

Characteristic	Variable	Total Knee Osteoarthritis		Total Knee All Diagnoses	
		Significant HR	Table/Figure no.	Significant HR	Table/Figure no.
	Femoral Material	♦	Figure KT56	NT	
	Femoral Material and Loosening*	♦	Figure KT58	NT	
	Femoral Bearing Surface and Prosthesis Combination*	♦	Table KT64		
Surgeon Assistive Tools					
	Computer Navigation		Figure KT60	NT	
	Computer Navigation and Age	♦	Figure KT62	NT	
	Computer Navigation with Patella by Prosthesis Combination	♦	Table KT68	NT	
	IDI	♦	Figure KT63	NT	
	IDI and Age	♦	Figure KT65	NT	
	IDI with Patella by Prosthesis Combination	♦	Table KT72	NT	
	Robotic Assistance		Figure KT66	NT	
	Robotic Assistance and Age		Figure KT68	NT	
	Robotic Assistance by Prosthesis Combination*	♦	Table KT76	NT	
	XLPE by Surgeon Assistive Tool		Figure KT69	NT	
	Persona CR/Persona Prosthesis Combination with XLPE by Surgeon Assistive Tool		Figure KT70	NT	
	Triathlon CR/Triathlon Prosthesis Combination with XLPE by Surgeon Assistive Tool		Figure KT71	NT	

♦ Significant Hazard Ratio difference between categories where $p<0.05$

NT Not Tested: Insufficient numbers to make statistical comparisons or comparison not relevant

*New analysis for this year's Annual Report

Knee Replacement

Use of Knee Replacement

This report analyses 1,205,616 knee replacements with a procedure date up to and including 31 December 2024. This is an additional 80,402 knee procedures since the last report. The relative frequency of each category of knee replacement is provided in Table K3.

For further information on the **closure of the database,** please see the **Glossary** of this report.

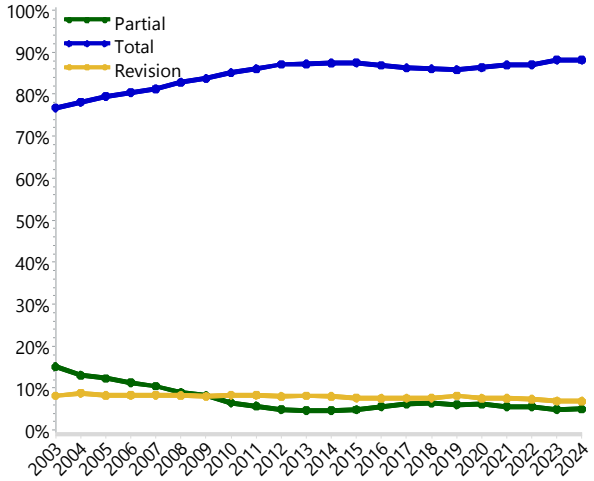
Table K3 Number of Knee Replacements

Knee Category	Number	Percent
Partial	84395	7.0
Total	1026935	85.2
Revision	94286	7.8
TOTAL	**1205616**	**100.0**

In 2024, the number of knee replacements undertaken has increased by 300 (0.4%) compared to 2023. During the last year, primary partial knee replacement increased by 2.3% and primary total knee replacement increased by 0.3%. Revision knee replacement decreased by 0.3%.

In 2024, primary total knee replacement accounted for 88.1% of all knee replacement procedures, primary partial knee replacement accounted for 5.0%, and the proportion of revision knee procedures was 6.9%. This equates to 1,552 fewer revision procedures in 2024 than would have been expected if the proportion of revision procedures had remained at the level reported in 2004 (Figure K1).

Figure K1 Proportion of Knee Replacements



ASA Score and BMI in Knee Replacement

Data are reported on knee replacement procedures for both the American Society of Anesthesiologists Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of knee replacement surgery. The Registry commenced the collection of ASA score in 2012 and BMI data in 2015.

There are ASA score data on 757,266 and BMI data on 644,992 knee replacement procedures. Since its initial collection, ASA score has been recorded for 97.6% of procedures. BMI has been recorded for 96.2% of procedures since collection commenced.

ASA SCORE

There are five ASA score classifications:[1]

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

Overall, in 93.4% of knee replacement procedures, patients have an ASA score of 2 or 3, 5.4% have a score of 1 and 1.3% have a score of 4. Very few procedures are recorded where patients have an ASA score of 5.

There is a difference in ASA score depending on the class of knee replacement. There are more patients undergoing partial knee replacement procedures with ASA scores 1 or 2, than those having primary total knee replacement procedures. For patients undergoing revision knee replacement surgery, there are lower proportions with ASA scores of 1 or 2 (Table K4).

BMI CATEGORY

BMI for adults is classified into six main categories:[2]

Underweight	<18.5
Normal	18.5–24.9
Pre-obese	25.0–29.9
Obese Class 1	30.0–34.9
Obese Class 2	35.0–39.9
Obese Class 3	≥40.0

For all knee replacements, the majority of procedures are undertaken in patients who are either pre-obese or obese class 1. There is very little difference in BMI for patients when primary total and revision knee replacement are compared. However, for partial knee replacement, patients generally have a lower BMI (Table K5).

Table K4 ASA Score for Knee Replacement

ASA Score	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
ASA 1	4712	11.3	34030	5.2	1787	3.2	40529	5.4
ASA 2	25333	60.7	350449	53.2	22617	39.9	398399	52.6
ASA 3	11532	27.6	267433	40.6	29756	52.5	308721	40.8
ASA 4	187	0.4	6898	1.0	2488	4.4	9573	1.3
ASA 5	.	.	24	0.0	20	0.0	44	0.0
TOTAL	**41764**	**100.0**	**658834**	**100.0**	**56668**	**100.0**	**757266**	**100.0**

Note: A further 448,350 procedures did not have ASA score recorded.

Table K5 BMI Category for Knee Replacement

BMI Category	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Underweight	75	0.2	1160	0.2	162	0.4	1397	0.2
Normal	5509	15.0	59881	10.6	5098	11.2	70488	10.9
Pre Obese	14777	40.4	176294	31.3	13687	30.0	204758	31.7
Obese Class 1	11068	30.2	173264	30.8	13908	30.5	198240	30.7
Obese Class 2	3807	10.4	95121	16.9	7730	17.0	106658	16.5
Obese Class 3	1369	3.7	57110	10.1	4972	10.9	63451	9.8
TOTAL	**36605**	**100.0**	**562830**	**100.0**	**45557**	**100.0**	**644992**	**100.0**

Note: BMI has not been presented for patients aged ≤19 years. A further 560,624 procedures did not have BMI recorded or the patient is aged ≤19 years.

[1] https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system

[2] https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity/contents/measuring-overweight-and-obesity

Primary Partial Knee Replacement

Classes of Partial Knee Replacement

Partial knee replacement is subcategorised into five classes. These are defined by the types of prostheses used.

Partial resurfacing involves the use of one or more button prostheses to replace part of the natural articulating surface on one or more sides of the joint, in one or more articular compartments of the knee.

Unispacer involves the use of a medial or lateral femorotibial compartment articular spacer.

Bicompartmental involves the replacement of the medial femoral and trochlear articular surface of the knee with a single femoral prosthesis, as well as the medial tibial articular surface with a unicompartmental tibial prosthesis. It may also include the use of a patellar prosthesis.

Patella/trochlea involves the use of a trochlear prosthesis to replace the femoral trochlear articular surface and, on most occasions, a patellar prosthesis.

Unicompartmental involves the replacement of the femoral and tibial articular surface of either the medial or lateral femorotibial compartment using unicompartmental femoral and tibial prostheses.

Detailed information on unispacer, bicompartmental and partial resurfacing knee replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Use of Partial Knee Replacement

Unicompartmental knee replacement remains the most common class of primary partial knee replacement, accounting for 92.7% of all partial knee replacement procedures. The second most common class is patella/trochlear replacement (6.8%). Within the remaining three classes (partial resurfacing, unispacer and bicompartmental knee replacement), only small numbers of procedures have been reported (Table KP1).

Table KP1 Partial Knee Replacement by Class

Partial Knee Class	Number	Percent
Partial Resurfacing	248	0.3
Unispacer	40	0.0
Bicompartmental	166	0.2
Patella/Trochlea	5722	6.8
Unicompartmental	78219	92.7
TOTAL	**84395**	**100.0**

The unispacer procedure has not been used since 2005 and has the highest revision rate of any class of partial knee replacement. Bicompartmental knee replacement has not been used since 2012. There were no partial resurfacing procedures undertaken in 2024. These classes of partial knee replacement are not presented in detail in this report.

Patella/Trochlear

DEMOGRAPHICS

There are 5,722 patella/trochlear knee replacement procedures undertaken for all diagnoses. This is an additional 297 procedures compared to the previous report.

For further information on the **closure of the database** please see the **Glossary** of this report.

Patella/trochlear knee replacement accounted for 7.9% of all partial knee replacement procedures in 2024. Although the proportion of patella/trochlear knee replacements has increased from 2003 when it was 3.5%, it has changed little since 2016 (Figure KP1).

The principal diagnosis for patella/trochlea procedures is osteoarthritis. The proportion of males and females has remained relatively stable over the years (Figure KP2). The mean age of patients is 58.4 years, with this procedure undertaken more frequently in females (Table KP3). The age distribution has remained relatively stable since 2003 (Figure KP3).

In 2024, there were four resurfacing trochlea prostheses used in patella/trochlear knee replacement. The Gender Solutions and Restoris MCK are the most used prostheses in 2024 (Table KP4).

The outcomes of patella/trochlea knee prosthesis combinations used in 2024 are presented in Table KP5.

Table KP2 Primary Patella/Trochlea Knee Replacement by Primary Diagnosis

Primary Diagnosis	N	Col%
Osteoarthritis	5658	98.9
Other Inflammatory Arthritis	23	0.4
Rheumatoid Arthritis	9	0.2
Osteonecrosis	6	0.1
Fracture	4	0.1
Tumour	2	0.0
Other	20	0.3
TOTAL	5722	100.0

Figure KP2 Primary Patella/Trochlea Knee Replacement by Gender and Year of Procedure

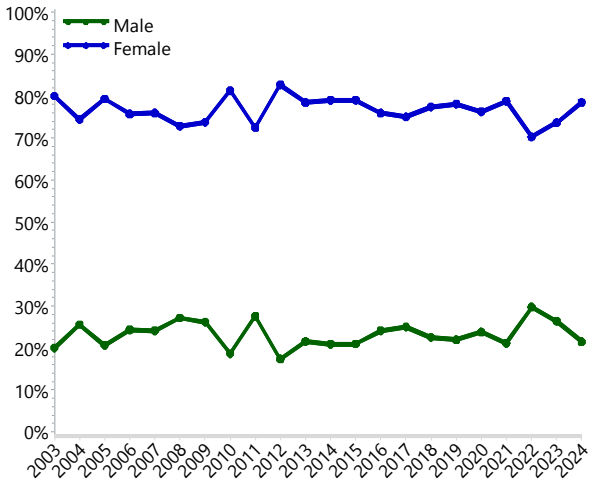


Figure KP1 Primary Patella/Trochlea Knee Replacement by Year (All Diagnoses)

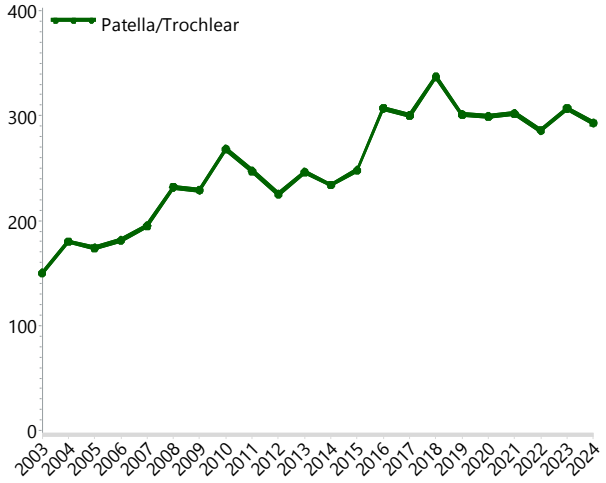
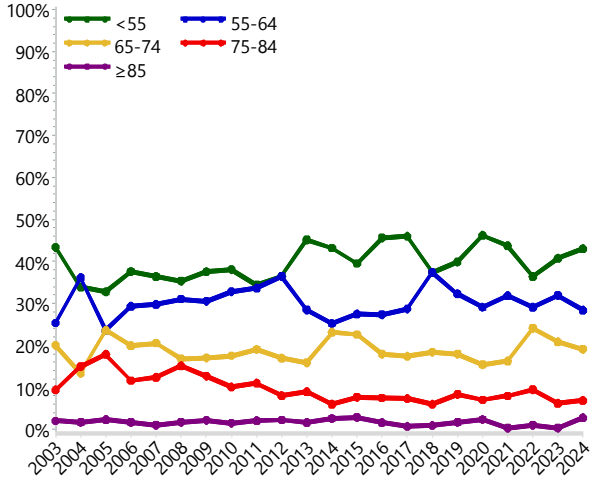


Figure KP3 Primary Patella/Trochlea Knee Replacement by Age and Year of Procedure



Primary Partial Knee Replacement

Table KP3 Age and Gender of Primary Patella/Trochlea Knee Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	1340	23.4%	24	95	61	60.8	12.8
Female	4382	76.6%	21	95	57	57.7	11.7
TOTAL	**5722**	**100.0%**	**21**	**95**	**58**	**58.4**	**12.1**

Table KP4 Most Used Resurfacing Trochlea Prostheses used in Primary Patella/Trochlea Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
56	LCS	160	Gender Solutions	128	Restoris MCK	147	Gender Solutions	123	Gender Solutions
43	Avon	93	Restoris MCK	115	Gender Solutions	113	Restoris MCK	121	Restoris MCK
29	Lubinus	39	Journey	41	Journey	46	Journey	47	Journey
13	Themis	7	Avon	2	Avon	1	Avon	2	Moto
8	MOD III	3	RBK						
1	RBK								
Most Used									
150	(6) 100.0%	302	(5) 100.0%	286	(4) 100.0%	307	(4) 100.0%	293	(4) 100.0%

Table KP5 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Prosthesis Combination

Resurfacing Trochlear	Patella	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Gender Solutions	Nexgen	227	1554	1.3 (0.8, 2.0)	6.1 (5.0, 7.4)	9.2 (7.8, 10.8)	14.4 (12.5, 16.5)	20.5 (17.9, 23.4)	
	Persona	8	316	0.8 (0.2, 3.1)	4.0 (1.7, 9.5)				
Journey	Genesis II	177	790	2.4 (1.5, 3.7)	8.2 (6.4, 10.4)	12.8 (10.5, 15.6)	17.9 (15.1, 21.2)	25.4 (21.8, 29.5)	41.6 (35.9, 47.8)
Restoris MCK	Restoris MCK	54	564	1.0 (0.4, 2.3)	6.1 (4.2, 8.8)	10.5 (7.7, 14.2)	18.8 (14.0, 25.0)		
	Triathlon	6	214	2.1 (0.8, 5.5)	2.9 (1.2, 7.0)				
Other (6)		6	30	3.4 (0.5, 22.1)	24.9 (10.9, 50.9)	24.9 (10.9, 50.9)	24.9 (10.9, 50.9)	37.5 (16.7, 70.1)	
TOTAL		**478**	**3468**						

Note: Restricted to modern prostheses. Only prostheses with over 20 procedures have been listed.

OUTCOME FOR OSTEOARTHRITIS - PATIENT CHARACTERISTICS

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

There are 473 revisions of the 3,430 primary patella/trochlear knee replacement procedures for osteoarthritis for analysis this year. There are 2,228 further patella/trochlear procedures excluded from analyses as the prosthesis is no longer used or the initial diagnosis is not osteoarthritis.

The cumulative percent revision for patella/trochlear replacement at 15 years is 34.4% (Table KP6 and Figure KP4).

Reasons for Revision

The main reasons for revision of patella/trochlear knee replacement are progression of disease, pain and loosening (Table KP7 and Table KP5). The main type of revision is to a total knee replacement (Table KP8).

Age and Gender

Age and gender are factors affecting the outcome of primary patella/trochlear knee replacement. Patients aged <65 years have a higher rate of revision compared to patients aged ≥65 years (Table KP9 and Figure KP6). Males have a higher rate of revision than females for the first 5 years, with no difference after this time (Table KP10 and Figure KP7).

Males aged <65 years have a higher rate of revision than males ≥65 years and females <65 years, but only for the first 5 years. There is no difference in rate of revision when females aged <65 years are compared to females ≥65 years (Table KP10 and Figure KP8).

ASA and BMI

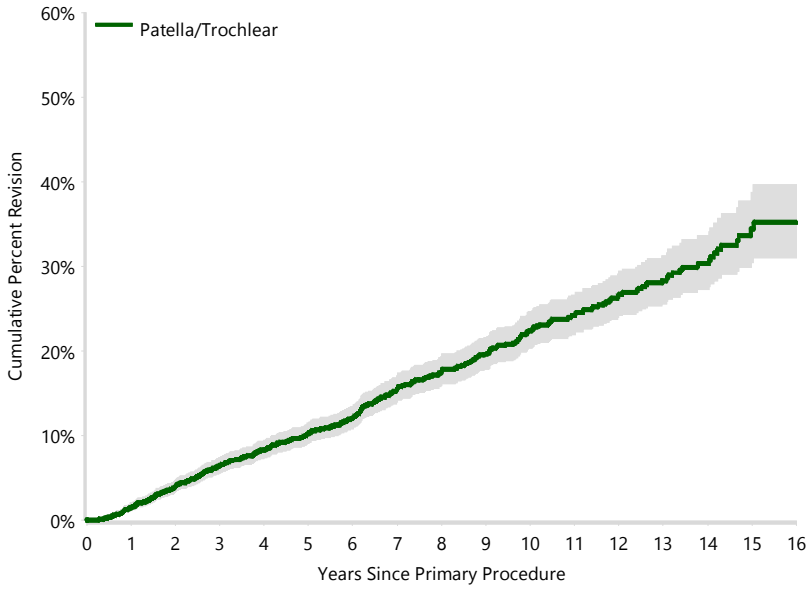
Patient ASA score is not a risk factor for revision (Table KP11 and Figure KP9). When patient BMI category was assessed, obese class 2 and 3 patients have a higher rate of revision compared to patients with a normal BMI (Table KP12 and Figure KP10).

Table KP6 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)

Knee Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Patella/Trochlear	473	3430	1.5 (1.2, 2.0)	6.5 (5.6, 7.4)	10.2 (9.1, 11.5)	15.5 (14.0, 17.1)	22.5 (20.4, 24.7)	34.4 (30.5, 38.7)
TOTAL	473	3430						

Note: Restricted to modern prostheses.

Figure KP4 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Patella/Trochlear	3430	3081	2358	1737	1146	578	85

Note: Restricted to modern prostheses.

Primary Partial Knee Replacement

Table KP7 Primary Patella/Trochlear Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Progression Of Disease	304	64.3
Pain	54	11.4
Loosening	43	9.1
Infection	12	2.5
Malalignment	8	1.7
Wear Patella	9	1.9
Lysis	6	1.3
Implant Breakage Patella	3	0.6
Implant Breakage Femoral	1	0.2
Arthrofibrosis	1	0.2
Patella Erosion	1	0.2
Other	31	6.6
TOTAL	473	100.0

Note: Restricted to modern prostheses.

Table KP8 Primary Patella/Trochlear Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
TKR (Tibial/Femoral)	417	88.2
Patella Only	30	6.3
UKR (Uni Tibial/Uni Femoral)	10	2.1
Patella/Trochlear Resurfacing	8	1.7
Cement Spacer	3	0.6
Removal of Prostheses	3	0.6
Femoral Component	1	0.2
Minor Components	1	0.2
TOTAL	473	100.0

Note: Restricted to modern prostheses.

Figure KP5 Cumulative Incidence Revision Diagnosis of Primary Patella/Trochlear Knee Replacement by Reason for Revision (Primary Diagnosis OA)

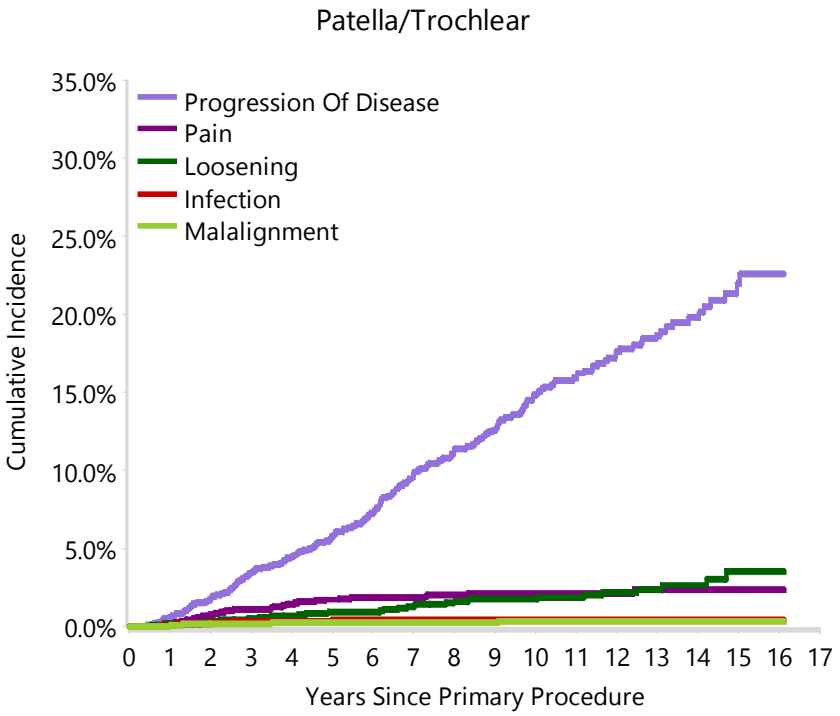
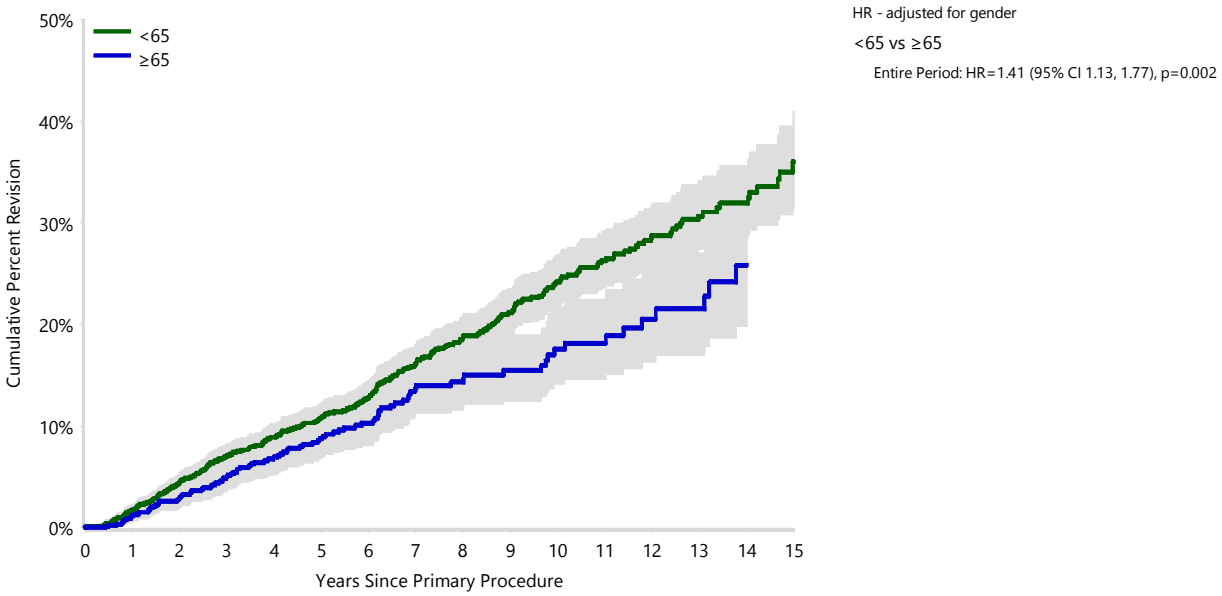


Table KP9 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	373	2482	1.7 (1.3, 2.3)	7.0 (6.0, 8.2)	10.8 (9.5, 12.3)	16.2 (14.4, 18.1)	24.1 (21.7, 26.8)	36.0 (31.5, 40.9)
≥65	100	948	1.1 (0.6, 2.1)	5.0 (3.7, 6.8)	8.8 (6.8, 11.2)	13.7 (11.0, 16.9)	17.5 (14.1, 21.7)	
TOTAL	473	3430						

Note: Restricted to modern prostheses.

Figure KP6 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	2482	2235	1733	1279	849	431	65
≥65	948	846	625	458	297	147	20

Note: Restricted to modern prostheses.

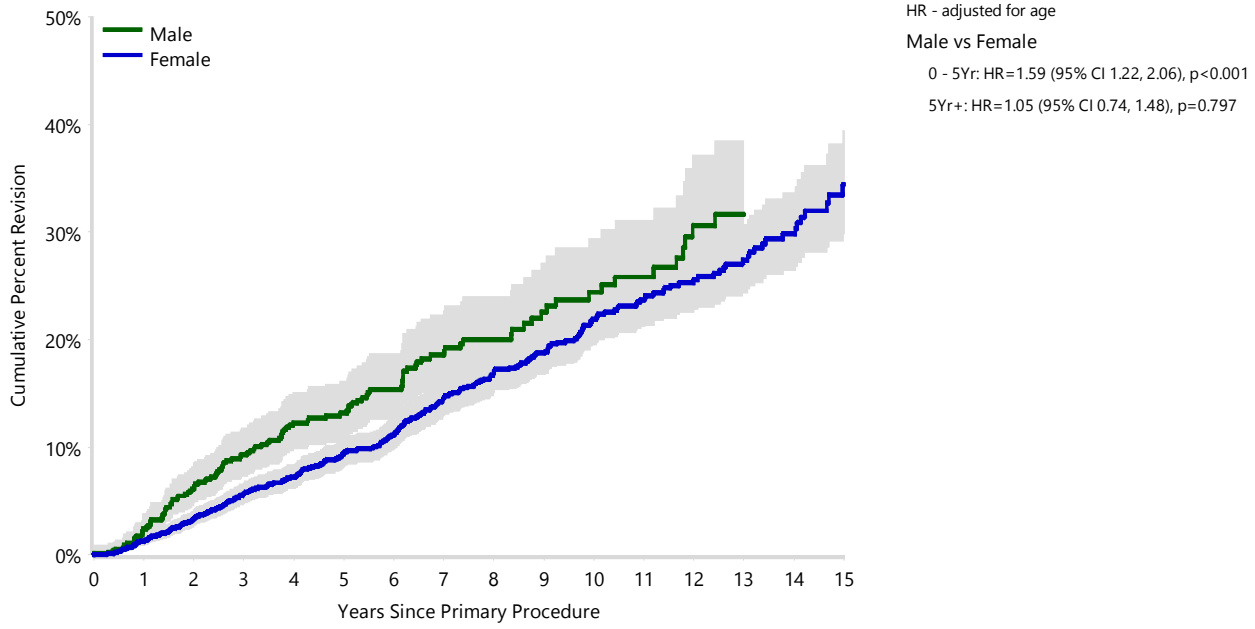
Primary Partial Knee Replacement

Table KP10 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male		**122**	**789**	**2.4 (1.5, 3.8)**	**9.3 (7.3, 11.8)**	**13.1 (10.7, 16.1)**	**18.6 (15.4, 22.3)**	**24.4 (20.2, 29.3)**	
	<65	92	478	2.9 (1.7, 4.9)	11.6 (8.8, 15.2)	15.9 (12.5, 20.1)	22.5 (18.2, 27.6)	31.0 (25.1, 37.9)	
	≥65	30	311	1.7 (0.7, 4.1)	5.7 (3.5, 9.3)	8.8 (5.8, 13.4)	12.3 (8.4, 17.9)	13.3 (9.1, 19.2)	
Female		**351**	**2641**	**1.3 (0.9, 1.8)**	**5.7 (4.8, 6.7)**	**9.4 (8.2, 10.7)**	**14.6 (13.0, 16.4)**	**21.9 (19.5, 24.4)**	**34.4 (29.9, 39.4)**
	<65	281	2004	1.4 (1.0, 2.1)	6.0 (5.0, 7.2)	9.6 (8.2, 11.2)	14.7 (12.9, 16.8)	22.6 (20.0, 25.5)	35.3 (30.1, 41.0)
	≥65	70	637	0.8 (0.4, 2.0)	4.6 (3.1, 6.8)	8.7 (6.4, 11.7)	14.2 (11.0, 18.4)	19.3 (14.9, 24.8)	
TOTAL		**473**	**3430**						

Note: Restricted to modern prostheses.

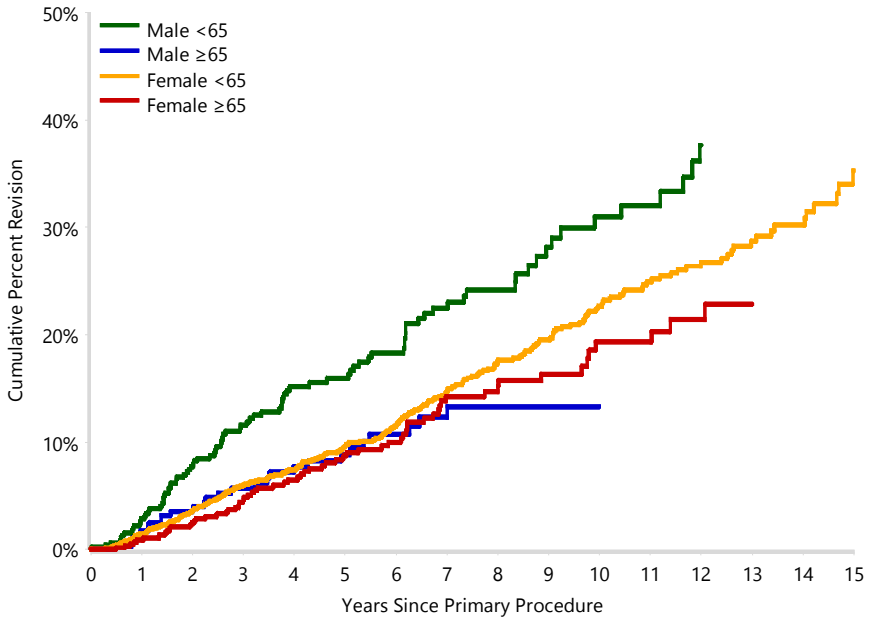
Figure KP7 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male	789	705	494	368	238	111	17
Female	2641	2376	1864	1369	908	467	68

Note: Restricted to modern prostheses.

Figure KP8 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Gender and Age (Primary Diagnosis OA)



Male <65 vs Male ≥65
Entire Period: HR=2.02 (95% CI 1.34, 3.06), p<0.001

Male <65 vs Female <65
0 - 5Yr: HR=1.77 (95% CI 1.32, 2.38), p<0.001
5Yr+: HR=1.27 (95% CI 0.87, 1.87), p=0.213

Male ≥65 vs Female ≥65
Entire Period: HR=0.92 (95% CI 0.60, 1.41), p=0.709

Female <65 vs Female ≥65
Entire Period: HR=1.20 (95% CI 0.92, 1.55), p=0.179

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male	**<65**	478	426	296	216	149	67	13
	≥65	311	279	198	152	89	44	4
Female	**<65**	2004	1809	1437	1063	700	364	52
	≥65	637	567	427	306	208	103	16

Note: Restricted to modern prostheses.

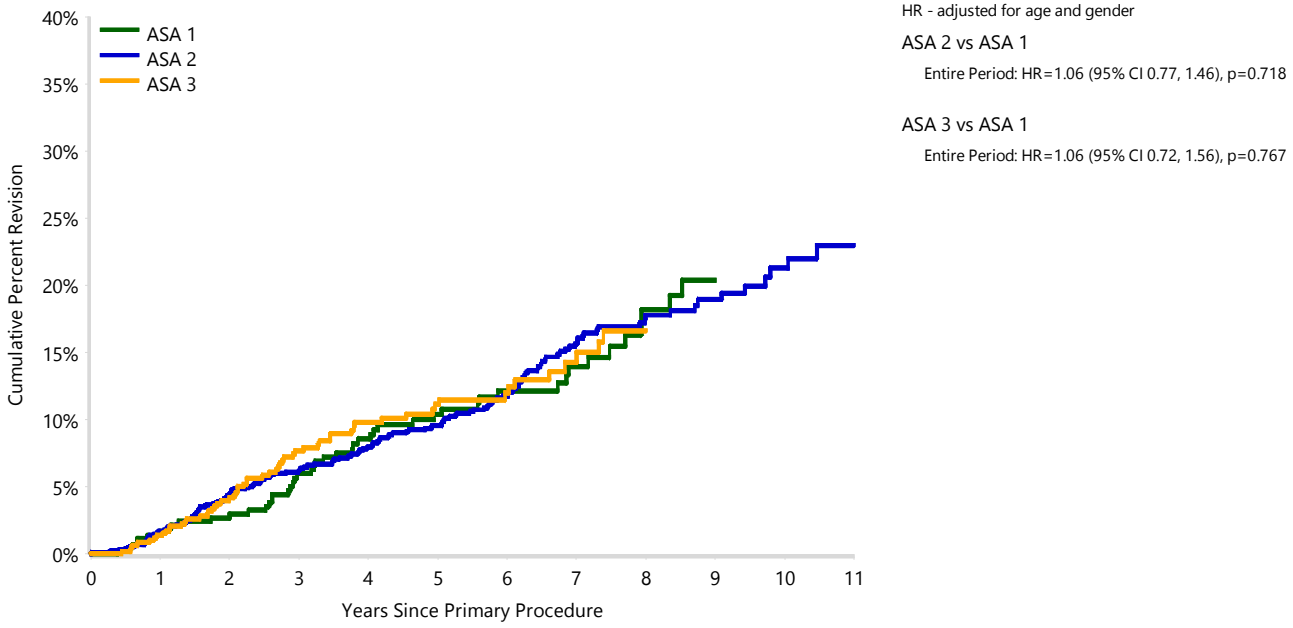
Primary Partial Knee Replacement

Table KP11 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	50	442	1.7 (0.8, 3.5)	6.0 (4.0, 8.9)	10.4 (7.5, 14.2)	14.0 (10.4, 18.7)	
ASA 2	180	1715	1.7 (1.2, 2.5)	6.2 (5.0, 7.6)	9.6 (8.1, 11.4)	15.6 (13.4, 18.2)	21.3 (17.8, 25.2)
ASA 3	61	656	1.3 (0.7, 2.7)	7.7 (5.7, 10.4)	11.1 (8.5, 14.5)	14.3 (10.9, 18.6)	
ASA 4	2	8	0.0 (0.0, 0.0)	28.6 (8.0, 74.2)			
TOTAL	293	2821					

Note: Excludes 609 procedures with unknown ASA score.
Restricted to modern prostheses.

Figure KP9 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by ASA Score (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	442	400	303	222	134	35
ASA 2	1715	1514	1108	744	409	109
ASA 3	656	562	384	245	118	16

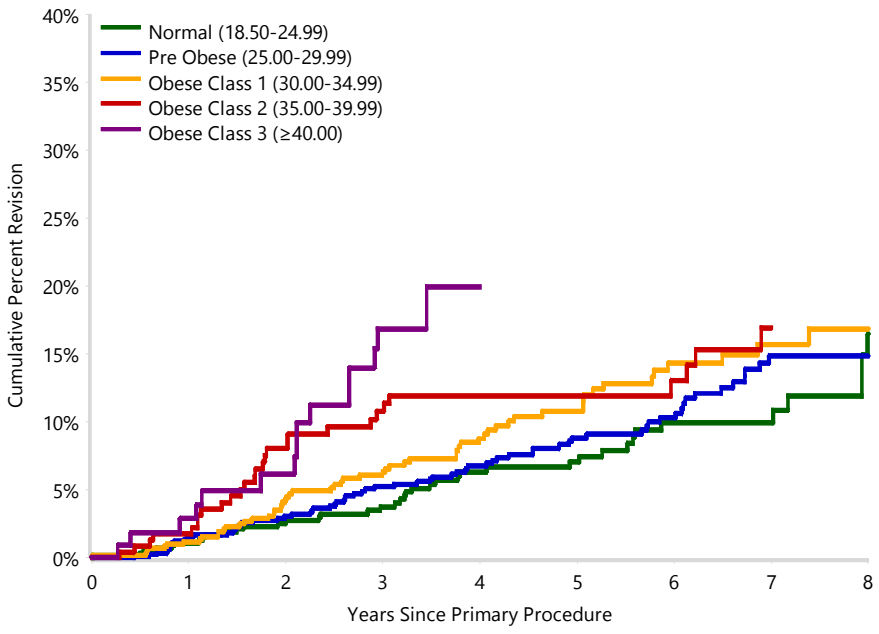
Note: Excludes 609 procedures with unknown ASA score.
Restricted to modern prostheses.
ASA 4 excluded due to low numbers.

Table KP12 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Underweight	1	23	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	9.1 (1.3, 49.2)	9.1 (1.3, 49.2)	
Normal	40	591	1.1 (0.5, 2.4)	3.8 (2.4, 5.9)	7.1 (4.9, 10.1)	9.9 (7.1, 13.9)	16.5 (11.1, 24.2)
Pre Obese	74	904	1.6 (0.9, 2.7)	5.2 (3.8, 7.1)	8.8 (6.8, 11.4)	14.8 (11.6, 18.9)	14.8 (11.6, 18.9)
Obese Class 1	60	639	1.2 (0.6, 2.5)	6.3 (4.5, 8.8)	10.8 (8.1, 14.2)	15.7 (12.0, 20.4)	16.8 (12.7, 22.1)
Obese Class 2	31	241	1.7 (0.7, 4.6)	10.8 (7.2, 15.9)	11.9 (8.1, 17.3)	16.9 (11.5, 24.5)	
Obese Class 3	16	112	2.9 (0.9, 8.6)	16.8 (10.3, 27.0)			
TOTAL	222	2510					

Note: BMI has not been presented for patients aged ≤19 years.
Excludes 920 procedures with unknown BMI.
Restricted to modern prostheses.

Figure KP10 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by BMI Category (Primary Diagnosis OA)



HR - adjusted for age and gender

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=1.09 (95% CI 0.74, 1.61), p=0.676

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
Entire Period: HR=1.31 (95% CI 0.87, 1.97), p=0.199

Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
Entire Period: HR=1.72 (95% CI 1.07, 2.77), p=0.024

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
Entire Period: HR=2.42 (95% CI 1.35, 4.35), p=0.003

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Underweight	591	511	442	362	279	226	158	98	54
Normal	904	796	667	559	451	360	265	169	90
Pre Obese	639	553	464	380	302	224	163	94	53
Obese Class 1	241	216	179	155	135	106	78	52	29
Obese Class 2	112	96	74	58	42	30	22	15	8

Note: BMI has not been presented for patients aged ≤19 years.
Excludes 920 procedures with unknown BMI. Restricted to modern prostheses.
Underweight BMI category excluded due to low numbers.

Primary Partial Knee Replacement

Outcome by Prosthesis Characteristics

Surgeon Assistive Tools

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. Computer navigation and IDI are rarely used with patella/trochlea replacement.

Robotic assistance for patella/trochlea knee replacement was first recorded in 2015. Use of robotic assistance increased to 48.6% of patella/trochlea procedures in 2022.

In 2024, 40.1% of patella/trochlea knee procedures use robotic assistance (Figure KP11). There are 767 robotically assisted patella/trochlea knee replacement procedures undertaken for osteoarthritis. There are 9 patella/trochlea combinations that can be used with robotic assistance.

When adjusted for age, gender, ASA and BMI there is no difference in the rate of revision for patella/trochlea knee procedures using robotic assistance compared to patella/trochlea procedures using traditional instrumentation (Table KP13 and Figure KP12).

Figure KP11 Primary Patella/Trochlear Knee Replacement by Surgeon Assistive Tools (Primary Diagnosis OA)

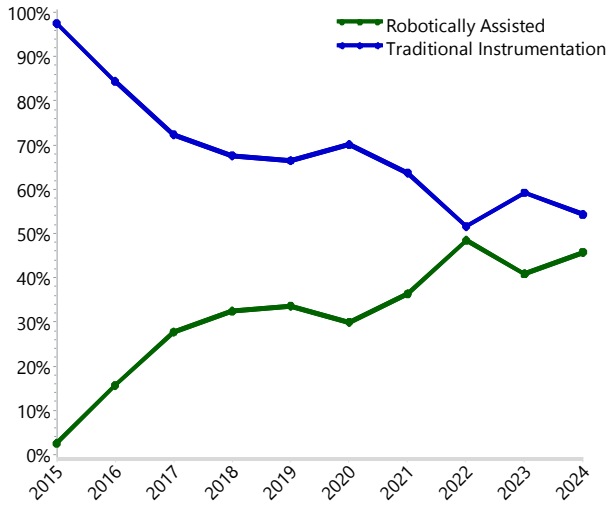
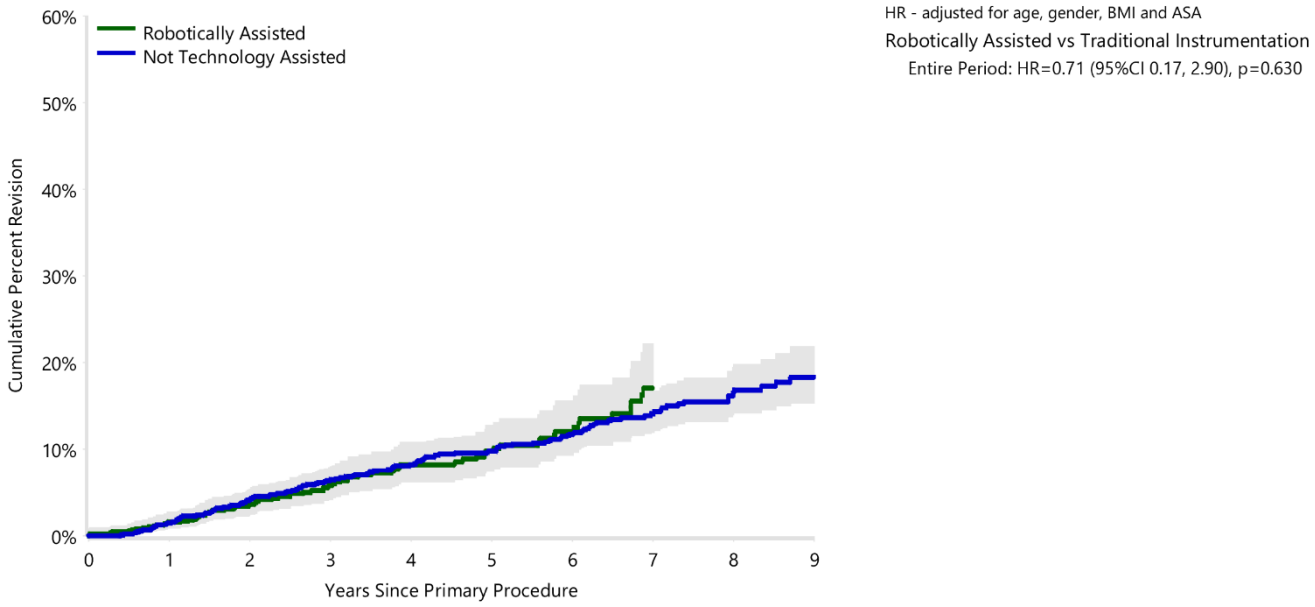


Table KP13 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement Since 2015 by Surgeon Assistive Tools (Primary Diagnosis OA)

Surgeon Assistive Tools	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	72	901	1.6 (0.9, 2.7)	3.6 (2.4, 5.1)	5.8 (4.3, 7.9)	8.3 (6.3, 10.8)	9.8 (7.5, 12.7)	12.1 (9.3, 15.6)	17.1 (13.1, 22.1)
Traditional Instrumentation	166	1691	1.5 (1.0, 2.3)	4.2 (3.3, 5.3)	6.5 (5.3, 7.9)	8.2 (6.9, 9.9)	9.8 (8.3, 11.7)	11.8 (10.0, 13.8)	14.1 (12.0, 16.5)
TOTAL	238	2592							

Note: Restricted to modern prostheses.

Figure KP12 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement Since 2015 by Surgeon Assistive Tools (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	901	756	621	477	363	279	188	97
Traditional Instrumentation	1691	1504	1290	1121	926	740	566	387

Note: Restricted to modern prostheses.

Primary Partial Knee Replacement

Unicompartmental

DEMOGRAPHICS

There are 78,219 primary unicompartmental knee procedures recorded. This is an additional 3,713 procedures compared to the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

The use of unicompartmental knee replacement has decreased to 4.5% of all knee procedures in 2024. Although the proportion of unicompartmental knee replacements has increased from 2014, when it was 4.2%, it is still considerably less than in 2003 (14.5%).

Osteoarthritis is the principal diagnosis (Table KP14). This procedure is undertaken more often in males (55.1%) (Table KP15). The proportion of males has decreased to 61.6% in 2024 (Figure KP13). Unicompartmental knee replacement is most frequently undertaken in patients aged 55–74 years. The age distribution has remained relatively stable since 2003 (Figure KP14). The mean age of patients is 65.5 years (Table KP15).

Table KP14 Primary Unicompartmental Knee Replacement by Primary Diagnosis

Primary Diagnosis	N	%
Osteoarthritis	77535	99.1
Osteonecrosis	460	0.6
Rheumatoid Arthritis	159	0.2
Other Inflammatory Arthritis	55	0.1
Fracture	5	0.0
Osteochondritis Dissecans	2	0.0
Tumour	1	0.0
Other	2	0.0
TOTAL	78219	100.0

Figure KP13 Primary Unicompartmental Knee Replacement by Gender

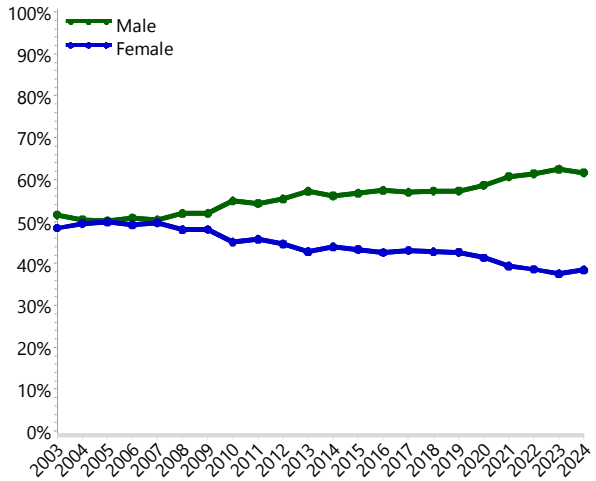
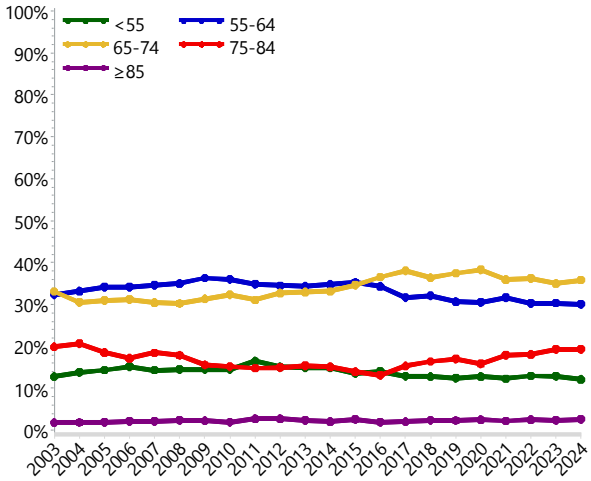


Figure KP14 Primary Unicompartmental Knee Replacement by Age



The use of mobile unicompartmental knee replacement has declined over time and in 2024 accounted for 21.3% of unicompartmental knee procedures (Figure KP15). The proportion of unicompartmental knee replacements using robotic assistance increased to 53.4% in 2024 (Figure KP16).

In 2024, the 10 most used tibial prostheses account for 99.8% of all unicompartmental procedures. The Restoris MCK, Persona and Oxford (cementless) are the most used prostheses in 2024 (Table KP16).

The outcomes of unicompartmental knee prosthesis combinations with >200 procedures are presented in Table KP17.

Figure KP15 Primary Unicompartmental Knee Replacement by Mobility

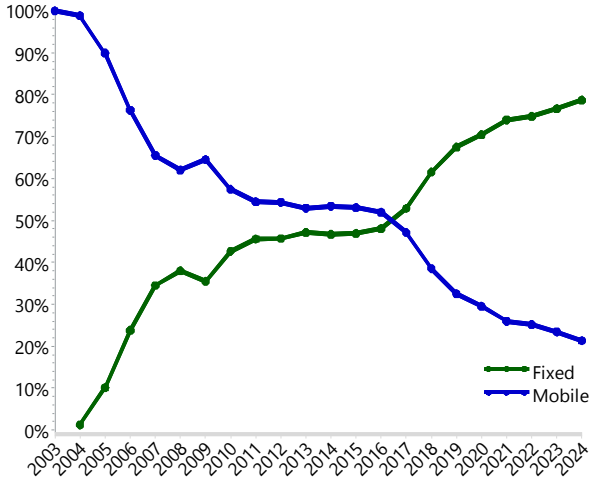
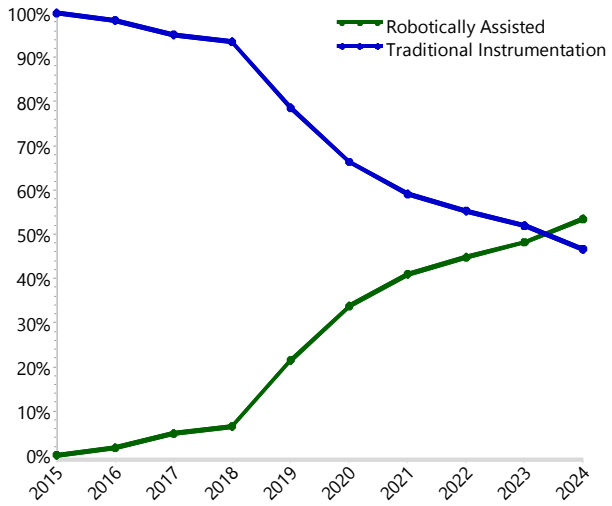


Figure KP16 Primary Unicompartmental Knee Replacement by Surgeon Assistive Tool (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Table KP15 Age and Gender of Primary Unicompartmental Knee Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	43306	55.4%	24	98	66	65.9	9.6
Female	34913	44.6%	13	98	65	65.0	10.2
TOTAL	**78219**	**100.0%**	**13**	**98**	**65**	**65.5**	**9.8**

Table KP16 10 Most Used Tibial Prostheses in Primary Unicompartmental Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1365	Oxford (ctd)	1200	Restoris MCK	1271	Restoris MCK	1360	Restoris MCK	1617	Restoris MCK
444	Repicci II	777	Oxford (cless)	745	Oxford (cless)	777	Persona	773	Persona
373	Preservation Fixed	533	Persona	698	Persona	751	Oxford (cless)	694	Oxford (cless)
353	M/G	281	ZUK	146	Journey Uni (v2)	194	Journey Uni (v2)	170	Journey Uni (v2)
336	Allegretto Uni	177	Sigma HP	134	Sigma HP	134	Sigma HP	109	BalanSys Uni Fixed
321	GRU	163	BalanSys Uni Fixed	125	BalanSys Uni Fixed	116	BalanSys Uni Fixed	100	Sigma HP
275	Genesis	158	Journey Uni (v2)	111	Genus	103	Genus	90	Oxford (ctd)
260	Unix	124	Oxford (ctd)	108	Oxford (ctd)	92	Oxford (ctd)	65	Genus
121	Preservation Mobile	107	Genus	31	ZUK	25	ZUK	38	ZUK
101	Endo-Model Sled	10	Journey Uni All Poly	17	Moto	23	Moto	20	Moto
10 Most Used									
3949	(10) 96.2%	3530	(10) 99.3%	3386	(10) 99.6%	3575	(10) 99.8%	3676	(10) 99.8%
Remainder									
158	(7) 3.8%	24	(5) 0.7%	14	(5) 0.4%	7	(2) 0.2%	7	(2) 0.2%
TOTAL									
4107	(17) 100.0%	3554	(15) 100.0%	3400	(15) 100.0%	3582	(12) 100.0%	3683	(12) 100.0%

Primary Partial Knee Replacement

Table KP17 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Prosthesis Combination

Uni Femoral	Uni Tibial	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
BalanSys Uni	BalanSys Uni Fixed	89	1435	1.9 (1.3, 2.8)	3.8 (2.9, 5.0)	4.8 (3.8, 6.2)	8.9 (6.9, 11.5)	13.5 (10.1, 17.8)	
Genus	Genus	35	675	3.2 (2.1, 4.9)	4.7 (3.2, 6.7)	7.0 (4.8, 10.2)			
Journey Uni	Journey Uni (v2)	116	1719	2.3 (1.7, 3.2)	5.2 (4.2, 6.5)	6.9 (5.7, 8.4)	11.3 (9.0, 14.2)		
	Journey Uni All Poly	51	352	1.4 (0.6, 3.4)	6.4 (4.3, 9.6)	9.2 (6.6, 12.9)	15.1 (11.4, 19.9)		
Oxford (cless)	Oxford (cless)	826	10442	2.6 (2.3, 2.9)	4.5 (4.1, 5.0)	5.8 (5.3, 6.3)	10.3 (9.6, 11.2)	18.9 (17.0, 21.0)	
	Oxford (ctd)	66	550	3.2 (2.0, 5.1)	6.3 (4.5, 8.8)	9.0 (6.7, 11.9)	14.4 (11.1, 18.4)		
Oxford (ctd)	Oxford (ctd)	2911	13753	2.1 (1.9, 2.4)	5.7 (5.3, 6.1)	8.1 (7.6, 8.6)	14.5 (13.9, 15.2)	22.0 (21.2, 22.8)	30.3 (29.3, 31.5)
Persona	Persona	66	2847	1.3 (0.9, 1.9)	3.6 (2.8, 4.8)				
Restoris MCK	Restoris MCK	145	6792	0.7 (0.5, 1.0)	2.7 (2.3, 3.3)	4.1 (3.4, 4.9)			
Sigma HP	Sigma HP	116	2015	1.1 (0.7, 1.7)	3.0 (2.3, 3.9)	4.3 (3.5, 5.4)	7.3 (5.9, 9.0)	12.2 (9.6, 15.4)	
Triathlon PKR	Triathlon PKR	40	386	3.1 (1.8, 5.4)	6.8 (4.7, 9.9)	8.2 (5.8, 11.5)	11.8 (8.7, 16.0)		
ZUK	ZUK	772	9673	1.5 (1.3, 1.8)	3.4 (3.1, 3.8)	4.6 (4.2, 5.1)	8.0 (7.4, 8.7)	12.4 (11.5, 13.5)	
Other (5)		25	271	3.8 (2.1, 7.0)	5.7 (3.4, 9.4)	8.1 (5.1, 12.7)			
TOTAL		5258	50910						

Note: Restricted to modern prostheses.
Only prostheses with >200 procedures have been listed.

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

There are 5,206 revisions of 50,481 primary unicompartmental knee replacement procedures with an initial diagnosis of osteoarthritis for analysis this year. There are 27,054 further unicompartmental procedures excluded from the analyses as the prosthesis is no longer used or the initial diagnosis is not osteoarthritis.

The cumulative percent revision for primary unicompartmental knee replacement undertaken for osteoarthritis is 11.3% at 10 years and 26.7% at 20 years (Table KP18 and Figure KT17).

Reasons for Revision

The main reasons for revision of unicompartmental knee replacement are progression of disease, loosening and pain (Table KP19 and Figure KP18). The main type of revision is to a total knee replacement (Table KP20).

Age and Gender

Age is a major factor affecting the outcome of primary unicompartmental knee replacement, with the rate of revision decreasing with increasing age (Table KP21 and Figure KP19). Females have a higher rate of revision than males (Table KP22 and Figure KP20). The main reason for this difference is an increased cumulative incidence for progression of disease (Figure KP21). The effect of age on the rate of revision is evident in both males and females (Table KP22, Figure KP22 and Figure KP23).

ASA and BMI

ASA scores have been collected since 2012. There are 32,537 primary unicompartmental knee replacement procedures for osteoarthritis with these scores. When compared to patients with an ASA score of 1, patients with an ASA score of 3 have a higher rate of revision (Table KP23 and Figure KP24). The most common reasons for revision are shown in Figure KP25.

BMI data have been collected since 2015. There are revision outcomes for 28,769 primary unicompartmental knee replacement procedures for osteoarthritis in relation to BMI category. There is no difference in the rate of revision comparing normal BMI to other categories (Table KP24 and Figure KP26). The most common reasons for revision are shown in Figure KP27.

Primary Partial Knee Replacement

Table KP18 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)

Knee Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs	20 Yrs
Unicompartmental	5206	50481	1.9 (1.8, 2.0)	4.4 (4.2, 4.6)	6.1 (5.9, 6.4)	8.0 (7.8, 8.3)	11.3 (10.9, 11.7)	18.2 (17.7, 18.8)	26.7 (25.7, 27.7)
TOTAL	5206	50481							

Note: Restricted to modern prostheses.

Figure KP17 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs	20 Yrs
Unicompartmental	50481	45754	37393	29802	23380	15653	6794	1724

Note: Restricted to modern prostheses.

Table KP19 Primary Unicompartmental Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Progression Of Disease	1997	38.4
Loosening	1572	30.2
Pain	372	7.1
Infection	263	5.1
Bearing Dislocation	201	3.9
Fracture	158	3.0
Instability	108	2.1
Lysis	97	1.9
Wear Tibial Insert	88	1.7
Malalignment	66	1.3
Implant Breakage Tibial Insert	61	1.2
Other (13)	223	4.3
TOTAL	5206	100.0

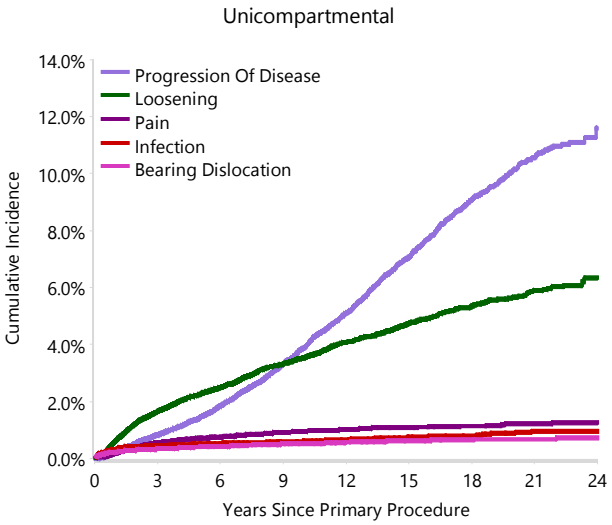
Note: Restricted to modern prostheses.

Table KP20 Primary Unicompartmental Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
TKR (Tibial/Femoral)	4388	84.3
Uni Insert Only	572	11.0
Uni Tibial Component	95	1.8
Uni Femoral Component	46	0.9
Cement Spacer	40	0.8
UKR (Uni Tibial/Uni Femoral)	34	0.7
Patella/Trochlear Resurfacing	16	0.3
Removal of Prostheses	5	0.1
Reinsertion of Components	4	0.1
Femoral Component*	4	0.1
Tibial Component	1	0.0
Patella Only	1	0.0
TOTAL	5206	100.0

Note: Restricted to modern prostheses. *Bicompartmental component.

Figure KP18 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

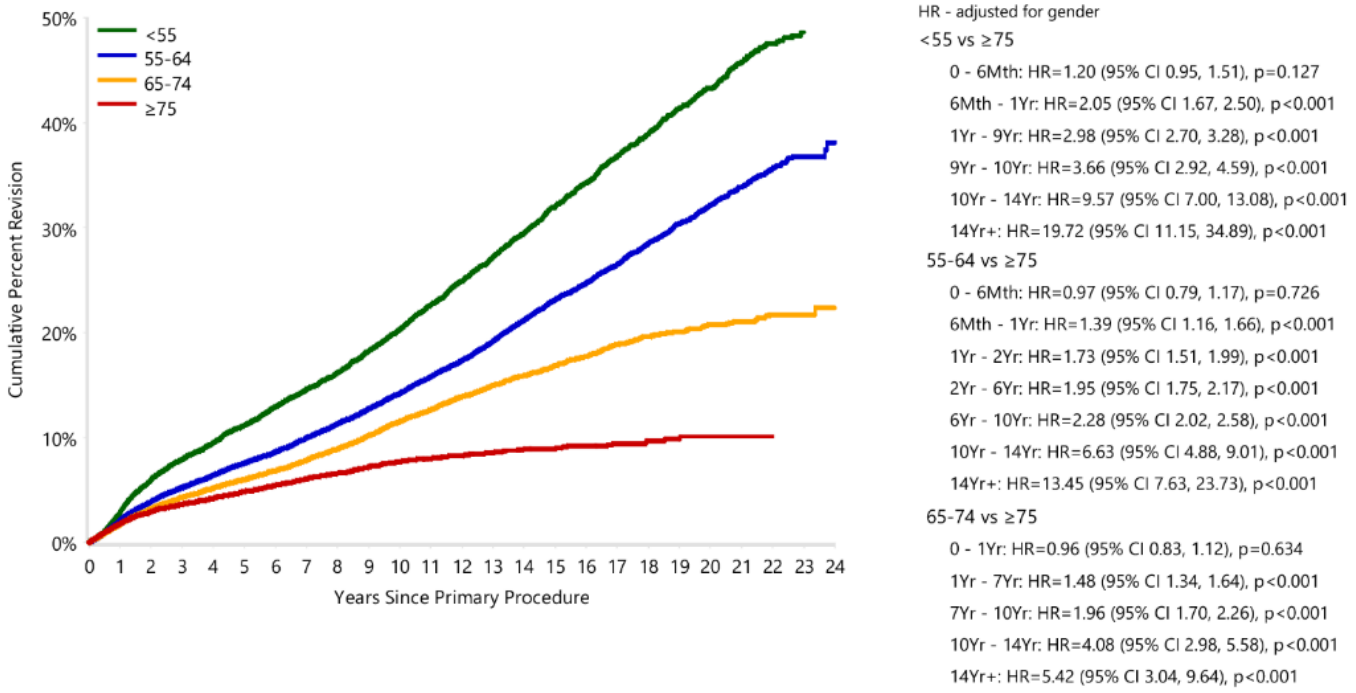
Primary Partial Knee Replacement

Table KP21 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	1119	6582	2.6 (2.3, 3.1)	6.7 (6.1, 7.4)	9.3 (8.6, 10.1)	16.8 (15.7, 18.0)	26.7 (25.1, 28.4)	39.1 (36.6, 41.7)
55-64	2055	16494	1.9 (1.7, 2.1)	4.6 (4.3, 4.9)	6.6 (6.2, 7.0)	11.9 (11.3, 12.5)	20.3 (19.3, 21.3)	30.3 (28.7, 31.9)
65-74	1532	17651	1.6 (1.5, 1.8)	3.8 (3.5, 4.1)	5.3 (5.0, 5.7)	10.4 (9.8, 11.0)	15.9 (15.0, 16.8)	20.7 (19.3, 22.2)
≥75	500	9754	1.8 (1.5, 2.1)	3.4 (3.1, 3.8)	4.4 (4.0, 4.9)	7.4 (6.8, 8.2)	8.6 (7.8, 9.6)	10.4 (8.7, 12.5)
TOTAL	5206	50481						

Note: Restricted to modern prostheses.

Figure KP19 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	10624	9881	8483	7339	4658	2715	873
55-64	25436	23784	20870	18146	11694	6923	2147
65-74	26334	24510	21234	18019	10515	5645	1527
≥75	15141	13917	11707	9572	4785	1715	257

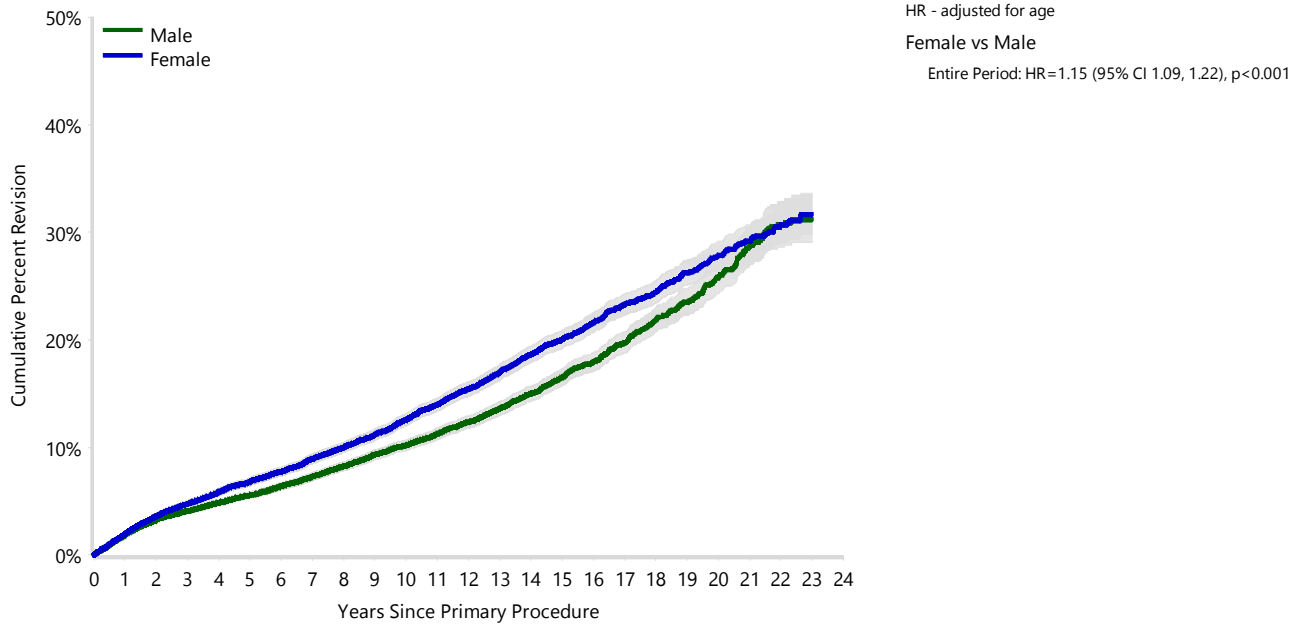
Note: Restricted to modern prostheses.

Table KP22 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**2509**	**28369**	**1.8 (1.7, 2.0)**	**4.1 (3.9, 4.4)**	**5.6 (5.3, 5.9)**	**10.2 (9.7, 10.7)**	**16.5 (15.7, 17.3)**	**25.7 (24.3, 27.3)**
	<55	488	3186	2.7 (2.2, 3.3)	6.3 (5.5, 7.3)	8.5 (7.5, 9.7)	16.5 (14.8, 18.3)	26.5 (24.0, 29.3)	40.7 (36.5, 45.2)
	55-64	1031	9346	1.9 (1.6, 2.2)	4.4 (3.9, 4.8)	6.1 (5.6, 6.7)	11.2 (10.5, 12.1)	18.8 (17.5, 20.1)	29.5 (27.3, 31.9)
	65-74	747	10281	1.6 (1.3, 1.8)	3.6 (3.2, 4.0)	4.9 (4.4, 5.4)	8.9 (8.2, 9.7)	13.7 (12.6, 14.9)	18.9 (16.9, 21.1)
	≥75	243	5556	1.7 (1.4, 2.1)	3.3 (2.8, 3.8)	4.1 (3.5, 4.7)	6.4 (5.6, 7.3)	7.6 (6.4, 8.9)	
Female		**2697**	**22112**	**2.0 (1.8, 2.1)**	**4.8 (4.5, 5.1)**	**6.8 (6.4, 7.1)**	**12.5 (12.0, 13.1)**	**20.0 (19.2, 20.9)**	**27.8 (26.5, 29.1)**
	<55	631	3396	2.6 (2.1, 3.2)	7.1 (6.3, 8.1)	10.0 (8.9, 11.1)	17.2 (15.7, 18.8)	27.0 (24.9, 29.2)	38.3 (35.2, 41.6)
	55-64	1024	7148	1.9 (1.6, 2.2)	4.9 (4.4, 5.5)	7.2 (6.6, 7.9)	12.6 (11.7, 13.6)	21.9 (20.5, 23.3)	31.2 (29.1, 33.4)
	65-74	785	7370	1.8 (1.5, 2.1)	4.1 (3.7, 4.6)	5.9 (5.3, 6.5)	12.3 (11.3, 13.3)	18.5 (17.2, 19.9)	22.9 (21.0, 24.9)
	≥75	257	4198	1.9 (1.5, 2.3)	3.6 (3.1, 4.3)	4.9 (4.2, 5.7)	8.6 (7.5, 9.8)	9.8 (8.5, 11.2)	11.2 (9.2, 13.6)
TOTAL		**5206**	**50481**						

Note: Restricted to modern prostheses.

Figure KP20 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)

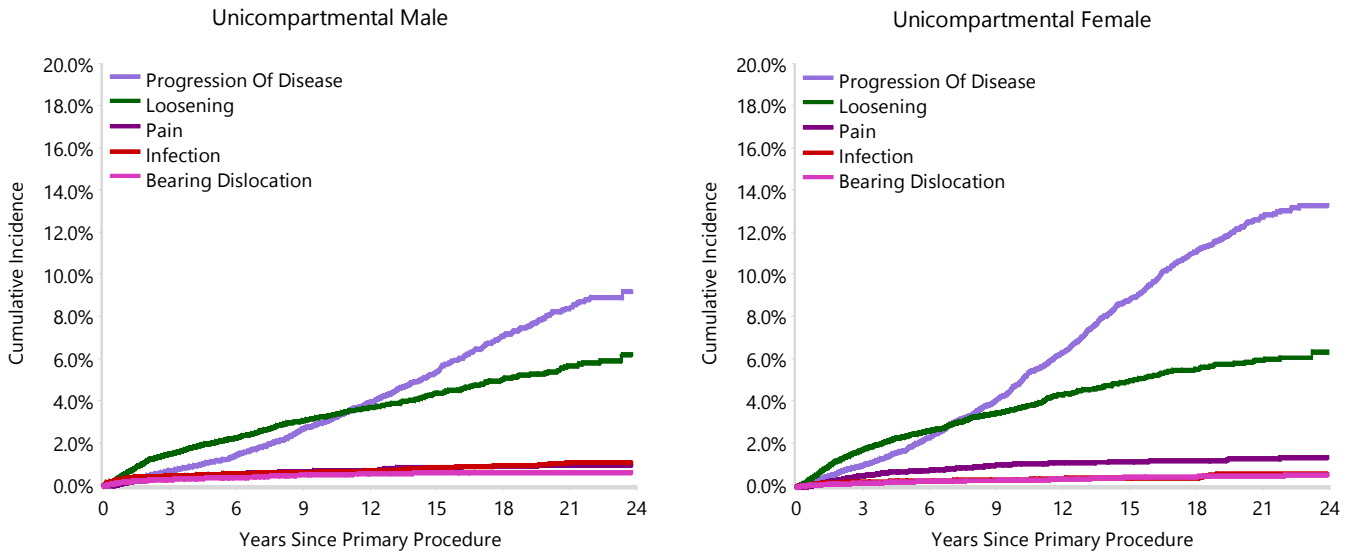


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	28369	25502	20415	15915	7904	3208	750
Female	22112	20252	16978	13887	7749	3586	974

Note: Restricted to modern prostheses.

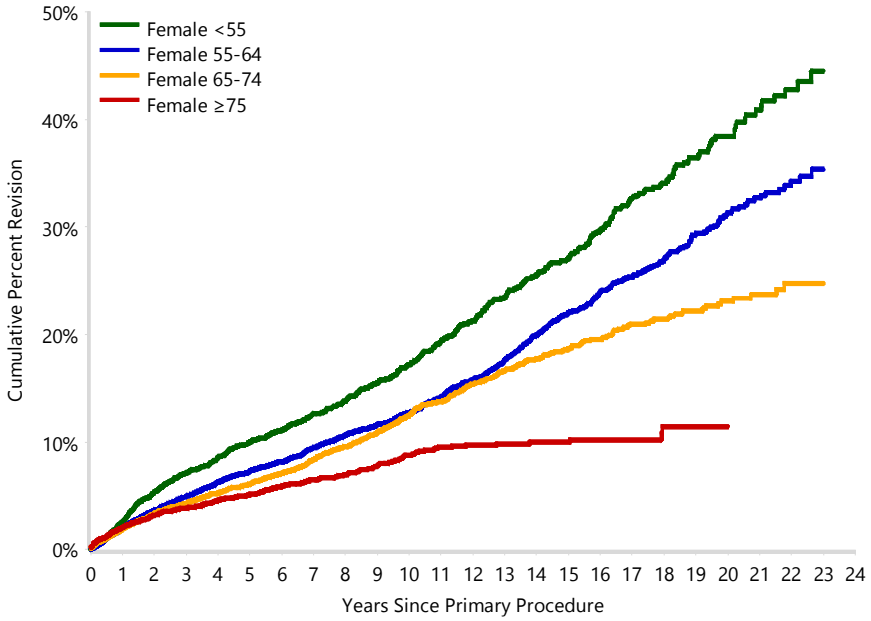
Primary Partial Knee Replacement

Figure KP21 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Figure KP22 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Females by Age (Primary Diagnosis OA)



Female <55 vs Female ≥75
- 0 - 1Yr: HR=1.38 (95% CI 1.01, 1.87), p=0.043
- 1Yr - 11Yr: HR=2.40 (95% CI 2.01, 2.88), p<0.001
- 11Yr - 12Yr: HR=8.93 (95% CI 3.71, 21.49), p<0.001
- 12Yr+: HR=18.11 (95% CI 8.40, 39.01), p<0.001

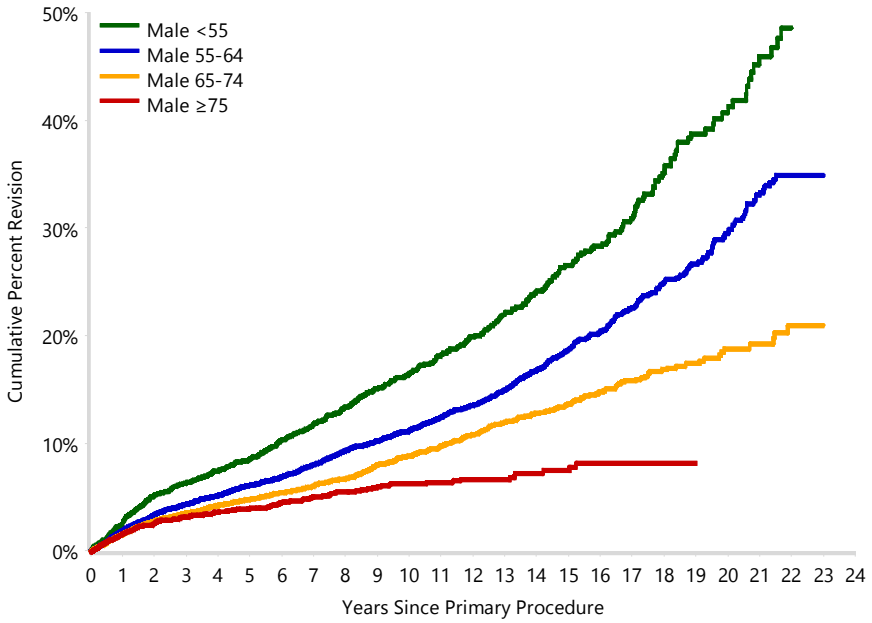
Female 55-64 vs Female ≥75
- 0 - 1Yr: HR=1.00 (95% CI 0.75, 1.33), p=0.998
- 1Yr - 11Yr: HR=1.70 (95% CI 1.43, 2.01), p<0.001
- 11Yr - 12Yr: HR=7.45 (95% CI 3.24, 17.14), p<0.001
- 12Yr+: HR=14.41 (95% CI 6.74, 30.80), p<0.001

Female 65-74 vs Female ≥75
- 0 - 1Yr: HR=0.94 (95% CI 0.70, 1.24), p=0.650
- 1Yr - 11Yr: HR=1.57 (95% CI 1.32, 1.86), p<0.001
- 11Yr+: HR=7.29 (95% CI 3.41, 15.58), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	3396	3098	2584	2170	1266	624	199
	55-64	7148	6608	5651	4731	2873	1428	405
	65-74	7370	6749	5668	4550	2457	1137	305
	≥75	4198	3797	3075	2436	1153	397	65

Note: Restricted to modern prostheses.

Figure KP23 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Males by Age (Primary Diagnosis OA)



Male <55 vs Male ≥75

0 - 1Yr: HR=1.74 (95% CI 1.32, 2.30), p<0.001

1Yr - 3Yr: HR=2.33 (95% CI 1.82, 2.99), p<0.001

3Yr - 9Yr: HR=3.03 (95% CI 2.40, 3.82), p<0.001

9Yr - 10Yr: HR=3.56 (95% CI 1.99, 6.39), p<0.001

10Yr+: HR=10.60 (95% CI 5.58, 20.15), p<0.001

Male 55-64 vs Male ≥75

0 - 2Yr: HR=1.29 (95% CI 1.07, 1.56), p=0.007

2Yr - 10Yr: HR=1.99 (95% CI 1.65, 2.40), p<0.001

10Yr+: HR=6.91 (95% CI 3.68, 12.97), p<0.001

Male 65-74 vs Male ≥75

0 - 1Yr: HR=1.01 (95% CI 0.80, 1.28), p=0.924

1Yr - 8Yr: HR=1.30 (95% CI 1.09, 1.55), p=0.003

8Yr - 10Yr: HR=2.15 (95% CI 1.54, 2.99), p<0.001

10Yr+: HR=3.96 (95% CI 2.09, 7.52), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<55**	3186	2876	2261	1769	901	399	106
	55-64	9346	8464	6912	5546	3028	1382	364
	65-74	10281	9265	7474	5845	2893	1144	248
	≥75	5556	4897	3768	2755	1082	283	32

Note: Restricted to modern prostheses.

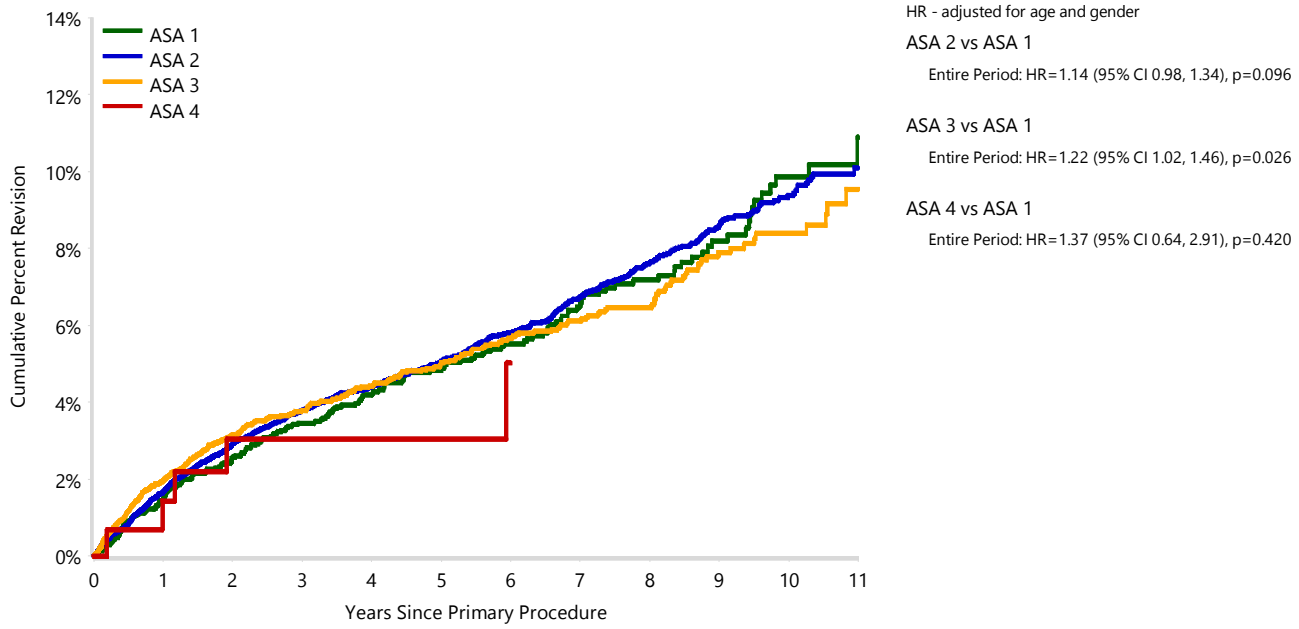
Primary Partial Knee Replacement

Table KP23 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
ASA 1	189	3384	1.5 (1.1, 1.9)	3.5 (2.9, 4.2)	4.8 (4.1, 5.7)	6.5 (5.5, 7.6)	9.9 (8.3, 11.7)	10.9 (8.8, 13.4)
ASA 2	1016	19772	1.7 (1.5, 1.9)	3.8 (3.5, 4.1)	5.1 (4.7, 5.4)	6.7 (6.3, 7.2)	9.4 (8.7, 10.1)	10.1 (9.3, 11.0)
ASA 3	423	9232	2.0 (1.7, 2.3)	3.8 (3.4, 4.2)	5.0 (4.5, 5.6)	6.1 (5.5, 6.8)	8.4 (7.4, 9.5)	9.6 (8.1, 11.2)
ASA 4	7	149	1.4 (0.4, 5.7)	3.1 (1.2, 8.0)	3.1 (1.2, 8.0)			
TOTAL	1635	32537						

Note: Excludes 17,944 procedures with unknown ASA score.
Restricted to modern prostheses.

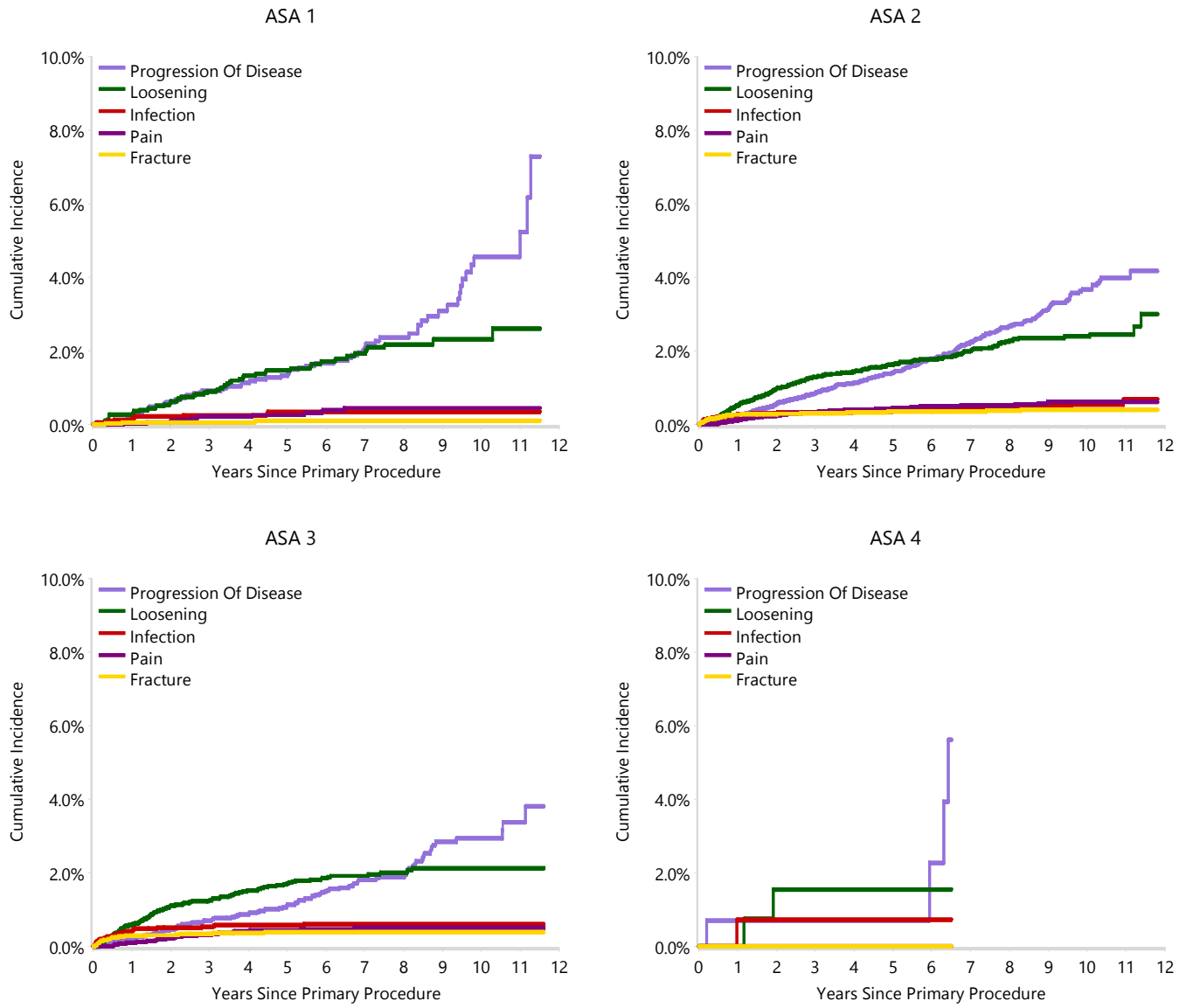
Figure KP24 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
ASA 1	3384	3076	2416	1758	1148	372	125
ASA 2	19772	17239	12814	8743	5319	1498	535
ASA 3	9232	7827	5453	3431	1948	518	207
ASA 4	149	132	100	62	35	9	3

Note: Excludes 17,944 procedures with unknown ASA score.
Restricted to modern prostheses.

Figure KP25 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)



Note: Excludes 17,944 procedures with unknown ASA score.
Restricted to modern prostheses.

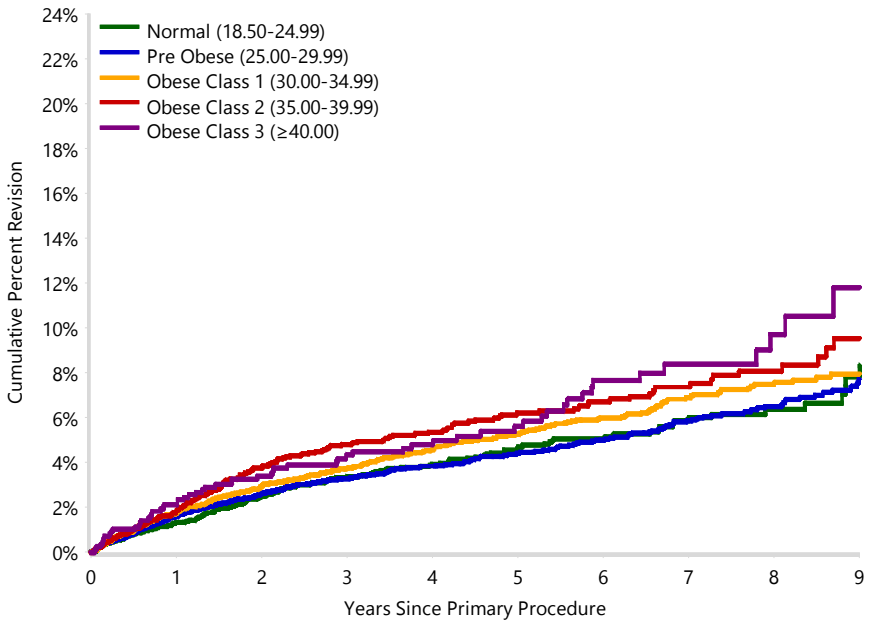
Primary Partial Knee Replacement

Table KP24 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight	3	45	2.2 (0.3, 14.7)	5.1 (1.3, 19.1)	5.1 (1.3, 19.1)	5.1 (1.3, 19.1)	
Normal	159	4092	1.3 (1.0, 1.7)	3.4 (2.8, 4.0)	4.6 (3.9, 5.5)	6.0 (5.0, 7.2)	8.3 (6.5, 10.6)
Pre Obese	467	11694	1.6 (1.4, 1.8)	3.3 (3.0, 3.7)	4.4 (4.0, 4.9)	5.9 (5.3, 6.5)	7.7 (6.8, 8.8)
Obese Class 1	410	8805	1.8 (1.5, 2.1)	3.8 (3.3, 4.2)	5.3 (4.8, 5.9)	6.9 (6.2, 7.7)	8.0 (7.1, 9.0)
Obese Class 2	163	3061	1.8 (1.4, 2.4)	4.8 (4.0, 5.7)	6.2 (5.3, 7.4)	7.4 (6.3, 8.7)	9.6 (7.8, 11.8)
Obese Class 3	62	1072	2.2 (1.4, 3.3)	4.4 (3.2, 5.9)	5.6 (4.2, 7.5)	8.4 (6.4, 11.1)	11.8 (8.3, 16.7)
TOTAL	1264	28769					

Note: Excludes 21,712 procedures with unknown BMI.
BMI has not been presented for patients aged ≤19 years.
Restricted to modern prostheses

Figure KP26 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)



HR - adjusted for age and gender

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=0.98 (95% CI 0.82, 1.18), p=0.832

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
Entire Period: HR=1.09 (95% CI 0.91, 1.31), p=0.362

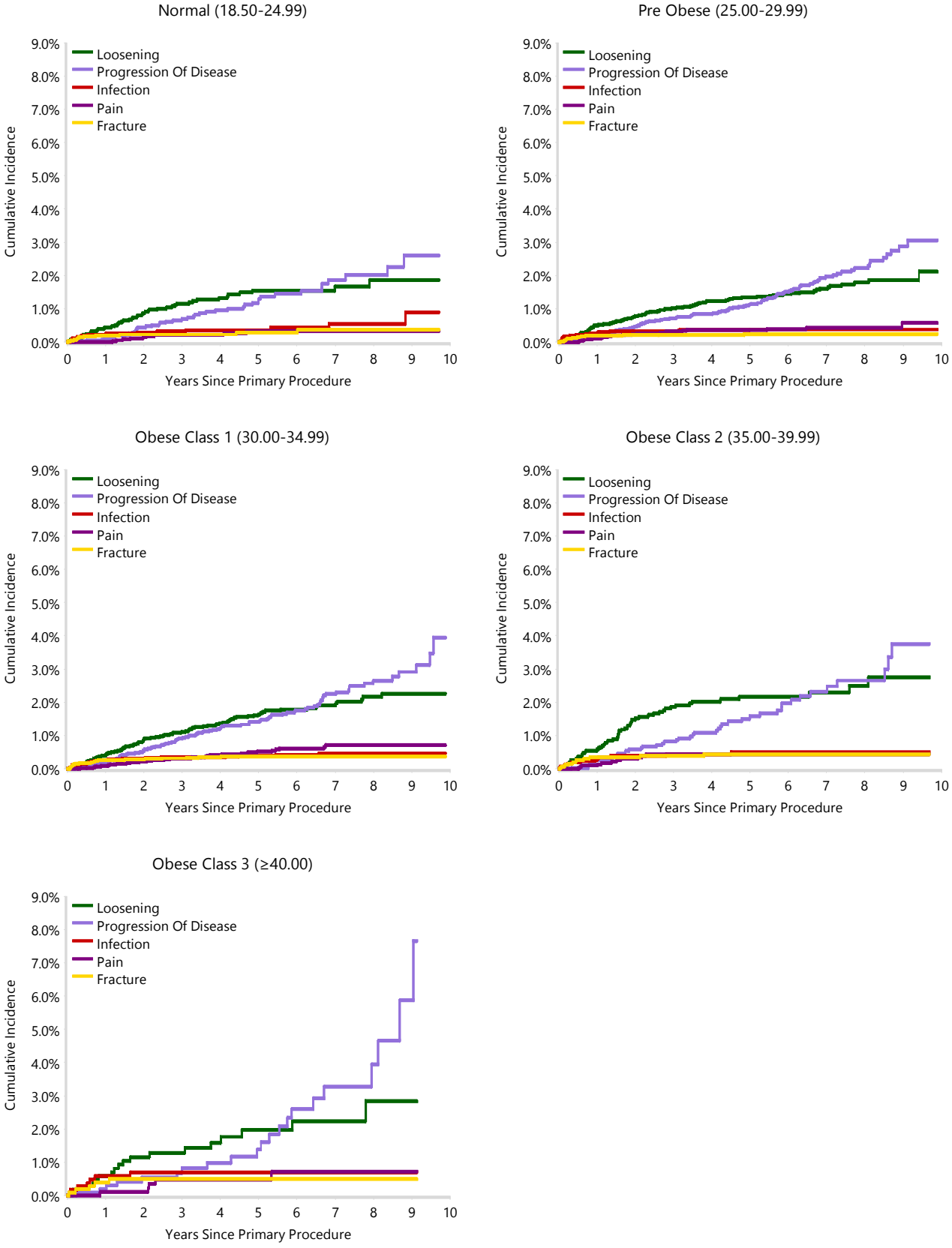
Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
Entire Period: HR=1.21 (95% CI 0.97, 1.51), p=0.092

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
Entire Period: HR=1.22 (95% CI 0.90, 1.64), p=0.196

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs
Normal	4092	3476	2929	2410	1900	1447	987	695	415	196
Pre Obese	11694	10024	8456	7027	5647	4371	3201	2217	1303	573
Obese Class 1	8805	7545	6422	5364	4284	3288	2432	1664	1013	452
Obese Class 2	3061	2620	2185	1835	1471	1148	834	583	358	159
Obese Class 3	1072	917	772	655	530	417	315	209	124	47

Note: Excludes 21,712 procedures with unknown BMI. BMI has not been presented for patients aged ≤19 years.
Restricted to modern prostheses.
Underweight BMI category excluded due to low numbers.

Figure KP27 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)



Note: Excludes 21,712 procedures with unknown BMI. BMI has not been presented for patients aged ≤19 years. Restricted to modern prostheses.

Primary Partial Knee Replacement

OUTCOME BY PROSTHESIS CHARACTERISTICS

Bearing Mobility

Fixed bearings are used in 51.1% of unicompartmental knee replacements, while in the remainder the bearing insert is mobile.

There are two prostheses using mobile bearings in 2024. Fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses (Table KP25 and Figure KP28).

Bearing Surface

XLPE is used for 26.1% of unicompartmental procedures. When compared to XLPE, procedures using non XLPE have a higher rate of revision (Table KP26 and Figure KP29).

Fixation

Cement fixation is used for 76.8% of unicompartmental knee replacements, cementless fixation for 21.6%, with hybrid fixation used rarely. In 2024, there are 2 prostheses used with cementless fixation. For the first 6 months, cemented fixation has a lower rate of revision, but after 6 months, cementless fixation has a lower rate of revision (Table KP27 and Figure KP30).

Surgeon Assistive Tools

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. Computer navigation and IDI are rarely used for unicompartmental knee replacement.

There are 7,743 robotically assisted unicompartmental knee replacement procedures undertaken for osteoarthritis recorded since 2015. In 2024, 53.4% of unicompartmental knee procedures use robotic assistance.

When adjusted for age, gender, ASA, BMI, surgeon volume and mobility, unicompartmental knee procedures using robotic assistance have a lower rate of revision compared to unicompartmental procedures using traditional instrumentation after 3.5 years (Table KP28 and Figure KP31).

The most common reasons for revision with and without robotic assistance are shown in Table KP29 and Figure KP32.

There are only two unicompartmental combinations that can be used both with and without robotic assistance. The results of these combinations are shown in Table KP30.

Position

There are 1,143 lateral unicompartmental knee procedures undertaken for osteoarthritis. For the first three months, the lateral unicompartmental knee has a higher rate of revision compared to medial unicompartmental knee replacement, but after 3 months, there is no difference (Table KP31 and Figure KP35). When lateral unicompartmental knee replacement is assessed for bearing mobility, fixed bearing prostheses have a lower rate of revision compared to mobile bearings (Table KP32 and Figure KP36).

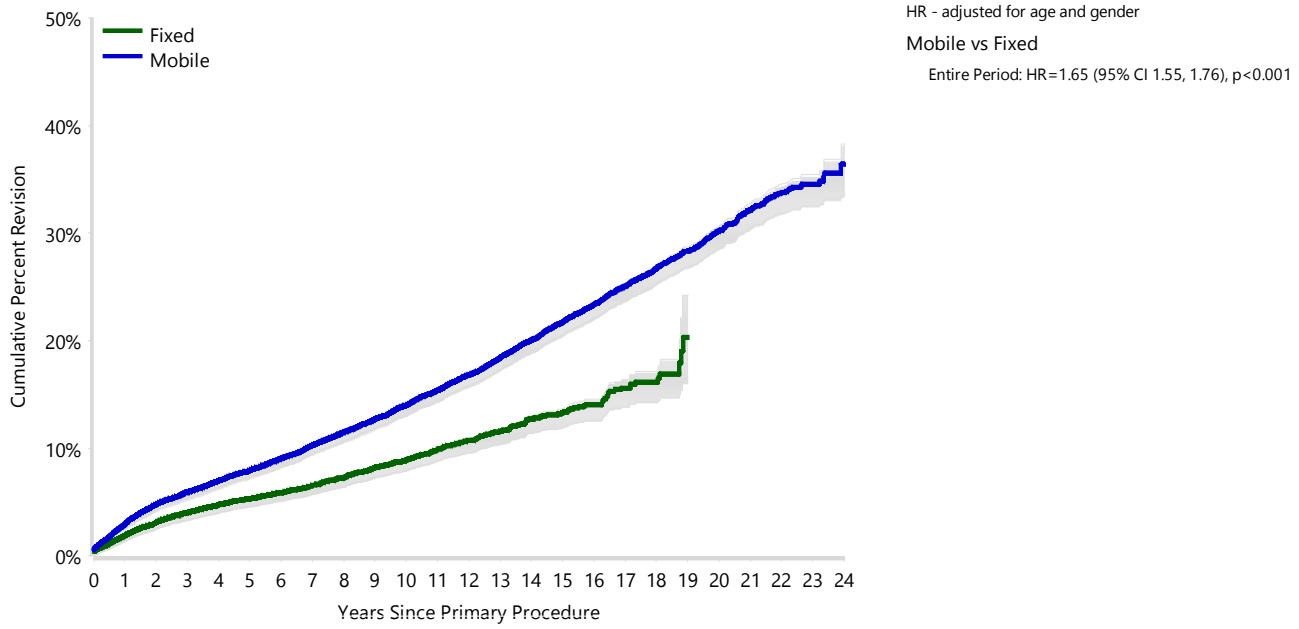
The most common reasons for revision of both lateral and medial unicompartmental knees are progression of disease and loosening (Table KP33 and Figure KP37).

Table KP25 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)

Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	1414	25783	1.4 (1.3, 1.6)	3.5 (3.3, 3.7)	4.8 (4.5, 5.1)	8.3 (7.8, 8.9)	12.7 (11.8, 13.6)	
Mobile	3791	24695	2.4 (2.2, 2.6)	5.3 (5.0, 5.5)	7.3 (6.9, 7.6)	13.2 (12.7, 13.7)	20.9 (20.2, 21.6)	29.3 (28.2, 30.3)
TOTAL	5205	50478						

Note: Excludes 3 primary unicompartmental knee procedures with unknown/missing mobility.
Restricted to modern prostheses.

Figure KP28 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	25783	22494	16748	11753	4721	1313	3
Mobile	24695	23258	20645	18049	10932	5481	1721

Note: Restricted to modern prostheses.

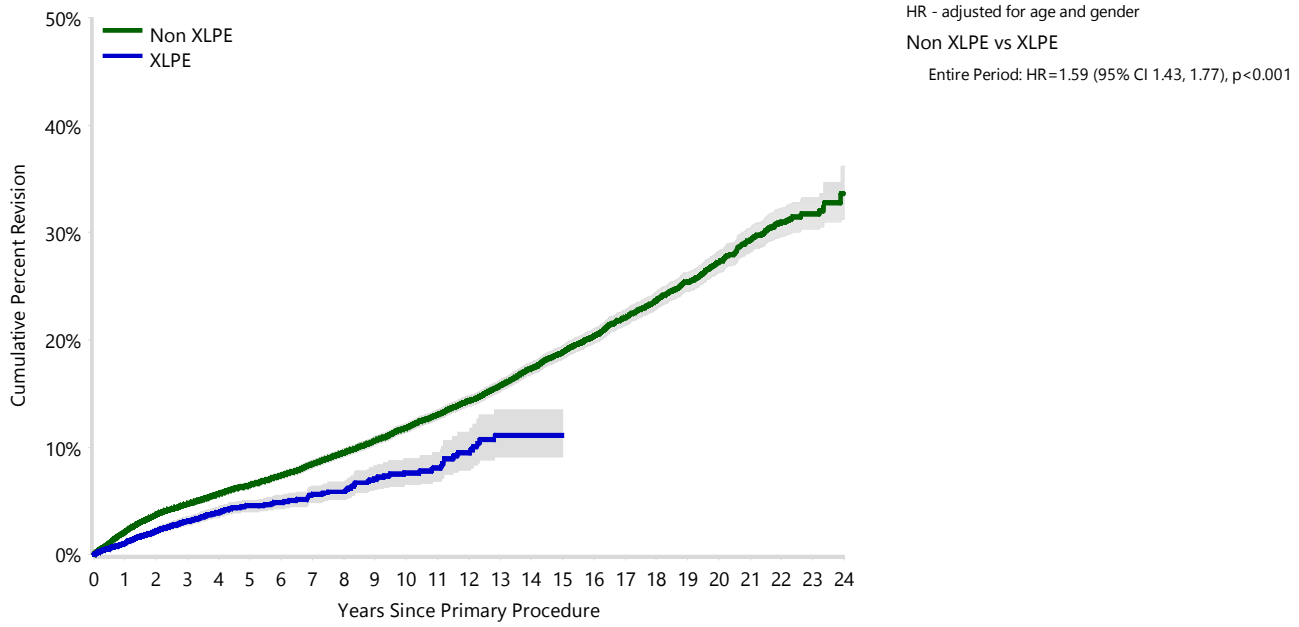
Primary Partial Knee Replacement

Table KP26 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	4660	36109	2.1 (2.0, 2.3)	4.7 (4.5, 5.0)	6.5 (6.2, 6.7)	11.8 (11.4, 12.2)	18.8 (18.2, 19.4)	27.2 (26.3, 28.2)
XLPE	384	12730	1.0 (0.9, 1.2)	3.1 (2.8, 3.5)	4.5 (4.0, 5.1)	7.6 (6.5, 8.9)	11.1 (9.1, 13.5)	
TOTAL	5044	48839						

Note: Excludes 1,642 primary unicompartmental knee procedures with unknown/missing polyethylene type.
Restricted to modern prostheses.

Figure KP29 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	36109	34231	30840	26743	14533	6563	1724
XLPE	12730	9998	5307	2119	559	63	0

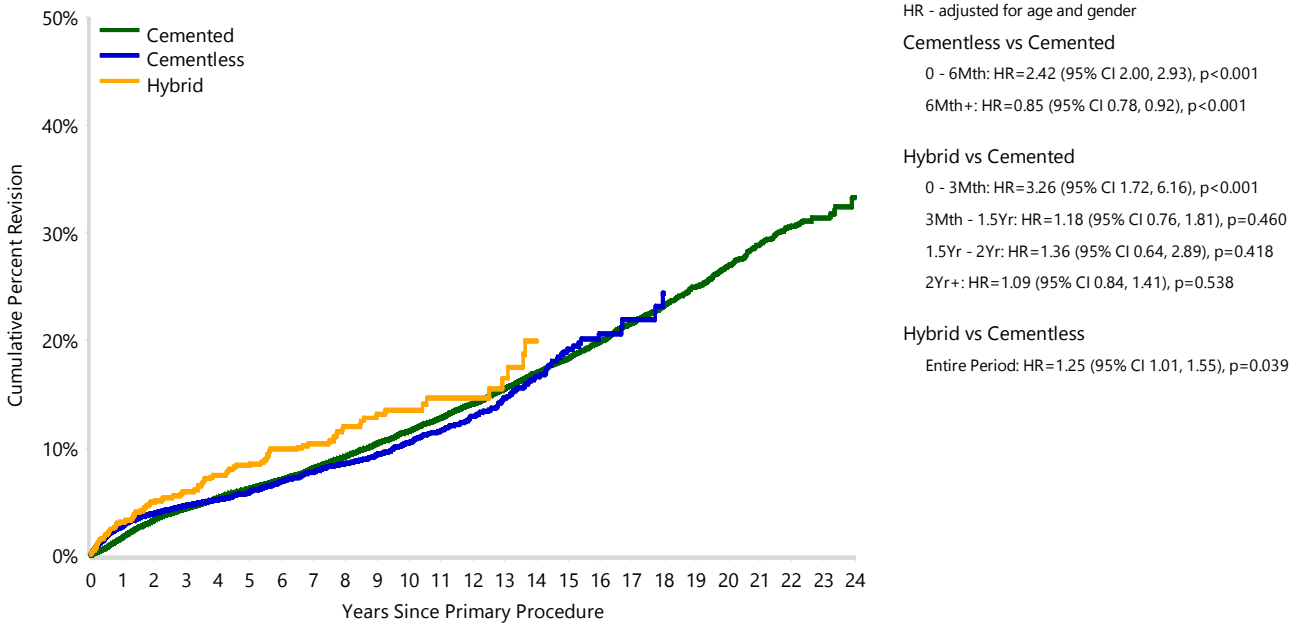
Note: Restricted to modern prostheses.

Table KP27 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	4267	38745	1.7 (1.5, 1.8)	4.3 (4.1, 4.5)	6.2 (5.9, 6.4)	11.5 (11.1, 11.9)	18.2 (17.6, 18.8)	26.7 (25.7, 27.8)
Cementless	844	10914	2.6 (2.3, 2.9)	4.5 (4.1, 4.9)	5.8 (5.4, 6.3)	10.4 (9.6, 11.2)	19.0 (17.1, 21.2)	
Hybrid	95	822	3.0 (2.0, 4.4)	5.8 (4.4, 7.7)	8.4 (6.6, 10.6)	13.3 (10.8, 16.4)		
TOTAL	5206	50481						

Note: Restricted to modern prostheses.

Figure KP30 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	38745	35137	28753	23101	13344	6446	1716
Cementless	10914	9864	7989	6130	2128	318	4
Hybrid	822	753	651	571	181	30	4

Note: Restricted to modern prostheses.

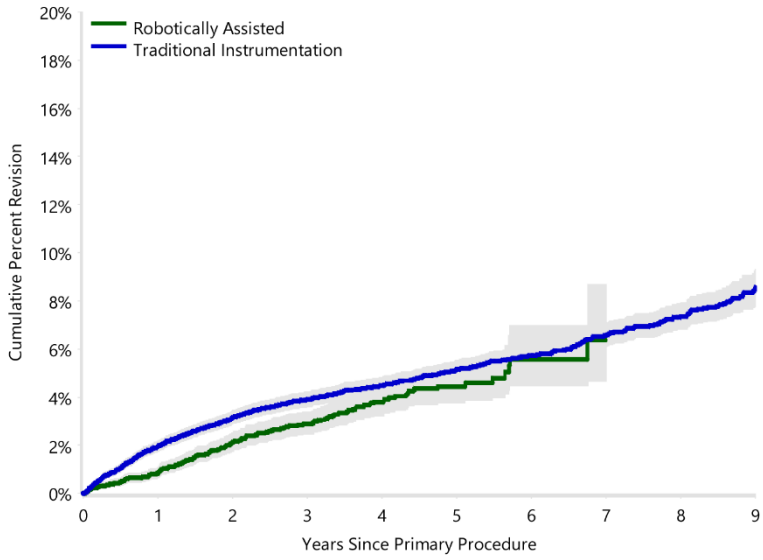
Primary Partial Knee Replacement

Table KP28 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	200	7743	0.9 (0.7, 1.1)	2.1 (1.8, 2.5)	3.1 (2.7, 3.6)	4.0 (3.5, 4.7)	4.7 (4.0, 5.5)	5.7 (4.6, 7.1)	6.5 (4.8, 8.6)
Traditional Instrumentation	955	18361	1.9 (1.7, 2.1)	3.1 (2.9, 3.4)	3.9 (3.6, 4.2)	4.5 (4.2, 4.8)	5.1 (4.8, 5.5)	5.7 (5.4, 6.1)	6.6 (6.1, 7.0)
TOTAL	1155	26104							

Note: Restricted to modern prostheses.

Figure KP31 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



HR - age, gender, BMI, ASA, surgeon volume and mobility

Robotically Assisted vs Traditional Instrumentation

0-1.5Yr: HR=1.10 (95% CI 0.88, 1.38), p=0.402

1.5-3.5Yr: HR=0.96 (95% CI 0.75, 1.24), p=0.781

3.5Yr+: HR=0.64 (95% CI 0.43, 0.95), p=0.029

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	7665	5828	4262	2903	1673	773	230	102
Traditional Instrumentation	17449	15556	13750	11971	10112	8253	6199	4280

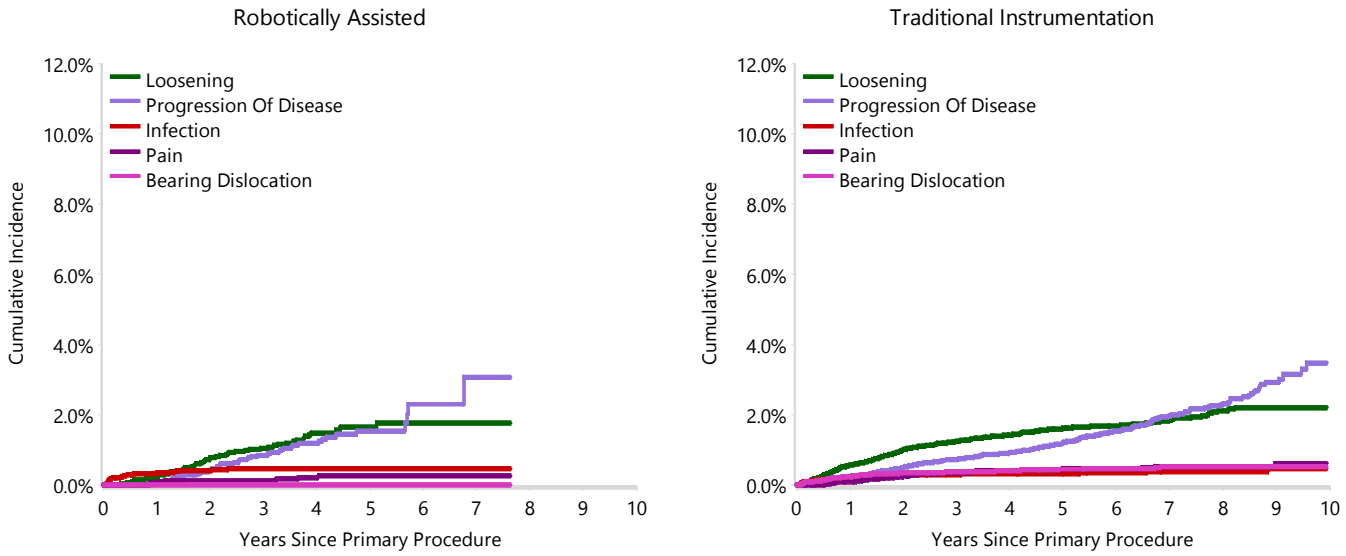
Note: Restricted to modern prostheses.
Excludes 2 procedures with unknown mobility.

Table KP29 Revision Diagnosis of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

Revision Diagnosis	Robotically Assisted			Traditional Instrumentation		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Loosening	66	0.9	34.9	261	1.5	29.4
Progression Of Disease	56	0.7	29.6	244	1.4	27.5
Bearing Dislocation				73	0.4	8.2
Pain	11	0.1	5.8	71	0.4	8.0
Fracture	6	0.1	3.2	64	0.4	7.2
Infection	31	0.4	16.4	58	0.3	6.5
Instability	4	0.1	2.1	35	0.2	3.9
Malalignment	3	0.0	1.6	21	0.1	2.4
Lysis	3	0.0	1.6	8	0.0	0.9
Prosthesis Dislocation				8	0.0	0.9
Incorrect Sizing				7	0.0	0.8
Patellofemoral Pain				5	0.0	0.6
Implant Breakage Tibial Insert	1	0.0	0.5	4	0.0	0.5
Wear Tibial Insert				4	0.0	0.5
Metal Related Pathology	1	0.0	0.5	3	0.0	0.3
Osteonecrosis	1	0.0	0.5	3	0.0	0.3
Synovitis				3	0.0	0.3
Arthrofibrosis	2	0.0	1.1	2	0.0	0.2
Implant Breakage Tibial	2	0.0	1.1	2	0.0	0.2
Patella Erosion				1	0.0	0.1
Other	2	0.0	1.1	10	0.1	1.1
Loosening	66	0.9	34.9	261	1.5	29.4
N Revision	**189**	**2.5**	**100.0**	**887**	**5.1**	**100.0**
N Primary	**7665**			**17449**		

Note: Restricted to modern prostheses.

Figure KP32 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



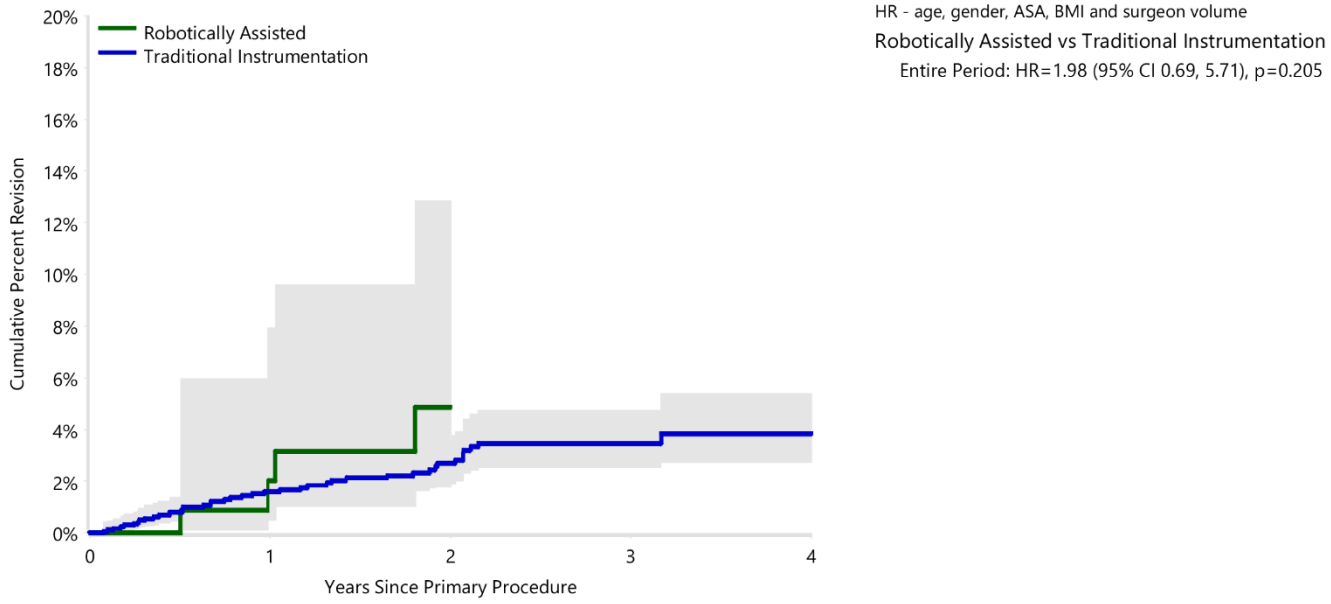
Note: Restricted to modern prostheses.

Table KP30 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Robotic Assistance	N Revised	N Total	1 Yr	2 Yrs	4 Yrs	6 Yrs	7 Yrs	8 Yrs
Journey Uni/ Journey Uni	Robotically Assisted	53	835	1.8 (1.1, 3.0)	3.9 (2.6, 5.6)	7.5 (5.6, 9.9)	10.3 (7.7, 13.7)	11.3 (8.3, 15.4)	
	Traditional Instrumentation	53	797	2.6 (1.7, 4.0)	4.0 (2.8, 5.7)	5.8 (4.3, 7.8)	7.2 (5.4, 9.4)	8.0 (6.1, 10.4)	8.0 (6.1, 10.4)
Persona/ Persona	Robotically Assisted	4	147	2.0 (0.5, 7.9)	4.8 (1.8, 12.7)				
	Traditional Instrumentation	44	1747	1.6 (1.1, 2.4)	2.8 (2.0, 3.9)	3.9 (2.8, 5.5)			
TOTAL		154	3526						

Note: Restricted to modern prostheses.

Figure KP33 Cumulative Percent Revision of Persona/Persona Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

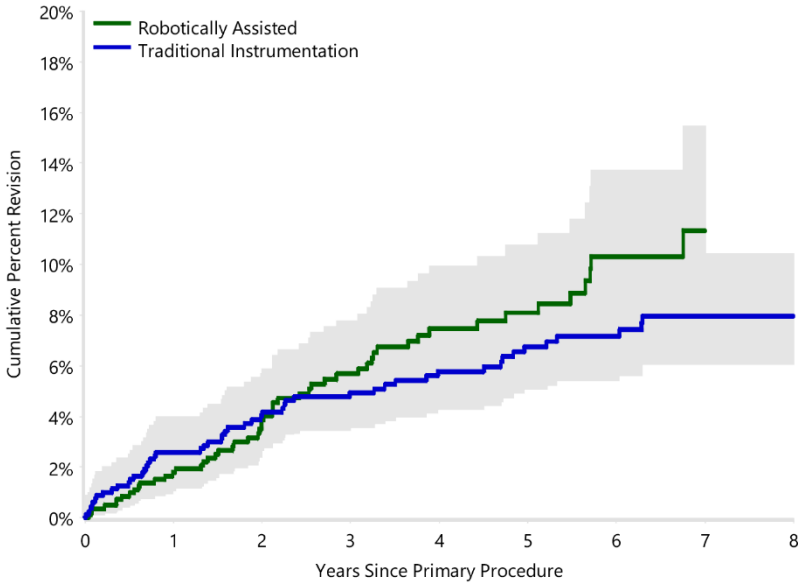


Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs
Robotically Assisted	146	85	52	37	1
Traditional Instrumentation	1732	1242	780	322	44

Note: Restricted to modern prostheses.

Primary Partial Knee Replacement

Figure KP34 Cumulative Percent Revision of Journey Uni/Journey Uni Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



HR - age, gender, ASA, BMI and surgeon volume
Robotically Assisted vs Traditional Instrumentation
0-9Mth: HR=0.55 (95% CI 0.25, 1.19), p=0.131
9+Mth: HR=1.67 (95% CI 1.03, 2.71), p=0.037

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	835	709	561	466	363	261	160	76	26	0
Traditional Instrumentation	797	716	646	591	530	470	371	243	136	36

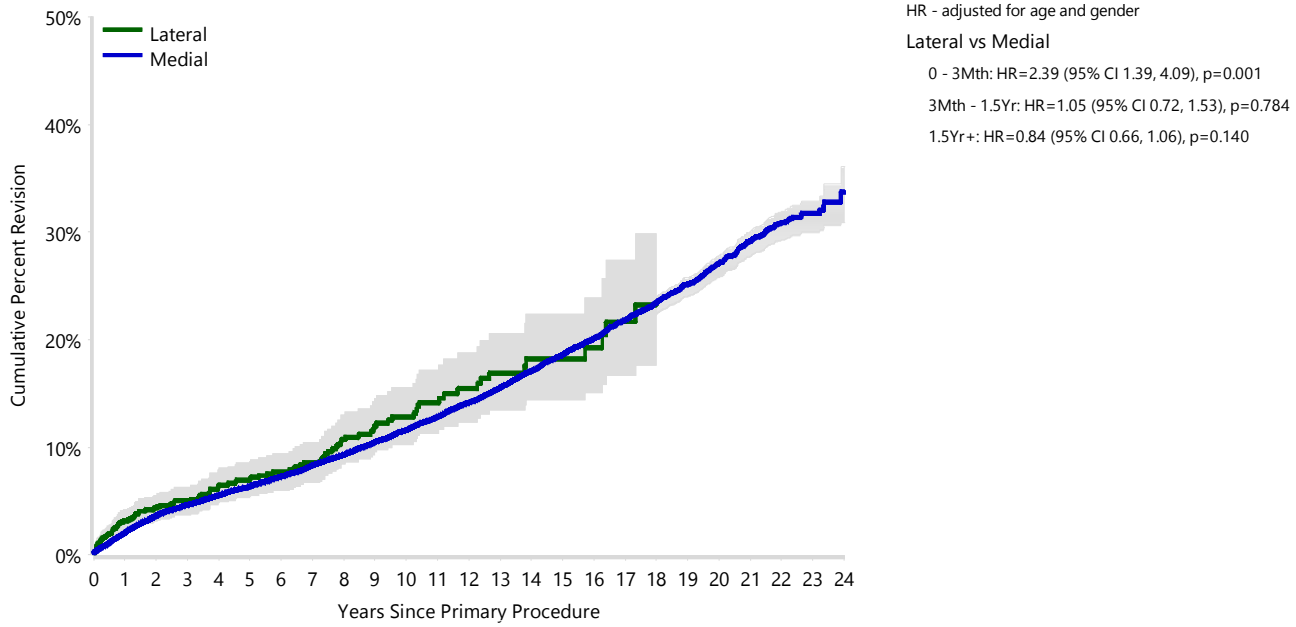
Note: Restricted to modern prostheses.

Table KP31 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)

Position	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Lateral	111	1143	3.0 (2.1, 4.2)	4.8 (3.7, 6.3)	6.9 (5.4, 8.7)	12.6 (10.2, 15.5)	18.0 (14.5, 22.4)	
Medial	5087	49078	1.9 (1.7, 2.0)	4.4 (4.2, 4.6)	6.1 (5.9, 6.3)	11.3 (10.9, 11.6)	18.2 (17.7, 18.8)	26.7 (25.7, 27.7)
TOTAL	5198	50221						

Note: Excludes 260 primary unicompartmental knee procedures with unknown/missing position.
Restricted to modern prostheses.

Figure KP35 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Lateral	1143	1021	824	637	279	95	30
Medial	49078	44516	36418	29092	15374	6699	1694

Note: Restricted to modern prostheses.

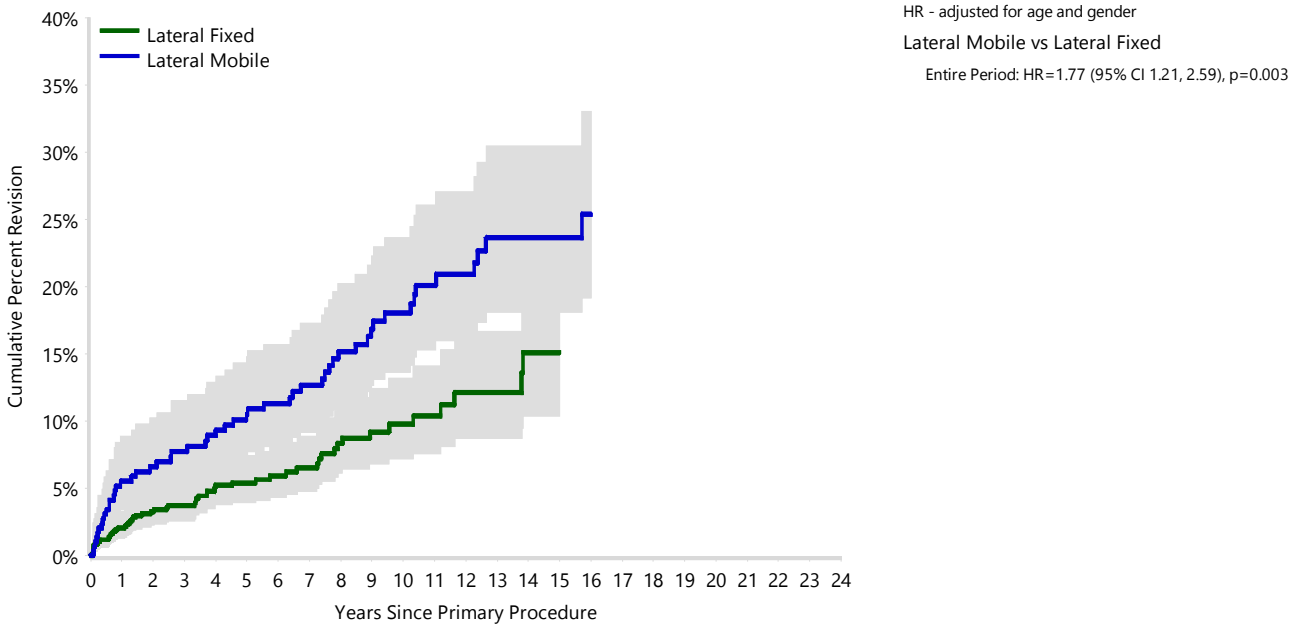
Primary Partial Knee Replacement

Table KP32 Cumulative Percent Revision of Lateral Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)

Position	Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Lateral	Fixed	58	849	2.1 (1.3, 3.3)	3.8 (2.6, 5.4)	5.4 (3.9, 7.4)	9.8 (7.2, 13.2)	15.1 (10.4, 21.7)
	Mobile	53	292	5.5 (3.4, 8.9)	7.8 (5.2, 11.6)	10.5 (7.4, 14.8)	18.1 (13.7, 23.7)	23.6 (18.1, 30.4)
TOTAL		111	1141					

Note: Excludes 263 primary unicompartmental knee procedures with unknown/missing position or mobility.
Restricted to modern prostheses.

Figure KP36 Cumulative Percent Revision of Lateral Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Lateral	Fixed	849	753	580	415	152	42	1
	Mobile	292	266	244	222	127	53	29

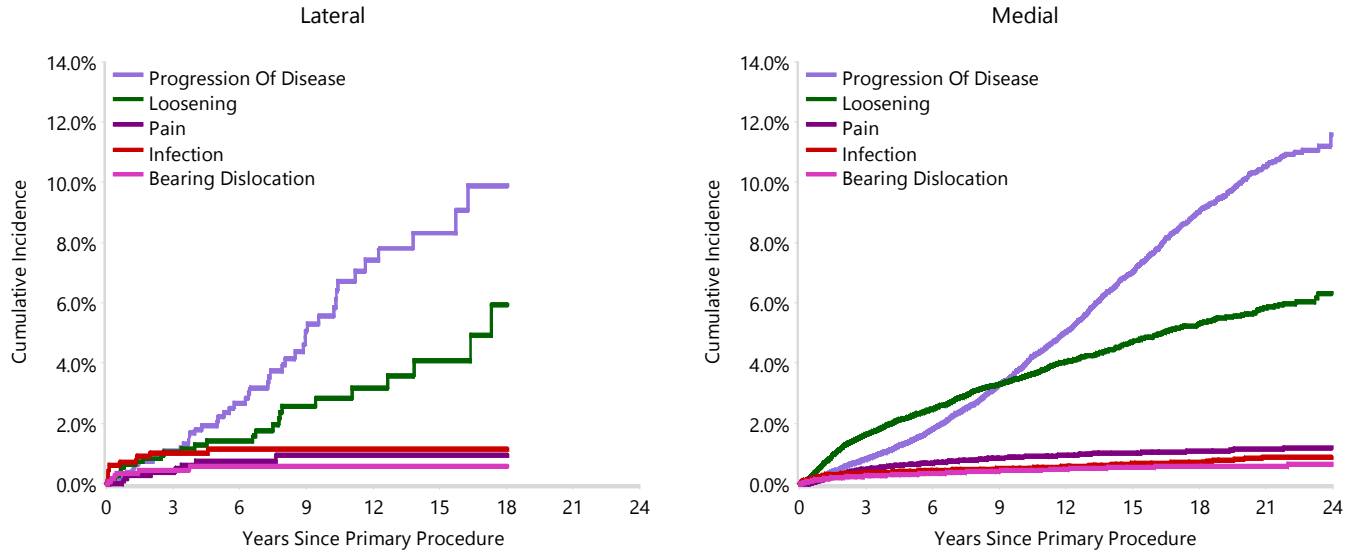
Note: Restricted to modern prostheses.

Table KP33 Reason for Revision of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)

Revision Diagnosis	Lateral			Medial		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Progression Of Disease	48	4.2	43.2	1947	4.0	38.3
Loosening	26	2.3	23.4	1544	3.1	30.4
Pain	8	0.7	7.2	363	0.7	7.1
Infection	12	1.0	10.8	250	0.5	4.9
Bearing Dislocation	6	0.5	5.4	194	0.4	3.8
Fracture	2	0.2	1.8	155	0.3	3.0
Instability	3	0.3	2.7	105	0.2	2.1
Lysis				97	0.2	1.9
Wear Tibial Insert	1	0.1	0.9	87	0.2	1.7
Malalignment	3	0.3	2.7	63	0.1	1.2
Other	2	0.2	1.8	282	0.6	5.5
N Revision	**111**	**9.7**	**100.0**	**5087**	**10.4**	**100.0**
N Primary	**1143**			**49078**		

Note: Restricted to modern prostheses.

Figure KP37 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Primary Total Knee Replacement

Class of Total Knee Replacement

Total knee replacement is defined as a replacement of the entire femorotibial articulation using a single femoral and a single tibial prosthesis. This may or may not be combined with a patella resurfacing replacement.

In this report, the outcome of total knee replacement based on specific patient, prosthesis and technique factors is shown. In addition, the outcome for different types of total knee prostheses is presented.

Most total knee systems have a variety of individual prostheses within the system that vary based on distinguishing prosthesis characteristics. Where possible, knee systems are subdivided into the specific prosthesis types. The initial characteristic used is fixation. Further subdivision is based on stability and bearing mobility. However, subdivision is not uniformly applied to all knee systems and is dependent on the number of procedures reported for each system.

DEMOGRAPHICS

There are 1,026,935 primary total knee replacement procedures recorded. This is an additional 70,760 procedures compared to the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

In 2024, there is an increase of 0.3% in primary total knee replacement procedures when compared to 2023. As a proportion of all knee replacement procedures, primary total knee replacement increased to 85.2% in 2024.

Osteoarthritis is the most common diagnosis for primary total knee replacement.

Primary total knee replacement remains more common in females (55.8%). This proportion has shown little change from 2003. The mean age of patients is 68.5 years (Table KT1 and Figure KT1).

Figure KT1 Primary Total Knee Replacement by Gender

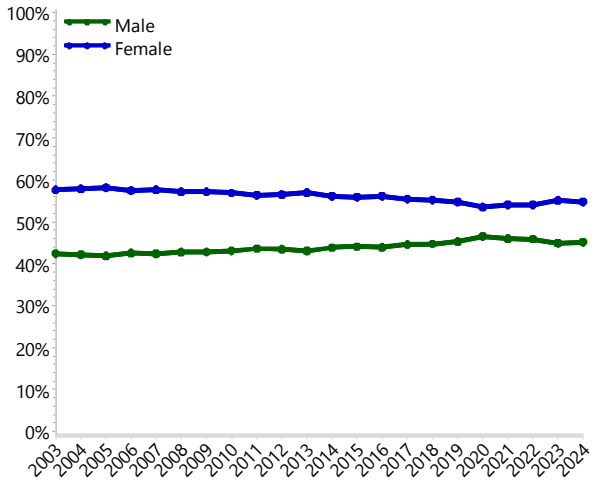


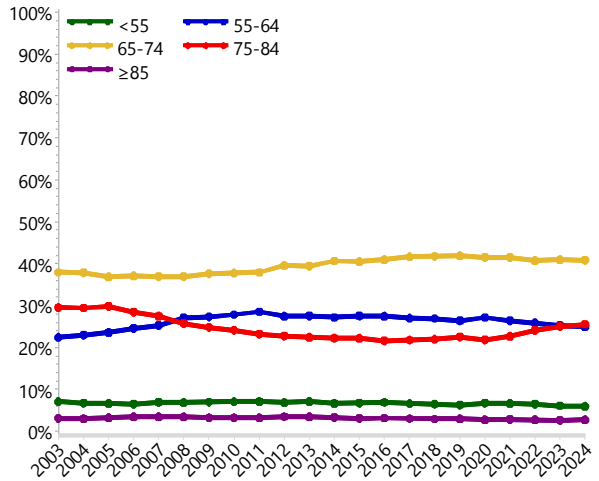
Table KT1 Age and Gender of Primary Total Knee Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	453947	44.2%	8	101	68	68.1	9.0
Female	572988	55.8%	8	107	69	68.8	9.3
TOTAL	**1026935**	**100.0%**	**8**	**107**	**69**	**68.5**	**9.2**

There are 1,026,935 primary total knee replacement procedures.
This is an increase of 70,760 procedures compared to the last report.

There has been little change in the proportion of patients in different age groups undergoing primary total knee replacement. The proportion of patients aged <55 years remains small (Figure KT2).

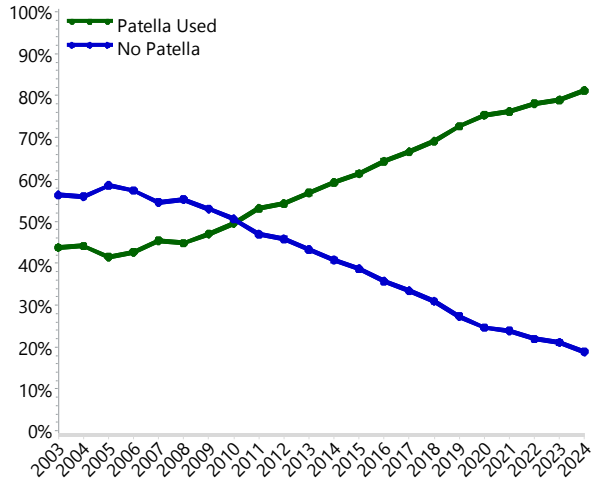
Figure KT2 Primary Total Knee Replacement by Age



Detailed demographic information on primary total knee replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

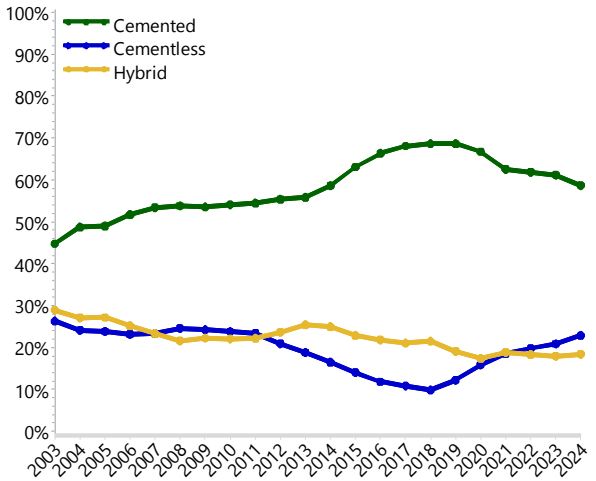
Patella resurfacing at the time of the primary total knee replacement has increased to 81.2% in 2024 (Figure KT3).

Figure KT3 Primary Total Knee Replacement by Patella Component Usage



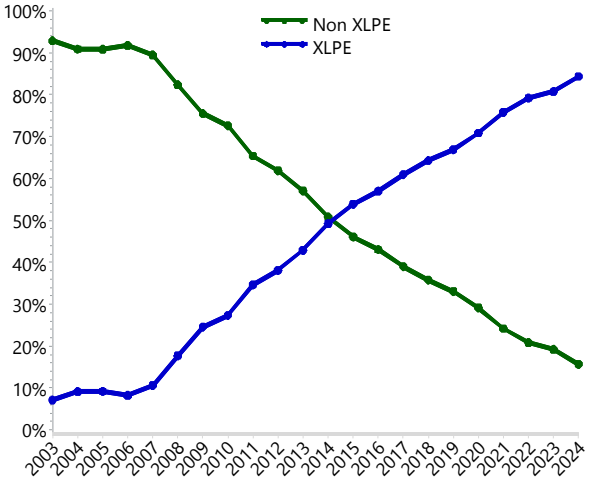
The most common method of fixation is cemented fixation for both femoral and tibial components. This accounts for 58.7% of procedures in 2024. The use of cementless fixation decreased to 9.8% of all primary total knee replacement in 2018 but has increased to 22.9% in 2024 (Figure KT4). Hybrid fixation for primary total knee replacement (femoral cementless) was used in 18.4% of procedures in 2024.

Figure KT4 Primary Total Knee Replacement by Fixation



The use of cross-linked polyethylene (XLPE) in primary total knee replacement increased to 84.3% in 2024 (Figure KT5).

Figure KT5 Primary Total Knee Replacement by Polyethylene Type



Primary Total Knee Replacement

Cruciate retaining (CR) and posterior stabilised (PS) prostheses are reported separately for the majority of total knee prostheses. This reporting is based on the design of the femoral component. In 2024, the most commonly used femoral prostheses are the Triathlon CR, Persona CR, and GMK Sphere Primary (Table KT2).

The most used cemented and cementless femoral components are listed in Table KT3 and Table KT4, respectively. The most used tibial components in 2023 are the Triathlon, Persona and Attune (Table KT5). The most used tibial prostheses are also reported based on fixation in Table KT6 and Table KT7.

Table KT2 10 Most Used Femoral Prostheses in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3183	LCS CR	16442	Triathlon CR	17076	Triathlon CR	22600	Triathlon CR	23314	Triathlon CR
2846	Duracon	11613	Persona CR	13076	Persona CR	16669	Persona CR	16960	Persona CR
2150	Nexgen CR	4213	Attune CR	4373	Attune CR	5201	Attune CR	5294	GMK Sphere Primary
1419	PFC Sigma CR	3677	GMK Sphere Primary	3779	GMK Sphere Primary	4960	GMK Sphere Primary	5205	Attune CR
1354	Scorpio CR	2240	Attune PS	2055	Attune PS	2365	Attune PS	2180	Attune PS
1058	Genesis II CR	1690	Nexgen CR Flex	1520	Apex Knee CR	1697	Apex Knee CR	1715	Apex Knee CR
1002	Natural Knee II	1628	Apex Knee CR	1250	Legion Oxinium CR	1464	Legion Oxinium CR	1708	Journey II Oxinium
902	Nexgen LPS	1601	Legion Oxinium CR	1120	Legion Oxinium PS	1327	Evolution	1320	Legion Oxinium CR
883	Profix	1228	Legion Oxinium PS	1080	Columbus	1249	Journey II Oxinium	1127	Legion Oxinium PS
751	Scorpio PS	1116	Legion CR	1061	Evolution	1196	Legion Oxinium PS	1067	Columbus
10 Most Used									
15548	(10) 71.5%	45448	(10) 76.1%	46390	(10) 81.1%	58728	(10) 84.3%	59890	(10) 85.7%
Remainder									
6185	(47) 28.5%	14282	(66) 23.9%	10805	(65) 18.9%	10954	(60) 15.7%	10021	(54) 14.3%
TOTAL									
21733	(57) 100.0%	59730	(76) 100.0%	57195	(75) 100.0%	69682	(70) 100.0%	69911	(64) 100.0%

Table KT3 10 Most Used Cemented Femoral Prostheses in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1222	Duracon	7177	Triathlon CR	7168	Triathlon CR	9538	Triathlon CR	8893	Triathlon CR
942	LCS CR	6373	Persona CR	6738	Persona CR	8349	Persona CR	8263	Persona CR
827	Nexgen LPS	3677	GMK Sphere Primary	3779	GMK Sphere Primary	4960	GMK Sphere Primary	5113	GMK Sphere Primary
765	Nexgen CR	2322	Attune CR	2304	Attune CR	2508	Attune CR	2551	Attune CR
693	Nexgen LPS Flex	2137	Attune PS	1926	Attune PS	2220	Attune PS	2030	Attune PS
645	Genesis II CR	1601	Legion Oxinium CR	1250	Legion Oxinium CR	1464	Legion Oxinium CR	1708	Journey II Oxinium
515	PFC Sigma PS	1228	Legion Oxinium PS	1120	Legion Oxinium PS	1306	Evolution	1320	Legion Oxinium CR
497	Profix	1105	Columbus	1080	Columbus	1249	Journey II Oxinium	1127	Legion Oxinium PS
479	Genesis II Oxinium CR	1010	Evolution	1020	Evolution	1196	Legion Oxinium PS	1067	Columbus
419	Genesis II PS	886	Genesis II Oxinium PS	868	Apex Knee CR	1084	Columbus	985	Apex Knee CR
10 Most Used									
7004	(10) 71.6%	27516	(10) 72.2%	27253	(10) 75.9%	33874	(10) 78.9%	33057	(10) 79.8%
Remainder									
2778	(38) 28.4%	10618	(64) 27.8%	8641	(60) 24.1%	9053	(57) 21.1%	8353	(52) 20.2%
TOTAL									
9782	(48) 100.0%	38134	(74) 100.0%	35894	(70) 100.0%	42927	(67) 100.0%	41410	(62) 100.0%

Table KT4 10 Most Used Cementless Femoral Prostheses in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
2241	LCS CR	9265	Triathlon CR	9908	Triathlon CR	13062	Triathlon CR	14421	Triathlon CR
1624	Duracon	5240	Persona CR	6338	Persona CR	8320	Persona CR	8697	Persona CR
1385	Nexgen CR	1891	Attune CR	2069	Attune CR	2693	Attune CR	2654	Attune CR
1075	PFC Sigma CR	808	Nexgen CR Flex	652	Apex Knee CR	774	Apex Knee CR	730	Apex Knee CR
1059	Scorpio CR	786	Apex Knee CR	499	Legion CR	503	Legion CR	443	Legion CR
746	Natural Knee II	587	LCS CR	294	GMK Primary	320	GMK Primary	311	GMK Primary
633	Active Knee	514	Legion CR	280	Nexgen CR Flex	181	ACS	240	Anatomic
425	Maxim	393	Score	202	Genesis II CR	176	Triathlon PS	181	GMK Sphere Primary
413	Genesis II CR	291	GMK Primary	184	Triathlon PS	168	Anatomic	160	Triathlon PS
386	Profix	246	Genesis II CR	142	BalanSys	145	Attune PS	150	Attune PS
10 Most Used									
9987	(10) 83.6%	20021	(10) 92.7%	20568	(10) 96.6%	26342	(10) 98.5%	27987	(10) 98.2%
Remainder									
1964	(28) 16.4%	1575	(24) 7.3%	733	(26) 3.4%	413	(18) 1.5%	514	(12) 1.8%
TOTAL									
11951	(38) 100.0%	21596	(34) 100.0%	21301	(36) 100.0%	26755	(28) 100.0%	28501	(22) 100.0%

Table KT5 10 Most Used Tibial Components in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3755	Nexgen	17141	Triathlon	17821	Triathlon	23466	Triathlon	24075	Triathlon
2843	Duracon	12194	Persona	13826	Persona	17701	Persona	17979	Persona
2039	Genesis II	6964	Genesis II	6516	Attune	7640	Attune	7476	Attune
1364	MBT	6503	Attune	5254	Genesis II	5654	Genesis II	5010	GMK Primary
1362	LCS	3519	GMK Primary	3642	GMK Primary	4691	GMK Primary	4875	Genesis II
1360	Series 7000	2363	Apex Knee	2109	Apex Knee	2499	Apex Knee	2389	Apex Knee
1168	PFC Sigma	2218	Nexgen	1080	Columbus	1298	Evolution	1707	Journey
1060	MBT Duofix	1105	Columbus	1029	Evolution	1249	Journey	1067	Columbus
1002	Natural Knee II	1017	Evolution	793	Journey	1084	Columbus	1015	Evolution
894	Profix	937	MBT	749	Nexgen	651	SAIPH	709	SAIPH
10 Most Used									
16847	(10) 77.5%	53961	(10) 90.3%	52819	(10) 92.3%	65933	(10) 94.6%	66302	(10) 94.8%
Remainder									
4886	(38) 22.5%	5769	(48) 9.7%	4376	(45) 7.7%	3749	(45) 5.4%	3609	(38) 5.2%
TOTAL									
21733	(48) 100.0%	59730	(58) 100.0%	57195	(55) 100.0%	69682	(55) 100.0%	69911	(48) 100.0%

Primary Total Knee Replacement

Table KT6 10 Most Used Cemented Tibial Components in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
3010	Nexgen	10724	Triathlon	11151	Persona	14288	Persona	14799	Persona
2348	Duracon	10023	Persona	10829	Triathlon	13969	Triathlon	13000	Triathlon
1992	Genesis II	6962	Genesis II	5253	Genesis II	5663	Attune	5386	Attune
1168	PFC Sigma	4544	Attune	4642	Attune	5653	Genesis II	4875	Genesis II
1067	MBT	3324	GMK Primary	3426	GMK Primary	4458	GMK Primary	4798	GMK Primary
1033	LCS	2339	Apex Knee	2061	Apex Knee	2492	Apex Knee	2388	Apex Knee
1007	Series 7000	2088	Nexgen	1080	Columbus	1298	Evolution	1707	Journey
719	Profix	1105	Columbus	1029	Evolution	1249	Journey	1067	Columbus
587	AGC	1017	Evolution	793	Journey	1084	Columbus	1015	Evolution
478	Natural Knee II	789	MBT	673	Nexgen	651	SAIPH	709	SAIPH
10 Most Used									
13409	(10) 84.9%	42915	(10) 90.3%	40937	(10) 91.3%	50805	(10) 93.7%	49744	(10) 93.7%
Remainder									
2382	(31) 15.1%	4603	(42) 9.7%	3915	(42) 8.7%	3440	(41) 6.3%	3359	(37) 6.3%
TOTAL									
15791	(41) 100.0%	47518	(52) 100.0%	44852	(52) 100.0%	54245	(51) 100.0%	53103	(47) 100.0%

Table KT7 10 Most Used Cementless Tibial Components in Primary Total Knee Replacement

2003		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
1060	MBT Duofix	6417	Triathlon	6992	Triathlon	9497	Triathlon	11075	Triathlon
745	Nexgen	2171	Persona	2675	Persona	3413	Persona	3180	Persona
524	Natural Knee II	1959	Attune	1874	Attune	1977	Attune	2090	Attune
495	Duracon	362	Nexgen TM CR	216	GMK Primary	233	GMK Primary	212	GMK Primary
487	Active Knee	296	Score	125	Nexgen TM CR	129	ACS Fixed	97	ACS Fixed
353	Series 7000	195	GMK Primary	93	Legion	91	Legion	89	Legion
329	LCS	148	MBT	90	Score	72	Score	62	Score
305	RBK	130	Nexgen	78	ACS Fixed	8	Nexgen TM CR	1	Apex Knee
297	MBT	98	Legion	76	Nexgen	7	Apex Knee	1	LCS
242	Profix Mobile	90	RBK	48	Apex Knee	3	LCS	1	Mutars
10 Most Used									
4837	(10) 81.4%	11866	(10) 97.2%	12267	(10) 99.4%	15430	(10) 100.0%	16808	(10) 100.0%
Remainder									
1105	(18) 18.6%	346	(14) 2.8%	76	(10) 0.6%	7	(7) 0.0%	0	(0) 0%
TOTAL									
5942	(28) 100.0%	12212	(24) 100.0%	12343	(20) 100.0%	15437	(17) 100.0%	16808	(10) 100.0%

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

Usage and availability of knee prostheses change with time. In order to keep data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified. This has resulted in 305,874 (29.7%) procedures being excluded from the analysis for this year's Annual Report. The most common primary diagnosis for total knee replacement is osteoarthritis. Comparisons of revision rates for other primary diagnoses compared to osteoarthritis are shown in Table KT8 and Figure KT6.

There are variations in the rate of revision when comparing osteoarthritis to other primary diagnoses.

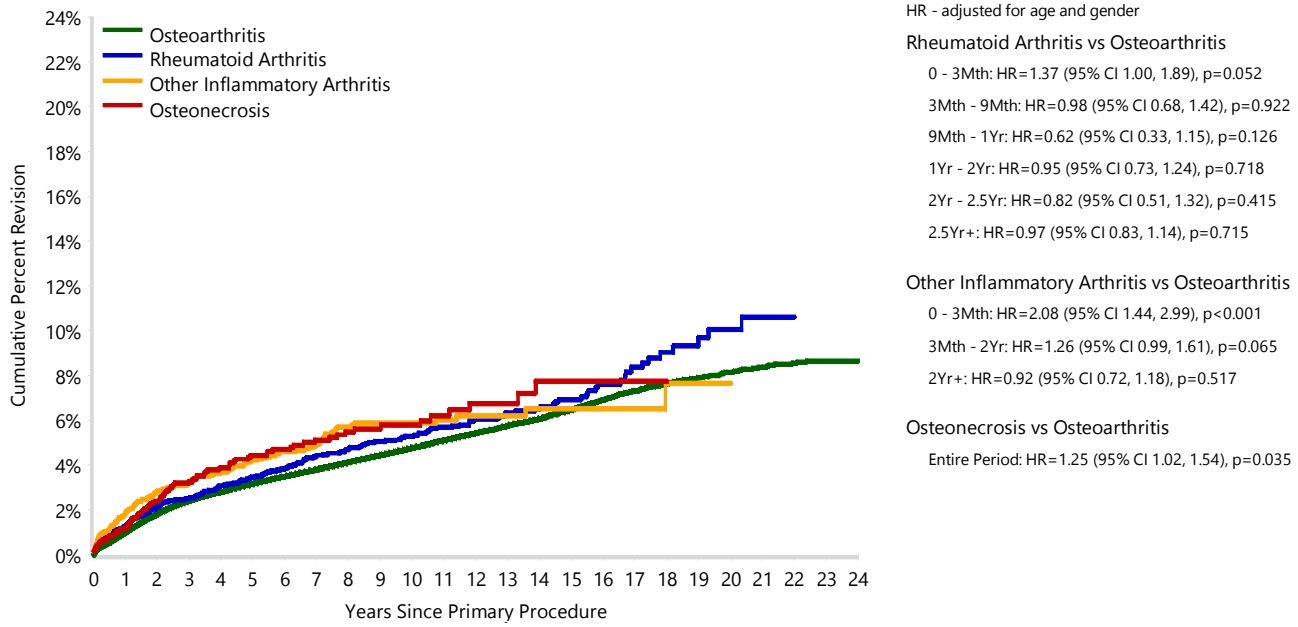
Detailed information on those prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Table KT8 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	23890	706349	1.0 (1.0, 1.0)	2.4 (2.3, 2.4)	3.1 (3.1, 3.2)	4.7 (4.6, 4.7)	6.3 (6.2, 6.5)	8.0 (7.8, 8.2)
Rheumatoid Arthritis	301	6957	1.1 (0.9, 1.4)	2.4 (2.1, 2.8)	3.3 (2.9, 3.8)	5.2 (4.6, 5.8)	6.8 (5.9, 7.8)	9.9 (8.2, 12.0)
Other Inflammatory Arthritis	158	3747	1.8 (1.4, 2.3)	3.1 (2.6, 3.7)	4.1 (3.5, 4.9)	5.7 (4.8, 6.7)	6.4 (5.3, 7.7)	7.5 (5.3, 10.5)
Osteonecrosis	90	2004	1.1 (0.7, 1.7)	3.1 (2.4, 4.0)	4.3 (3.4, 5.4)	5.6 (4.5, 7.0)	7.6 (5.8, 9.9)	
Other (4)	268	2004	4.6 (3.7, 5.6)	9.6 (8.3, 11.2)	13.6 (11.9, 15.5)	21.3 (18.7, 24.2)	30.5 (26.3, 35.3)	
TOTAL	24707	721061						

Note: Restricted to modern prostheses. Only primary diagnoses with >1,500 procedures have been listed.

Figure KT6 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis



HR - adjusted for age and gender

Rheumatoid Arthritis vs Osteoarthritis

- 0 - 3Mth: HR=1.37 (95% CI 1.00, 1.89), p=0.052
- 3Mth - 9Mth: HR=0.98 (95% CI 0.68, 1.42), p=0.922
- 9Mth - 1Yr: HR=0.62 (95% CI 0.33, 1.15), p=0.126
- 1Yr - 2Yr: HR=0.95 (95% CI 0.73, 1.24), p=0.718
- 2Yr - 2.5Yr: HR=0.82 (95% CI 0.51, 1.32), p=0.415
- 2.5Yr+: HR=0.97 (95% CI 0.83, 1.14), p=0.715

Other Inflammatory Arthritis vs Osteoarthritis

- 0 - 3Mth: HR=2.08 (95% CI 1.44, 2.99), p<0.001
- 3Mth - 2Yr: HR=1.26 (95% CI 0.99, 1.61), p=0.065
- 2Yr+: HR=0.92 (95% CI 0.72, 1.18), p=0.517

Osteonecrosis vs Osteoarthritis

- Entire Period: HR=1.25 (95% CI 1.02, 1.54), p=0.035

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	706349	627600	487721	371992	150981	40301	6544
Rheumatoid Arthritis	6957	6357	5264	4303	2091	770	182
Other Inflammatory Arthritis	3747	3345	2628	2014	749	208	47
Osteonecrosis	2004	1837	1479	1146	481	139	23

Note: Restricted to modern prostheses. Only primary diagnoses with >1,500 procedures have been listed; Restricted to modern prostheses.

Primary Total Knee Replacement

PROSTHESIS TYPES

Overall, there are 205 femoral and tibial prosthesis combinations that meet the definition of a modern prosthesis in primary total knee replacement.

The cumulative percent revision of the 84 combinations with >400 procedures by fixation are listed in Table KT9 to Table KT11. Although the listed combinations are a small proportion of all possible combinations, they represent 98.9% of all primary total knee replacement procedures. The 'other' group is the combined outcome of the remaining 121 prosthesis combinations with ≤400 procedures per combination.

There are 47 cemented femoral and tibial prosthesis combinations with >400 procedures (Table KT9).

There are 17 cementless femoral and tibial prosthesis combinations with >400 procedures (Table KT10).

There are 20 combinations of primary total knee replacement using hybrid fixation with >400 procedures (Table KT11).

Table KT9 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	29	870	1.7 (1.0, 2.8)	2.7 (1.8, 4.1)	3.3 (2.3, 4.8)	4.0 (2.7, 5.7)		
	ACS Mobile	54	1720	1.1 (0.7, 1.8)	2.1 (1.5, 3.0)	3.3 (2.5, 4.4)	4.2 (3.2, 5.5)		
Active Knee	Active Knee	156	4001	0.8 (0.6, 1.2)	2.6 (2.1, 3.1)	3.5 (2.9, 4.2)	5.2 (4.4, 6.2)	6.3 (5.0, 7.9)	
Anatomic	Anatomic	62	1762	1.3 (0.9, 2.0)	3.4 (2.6, 4.4)	4.1 (3.2, 5.3)			
Apex Knee CR	Apex Knee	117	7714	0.6 (0.4, 0.8)	1.3 (1.1, 1.7)	1.9 (1.6, 2.3)	2.6 (2.0, 3.4)		
Apex Knee PS	Apex Knee	229	7632	0.8 (0.6, 1.0)	2.2 (1.9, 2.6)	3.1 (2.7, 3.6)	5.0 (4.3, 5.9)		
Attune CR	Attune	692	27734	0.9 (0.8, 1.0)	2.1 (1.9, 2.3)	2.7 (2.5, 2.9)	3.5 (3.3, 3.9)		
Attune PS	Attune	383	15990	0.8 (0.7, 1.0)	2.0 (1.8, 2.3)	2.6 (2.3, 2.9)	4.7 (4.0, 5.4)		
BalanSys	BalanSys	82	2550	0.6 (0.3, 1.0)	1.7 (1.3, 2.4)	2.2 (1.7, 2.9)	3.8 (3.0, 4.8)	4.9 (3.8, 6.4)	
Columbus	Columbus	180	7711	1.0 (0.8, 1.3)	2.2 (1.9, 2.6)	3.1 (2.6, 3.6)	4.4 (3.4, 5.8)	4.4 (3.4, 5.8)	
E.Motion	E.Motion	33	626	1.9 (1.1, 3.4)	3.8 (2.5, 5.6)	4.0 (2.7, 5.8)	6.8 (4.8, 9.7)		
Evolis	Evolis	31	1294	0.3 (0.1, 0.8)	1.0 (0.6, 1.8)	1.6 (1.0, 2.5)	3.1 (2.1, 4.5)	3.9 (2.5, 5.9)	
Evolution	Evolution	377	13311	0.9 (0.7, 1.0)	2.3 (2.0, 2.5)	2.9 (2.6, 3.3)	4.2 (3.7, 4.8)		
GMK Primary	GMK Primary	31	830	1.1 (0.6, 2.1)	2.6 (1.7, 4.0)	3.6 (2.5, 5.3)	4.4 (3.1, 6.2)		
GMK Sphere Primary	GMK Primary	666	26510	1.2 (1.1, 1.4)	2.6 (2.4, 2.9)	3.2 (2.9, 3.5)	4.4 (3.9, 5.0)		
	GMK Sphere Primary	114	4070	0.7 (0.5, 1.0)	2.6 (2.1, 3.2)	3.7 (3.0, 4.5)	4.9 (3.9, 6.2)		
GMRS	MRH	59	417	4.1 (2.5, 6.6)	9.2 (6.5, 13.0)	15.4 (11.5, 20.4)			
Genesis II CR	Genesis II	741	17658	0.9 (0.8, 1.0)	2.3 (2.0, 2.5)	2.9 (2.7, 3.2)	4.4 (4.0, 4.7)	5.4 (5.0, 5.8)	6.4 (5.8, 7.1)
Genesis II Oxinium CR	Genesis II	682	11584	1.1 (0.9, 1.3)	2.7 (2.4, 3.0)	3.4 (3.1, 3.8)	5.9 (5.4, 6.4)	8.3 (7.7, 9.1)	10.5 (9.6, 11.6)
Genesis II Oxinium PS	Genesis II	1600	23196	1.4 (1.3, 1.6)	3.5 (3.3, 3.8)	4.8 (4.5, 5.1)	7.0 (6.6, 7.3)	9.3 (8.8, 9.8)	11.9 (10.8, 13.1)
Genesis II PS	Genesis II	928	20484	1.1 (1.0, 1.3)	2.6 (2.4, 2.8)	3.5 (3.2, 3.7)	4.7 (4.4, 5.0)	5.9 (5.5, 6.3)	6.7 (6.1, 7.2)
Genus	Genus	9	554	1.1 (0.4, 2.6)	2.8 (1.3, 6.3)				
Journey II Oxinium	Journey	34	3952	0.5 (0.3, 0.8)	2.2 (1.3, 3.6)	4.4 (2.4, 8.1)	4.4 (2.4, 8.1)		
LCS CR	LCS	342	3943	1.0 (0.7, 1.4)	3.7 (3.2, 4.4)	5.1 (4.4, 5.8)	7.3 (6.5, 8.2)	9.4 (8.5, 10.5)	10.7 (9.6, 11.9)
	MBT*	681	13326	0.9 (0.7, 1.0)	2.6 (2.4, 2.9)	3.6 (3.3, 3.9)	5.3 (4.9, 5.7)	6.3 (5.8, 6.8)	7.8 (6.8, 8.9)
Legion CR	Genesis II	149	5292	1.1 (0.9, 1.5)	2.3 (1.9, 2.7)	3.3 (2.8, 3.9)	3.9 (3.2, 4.7)	5.2 (3.7, 7.2)	

Table KT9 ***Cont***

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Legion Oxinium CR	Genesis II	371	12896	0.9 (0.7, 1.0)	2.4 (2.1, 2.7)	3.2 (2.8, 3.5)	4.3 (3.8, 4.9)	5.7 (4.8, 6.7)	
Legion Oxinium FS	Legion	38	416	5.4 (3.6, 8.1)	7.4 (5.2, 10.6)	9.2 (6.6, 12.8)	11.7 (8.3, 16.2)		
Legion Oxinium PS	Genesis II	832	19716	1.0 (0.9, 1.2)	2.9 (2.6, 3.1)	3.7 (3.5, 4.0)	5.1 (4.8, 5.5)	8.0 (6.9, 9.1)	
Legion PS	Genesis II	240	6589	1.4 (1.1, 1.7)	2.6 (2.2, 3.0)	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)	6.2 (4.5, 8.5)	
MRK	MRK	28	774	1.0 (0.5, 2.1)	2.3 (1.4, 3.7)	2.9 (1.9, 4.4)	4.5 (3.0, 6.6)	5.7 (3.7, 8.7)	
Mutars	Mutars	69	425	7.5 (5.3, 10.6)	17.5 (13.7, 22.3)	23.3 (18.3, 29.4)			
Nexgen LCCK	Nexgen	67	1122	2.1 (1.4, 3.1)	3.7 (2.7, 5.0)	4.9 (3.7, 6.3)	6.1 (4.7, 7.9)	9.5 (6.9, 13.1)	
Nexgen LPS Flex	Nexgen	1484	30441	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.1 (2.9, 3.3)	4.9 (4.7, 5.2)	6.5 (6.1, 6.9)	8.3 (7.4, 9.3)
Nexgen RH	Nexgen	51	958	2.1 (1.3, 3.3)	4.0 (2.8, 5.6)	5.3 (3.9, 7.2)	8.3 (6.2, 11.2)		
ORIGIN	ORIGIN	2	567	0.4 (0.1, 1.5)					
Persona CR	Persona	656	41362	0.9 (0.8, 1.0)	1.9 (1.7, 2.0)	2.4 (2.2, 2.6)	2.6 (2.4, 2.9)		
Persona PS	Persona	157	6737	1.1 (0.9, 1.4)	2.2 (1.9, 2.7)	2.8 (2.4, 3.3)	3.4 (2.8, 4.0)		
SAIPH	SAIPH	122	6791	0.6 (0.4, 0.8)	1.6 (1.3, 2.0)	2.1 (1.7, 2.5)	2.8 (2.1, 3.6)		
Score	Score	57	1385	1.5 (1.0, 2.3)	3.0 (2.2, 4.2)	4.0 (3.0, 5.3)	5.4 (4.2, 7.1)		
Trekking	Trekking	32	429	2.4 (1.3, 4.3)	4.9 (3.2, 7.5)	6.5 (4.5, 9.4)	8.4 (6.0, 11.8)		
Triathlon CR	Triathlon	2104	89227	0.8 (0.7, 0.8)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)	3.5 (3.3, 3.6)	4.5 (4.2, 4.8)	
Triathlon FS	Triathlon	36	576	2.7 (1.6, 4.4)	5.6 (3.9, 8.0)	6.8 (4.8, 9.5)	8.0 (5.6, 11.4)		
Triathlon PS	Triathlon	510	11481	1.4 (1.2, 1.6)	2.9 (2.6, 3.2)	3.7 (3.3, 4.0)	5.3 (4.8, 5.8)	6.6 (5.9, 7.3)	
Unity Knee	Unity Knee	9	1129	0.6 (0.3, 1.3)	0.8 (0.4, 1.6)	1.0 (0.5, 1.9)			
Vanguard CR	Vanguard	530	12383	0.7 (0.6, 0.9)	2.1 (1.9, 2.4)	2.7 (2.4, 3.0)	4.4 (4.0, 4.8)	6.8 (6.0, 7.5)	
iTotal	iTotal	11	747	0.8 (0.4, 1.8)	1.7 (0.9, 3.4)	2.4 (1.2, 4.9)			
Other (51)		289	3946	2.8 (2.3, 3.4)	6.1 (5.3, 6.9)	7.9 (7.0, 9.0)	11.6 (10.1, 13.3)	17.8 (14.5, 21.7)	
TOTAL		16156	474828						

Note: Restricted to modern prostheses.
Some cementless components have been cemented.
Only combinations with >400 procedures have been listed.
* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2024.

Primary Total Knee Replacement

Table KT10 Cumulative Percent Revision of Cementless Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	63	1397	1.5 (0.9, 2.3)	3.8 (2.9, 5.0)	4.4 (3.4, 5.7)	5.5 (4.3, 7.1)		
Active Knee	Active Knee	622	4899	1.3 (1.1, 1.7)	4.0 (3.4, 4.5)	5.6 (5.0, 6.3)	9.6 (8.8, 10.5)	13.2 (12.2, 14.2)	16.2 (15.0, 17.6)
Apex Knee CR	Apex Knee	32	525	2.5 (1.4, 4.2)	5.0 (3.4, 7.3)	5.7 (4.0, 8.1)	6.5 (4.7, 9.2)		
Attune CR	Attune	91	6506	0.9 (0.7, 1.2)	1.9 (1.5, 2.3)	2.2 (1.7, 2.7)			
Attune PS	Attune	6	498	0.2 (0.0, 1.5)	1.8 (0.8, 4.0)				
Columbus	Columbus	72	500	3.2 (2.0, 5.2)	7.7 (5.6, 10.4)	9.7 (7.4, 12.7)	13.1 (10.4, 16.5)	15.9 (12.6, 19.9)	
GMK Primary	GMK Primary	81	2134	1.1 (0.8, 1.7)	3.0 (2.3, 3.8)	3.7 (2.9, 4.7)	5.7 (4.5, 7.3)		
Genesis II CR	Genesis II	51	749	1.5 (0.8, 2.6)	3.8 (2.6, 5.4)	4.7 (3.4, 6.5)	6.9 (5.3, 9.1)	8.3 (6.1, 11.2)	
Genesis II PS	Genesis II	36	420	1.7 (0.8, 3.5)	3.3 (2.0, 5.6)	4.1 (2.5, 6.5)	6.3 (4.3, 9.1)	9.3 (6.6, 12.8)	
LCS CR	LCS	176	2388	1.4 (1.0, 2.0)	3.4 (2.8, 4.2)	4.4 (3.6, 5.3)	6.2 (5.3, 7.3)	7.4 (6.3, 8.6)	8.8 (7.6, 10.1)
	MBT*	547	9395	1.1 (0.9, 1.3)	3.4 (3.1, 3.8)	4.1 (3.8, 4.6)	5.4 (5.0, 5.9)	7.4 (6.6, 8.1)	9.9 (8.7, 11.3)
Nexgen LPS Flex	Nexgen	54	1199	2.6 (1.8, 3.7)	3.9 (3.0, 5.2)	4.2 (3.2, 5.5)	4.8 (3.7, 6.3)		
Persona CR	Persona	209	11385	1.1 (0.9, 1.3)	2.5 (2.1, 2.8)	3.0 (2.5, 3.6)			
Score	Score	264	2990	1.5 (1.1, 2.0)	4.7 (4.0, 5.5)	6.3 (5.5, 7.3)	10.1 (8.9, 11.4)	12.3 (10.7, 14.0)	
Triathlon CR	Triathlon	1354	57628	1.0 (0.9, 1.1)	2.1 (2.0, 2.2)	2.7 (2.5, 2.9)	4.0 (3.8, 4.3)	5.4 (5.0, 5.8)	
Triathlon PS	Triathlon	78	1601	1.8 (1.2, 2.6)	3.2 (2.5, 4.3)	4.1 (3.2, 5.3)	5.2 (4.1, 6.6)	6.5 (5.1, 8.3)	
Vanguard CR	Vanguard	119	1695	1.4 (1.0, 2.1)	4.1 (3.3, 5.2)	4.8 (3.9, 6.0)	6.4 (5.3, 7.7)	10.1 (7.7, 13.1)	
Other (22)		144	1768	2.5 (1.9, 3.4)	6.4 (5.3, 7.7)	7.7 (6.4, 9.1)	9.2 (7.8, 10.9)	10.9 (8.9, 13.4)	
TOTAL		3999	107677						

Note: Restricted to modern prostheses
Only combinations with >400 procedures have been listed
* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2024

Table KT11 Cumulative Percent Revision of Hybrid Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	79	1630	1.2 (0.8, 1.9)	3.5 (2.7, 4.5)	4.3 (3.4, 5.5)	5.8 (4.6, 7.3)		
Active Knee	Active Knee	178	2424	0.6 (0.4, 1.0)	2.7 (2.1, 3.5)	3.8 (3.1, 4.7)	6.7 (5.7, 7.9)	10.0 (8.6, 11.8)	11.5 (9.7, 13.6)
Anatomic	Anatomic	16	760	1.6 (0.8, 2.9)	2.3 (1.3, 4.0)	2.7 (1.5, 4.6)			
Apex Knee CR	Apex Knee	122	6320	0.8 (0.6, 1.1)	1.7 (1.4, 2.0)	2.1 (1.7, 2.6)	3.3 (2.6, 4.3)		
Attune CR	Attune	45	3454	0.8 (0.5, 1.2)	2.0 (1.4, 2.7)	2.1 (1.5, 2.9)			
Attune PS	Attune	39	1342	1.6 (1.0, 2.5)	3.6 (2.6, 5.0)				
BalanSys	BalanSys	76	2540	1.0 (0.7, 1.5)	2.1 (1.6, 2.8)	2.8 (2.2, 3.5)	3.9 (3.1, 5.1)		
GMK Primary	GMK Primary	40	1074	1.3 (0.8, 2.2)	3.5 (2.5, 4.9)	4.0 (2.9, 5.5)	4.7 (3.4, 6.4)		
Genesis II CR	Genesis II	553	8888	1.0 (0.8, 1.2)	3.3 (2.9, 3.7)	4.4 (3.9, 4.8)	6.0 (5.5, 6.5)	7.4 (6.8, 8.1)	9.1 (8.1, 10.1)
Genesis II PS	Genesis II	72	707	1.7 (1.0, 3.0)	4.4 (3.1, 6.2)	5.6 (4.1, 7.6)	8.9 (7.0, 11.4)	10.7 (8.5, 13.5)	12.4 (9.8, 15.6)
LCS CR	LCS	156	2364	1.0 (0.7, 1.5)	2.7 (2.1, 3.5)	3.8 (3.1, 4.7)	5.5 (4.6, 6.6)	6.9 (5.8, 8.1)	8.1 (6.9, 9.5)
	MBT*	439	11102	0.7 (0.6, 0.9)	2.2 (1.9, 2.5)	2.8 (2.5, 3.1)	4.0 (3.6, 4.4)	4.8 (4.3, 5.3)	6.2 (5.4, 7.2)
Legion CR	Genesis II	227	5168	1.3 (1.0, 1.7)	3.3 (2.8, 3.9)	4.3 (3.7, 4.9)	6.7 (5.8, 7.9)		
Nexgen LPS Flex	Nexgen	58	933	2.3 (1.5, 3.4)	4.3 (3.2, 5.8)	5.4 (4.1, 7.1)	6.8 (5.2, 8.7)		
Persona CR	Persona	359	24529	0.9 (0.7, 1.0)	1.9 (1.7, 2.1)	2.3 (2.1, 2.6)			
Score	Score	135	2055	1.3 (0.9, 1.9)	3.7 (2.9, 4.7)	5.5 (4.5, 6.7)	9.1 (7.6, 10.9)		
Trekking	Trekking	24	564	1.1 (0.5, 2.4)	2.9 (1.8, 4.6)	3.4 (2.2, 5.3)	4.4 (2.9, 6.5)		
Triathlon CR	Triathlon	985	43631	0.7 (0.6, 0.7)	1.6 (1.4, 1.7)	2.1 (2.0, 2.3)	3.1 (2.9, 3.3)	4.5 (4.0, 5.1)	
Triathlon PS	Triathlon	142	3256	1.6 (1.2, 2.1)	2.7 (2.2, 3.3)	3.5 (2.9, 4.3)	4.9 (4.2, 5.8)	5.6 (4.7, 6.7)	
Vanguard CR	Vanguard	595	13484	0.8 (0.6, 0.9)	2.2 (2.0, 2.5)	2.9 (2.6, 3.2)	4.6 (4.2, 5.0)	6.8 (6.1, 7.6)	
Other (48)		212	2331	3.2 (2.5, 4.1)	7.0 (5.9, 8.2)	8.5 (7.4, 9.9)	10.9 (9.5, 12.5)	12.7 (11.1, 14.6)	
TOTAL		**4552**	**138556**						

Note: Restricted to modern prostheses
Only combinations with >400 procedures have been listed
* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2024

Primary Total Knee Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

Primary total knee replacement has the lowest rate of revision compared to all other classes of primary knee replacement. At 20 years, the cumulative percent revision of all primary total knee replacement procedures undertaken for osteoarthritis is 8.0% (Table KT12 and Figure KT7).

Reasons for Revision

Infection is the most common reason for revision, followed by loosening, instability, patella erosion, and pain (Table KT13 and Figure KT8).

Types of Revision

The most common types of revision are insert only, both femoral and tibial components, and patella only (Table KT14).

Age and Gender

The rate of revision decreases with increasing age. This difference becomes more evident with time. Compared to patients aged ≥75 years, patients aged <55 years have almost 3 times the rate of revision after 6 months and this increases to nearly 7 times after 12 years (Table KT15 and Figure KT9).

Males have a higher rate of revision compared to females (Table KT16 and Figure KT10). Loosening is the most common reason for revision in females. Males have a higher incidence of revision for infection (Figure KT11,Table KT17 and Figure KT12).

Age-related differences in the rate of revision are evident for both males and females (Table KT16, Figure KT13 and Figure KT14).

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. There are 536,722 primary total knee replacement procedures for osteoarthritis with these scores. When compared to patients with an ASA score of 1, patients in all other ASA groups have a higher rate of revision (Table KT18 and Figure KT15). The difference in the rate of revision for each ASA score is partially due to an increase in the cumulative incidence of infection with increasing ASA score (Figure KT16).

When patients with ASA scores 3-5 are compared, males have a higher rate of revision than females. Male patients with ASA scores 1-2 have a higher rate of revision compared to female patients with these scores only until 1.5 years, and after this time, there is no longer a difference (Table KT19 and Figure KT17).

Patients aged <65 years have higher rates of revision compared to patients ≥65 years when compared by comorbidity scores, which are grouped ASA 1-2 and ASA 3-5 (Table KT20 and Figure KT18).

BMI data have been collected since 2015. There are revision outcomes for 460,298 primary total knee replacement procedures for osteoarthritis in relation to BMI category. When compared to patients with normal BMI, there is no difference in the rate of revision for patients who are pre-obese or obese class 1. However, there is an early increase in the rate of revision for patients in obese class 2 and obese class 3 (Table KT20 and Figure KT19).

The most common reasons for revision are shown in Figure KT20.

Compared to patients who have BMI <30, patients in obese classes 1-3 have an increased rate of early revision until 3 months for females, and until 2 years for males. There is an increased rate of revision for obese male patients compared to obese female patients (Table KT22 and Figure KT21).

Patients aged <65 years have higher rates of revision than patients aged ≥65 years irrespective of obesity (Table KT23 and Figure KT22).

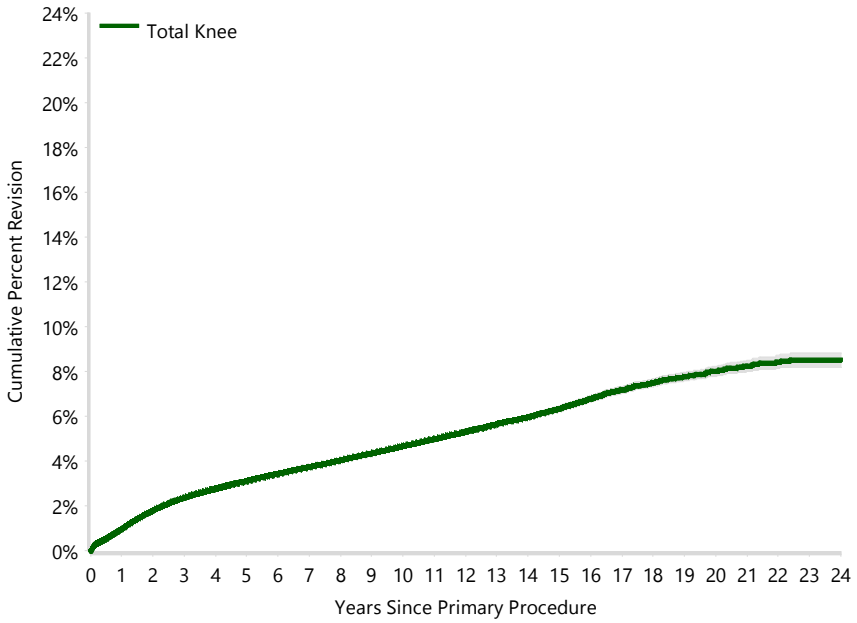
Males have a higher rate of revision which is largely due to an increased incidence of infection.

Table KT12 Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)

Knee Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	23890	706349	1.0 (1.0, 1.0)	2.4 (2.3, 2.4)	3.1 (3.1, 3.2)	4.7 (4.6, 4.7)	6.3 (6.2, 6.5)	8.0 (7.8, 8.2)
TOTAL	23890	706349						

Note: Restricted to modern prostheses

Figure KT7 Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	706349	627600	487721	371992	150981	40301	6544

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Table KT13 Primary Total Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Infection	6816	28.5
Loosening	5090	21.3
Instability	2475	10.4
Patella Erosion	1774	7.4
Pain	1727	7.2
Patellofemoral Pain	1435	6.0
Arthrofibrosis	1039	4.3
Fracture	963	4.0
Malalignment	469	2.0
Wear Tibial Insert	311	1.3
Lysis	256	1.1
Incorrect Sizing	204	0.9
Metal Related Pathology	97	0.4
Other	1234	5.2
TOTAL	23890	100.0

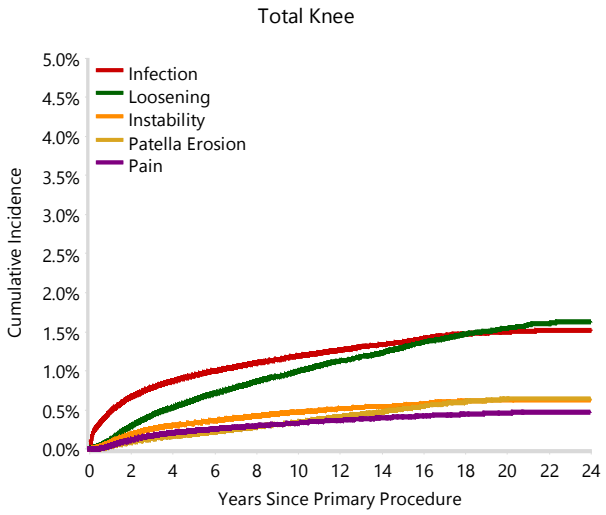
Note: Restricted to modern prostheses

Table KT14 Primary Total Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Insert Only	7431	31.1
TKR (Tibial/Femoral)	5741	24.0
Patella Only	4054	17.0
Insert/Patella	2610	10.9
Tibial Component	1740	7.3
Femoral Component	1081	4.5
Cement Spacer	1043	4.4
Removal of Prostheses	115	0.5
Minor Components	50	0.2
Total Femoral	13	0.1
Reinsertion of Components	7	0.0
Cement Only	5	0.0
TOTAL	23890	100.0

Note: Restricted to modern prostheses

Figure KT8 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement (Primary Diagnosis OA)



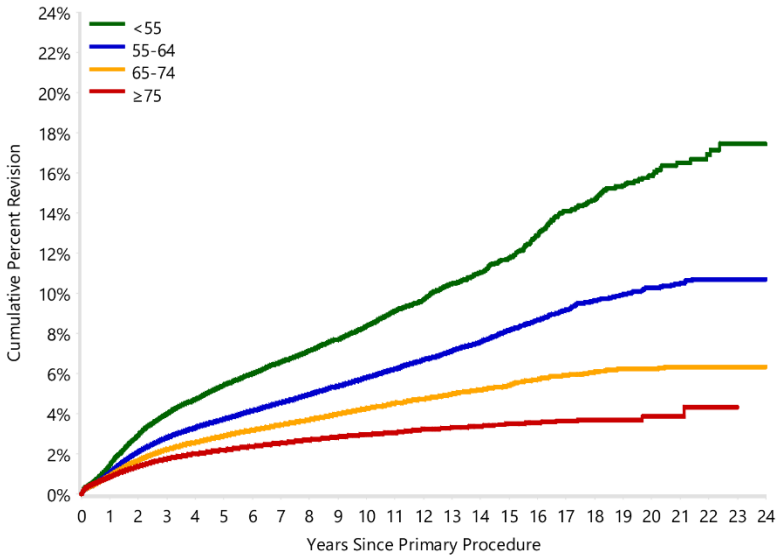
Note: Restricted to modern prostheses

Table KT15 Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	2983	45534	1.5 (1.3, 1.6)	4.0 (3.8, 4.2)	5.4 (5.2, 5.7)	8.4 (8.0, 8.7)	11.8 (11.2, 12.3)	15.8 (14.9, 16.8)
55-64	8238	187339	1.1 (1.0, 1.1)	2.8 (2.7, 2.9)	3.7 (3.6, 3.8)	5.8 (5.7, 5.9)	8.2 (7.9, 8.4)	10.3 (9.9, 10.7)
65-74	8742	285944	0.9 (0.9, 1.0)	2.2 (2.2, 2.3)	2.9 (2.8, 3.0)	4.3 (4.2, 4.4)	5.4 (5.3, 5.6)	6.3 (6.0, 6.5)
≥75	3927	187532	0.9 (0.8, 0.9)	1.8 (1.7, 1.8)	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	3.5 (3.3, 3.7)	3.9 (3.5, 4.3)
TOTAL	23890	706349						

Note: Restricted to modern prostheses

Figure KT9 Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)



HR - adjusted for gender

<55 vs ≥75

0 - 3Mth: HR=1.12 (95% CI 0.96, 1.31), p=0.152
3Mth - 6Mth: HR=1.52 (95% CI 1.25, 1.84), p<0.001
6Mth - 1.5Yr: HR=2.59 (95% CI 2.34, 2.86), p<0.001
1.5Yr - 2Yr: HR=2.97 (95% CI 2.56, 3.45), p<0.001
2Yr - 2.5Yr: HR=2.82 (95% CI 2.40, 3.31), p<0.001
2.5Yr - 4Yr: HR=3.24 (95% CI 2.87, 3.67), p<0.001
4Yr - 12Yr: HR=3.85 (95% CI 3.52, 4.22), p<0.001
12Yr+: HR=6.97 (95% CI 5.85, 8.30), p<0.001

55-64 vs ≥75

0 - 6Mth: HR=0.94 (95% CI 0.86, 1.03), p=0.176
6Mth - 1.5Yr: HR=1.85 (95% CI 1.71, 1.99), p<0.001
1.5Yr - 2Yr: HR=2.01 (95% CI 1.79, 2.25), p<0.001
2Yr - 2.5Yr: HR=1.72 (95% CI 1.52, 1.94), p<0.001
2.5Yr - 3Yr: HR=2.14 (95% CI 1.84, 2.49), p<0.001
3Yr - 4Yr: HR=2.24 (95% CI 2.01, 2.49), p<0.001
4Yr - 5.5Yr: HR=2.21 (95% CI 1.99, 2.46), p<0.001
5.5Yr - 12Yr: HR=2.69 (95% CI 2.48, 2.92), p<0.001
12Yr - 13Yr: HR=3.55 (95% CI 2.78, 4.53), p<0.001
13Yr+: HR=4.05 (95% CI 3.43, 4.79), p<0.001

65-74 vs ≥75

0 - 6Mth: HR=0.91 (95% CI 0.84, 0.99), p=0.024
6Mth - 1.5Yr: HR=1.38 (95% CI 1.28, 1.49), p<0.001
1.5Yr - 2.5Yr: HR=1.42 (95% CI 1.30, 1.56), p<0.001
2.5Yr - 3Yr: HR=1.60 (95% CI 1.38, 1.85), p<0.001
3Yr+: HR=1.66 (95% CI 1.55, 1.77), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	45534	40826	32307	25125	11711	3803	870
55-64	187339	167976	133159	103888	46827	14556	2744
65-74	285944	254290	198178	151584	61915	16523	2478
≥75	187532	164508	124077	91395	30528	5419	452

Note: Restricted to modern prostheses

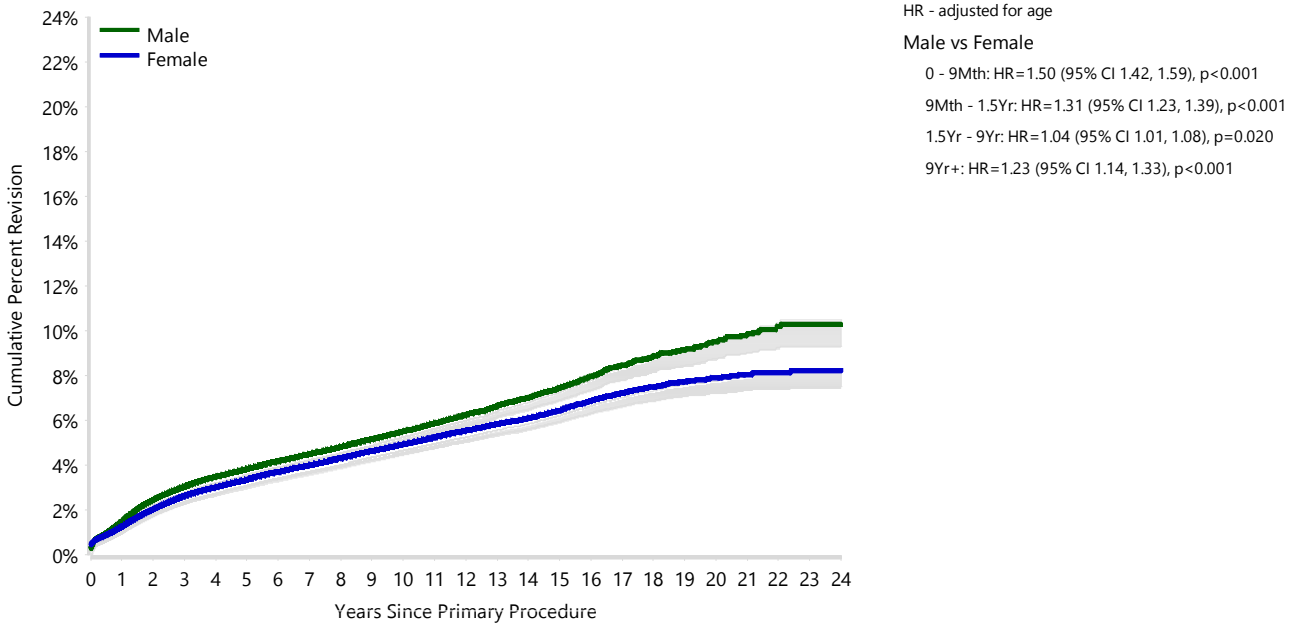
Primary Total Knee Replacement

Table KT16 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		**11595**	**315153**	**1.2 (1.2, 1.2)**	**2.7 (2.6, 2.8)**	**3.5 (3.4, 3.5)**	**5.1 (5.0, 5.2)**	**7.0 (6.8, 7.2)**	**9.1 (8.7, 9.4)**
	<55	1360	19711	1.8 (1.6, 2.0)	4.4 (4.1, 4.7)	5.8 (5.4, 6.1)	8.7 (8.2, 9.2)	12.1 (11.3, 12.9)	16.4 (15.0, 17.9)
	55-64	4116	88899	1.3 (1.2, 1.3)	3.1 (3.0, 3.2)	4.0 (3.9, 4.2)	6.1 (5.9, 6.4)	8.8 (8.5, 9.2)	11.5 (10.9, 12.3)
	65-74	4324	129601	1.1 (1.1, 1.2)	2.5 (2.4, 2.6)	3.2 (3.1, 3.3)	4.7 (4.5, 4.8)	6.0 (5.7, 6.2)	6.8 (6.4, 7.2)
	≥75	1795	76942	1.0 (1.0, 1.1)	2.1 (2.0, 2.2)	2.5 (2.4, 2.7)	3.3 (3.1, 3.4)	3.8 (3.6, 4.1)	4.5 (3.4, 5.9)
Female		**12295**	**391196**	**0.8 (0.8, 0.8)**	**2.1 (2.1, 2.2)**	**2.8 (2.8, 2.9)**	**4.4 (4.3, 4.4)**	**5.8 (5.7, 6.0)**	**7.3 (7.0, 7.5)**
	<55	1623	25823	1.2 (1.1, 1.4)	3.7 (3.5, 3.9)	5.2 (4.9, 5.5)	8.1 (7.7, 8.6)	11.5 (10.8, 12.2)	15.4 (14.2, 16.7)
	55-64	4122	98440	0.9 (0.8, 1.0)	2.5 (2.4, 2.7)	3.5 (3.3, 3.6)	5.5 (5.3, 5.7)	7.6 (7.3, 7.9)	9.3 (8.8, 9.7)
	65-74	4418	156343	0.7 (0.7, 0.8)	2.0 (1.9, 2.1)	2.6 (2.5, 2.7)	4.0 (3.8, 4.1)	5.0 (4.8, 5.2)	5.8 (5.5, 6.2)
	≥75	2132	110590	0.7 (0.7, 0.8)	1.5 (1.5, 1.6)	2.0 (1.9, 2.1)	2.8 (2.6, 2.9)	3.3 (3.1, 3.5)	3.5 (3.2, 3.8)
TOTAL		23890	706349						

Note: Restricted to modern prostheses

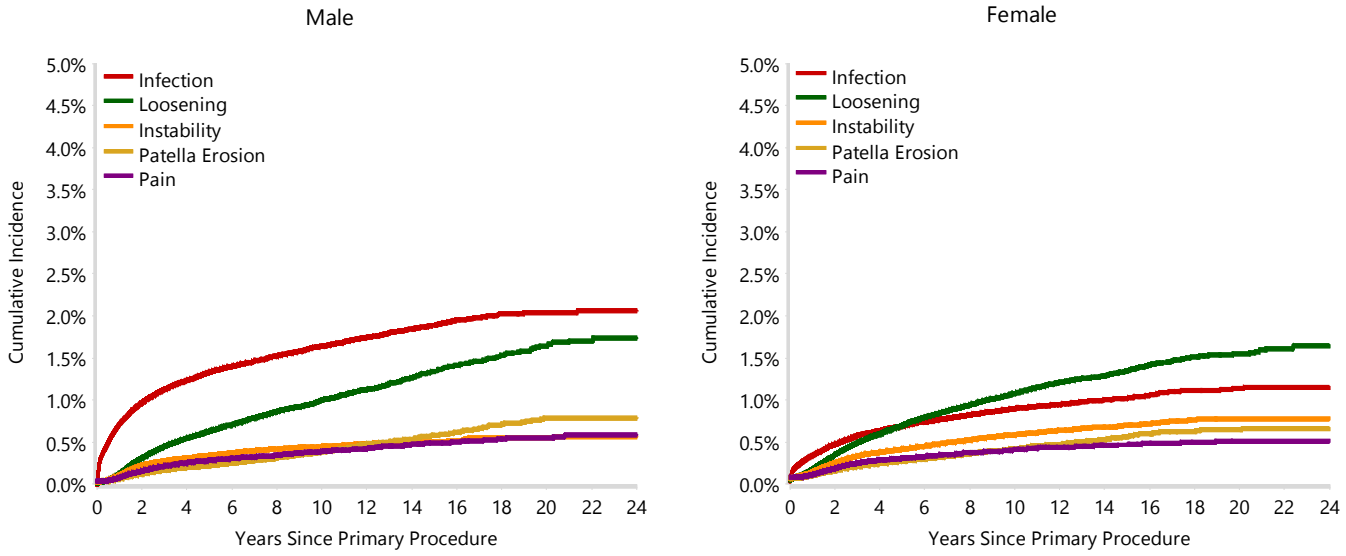
Figure KT10 Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	315153	278550	213911	159906	62303	16039	2543
Female	391196	349050	273810	212086	88678	24262	4001

Note: Restricted to modern prostheses

Figure KT11 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)



Note: Restricted to modern prostheses

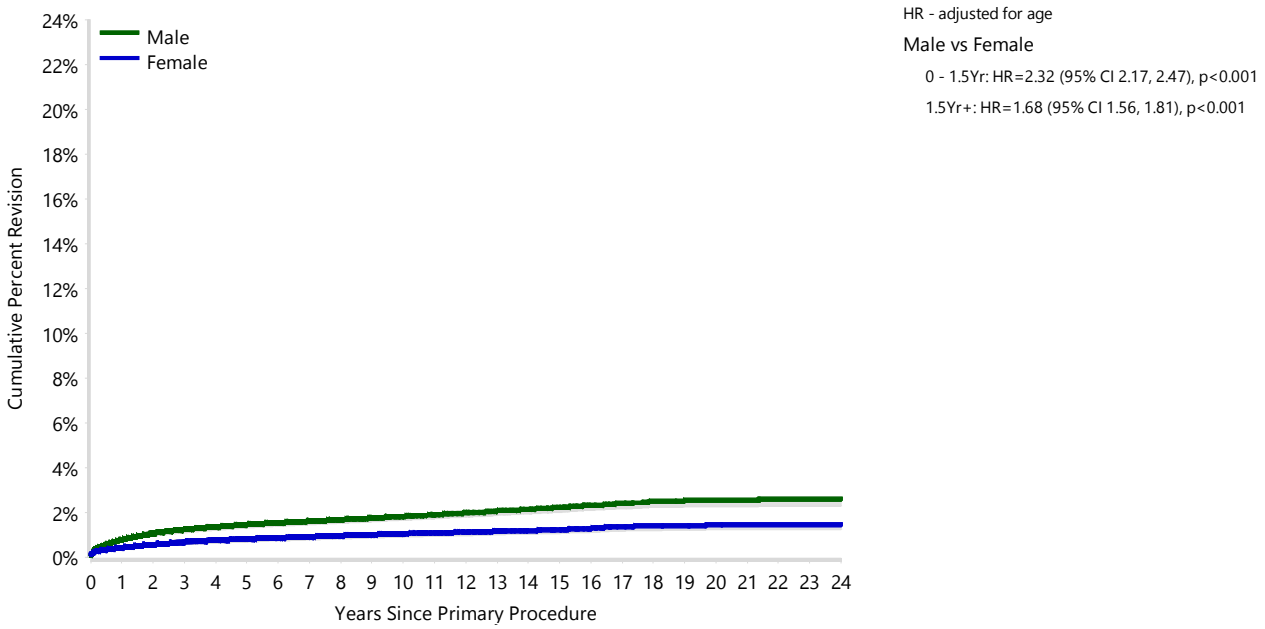
Primary Total Knee Replacement

Table KT17 Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA, Revision for Infection)

Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	4186	315153	0.7 (0.7, 0.7)	1.1 (1.1, 1.2)	1.4 (1.3, 1.4)	1.7 (1.7, 1.8)	2.1 (2.0, 2.2)	2.4 (2.3, 2.6)
Female	2630	391196	0.3 (0.3, 0.3)	0.5 (0.5, 0.6)	0.7 (0.6, 0.7)	0.9 (0.9, 0.9)	1.1 (1.0, 1.1)	1.3 (1.2, 1.4)
TOTAL	6816	706349						

Note: Restricted to modern prostheses

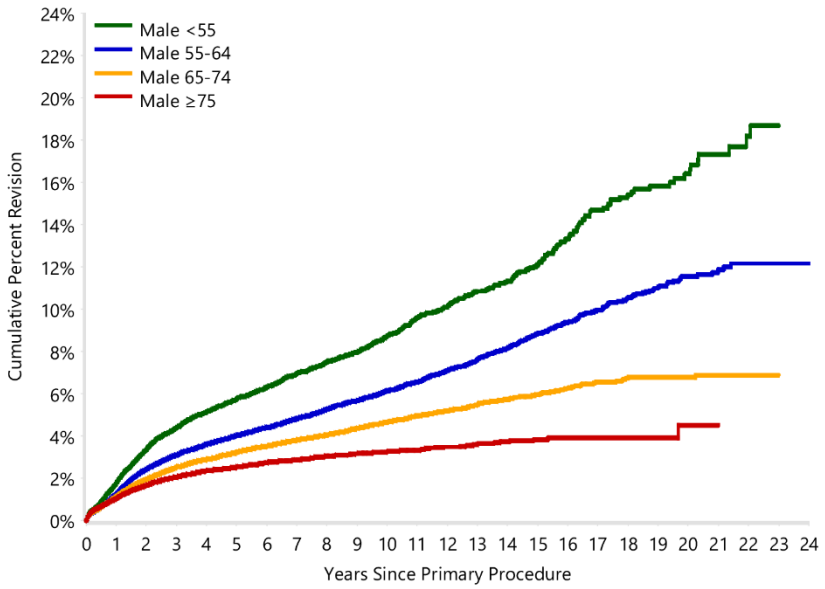
Figure KT12 Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA, Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	315153	278550	213911	159906	62303	16039	2543
Female	391196	349050	273810	212086	88678	24262	4001

Note: Restricted to modern prostheses

Figure KT13 Cumulative Percent Revision of Primary Total Knee Replacement in Males by Age (Primary Diagnosis OA)



Male <55 vs Male ≥75
- 0 - 3Mth: HR=1.10 (95% CI 0.89, 1.37), p=0.386
- 3Mth - 1.5Yr: HR=2.21 (95% CI 1.96, 2.50), p<0.001
- 1.5Yr - 2Yr: HR=2.93 (95% CI 2.36, 3.64), p<0.001
- 2Yr - 4Yr: HR=2.67 (95% CI 2.28, 3.11), p<0.001
- 4Yr - 7Yr: HR=3.88 (95% CI 3.22, 4.68), p<0.001
- 7Yr - 9Yr: HR=3.73 (95% CI 2.85, 4.89), p<0.001
- 9Yr - 11Yr: HR=5.96 (95% CI 4.58, 7.76), p<0.001
- 11Yr - 12.5Yr: HR=4.53 (95% CI 3.11, 6.61), p<0.001
- 12.5Yr - 14Yr: HR=4.15 (95% CI 2.66, 6.48), p<0.001
- 14Yr+: HR=9.11 (95% CI 6.51, 12.74), p<0.001

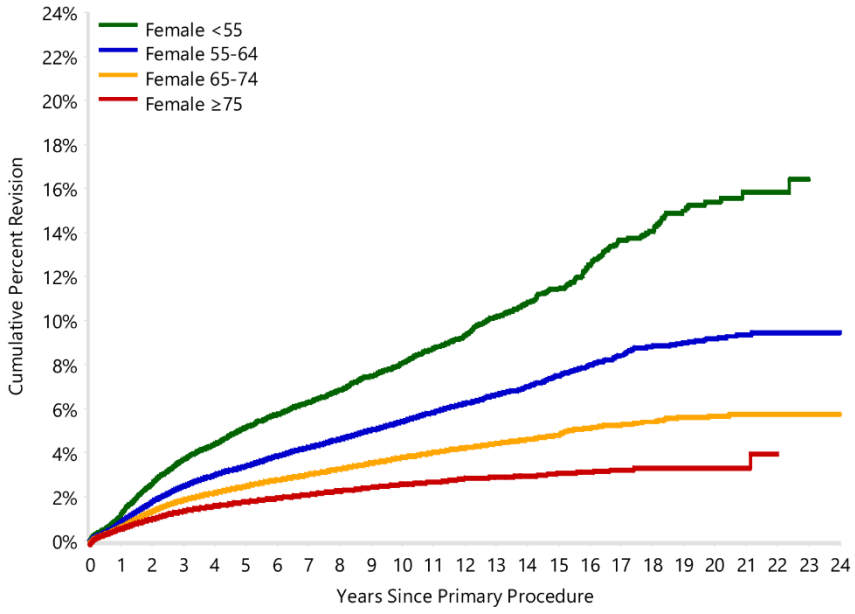
Male 55-64 vs Male ≥75
- 0 - 6Mth: HR=0.96 (95% CI 0.86, 1.08), p=0.513
- 6Mth - 1.5Yr: HR=1.73 (95% CI 1.56, 1.92), p<0.001
- 1.5Yr - 2Yr: HR=1.92 (95% CI 1.63, 2.26), p<0.001
- 2Yr - 2.5Yr: HR=1.64 (95% CI 1.38, 1.95), p<0.001
- 2.5Yr - 4Yr: HR=1.78 (95% CI 1.53, 2.06), p<0.001
- 4Yr - 7Yr: HR=2.54 (95% CI 2.19, 2.95), p<0.001
- 7Yr - 13Yr: HR=3.27 (95% CI 2.80, 3.83), p<0.001
- 13Yr+: HR=5.07 (95% CI 3.88, 6.62), p<0.001

Male 65-74 vs Male ≥75
- 0 - 6Mth: HR=0.95 (95% CI 0.86, 1.06), p=0.391
- 6Mth - 1.5Yr: HR=1.30 (95% CI 1.18, 1.44), p<0.001
- 1.5Yr - 2.5Yr: HR=1.32 (95% CI 1.16, 1.51), p<0.001
- 2.5Yr - 4Yr: HR=1.44 (95% CI 1.24, 1.66), p<0.001
- 4Yr+: HR=1.93 (95% CI 1.69, 2.20), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	**<55**	19711	17580	13906	10746	4947	1650	388
	55-64	88899	79203	62053	47548	20649	6209	1137
	65-74	129601	114683	88480	66415	26084	6548	895
	≥75	76942	67084	49472	35197	10623	1632	123

Note: Restricted to modern prostheses

Figure KT14 Cumulative Percent Revision of Primary Total Knee Replacement in Females by Age (Primary Diagnosis OA)



Female <55 vs Female ≥75
- 0 - 6Mth: HR=1.17 (95% CI 0.97, 1.42), p=0.095
- 6Mth - 2.5Yr: HR=2.88 (95% CI 2.59, 3.20), p<0.001
- 2.5Yr - 4Yr: HR=3.31 (95% CI 2.82, 3.89), p<0.001
- 4Yr - 12Yr: HR=4.04 (95% CI 3.59, 4.54), p<0.001
- 12Yr+: HR=7.70 (95% CI 6.09, 9.74), p<0.001

Female 55-64 vs Female ≥75
- 0 - 6Mth: HR=0.92 (95% CI 0.80, 1.04), p=0.188
- 6Mth - 1.5Yr: HR=1.91 (95% CI 1.72, 2.12), p<0.001
- 1.5Yr - 2Yr: HR=2.13 (95% CI 1.82, 2.49), p<0.001
- 2Yr - 2.5Yr: HR=1.73 (95% CI 1.46, 2.04), p<0.001
- 2.5Yr - 3Yr: HR=2.28 (95% CI 1.91, 2.74), p<0.001
- 3Yr - 5.5Yr: HR=2.32 (95% CI 2.08, 2.58), p<0.001
- 5.5Yr - 12Yr: HR=2.74 (95% CI 2.46, 3.05), p<0.001
- 12Yr - 13Yr: HR=3.44 (95% CI 2.44, 4.83), p<0.001
- 13Yr+: HR=3.87 (95% CI 3.08, 4.87), p<0.001

Female 65-74 vs Female ≥75
- 0 - 6Mth: HR=0.87 (95% CI 0.77, 0.98), p=0.021
- 6Mth - 1.5Yr: HR=1.43 (95% CI 1.29, 1.58), p<0.001
- 1.5Yr - 2Yr: HR=1.59 (95% CI 1.37, 1.85), p<0.001
- 2Yr - 2.5Yr: HR=1.42 (95% CI 1.21, 1.66), p<0.001
- 2.5Yr - 3.5Yr: HR=1.46 (95% CI 1.26, 1.68), p<0.001
- 3.5Yr+: HR=1.67 (95% CI 1.52, 1.83), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	**<55**	25823	23246	18401	14379	6764	2153	482
	55-64	98440	88773	71106	56340	26178	8347	1607
	65-74	156343	139607	109698	85169	35831	9975	1583
	≥75	110590	97424	74605	56198	19905	3787	329

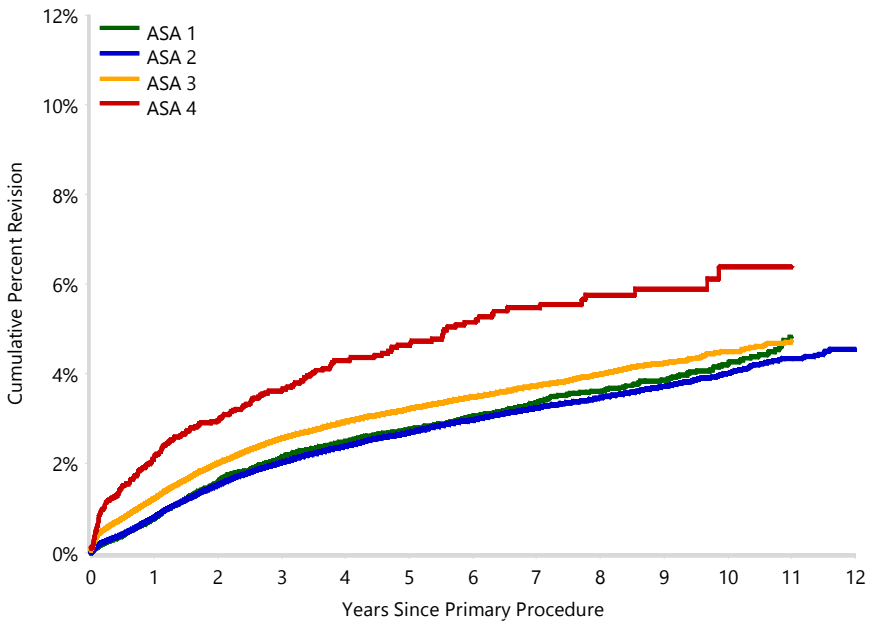
Note: Restricted to modern prostheses

Table KT18 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1	788	28454	0.8 (0.7, 0.9)	2.1 (2.0, 2.3)	2.7 (2.5, 3.0)	3.4 (3.1, 3.6)	3.9 (3.6, 4.2)	4.8 (4.3, 5.3)
ASA 2	7096	294284	0.8 (0.7, 0.8)	2.0 (1.9, 2.0)	2.6 (2.6, 2.7)	3.2 (3.1, 3.3)	3.7 (3.6, 3.7)	4.3 (4.1, 4.4)
ASA 3	5966	225884	1.2 (1.1, 1.2)	2.5 (2.4, 2.5)	3.1 (3.0, 3.2)	3.6 (3.5, 3.7)	4.1 (4.0, 4.3)	4.6 (4.4, 4.8)
ASA 4	218	5558	2.0 (1.7, 2.5)	3.5 (3.0, 4.1)	4.5 (3.9, 5.2)	5.4 (4.6, 6.2)	5.8 (5.0, 6.7)	6.3 (5.3, 7.5)
ASA 5	1	21	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	9.1 (1.3, 49.2)	9.1 (1.3, 49.2)		
TOTAL	14069	554201						

Note: Restricted to modern prostheses
Excludes 152,148 procedures with unknown ASA score

Figure KT15 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)



HR - adjusted for age and gender

ASA 2 vs ASA 1

Entire Period: HR=1.12 (95% CI 1.04, 1.20), p=0.003

ASA 3 vs ASA 1

0 - 2Wk: HR=2.37 (95% CI 1.88, 3.00), p<0.001
2Wk - 1Mth: HR=2.79 (95% CI 2.36, 3.30), p<0.001
1Mth - 6Mth: HR=1.90 (95% CI 1.70, 2.13), p<0.001
6Mth - 2Yr: HR=1.36 (95% CI 1.25, 1.48), p<0.001
2Yr+: HR=1.21 (95% CI 1.11, 1.32), p<0.001

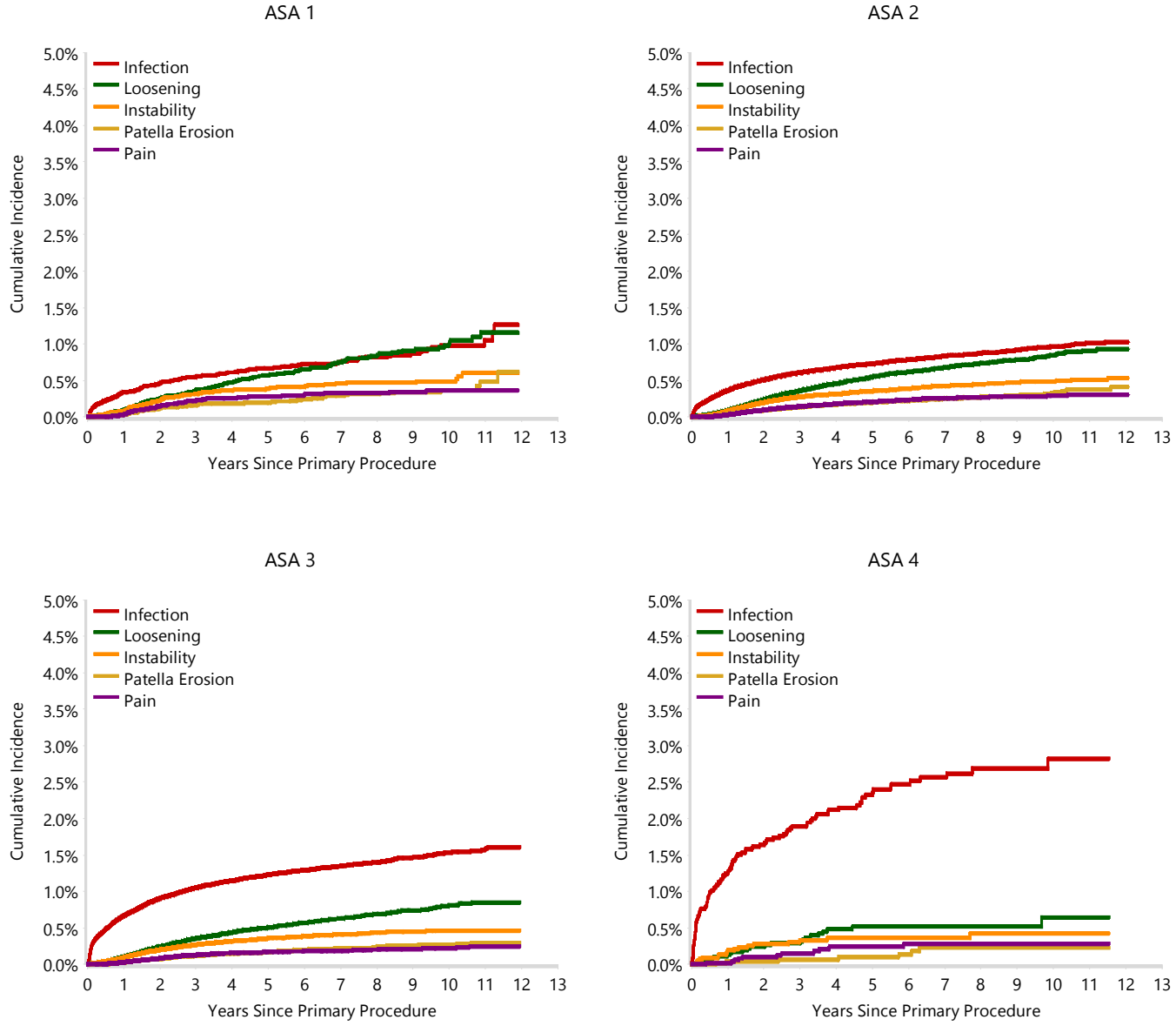
ASA 4 vs ASA 1

0 - 1Mth: HR=4.21 (95% CI 2.73, 6.51), p<0.001
1Mth - 3Mth: HR=5.67 (95% CI 3.99, 8.05), p<0.001
3Mth - 1.5Yr: HR=2.29 (95% CI 1.81, 2.89), p<0.001
1.5Yr+: HR=1.63 (95% CI 1.30, 2.04), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1	28454	25782	20296	14838	9695	5045	1201
ASA 2	294284	257296	190269	133046	82941	41428	8812
ASA 3	225884	190574	131193	86168	49059	21896	4263
ASA 4	5558	4684	3189	2055	1178	570	124

Note: Restricted to modern prostheses
Excludes 152,148 procedures with unknown ASA score; ASA 5 excluded due to low numbers.

Figure KT16 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)



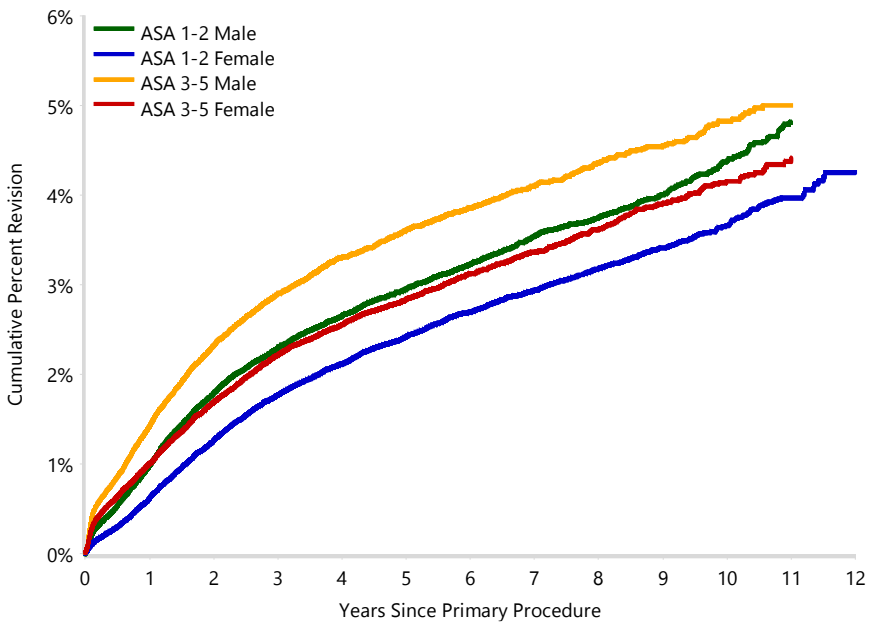
Note: Restricted to modern prostheses
Excludes 152,148 procedures with unknown ASA score; ASA 5 excluded due to low numbers.

Table KT19 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and ASA Score (Primary Diagnosis OA)

ASA Category	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	3968	146764	1.0 (0.9, 1.0)	2.3 (2.2, 2.4)	2.9 (2.8, 3.0)	3.5 (3.4, 3.7)	4.0 (3.9, 4.1)	4.8 (4.6, 5.0)
	Female	3916	175974	0.6 (0.6, 0.7)	1.8 (1.7, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.4 (3.3, 3.5)	4.0 (3.8, 4.1)
ASA 3-5	Male	3076	103000	1.4 (1.3, 1.5)	2.9 (2.8, 3.0)	3.6 (3.5, 3.7)	4.1 (3.9, 4.2)	4.5 (4.3, 4.7)	5.0 (4.7, 5.2)
	Female	3109	128463	1.0 (0.9, 1.0)	2.2 (2.1, 2.3)	2.8 (2.7, 2.9)	3.3 (3.2, 3.5)	3.9 (3.7, 4.1)	4.4 (4.2, 4.6)
TOTAL		14069	554201						

Note: Restricted to modern prostheses
Excludes 152,148 procedures with unknown ASA score

Figure KT17 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and ASA Score (Primary Diagnosis OA)



HR - adjusted for age

ASA 1-2 Male vs ASA 1-2 Female
0 - 6Mth: HR=1.69 (95% CI 1.52, 1.88), p<0.001
6Mth - 1.5Yr: HR=1.32 (95% CI 1.23, 1.43), p<0.001
1.5Yr+: HR=1.04 (95% CI 0.99, 1.11), p=0.137

ASA 1-2 Male vs ASA 3-5 Male
0 - 3Mth: HR=0.51 (95% CI 0.46, 0.57), p<0.001
3Mth - 9Mth: HR=0.68 (95% CI 0.61, 0.76), p<0.001
9Mth - 4Yr: HR=0.81 (95% CI 0.76, 0.86), p<0.001
4Yr+: HR=0.95 (95% CI 0.85, 1.05), p=0.329

ASA 1-2 Female vs ASA 3-5 Female
0 - 1Mth: HR=0.37 (95% CI 0.32, 0.44), p<0.001
1Mth - 6Mth: HR=0.50 (95% CI 0.44, 0.56), p<0.001
6Mth+: HR=0.89 (95% CI 0.85, 0.94), p<0.001

ASA 3-5 Male vs ASA 3-5 Female
0 - 1.5Yr: HR=1.43 (95% CI 1.34, 1.52), p<0.001
1.5Yr - 2Yr: HR=1.19 (95% CI 1.04, 1.35), p=0.012
2Yr+: HR=1.09 (95% CI 1.01, 1.18), p=0.026

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	146764	128269	94569	65179	40214	19798	4192
	Female	175974	154809	115996	82705	52422	26675	5821
ASA 3-5	Male	103000	86428	58737	37599	20857	9146	1717
	Female	128463	108844	75656	50631	29386	13323	2670

Note: Restricted to modern prostheses
Excludes 152,148 procedures with unknown ASA score

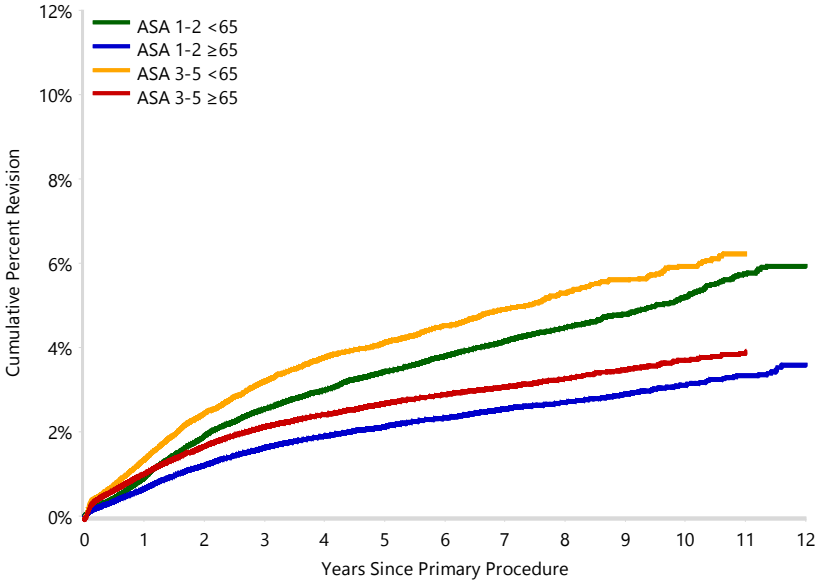
Primary Total Knee Replacement

Table KT20 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score and Age

ASA Score	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	3902	120190	0.9 (0.9, 1.0)	2.6 (2.5, 2.7)	3.5 (3.3, 3.6)	4.2 (4.0, 4.3)	4.8 (4.7, 5.0)	5.8 (5.5, 6.0)
	≥65	3982	202548	0.7 (0.7, 0.7)	1.7 (1.6, 1.7)	2.2 (2.1, 2.2)	2.6 (2.5, 2.7)	2.9 (2.8, 3.1)	3.4 (3.2, 3.5)
ASA 3-5	<65	2260	61921	1.4 (1.3, 1.5)	3.3 (3.1, 3.4)	4.2 (4.0, 4.4)	5.0 (4.8, 5.2)	5.7 (5.4, 6.0)	6.3 (5.9, 6.7)
	≥65	3925	169542	1.1 (1.0, 1.1)	2.2 (2.1, 2.3)	2.8 (2.7, 2.9)	3.2 (3.1, 3.3)	3.6 (3.4, 3.7)	4.0 (3.8, 4.2)
TOTAL		14069	554201						

Note: Excludes 152,148 procedures with unknown ASA score; Restricted to modern prostheses.

Figure KT18 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score and Age



HR - adjusted for gender

ASA 1-2 <65 vs ASA 1-2 ≥65 years
- 0 - 6Mth: HR=1.08 (95% CI 0.97, 1.20), p=0.153
- 6Mth - 1.5Yr: HR=1.69 (95% CI 1.56, 1.83), p<0.001
- 1.5Yr - 2Yr: HR=1.82 (95% CI 1.60, 2.06), p<0.001
- 2Yr - 2.5Yr: HR=1.47 (95% CI 1.28, 1.68), p<0.001
- 2.5Yr+: HR=1.74 (95% CI 1.62, 1.87), p<0.001

ASA 1-2 <65 vs ASA 3-5 <65
- 0 - 6Mth: HR=0.53 (95% CI 0.48, 0.59), p<0.001
- 6Mth - 9Mth: HR=0.73 (95% CI 0.63, 0.85), p<0.001
- 9Mth - 4Yr: HR=0.85 (95% CI 0.80, 0.91), p<0.001
- 4Yr+: HR=1.02 (95% CI 0.93, 1.12), p=0.702

ASA 1-2 ≥65 years vs ASA 3-5 ≥65 years
- 0 - 3Mth: HR=0.51 (95% CI 0.46, 0.56), p<0.001
- 3Mth - 9Mth: HR=0.70 (95% CI 0.63, 0.78), p<0.001
- 9Mth - 1.5Yr: HR=0.84 (95% CI 0.77, 0.92), p<0.001
- 1.5Yr - 2Yr: HR=0.83 (95% CI 0.73, 0.95), p=0.005
- 2Yr+: HR=0.93 (95% CI 0.87, 1.00), p=0.054

ASA 3-5 <65 vs ASA 3-5 ≥65 years
- 0 - 3Mth: HR=1.04 (95% CI 0.94, 1.15), p=0.416
- 3Mth - 6Mth: HR=1.39 (95% CI 1.20, 1.61), p<0.001
- 6Mth - 2Yr: HR=1.67 (95% CI 1.55, 1.80), p<0.001
- 2Yr+: HR=1.71 (95% CI 1.58, 1.85), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	120190	106208	80131	56883	36631	18892	4319
	≥65	202548	176870	130434	91001	56005	27581	5694
ASA 3-5	<65	61921	52662	37071	25098	15115	7187	1602
	≥65	169542	142610	97322	63132	35128	15282	2785

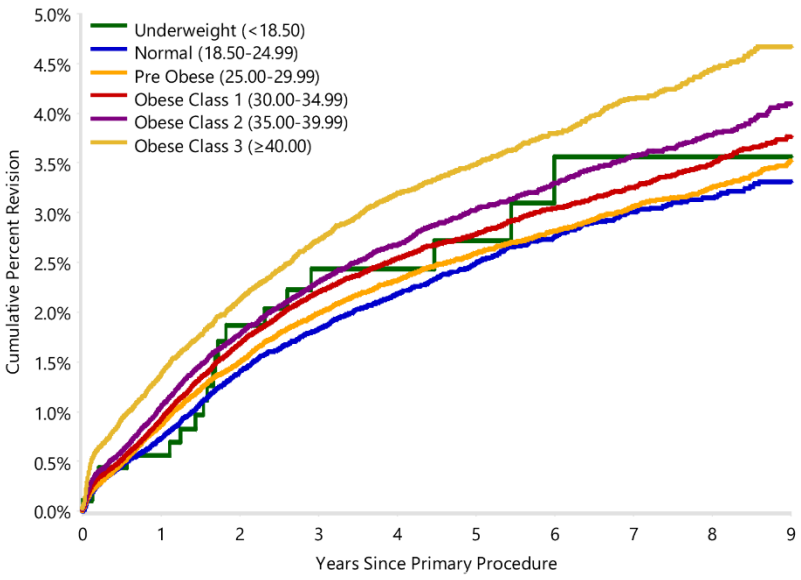
Note: Excludes 152,148 procedures with unknown ASA score; Restricted to modern prostheses.

Table KT21 Cumulative Percent Revision of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight	21	924	0.6 (0.2, 1.3)	2.4 (1.5, 3.9)	2.7 (1.7, 4.4)	3.6 (2.2, 5.8)	3.6 (2.2, 5.8)
Normal	1029	52046	0.7 (0.7, 0.8)	1.8 (1.7, 2.0)	2.5 (2.3, 2.7)	3.0 (2.8, 3.2)	3.3 (3.1, 3.6)
Pre Obese	3237	154081	0.9 (0.8, 0.9)	2.0 (1.9, 2.1)	2.6 (2.5, 2.7)	3.0 (2.9, 3.2)	3.5 (3.4, 3.7)
Obese Class 1	3458	151675	0.9 (0.9, 1.0)	2.2 (2.1, 2.3)	2.8 (2.7, 2.9)	3.2 (3.1, 3.3)	3.7 (3.6, 3.9)
Obese Class 2	2029	82670	1.0 (1.0, 1.1)	2.3 (2.2, 2.4)	3.0 (2.9, 3.1)	3.5 (3.4, 3.7)	4.1 (3.8, 4.3)
Obese Class 3	1451	49595	1.3 (1.2, 1.5)	2.7 (2.5, 2.9)	3.5 (3.3, 3.6)	4.1 (3.9, 4.3)	4.6 (4.4, 4.9)
TOTAL	11225	490991					

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Excludes 215,358 procedures with an unknown BMI

Figure KT19 Cumulative Percent Revision of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)

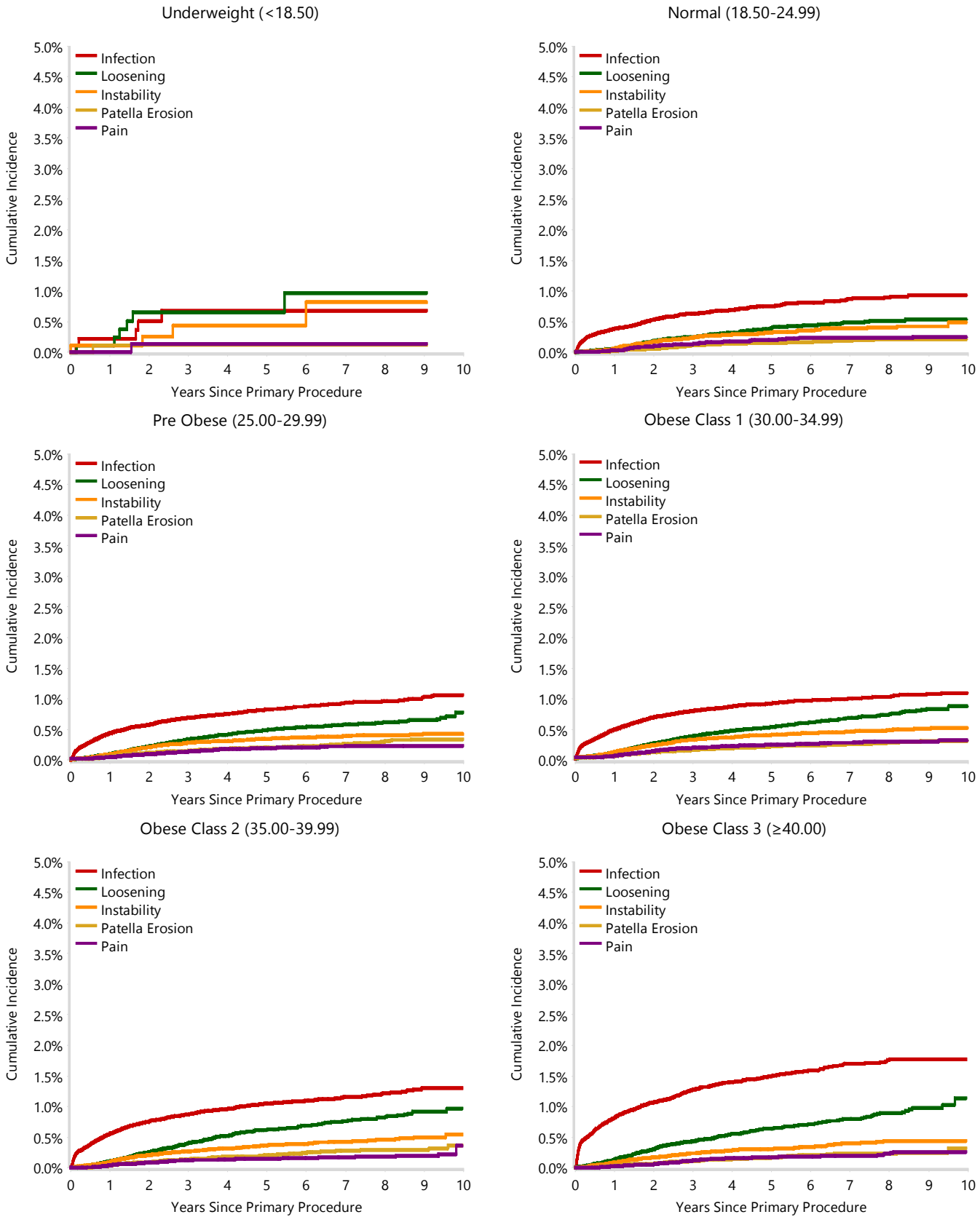


HR - adjusted for age and gender
Underweight (<18.50) vs Normal (18.50-24.99)
Entire Period: HR=1.28 (95% CI 0.83, 1.97), p=0.264
Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=0.98 (95% CI 0.91, 1.05), p=0.495
Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
0 - 1.5Yr: HR=1.05 (95% CI 0.96, 1.14), p=0.277
1.5Yr+: HR=0.98 (95% CI 0.90, 1.07), p=0.676
Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
0 - 1Mth: HR=1.30 (95% CI 1.08, 1.55), p=0.005
1Mth - 6Mth: HR=1.07 (95% CI 0.93, 1.24), p=0.326
6Mth - 1.5Yr: HR=1.11 (95% CI 1.00, 1.23), p=0.060
1.5Yr+: HR=1.02 (95% CI 0.93, 1.12), p=0.690
Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
0 - 1Mth: HR=2.25 (95% CI 1.88, 2.69), p<0.001
1Mth - 3Mth: HR=1.49 (95% CI 1.22, 1.81), p<0.001
3Mth - 6Mth: HR=1.50 (95% CI 1.22, 1.84), p<0.001
6Mth - 1Yr: HR=1.10 (95% CI 0.93, 1.29), p=0.265
1Yr+: HR=1.09 (95% CI 0.99, 1.20), p=0.065

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight	924	767	476	297	147	44
Normal	52046	44087	29702	18312	9128	2538
Pre Obese	154081	130529	89549	56138	28561	7689
Obese Class 1	151675	128967	88859	56069	28529	7646
Obese Class 2	82670	70049	48137	30505	15441	4135
Obese Class 3	49595	42097	29356	19020	9729	2498

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Excludes 215,358 procedures with an unknown BMI

Figure KT20 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)



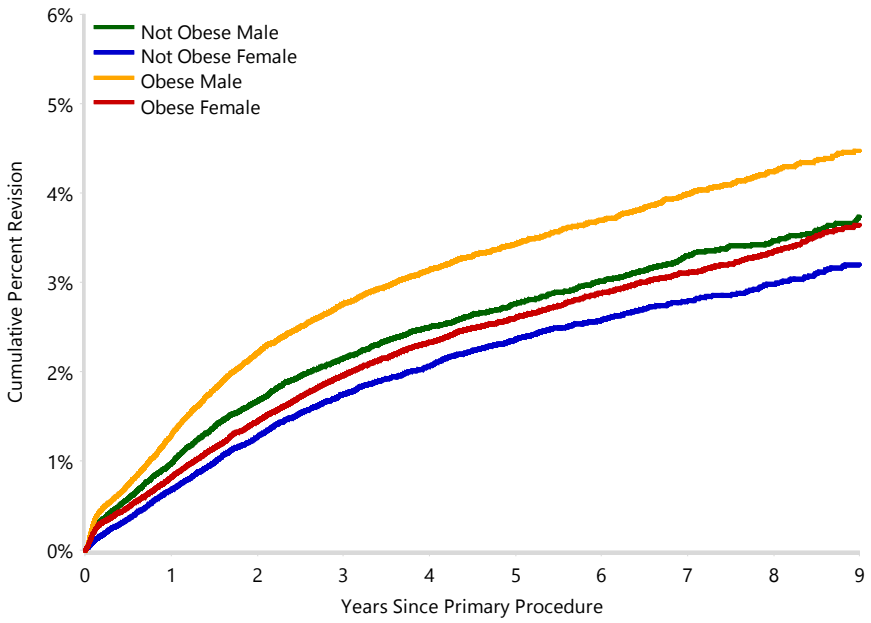
Note: Restricted to modern prostheses. BMI has not been presented for patients aged ≤19 years. Excludes 215,358 procedures with an unknown BMI

Table KT22 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and Obesity (Primary Diagnosis OA)

Obesity	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Not Obese	Male	2312	102068	1.0 (0.9, 1.0)	2.1 (2.0, 2.2)	2.8 (2.6, 2.9)	3.3 (3.1, 3.4)	3.7 (3.5, 3.9)
	Female	1975	104983	0.7 (0.6, 0.7)	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.2 (3.0, 3.4)
Obese	Male	3409	120337	1.3 (1.2, 1.4)	2.8 (2.7, 2.9)	3.4 (3.3, 3.6)	4.0 (3.8, 4.1)	4.5 (4.3, 4.7)
	Female	3529	163603	0.8 (0.8, 0.9)	2.0 (1.9, 2.0)	2.6 (2.5, 2.7)	3.1 (3.0, 3.2)	3.6 (3.5, 3.8)
TOTAL		11225	490991					

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Excludes 215,358 procedures with an unknown BMI
Not Obese group includes underweight, normal and pre-obese
Obese group includes obese class 1, 2 and 3

Figure KT21 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and Obesity (Primary Diagnosis OA)



HR - adjusted for age

Not Obese Male vs Not Obese Female

0 - 3Mth: HR=1.84 (95% CI 1.56, 2.17), p<0.001

3Mth - 1.5Yr: HR=1.25 (95% CI 1.15, 1.37), p<0.001

1.5Yr+: HR=0.99 (95% CI 0.91, 1.07), p=0.751

Not Obese Male vs Obese Male

0 - 2Yr: HR=0.84 (95% CI 0.78, 0.89), p<0.001

2Yr+: HR=0.94 (95% CI 0.86, 1.03), p=0.197

Not Obese Female vs Obese Female

0 - 3Mth: HR=0.67 (95% CI 0.57, 0.78), p<0.001

3Mth+: HR=1.04 (95% CI 0.98, 1.10), p=0.190

Obese Male vs Obese Female

0 - 2Yr: HR=1.50 (95% CI 1.41, 1.59), p<0.001

2Yr+: HR=1.07 (95% CI 0.99, 1.15), p=0.082

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Not obese	Male	102068	86298	58836	36195	18255	4865
	Female	104983	89085	60891	38552	19581	5406
Obese	Male	120337	101733	69253	42880	21179	5546
	Female	163603	139380	97099	62714	32520	8733

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Excludes 215,358 procedures with an unknown BMI
Not Obese group includes underweight, normal and pre-obese
Obese group includes obese class 1, 2 and 3

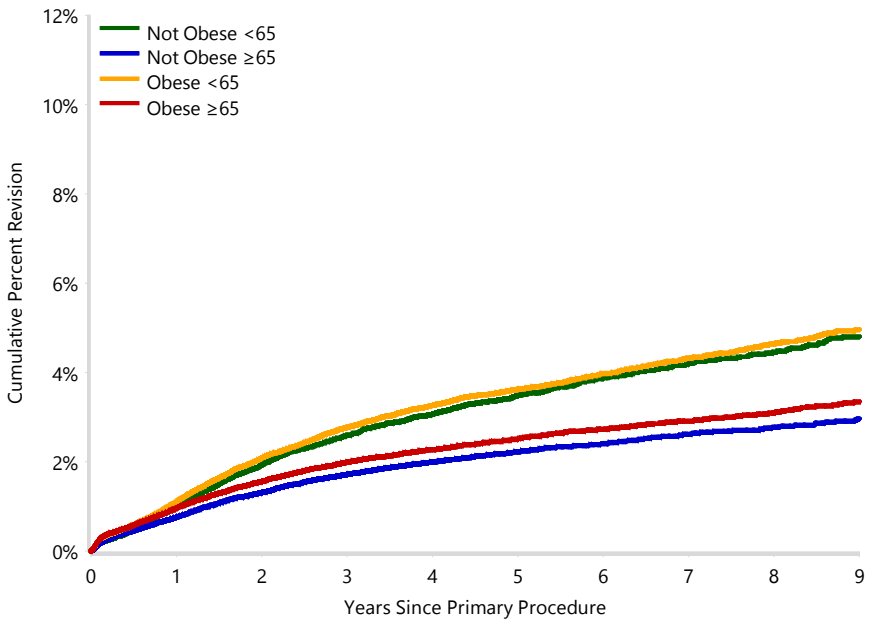
Primary Total Knee Replacement

Table KT23 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Age (Primary Diagnosis OA)

Obesity	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Not Obese	<65	1498	51542	1.0 (0.9, 1.1)	2.6 (2.4, 2.7)	3.5 (3.3, 3.7)	4.2 (4.0, 4.4)	4.5 (4.2, 4.7)	4.8 (4.5, 5.1)
	≥65	2789	155509	0.8 (0.7, 0.8)	1.7 (1.6, 1.8)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	2.8 (2.7, 2.9)	3.0 (2.8, 3.1)
Obese	<65	3319	109232	1.1 (1.0, 1.2)	2.8 (2.7, 2.9)	3.6 (3.5, 3.8)	4.3 (4.2, 4.5)	4.6 (4.5, 4.8)	5.0 (4.8, 5.2)
	≥65	3619	174708	1.0 (0.9, 1.0)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.0)	3.1 (3.0, 3.2)	3.3 (3.2, 3.5)
TOTAL		11225	490991						

Note: BMI has not been presented for patients aged ≤ 19 years
Excludes 215,358 procedures with unknown BMI
Restricted to modern prostheses.
Not obese group includes underweight, normal and pre-obese. Obese group includes obese class 1, 2 and 3

Figure KT22 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Age (Primary Diagnosis OA)



HR - adjusted for gender

Not Obese <65 vs Not Obese ≥65
0 - 6Mth: HR=1.01 (95% CI 0.88, 1.17), p=0.883
6Mth+: HR=1.70 (95% CI 1.58, 1.82), p<0.001

Not Obese <65 vs Obese <65
0 - 6Mth: HR=0.76 (95% CI 0.66, 0.88), p<0.001
6Mth - 9Mth: HR=1.17 (95% CI 0.97, 1.42), p=0.106
9Mth+: HR=0.95 (95% CI 0.88, 1.02), p=0.141

Not Obese ≥65 vs Obese ≥65
0 - 3Mth: HR=0.71 (95% CI 0.63, 0.79), p<0.001
3Mth+: HR=0.89 (95% CI 0.85, 0.94), p<0.001

Obese <65 vs Obese ≥65
0 - 3Mth: HR=0.95 (95% CI 0.85, 1.06), p=0.326
3Mth - 9Mth: HR=1.23 (95% CI 1.10, 1.38), p<0.001
9Mth - 1.5Yr: HR=1.50 (95% CI 1.36, 1.64), p<0.001
1.5Yr - 2Yr: HR=1.71 (95% CI 1.49, 1.96), p<0.001
2Yr+: HR=1.63 (95% CI 1.51, 1.76), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Not Obese	<65	51542	44333	31300	20001	10736	6657	3069
	≥65	155509	131050	88427	54746	27100	16248	7202
Obese	<65	109232	93612	65781	42462	22446	13834	6157
	≥65	174708	147501	100571	63132	31253	18497	8122

Note: BMI has not been presented for patients aged ≤ 19 years
Excludes 215,358 procedures with unknown BMI
Restricted to modern prostheses.
Not obese group includes underweight, normal and pre-obese. Obese group includes obese class 1, 2 and 3

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Bearing Mobility

Tibial prostheses are either modular or non-modular. Modular prostheses have a metal baseplate and tibial insert, which may be fixed or mobile. Non-modular prostheses are either all-polyethylene or polyethylene moulded to a metal baseplate. In 2024, few all-polyethylene and non-modular tibial components were used. Moulded non-modular components have a lower rate of revision for the first 3 months compared to all polyethylene prostheses and for the first 1.5 years compared to fixed modular designs, with no differences outside of these time periods (Table KT24 and Figure KT23).

Mobile bearing prostheses have a modular design where the tibial insert is designed to move relative to the baseplate. Fixed bearings include non-modular tibial prostheses, as well as modular designs with fixed inserts that do not move relative to the baseplate.

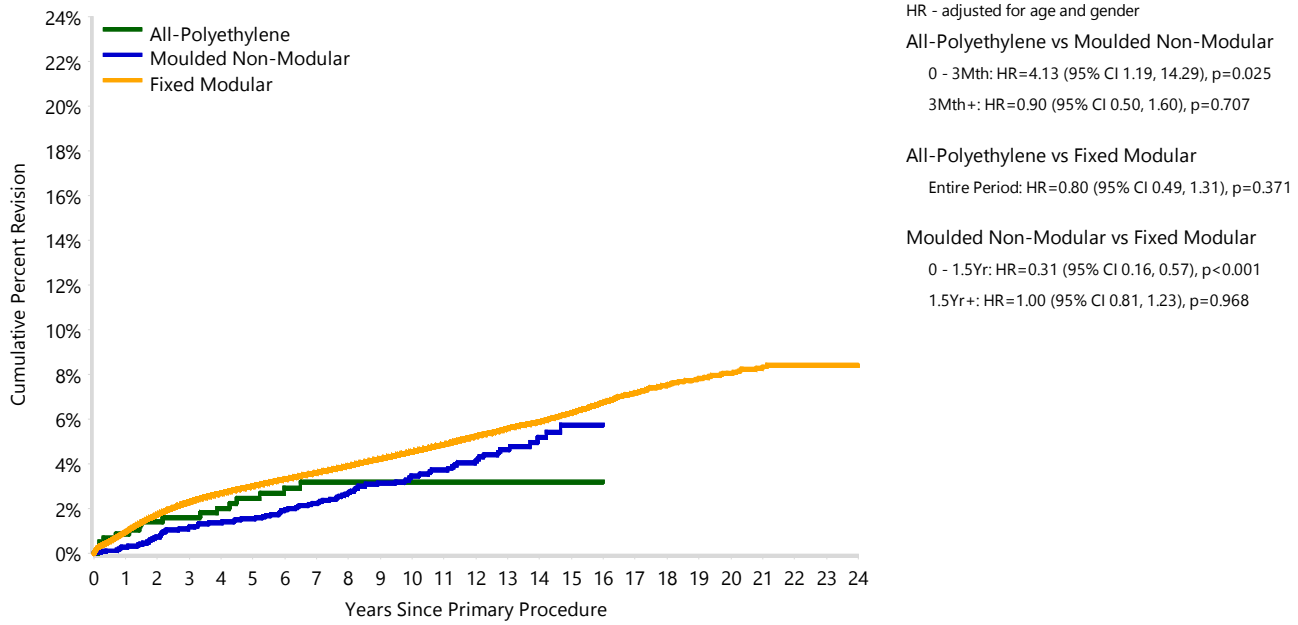
When adjusted for age, gender, fixation, and patella component usage, fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses for the majority of the early period, but after 7 years, mobile designs have a lower rate of revision (Table KT25 and Figure KT24).

Table KT24 Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)

Fixed Bearing Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All-Polyethylene	16	576	0.9 (0.4, 2.1)	1.6 (0.8, 3.1)	2.4 (1.4, 4.2)	3.2 (2.0, 5.2)	3.2 (2.0, 5.2)	
Moulded Non-Modular	96	2426	0.3 (0.1, 0.6)	1.2 (0.8, 1.7)	1.6 (1.1, 2.1)	3.5 (2.8, 4.3)	5.7 (4.5, 7.3)	
Fixed Modular	19624	610347	1.0 (0.9, 1.0)	2.3 (2.3, 2.3)	3.0 (3.0, 3.1)	4.6 (4.5, 4.6)	6.3 (6.2, 6.4)	8.1 (7.8, 8.3)
TOTAL	19736	613349						

Note: Restricted to modern prostheses

Figure KT23 Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All-Polyethylene	576	552	504	430	99	51	7
Moulded Non-Modular	2426	2403	2325	2227	1713	228	0
Fixed Modular	610347	538417	412682	311333	121140	30115	3401

Note: Restricted to modern prostheses

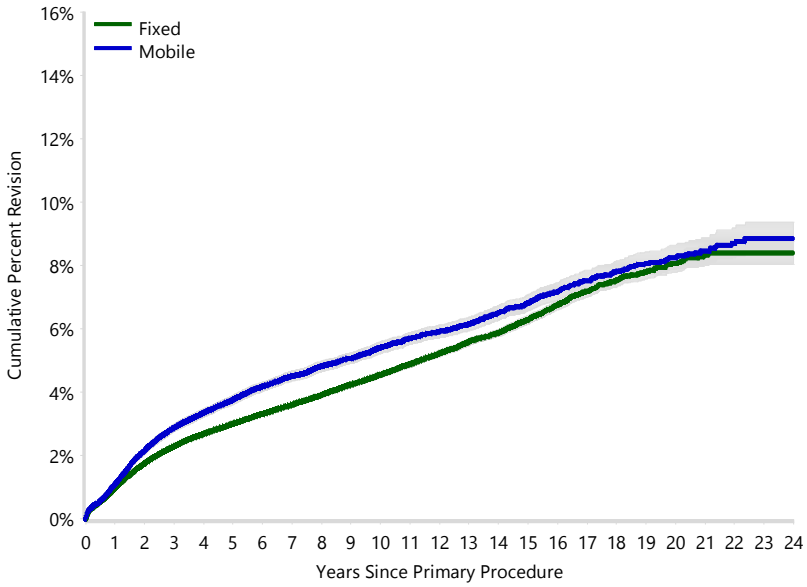
Primary Total Knee Replacement

Table KT25 Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)

Bearing Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	19736	613349	1.0 (0.9, 1.0)	2.3 (2.3, 2.3)	3.0 (3.0, 3.1)	4.6 (4.5, 4.6)	6.3 (6.2, 6.4)	8.1 (7.8, 8.3)
Mobile	4147	92852	1.1 (1.0, 1.1)	2.9 (2.8, 3.0)	3.8 (3.6, 3.9)	5.4 (5.2, 5.6)	6.8 (6.6, 7.1)	8.2 (7.9, 8.6)
TOTAL	23883	706201						

Note: Excludes 148 procedures with unknown bearing mobility
Restricted to modern prostheses

Figure KT24 Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)



HR - adjusted for age, gender, fixation, and patella usage

Mobile vs Fixed

0 - 1Yr: HR=1.07 (95% CI 1.00, 1.15), p=0.040
1 - 1.5Yr: HR=1.33 (95% CI 1.21, 1.47), p<0.001
1.5 – 3Yr: HR=1.13 1.27 (95% CI 1.18, 1.36), p<0.001
3 – 3.5Yr: HR=1.10 (95% CI 0.93, 1.29), p=0.271
3.5 - 7Yr: HR=1.22 (95% CI 1.13, 1.32), p<0.001
7Yr+: HR=0.83 (95% CI 0.76, 0.90), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	613349	541372	415511	313990	122952	30394	3408
Mobile	92852	86084	72107	57925	27978	9888	3132

Note: Excludes 148 procedures with unknown bearing mobility
Restricted to modern prostheses

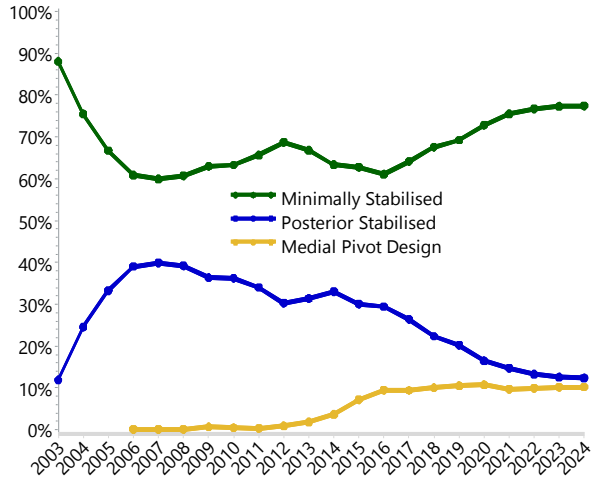
Stability

Stability refers to particular prosthetic features intended to substitute for the intrinsic stability of knee ligaments. In 2018, the classification of stability was expanded to include medial pivot design. The five categories are: minimally stabilised, medial pivot design, posterior stabilised, fully stabilised, and hinged prostheses.

Minimally stabilised prostheses are defined as those that have a flat or dished tibial articulation, regardless of congruency. Medial pivot design prostheses have a ball-and-socket medial portion of the articulation. Posterior stabilised prostheses provide additional posterior stability, most commonly using a peg and box design.

The use of minimally stabilised prostheses has remained relatively constant over the last 10 years. In 2024, these accounted for 77.4% of primary procedures. The use of posterior stabilised prostheses has declined to 12.4% in 2024. The use of medial pivot design prostheses has increased since 2014. In 2024, medial pivot design prostheses accounted for 10.2% of primary procedures (Figure KT25).

Figure KT25 Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Posterior stabilised prostheses have higher rates of revision compared to minimally stabilised prostheses. Medial pivot design prostheses have a lower rate of revision compared to posterior stabilised prostheses. Medial pivot design prostheses have a higher rate of revision compared to minimally stabilised prostheses in the first 1.5 years, no difference between 1.5 and 3 years, and a lower rate after 3 years. (Table KT26 and Figure KT26).

The cumulative incidence for the different reasons for revision varies depending on stability. Posterior stabilised prostheses have a higher cumulative incidence of revision for infection and for loosening when compared to minimally stabilised and medial pivot design prostheses.

Medial pivot design prostheses have a higher cumulative incidence of revision for instability compared to minimally stabilised prostheses (Figure KT27). The outcomes of the 4 different prostheses within the medial pivot design group are shown in Table KT27.

Prosthesis performance can also be analysed by polyethylene insert shape. Some prostheses offer tibial polyethylene inserts with differing levels of conformity to be used with a cruciate retaining femoral component. Conceptually, these sit between the minimally stabilised and posterior stabilised designs. These are described as 'anterior lipped', 'anterior stabilised', 'asymmetrically stabilised', 'medially stabilised', 'deep dish' or 'ultra-congruent' designs, which are intended to provide additional stability.

When prostheses with low polyethylene conformity are compared to those with high polyethylene conformity using XLPE, there is no difference in the rate of revision (Table KT28 and Figure KT28). The most common reasons for revision are shown in Figure KT29. The outcome of total knee replacement with XLPE by prosthesis combination and polyethylene insert shape is presented in Table KT29 and Table KT30.

Fully Stabilised and Hinged Prostheses

Fully stabilised (large peg and box design) and hinged knees are uncommonly used prostheses that provide additional collateral, as well as posterior ligament stability. While these designs of knee prostheses are usually considered to be revision components, they can also be used in complex primary clinical situations.

Fully constrained and hinged knee designs are used in 0.8% of primary procedures. Whereas osteoarthritis is the major diagnosis for all primary total knee replacements, fully stabilised prostheses are used in a higher proportion for rheumatoid arthritis. Hinged prostheses are used proportionally more for tumour, fracture, osteonecrosis, and other inflammatory arthritis (Table KT31).

Fully stabilised prostheses have been used in 3,277 primary procedures and hinged prostheses in 2,117 primary procedures. For these two knee designs, the cumulative percent revision for all diagnoses is shown in Table KT32 and Figure KT30.

When the outcome for osteoarthritis is considered, fully stabilised and hinged knee prostheses both have higher rates of revision compared to minimally stabilised prostheses (Table KT26 and Figure KT31). For both of these designs, infection is the most common reason for revision, followed by loosening, and instability for fully stabilised prostheses and fracture for hinged prostheses (Table KT33 and Figure KT32).

When used for osteoarthritis, fully stabilised and hinged prostheses have a higher revision rate than MS prostheses.

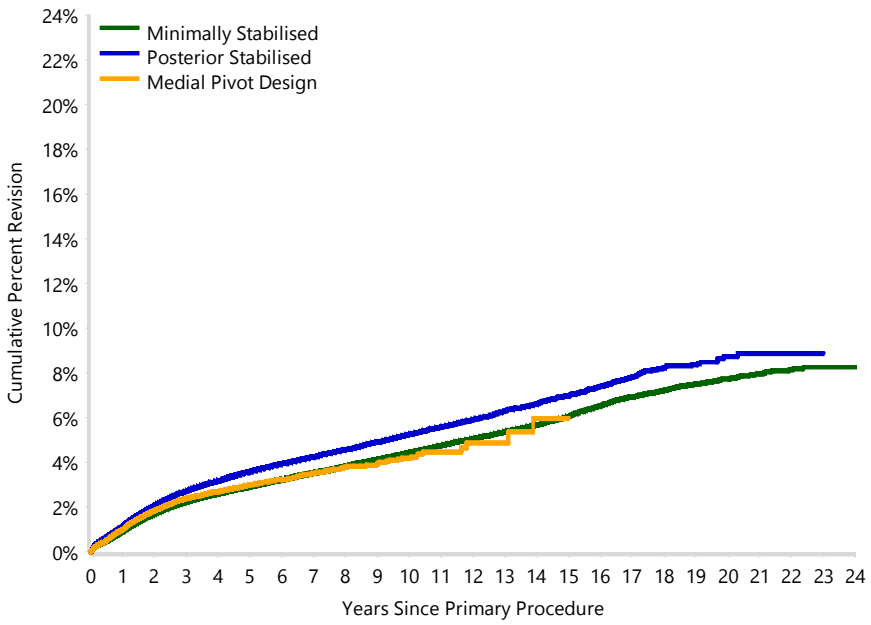
Primary Total Knee Replacement

Table KT26 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Stability	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	15311	492259	0.9 (0.9, 0.9)	2.2 (2.2, 2.3)	2.9 (2.9, 3.0)	4.4 (4.4, 4.5)	6.1 (5.9, 6.2)	7.7 (7.5, 8.0)
Posterior Stabilised	6933	157016	1.2 (1.1, 1.2)	2.7 (2.6, 2.8)	3.6 (3.5, 3.7)	5.3 (5.1, 5.4)	7.0 (6.8, 7.2)	8.7 (8.3, 9.2)
Medial Pivot Design	1304	51532	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.0 (2.8, 3.2)	4.2 (3.9, 4.5)	6.0 (4.5, 7.9)	
Fully Stabilised	179	3277	2.6 (2.1, 3.2)	4.5 (3.8, 5.4)	5.7 (4.8, 6.6)	7.2 (6.1, 8.4)	9.4 (7.6, 11.7)	
Hinged	156	2117	3.0 (2.4, 3.9)	6.3 (5.3, 7.6)	8.2 (6.9, 9.7)	11.9 (9.9, 14.1)		
TOTAL	23883	706201						

Note: Excludes 148 procedures with unknown stability
Restricted to modern prostheses

Figure KT26 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



HR - adjusted for age and gender

Posterior Stabilised vs Minimally Stabilised

0 - 6Mth: HR=1.36 (95% CI 1.27, 1.46), p<0.001

6Mth - 2Yr: HR=1.18 (95% CI 1.12, 1.24), p<0.001

2Yr - 2.5Yr: HR=1.24 (95% CI 1.12, 1.38), p<0.001

2.5Yr - 5Yr: HR=1.24 (95% CI 1.16, 1.32), p<0.001

5Yr+: HR=1.09 (95% CI 1.03, 1.15), p=0.002

Posterior Stabilised vs Medial Pivot Design

Entire Period: HR=1.21 (95% CI 1.14, 1.28), p<0.001

Medial Pivot Design vs Minimally Stabilised

0 - 1.5Yr: HR=1.10 (95% CI 1.02, 1.19), p=0.018

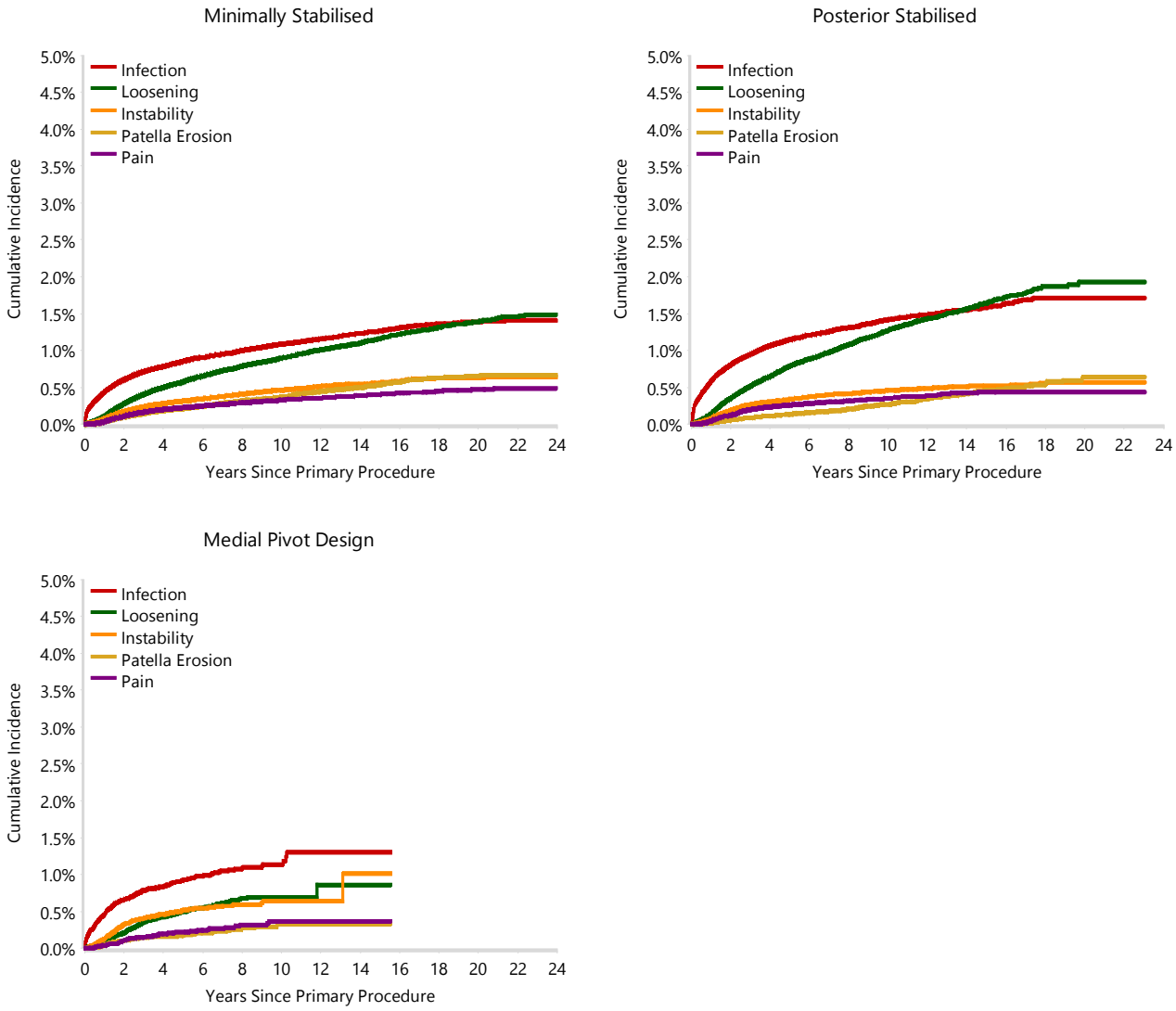
1.5Yr - 3Yr: HR=1.02 (95% CI 0.92, 1.15), p=0.670

3Yr+: HR=0.83 (95% CI 0.74, 0.94), p=0.002

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	492259	433023	328075	244273	100497	27678	5672
Posterior Stabilised	157016	145866	125413	105322	48082	12419	862
Medial Pivot Design	51532	43930	30745	19979	1719	88	0

Note: Restricted to modern prostheses

Figure KT27 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table KT27 Cumulative Percent Revision of Primary Total Knee Replacement with Medial Pivot Design by Insert (Primary Diagnosis OA)

Insert	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Evolution	378	13656	0.8 (0.7, 1.0)	2.2 (2.0, 2.5)	2.9 (2.6, 3.2)	4.2 (3.7, 4.8)	
GMK Sphere Primary	771	30312	1.2 (1.0, 1.3)	2.6 (2.4, 2.8)	3.3 (3.0, 3.5)	4.5 (4.0, 5.0)	
MRK	35	855	1.1 (0.6, 2.0)	2.6 (1.7, 3.9)	3.1 (2.1, 4.5)	4.6 (3.2, 6.6)	6.6 (4.4, 9.6)
SAIPH	120	6709	0.6 (0.4, 0.8)	1.6 (1.3, 2.0)	2.1 (1.7, 2.5)	2.8 (2.1, 3.6)	
TOTAL	**1304**	**51532**					

Note: Restricted to modern prostheses

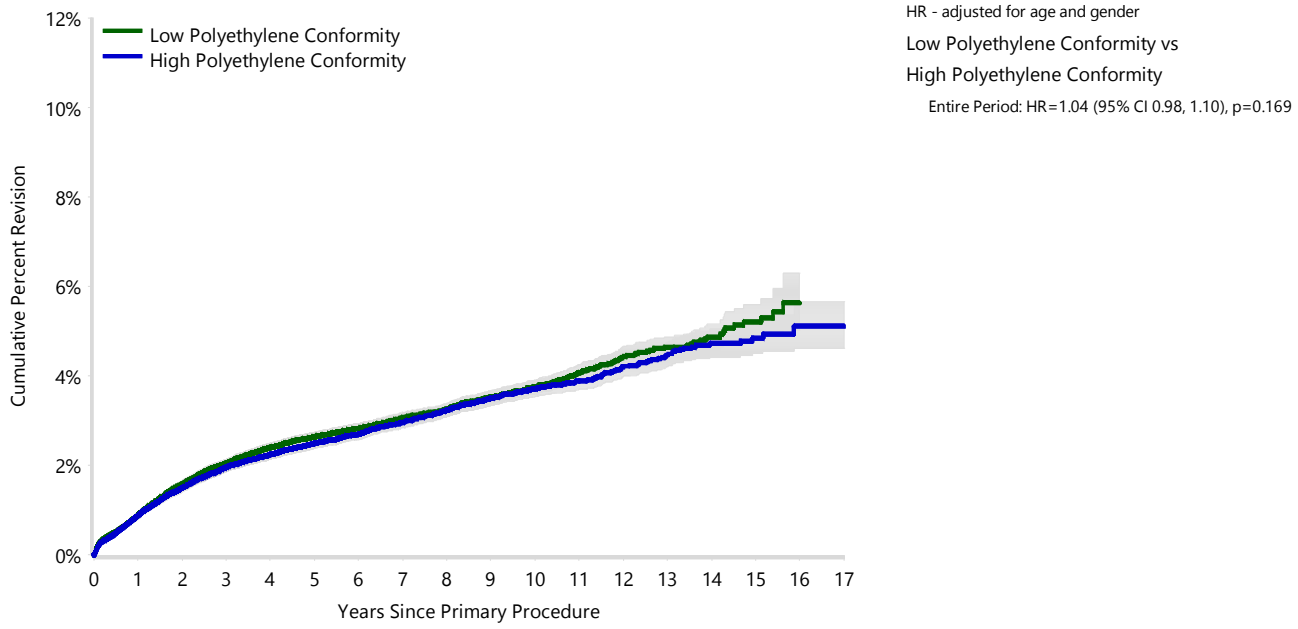
Primary Total Knee Replacement

Table KT28 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)

Polyethylene Conformity	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Low Polyethylene Conformity	3049	113020	0.9 (0.8, 0.9)	2.0 (2.0, 2.1)	2.6 (2.5, 2.7)	3.7 (3.6, 3.9)	5.2 (4.8, 5.6)	
High Polyethylene Conformity	2426	105911	0.9 (0.8, 0.9)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.7 (3.5, 3.9)	4.9 (4.5, 5.2)	
TOTAL	**5475**	**218931**						

Note: Restricted to modern prostheses

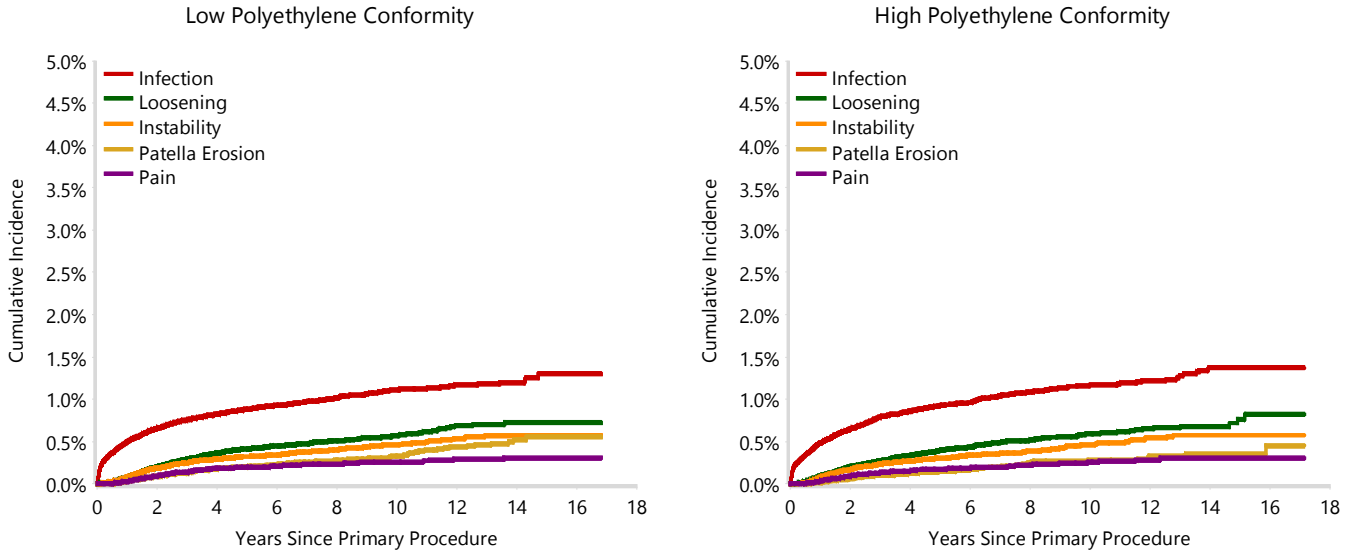
Figure KT28 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Low Polyethylene Conformity	113020	102884	83430	64229	16138	1123	0
High Polyethylene Conformity	105911	90932	65442	43914	12299	1256	0

Note: Restricted to modern prostheses

Figure KT29 Cumulative Incidence Revision Diagnosis of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table KT29 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Prosthesis Combination and Polyethylene Insert Shape (Primary Diagnosis OA)

Prothesis Combination	Polyethylene Shape	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Genesis II/Genesis II	CR High Flex	278	8937	1.1 (0.9, 1.3)	2.4 (2.1, 2.7)	2.9 (2.6, 3.3)	3.4 (3.0, 3.9)	4.9 (4.2, 5.7)	
	Deep Dish	16	1238	0.7 (0.4, 1.4)	1.7 (1.0, 2.9)	2.3 (1.2, 4.6)			
Legion Oxinium/ Genesis II	Cruciate Retaining	259	9523	0.8 (0.7, 1.1)	2.3 (2.0, 2.7)	3.2 (2.8, 3.7)	3.8 (3.3, 4.4)	4.6 (3.9, 5.4)	
	Ultra-Congruent	22	1122	0.9 (0.5, 1.7)	2.6 (1.7, 4.0)	2.6 (1.7, 4.0)			
Legion/Genesis II	Cruciate Retaining	204	6662	1.2 (0.9, 1.4)	2.7 (2.3, 3.1)	3.6 (3.1, 4.2)	4.0 (3.5, 4.6)	4.1 (3.6, 4.8)	
	Ultra-Congruent	34	1315	1.3 (0.8, 2.1)	2.9 (2.0, 4.2)	4.6 (3.1, 6.7)			
Persona	Cruciate Retaining	443	24297	1.0 (0.8, 1.1)	2.0 (1.8, 2.2)	2.4 (2.2, 2.7)	2.7 (2.4, 3.0)	2.8 (2.4, 3.2)	
	Medial-Congruent	642	45755	0.8 (0.7, 0.9)	1.9 (1.8, 2.1)	2.6 (2.3, 3.0)			
	Ultra-Congruent	113	6226	1.0 (0.8, 1.3)	2.0 (1.6, 2.4)	2.4 (2.0, 2.9)	2.7 (2.1, 3.4)		
Triathlon/Triathlon	Condylar Stabilising	2065	96651	0.8 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.2, 2.5)	2.8 (2.7, 3.0)	3.6 (3.4, 3.8)	4.7 (4.4, 5.1)
	Cruciate Retaining	1866	78718	0.8 (0.8, 0.9)	1.8 (1.7, 1.9)	2.4 (2.2, 2.5)	2.8 (2.7, 2.9)	3.5 (3.3, 3.7)	4.9 (4.5, 5.3)
TOTAL		5942	280444						

Note: Restricted to modern prostheses. Only prosthesis that have >500 procedures in each conformity category with a follow-up of >3 years are shown

Table KT30 Comparisons of Revision Rates for Minimally Stabilised Primary Total Knee Replacement with XLPE by Prosthesis Combination and Polyethylene Insert Shape (Primary Diagnosis OA)

Prothesis Combination	Comparison	Hazard Ratio – adjusted for age and gender
Genesis II/Genesis	CR High Flex vs Deep Dish	0 - 1Mth: HR=0.22 (95% CI 0.09, 0.55), p=0.001
		1Mth - 1Yr: HR=4.63 (95% CI 1.14, 18.85), p=0.032
		1Yr - 1.5Yr: HR=3.24 (95% CI 0.44, 23.69), p=0.246
		1.5Yr+: HR=1.19 (95% CI 0.52, 2.71), p=0.678
Legion Oxinium/Genesis II	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=1.02 (95% CI 0.66, 1.59), p=0.912
Legion/Genesis II	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=0.92 (95% CI 0.64, 1.33), p=0.657
Persona	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=1.02 (95% CI 0.83, 1.26), p=0.823
	Cruciate Retaining vs Medial-Congruent	0 - 2.5Yr: HR=1.12 (95% CI 0.98, 1.27), p=0.087
		2.5Yr+: HR=0.71 (95% CI 0.51, 0.97), p=0.032
Triathlon/Triathlon	Cruciate Retaining vs Condylar Stabilising	Entire Period: HR=1.00 (95% CI 0.94, 1.06), p=0.978

Note: Restricted to modern prostheses

Table KT31 Primary Total Knee Replacement by Primary Diagnosis and Stability

Primary Diagnosis	Fully Stabilised		Hinged		TOTAL	
	N	%	N	%	N	%
Osteoarthritis	3277	91.9	2117	60.1	5394	76.1
Tumour	9	0.3	772	21.9	781	11.0
Fracture	50	1.4	360	10.2	410	5.8
Rheumatoid Arthritis	142	4.0	95	2.7	237	3.3
Other Inflammatory Arthritis	38	1.1	50	1.4	88	1.2
Osteonecrosis	31	0.9	52	1.5	83	1.2
Other	20	0.6	75	2.1	95	1.3
TOTAL	**3567**	**100.0**	**3521**	**100.0**	**7088**	**100.0**

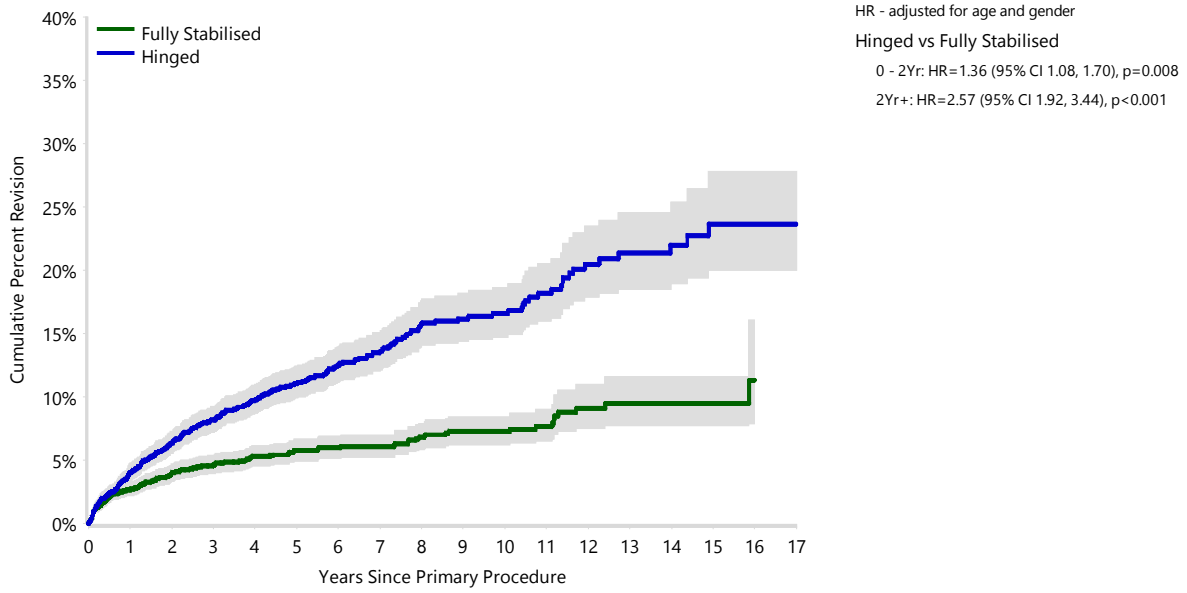
Note: Restricted to modern prostheses

Table KT32 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (All Diagnoses)

Stability	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fully Stabilised	199	3567	2.7 (2.2, 3.3)	4.6 (4.0, 5.4)	5.8 (5.0, 6.7)	6.1 (5.2, 7.0)	7.3 (6.2, 8.5)	9.5 (7.8, 11.6)
Hinged	359	3521	4.0 (3.4, 4.8)	8.2 (7.2, 9.2)	11.1 (9.9, 12.4)	13.6 (12.2, 15.2)	16.6 (14.7, 18.7)	23.6 (20.0, 27.8)
TOTAL	**558**	**7088**						

Note: Restricted to modern prostheses

Figure KT30 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (All Diagnoses)

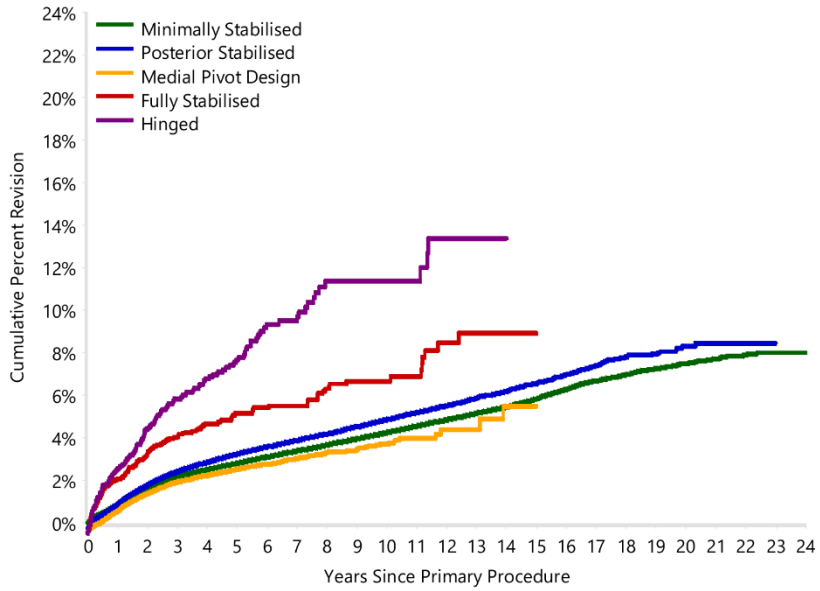


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fully Stabilised	3567	3095	2373	1720	1133	491	78
Hinged	3521	2888	1935	1244	756	357	82

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Figure KT31 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



HR - adjusted for age and gender

Posterior Stabilised vs Minimally Stabilised
- 0 - 6Mth: HR=1.36 (95% CI 1.27, 1.46), p<0.001
- 6Mth - 2Yr: HR=1.18 (95% CI 1.12, 1.24), p<0.001
- 2Yr - 2.5Yr: HR=1.24 (95% CI 1.12, 1.38), p<0.001
- 2.5Yr - 5Yr: HR=1.24 (95% CI 1.16, 1.32), p<0.001
- 5Yr+: HR=1.09 (95% CI 1.03, 1.15), p=0.001

Medial Pivot Design vs Minimally Stabilised
- 0 - 1.5Yr: HR=1.10 (95% CI 1.02, 1.19), p=0.018
- 1.5Yr - 3Yr: HR=1.02 (95% CI 0.91, 1.14), p=0.692
- 3Yr+: HR=0.84 (95% CI 0.74, 0.94), p=0.003

Fully Stabilised vs Minimally Stabilised
- 0 - 6Mth: HR=4.13 (95% CI 3.22, 5.30), p<0.001
- 6Mth - 1.5Yr: HR=1.37 (95% CI 0.97, 1.93), p=0.073
- 1.5Yr+: HR=1.53 (95% CI 1.23, 1.90), p<0.001

Hinged vs Minimally Stabilised
- 0 - 6Mth: HR=4.69 (95% CI 3.49, 6.30), p<0.001
- 6Mth - 1.5Yr: HR=1.89 (95% CI 1.30, 2.74), p<0.001
- 1.5Yr+: HR=2.94 (95% CI 2.37, 3.65), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	492259	433023	328075	244273	100497	27678	5672
Posterior Stabilised	157016	145866	125413	105322	48082	12419	862
Medial Pivot Design	51532	43930	30745	19979	1719	88	0
Fully Stabilised	3277	2843	2176	1590	442	66	4
Hinged	2117	1794	1209	751	190	31	2

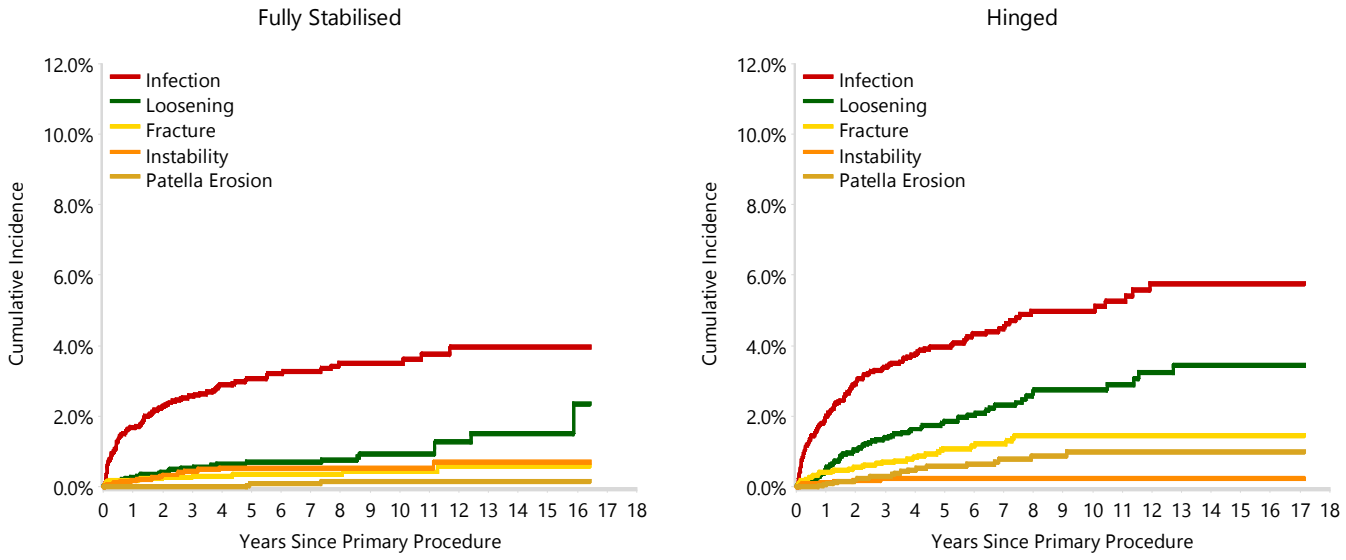
Note: Restricted to modern prostheses

Table KT33 Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Revision Diagnosis	Fully Stabilised			Hinged		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	107	3.0	53.8	140	4.0	39.0
Loosening	28	0.8	14.1	69	2.0	19.2
Fracture	13	0.4	6.5	35	1.0	9.7
Patella Erosion	3	0.1	1.5	20	0.6	5.6
Instability	17	0.5	8.5	7	0.2	1.9
Bearing Dislocation	8	0.2	4.0	5	0.1	1.4
Other	23	0.6	11.6	83	2.4	23.1
N Revision	**199**	**5.6**	**100.0**	**359**	**10.2**	**100.0**
N Primary	**3567**			**3521**		

Note: Restricted to modern prostheses

Figure KT32 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Knee Replacement

Patellar Resurfacing

Primary total knee replacement procedures with patellar resurfacing have a lower rate of revision compared to procedures without patellar resurfacing from 6 months onwards (Table KT34 and Figure KT33).

When the type of patella replacement is assessed, metal backed patella components have a higher rate of revision compared to all polyethylene patella components (Table KT35 and Figure KT34).

Procedures with patellar resurfacing have a lower rate of revision for each of the three common stability types. When resurfacing the patella, the rate of revision is lower for minimally stabilised compared to posterior stabilised prostheses. Posterior stabilised without patellar resurfacing has the highest rate of revision (Table KT36 and Figure KT35).

When the patella is resurfaced, there is no difference in the rate of revision for medial pivot design prostheses compared to minimally stabilised prostheses. When the patella is not resurfaced, medial pivot design prostheses have a higher rate of revision than minimally stabilised knee prostheses (Table KT36 and Figure KT36).

There are five prosthesis combinations that are used with and without patella resurfacing with >10,000 procedures in each patella usage group. There is prosthesis specific variation with patella use. These are shown in Table KT37 and Table KT38.

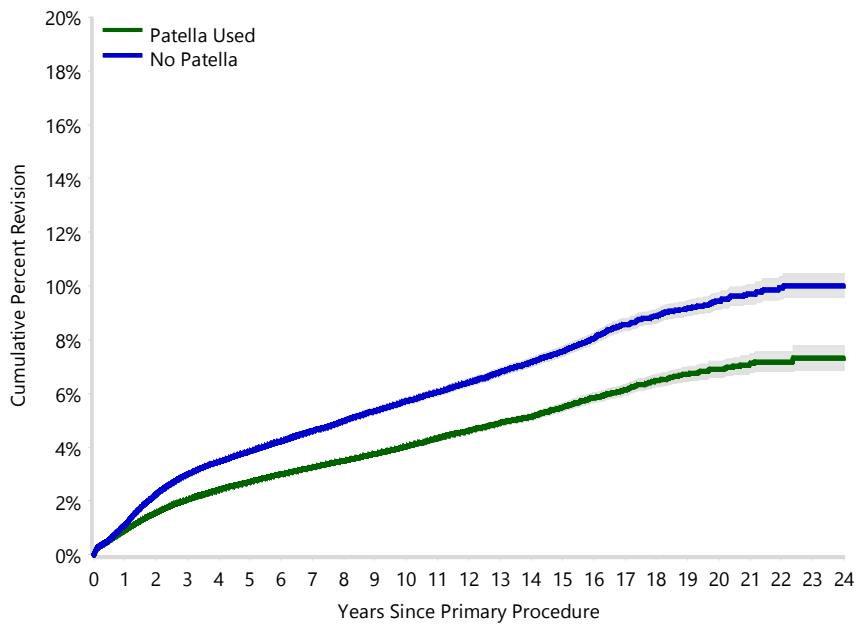
Procedures with a patella component have a lower rate of revision after 6 months.

Table KT34 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)

Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	12944	478626	0.9 (0.9, 0.9)	2.1 (2.0, 2.1)	2.7 (2.7, 2.8)	4.0 (4.0, 4.1)	5.5 (5.3, 5.6)	6.9 (6.6, 7.2)
No Patella	10946	227723	1.1 (1.1, 1.2)	3.0 (2.9, 3.1)	3.9 (3.8, 3.9)	5.7 (5.6, 5.8)	7.6 (7.4, 7.7)	9.4 (9.1, 9.7)
TOTAL	23890	706349						

Note: Restricted to modern prostheses

Figure KT33 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)



HR - adjusted for age and gender

No Patella vs Patella Used

0 - 6Mth: HR=1.01 (95% CI 0.94, 1.08), p=0.860

6Mth - 1Yr: HR=1.52 (95% CI 1.41, 1.63), p<0.001

1Yr - 1.5Yr: HR=1.73 (95% CI 1.61, 1.87), p<0.001

1.5Yr - 2Yr: HR=1.63 (95% CI 1.50, 1.77), p<0.001

2Yr+: HR=1.38 (95% CI 1.33, 1.43), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	478626	416637	310398	224800	77792	18290	2863
No Patella	227723	210963	177323	147192	73189	22011	3681

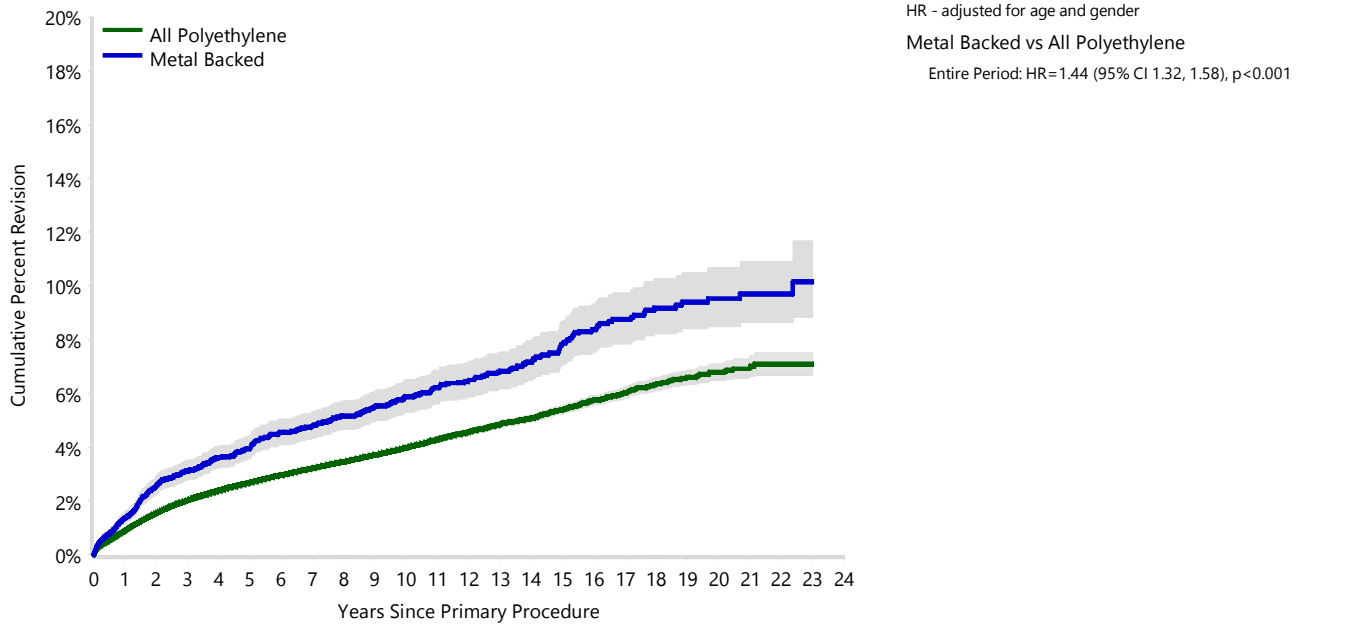
Note: Restricted to modern prostheses

Table KT35 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Type (Primary Diagnosis OA)

Patella Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All Polyethylene	12441	464688	0.9 (0.9, 0.9)	2.0 (2.0, 2.1)	2.7 (2.6, 2.7)	4.0 (3.9, 4.1)	5.4 (5.2, 5.5)	6.8 (6.5, 7.1)
Metal Backed	503	13919	1.4 (1.2, 1.6)	3.1 (2.8, 3.5)	4.0 (3.6, 4.4)	5.9 (5.3, 6.5)	7.9 (7.1, 8.7)	9.5 (8.5, 10.7)
TOTAL	12944	478607						

Note: Restricted to modern prostheses. Excludes 19 procedures with unknown patella type

Figure KT34 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All Polyethylene	464688	407042	303921	219696	74751	16778	2245
Metal Backed	13919	9579	6472	5100	3041	1512	618

Note: Restricted to modern prostheses. Excludes 19 procedures with unknown patella type

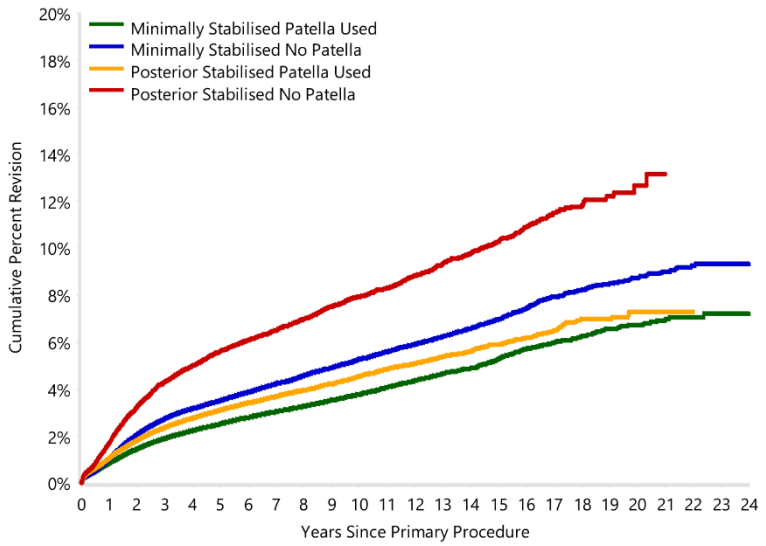
Primary Total Knee Replacement

Table KT36 Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Component Usage (Primary Diagnosis OA)

Stability	Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	Patella Used	7372	310513	0.8 (0.8, 0.9)	1.9 (1.8, 1.9)	2.5 (2.4, 2.6)	3.8 (3.7, 3.9)	5.3 (5.1, 5.5)	6.7 (6.3, 7.1)
	No Patella	7939	181746	1.0 (1.0, 1.1)	2.7 (2.6, 2.8)	3.5 (3.4, 3.6)	5.3 (5.1, 5.4)	7.0 (6.8, 7.1)	8.7 (8.4, 9.1)
Posterior Stabilised	Patella Used	4647	128436	1.0 (1.0, 1.1)	2.4 (2.3, 2.4)	3.1 (3.0, 3.2)	4.5 (4.4, 4.7)	5.9 (5.7, 6.1)	7.3 (6.8, 7.8)
	No Patella	2286	28580	1.7 (1.5, 1.8)	4.3 (4.1, 4.5)	5.6 (5.3, 5.9)	7.9 (7.6, 8.3)	10.3 (9.8, 10.7)	12.7 (11.7, 13.7)
Medial Pivot Design	Patella Used	697	35454	0.9 (0.8, 1.0)	2.0 (1.8, 2.1)	2.5 (2.3, 2.7)	3.2 (2.9, 3.6)		
	No Patella	607	16078	1.3 (1.1, 1.4)	3.3 (3.0, 3.6)	4.1 (3.7, 4.4)	5.7 (5.2, 6.3)	7.1 (5.6, 8.9)	
TOTAL		23548	700807						

Note: Restricted to modern prostheses

Figure KT35 Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Component Usage (Primary Diagnosis OA)



HR - adjusted for age and gender

Minimally Stabilised Patella Used vs Minimally Stabilised No Patella

- 0 - 3Mth: HR=1.05 (95% CI 0.95, 1.15), p=0.346
- 3Mth - 6Mth: HR=0.89 (95% CI 0.78, 1.01), p=0.074
- 6Mth - 1.5Yr: HR=0.62 (95% CI 0.59, 0.66), p<0.001
- 1.5Yr - 2Yr: HR=0.63 (95% CI 0.57, 0.69), p<0.001
- 2Yr - 3.5Yr: HR=0.69 (95% CI 0.64, 0.74), p<0.001
- 3.5Yr+: HR=0.78 (95% CI 0.74, 0.83), p<0.001

Minimally Stabilised Patella Used vs Posterior Stabilised Patella Used

- 0 - 6Mth: HR=0.84 (95% CI 0.77, 0.91), p<0.001
- 6Mth - 9Mth: HR=0.85 (95% CI 0.76, 0.96), p=0.008
- 9Mth - 1.5Yr: HR=0.75 (95% CI 0.70, 0.81), p<0.001
- 1.5Yr - 2Yr: HR=0.78 (95% CI 0.71, 0.86), p<0.001
- 2Yr - 2.5Yr: HR=0.77 (95% CI 0.68, 0.87), p<0.001
- 2.5Yr - 3.5Yr: HR=0.81 (95% CI 0.73, 0.90), p<0.001
- 3.5Yr - 4Yr: HR=0.92 (95% CI 0.79, 1.08), p=0.302
- 4Yr - 5Yr: HR=0.81 (95% CI 0.71, 0.92), p<0.001
- 5Yr+: HR=0.95 (95% CI 0.88, 1.02), p=0.128

Minimally Stabilised No Patella vs Posterior Stabilised No Patella

- 0 - 2Yr: HR=0.64 (95% CI 0.59, 0.69), p<0.001
- 2Yr - 3.5Yr: HR=0.63 (95% CI 0.56, 0.70), p<0.001
- 3.5Yr+: HR=0.69 (95% CI 0.65, 0.74), p<0.001

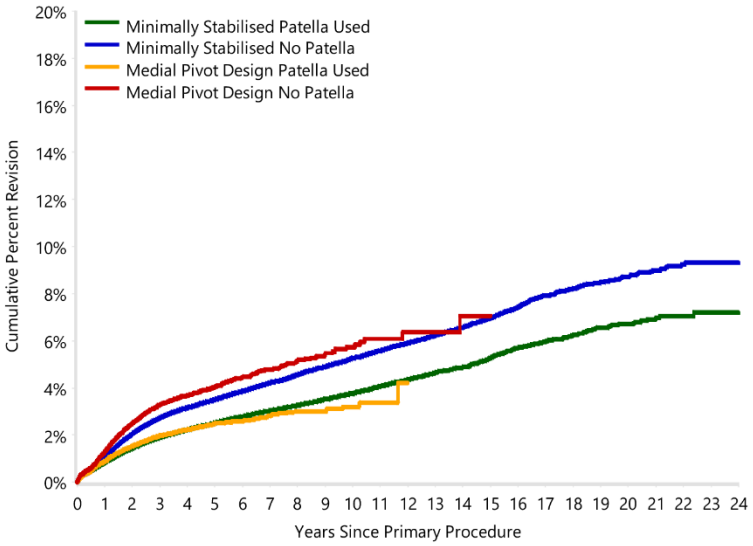
Posterior Stabilised Patella Used vs Posterior Stabilised No Patella

- Entire Period: HR=0.57 (95% CI 0.55, 0.60), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	Patella Used	310513	264924	187431	128488	42782	10624	2251
	No Patella	181746	168099	140644	115785	57715	17054	3421
Posterior Stabilised	Patella Used	128436	118408	100226	82378	33845	7603	607
	No Patella	28580	27458	25187	22944	14237	4816	255

Note: Restricted to modern prostheses

Figure KT36 Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Component Usage (Primary Diagnosis OA)



HR - adjusted for age and gender

Minimally Stabilised Patella Used vs Minimally Stabilised No Patella

- 0 - 3Mth: HR=1.07 (95% CI 0.97, 1.17), p=0.204
- 3Mth - 6Mth: HR=0.87 (95% CI 0.76, 1.00), p=0.047
- 6Mth - 1Yr: HR=0.68 (95% CI 0.63, 0.75), p<0.001
- 1Yr - 1.5Yr: HR=0.57 (95% CI 0.52, 0.62), p<0.001
- 1.5Yr - 2Yr: HR=0.61 (95% CI 0.55, 0.68), p<0.001
- 2Yr - 3.5Yr: HR=0.68 (95% CI 0.63, 0.73), p<0.001
- 3.5Yr+: HR=0.79 (95% CI 0.75, 0.83), p<0.001

Minimally Stabilised Patella Used vs Medial Pivot Design Patella Used

- Entire Period: HR=1.05 (95% CI 0.97, 1.13), p=0.246

Minimally Stabilised No Patella vs Medial Pivot Design No Patella

- 0 - 1.5Yr: HR=0.82 (95% CI 0.72, 0.92), p<0.001
- 1.5Yr+: HR=0.95 (95% CI 0.85, 1.07), p=0.382

Medial Pivot Design Patella Used vs Medial Pivot Design No Patella

- Entire Period: HR=0.62 (95% CI 0.56, 0.69), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	Patella Used	310513	264924	187431	128488	42782	10624	2251
	No Patella	181746	168099	140644	115785	57715	17054	3421
Medial Pivot Design	Patella Used	35454	29722	20179	12232	756	11	0
	No Patella	16078	14208	10566	7747	963	77	0

Note: Restricted to modern prostheses

Table KT37 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Type and Patella Component Usage (Primary Diagnosis OA)

Prosthesis Combination	Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Genesis II CR/Genesis II	Patella Used	474	11779	0.9 (0.8, 1.1)	2.2 (1.9, 2.4)	2.8 (2.5, 3.1)	4.2 (3.8, 4.6)	5.1 (4.6, 5.6)	6.2 (5.5, 7.1)
	No Patella	839	14893	0.9 (0.8, 1.1)	3.0 (2.7, 3.3)	3.9 (3.6, 4.2)	5.6 (5.2, 6.0)	6.9 (6.4, 7.4)	8.2 (7.5, 8.9)
LCS CR/MBT	Patella Used	605	10532	1.1 (0.9, 1.3)	3.1 (2.8, 3.5)	4.1 (3.7, 4.5)	5.8 (5.3, 6.3)	7.3 (6.7, 8.1)	9.3 (8.2, 10.5)
	No Patella	1021	22471	0.8 (0.7, 0.9)	2.5 (2.3, 2.7)	3.2 (3.0, 3.4)	4.5 (4.2, 4.8)	5.5 (5.2, 5.9)	7.3 (6.6, 8.1)
Persona CR/Persona	Patella Used	853	56999	0.9 (0.8, 0.9)	1.8 (1.7, 2.0)	2.3 (2.1, 2.5)	2.6 (2.3, 3.0)		
	No Patella	342	19214	0.9 (0.8, 1.1)	2.2 (2.0, 2.5)	2.8 (2.5, 3.1)			
Triathlon CR/Triathlon	Patella Used	2101	123128	0.7 (0.7, 0.8)	1.5 (1.4, 1.5)	1.9 (1.8, 2.0)	2.8 (2.6, 2.9)	4.0 (3.6, 4.3)	
	No Patella	2259	64300	1.0 (0.9, 1.1)	2.4 (2.3, 2.5)	3.0 (2.9, 3.2)	4.5 (4.3, 4.7)	5.7 (5.4, 6.1)	
Vanguard CR/Vanguard	Patella Used	508	13791	0.8 (0.6, 0.9)	2.0 (1.7, 2.2)	2.5 (2.3, 2.8)	3.9 (3.5, 4.3)	5.7 (5.1, 6.5)	
	No Patella	716	13389	0.8 (0.7, 1.0)	2.6 (2.4, 2.9)	3.3 (3.0, 3.6)	5.3 (4.9, 5.8)	7.9 (7.2, 8.7)	
TOTAL		9718	350496						

Note: Restricted to modern prostheses
Only prosthesis combinations with >10,000 procedures in both patella usage groups are listed

Table KT38 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Patella Usage (Primary Diagnosis OA)

Comparison	HR -adjusted for age and gender
Genesis II CR/Genesis II Patella Used vs Genesis II CR/Genesis II No Patella	Entire Period: HR=0.77 (95% CI 0.69, 0.86), p<0.001
LCS CR/MBT Patella Used vs LCS CR/MBT No Patella	Entire Period: HR=1.33 (95% CI 1.20, 1.47), p<0.001
Persona CR/Persona Patella Used vs Persona CR/Persona No Patella	Entire Period: HR=0.85 (95% CI 0.75, 0.97), p=0.014
Triathlon CR/Triathlon Patella Used vs Triathlon CR/Triathlon No Patella	Entire Period: HR=0.64 (95% CI 0.60, 0.68), p<0.001
Vanguard CR/Vanguard Patella Used vs Vanguard CR/Vanguard No Patella	0 - 1Mth: HR=1.21 (95% CI 0.65, 2.24), p=0.545
	1Mth+: HR=0.71 (95% CI 0.63, 0.80), p<0.001

Fixation

When fixation types for all modern total knee replacements are compared, procedures using hybrid fixation have a lower rate of revision compared to cementless fixation and compared to cemented fixation (except for a period from 6 months until 1.5 years). Procedures using cementless fixation have a higher rate of revision than when both components are cemented (Table KT39 and Figure KT37). However, the effect of fixation varies depending on prosthesis stability. For minimally stabilised prostheses, hybrid fixation has a lower revision rate for the first 6 months compared to cemented fixation, with no difference after. Cementless fixation has a higher rate of revision compared to both cemented fixation and hybrid fixation (Table KT39 and Figure KT38).

When minimally stabilised prostheses are further analysed by tibial fixation and age, patients aged <65 years with cementless tibial fixation have the highest rates of revision (Table KT40 and Figure KT39). Patients with minimally stabilised knees using cementless tibial fixation have a higher rate of revision regardless of gender. Males with cemented tibial fixation have a higher rate of revision compared to females with cemented tibial fixation in the first 1.5 years (Table KT42 and Figure KT40).

When a posterior stabilised knee is used, cemented fixation has a lower initial rate of revision compared to cementless fixation. After 1.5 years, cementless fixation has a lower rate of revision than cemented fixation. Cemented fixation has a lower rate of revision compared to hybrid fixation in the first 1.5 years only, with no difference after this time. There is no difference in the rate of revision when cementless fixation and hybrid fixation are compared (Table KT43 and Figure KT41).

When posterior stabilised prostheses are further analysed by tibial fixation and age, patients aged <65 years have a higher rate of revision with both fixation types compared to patients 65 years and over. The early higher rate of revision with cementless fixation is seen for both <65 years and 65 years and over, but only those <65 years have a later lower rate of revision. Females with cemented tibial fixation have the lowest rate of revision, while males with cementless tibial fixation have a lower rate of revision after 1.5 years.

Cementing the tibial component gives the best outcome for minimally stabilised knee replacement.

When a medial pivot design prosthesis is used, there is no difference in rate of revision between cemented and hybrid fixation. There are too few revisions of cementless fixation for an analysis to be undertaken (Table KT46 and Figure KT44).

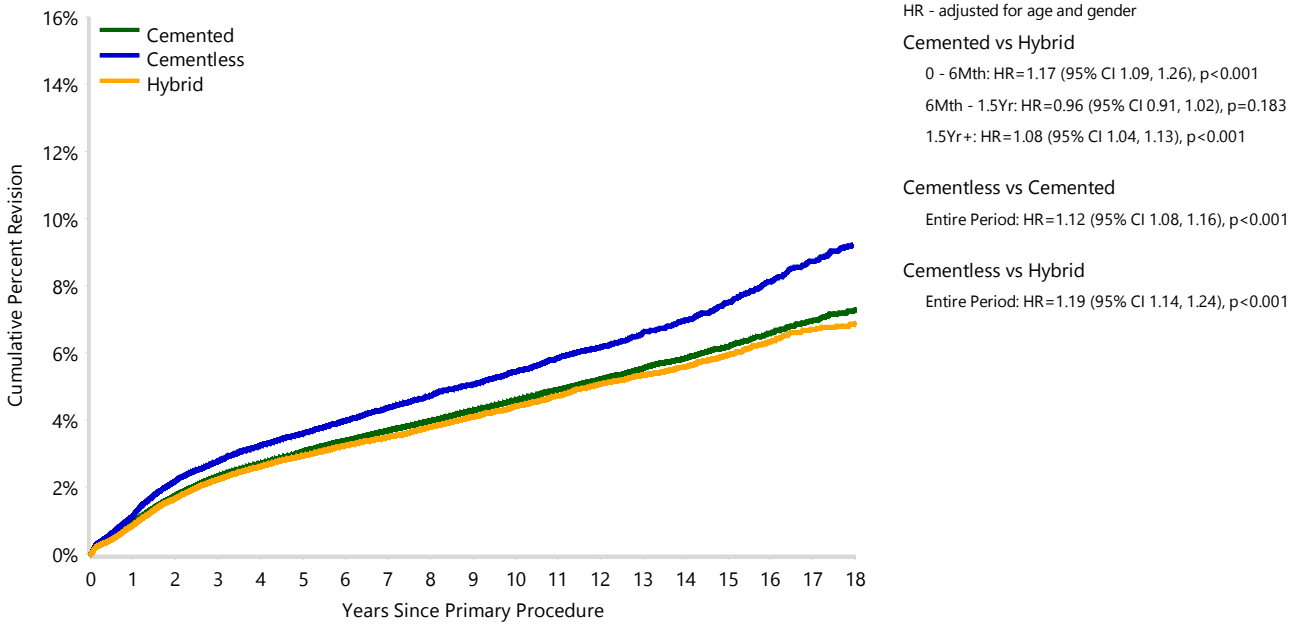
Primary Total Knee Replacement

Table KT39 Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	15531	463525	1.0 (0.9, 1.0)	2.3 (2.3, 2.4)	3.1 (3.0, 3.1)	4.6 (4.5, 4.7)	6.2 (6.1, 6.3)	7.8 (7.5, 8.1)
Cementless	3931	106429	1.2 (1.1, 1.2)	2.8 (2.7, 2.9)	3.6 (3.5, 3.7)	5.4 (5.2, 5.6)	7.5 (7.2, 7.8)	9.7 (9.2, 10.3)
Hybrid	4428	136395	0.9 (0.8, 0.9)	2.2 (2.2, 2.3)	2.9 (2.8, 3.0)	4.4 (4.3, 4.6)	5.9 (5.7, 6.2)	7.3 (6.9, 7.7)
TOTAL	23890	706349						

Note: Restricted to modern prostheses.

Figure KT37 Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	463525	416644	329465	252959	95275	25295	3473
Cementless	106429	89098	61867	43322	24485	7248	1670
Hybrid	136395	121858	96389	75711	31221	7758	1401

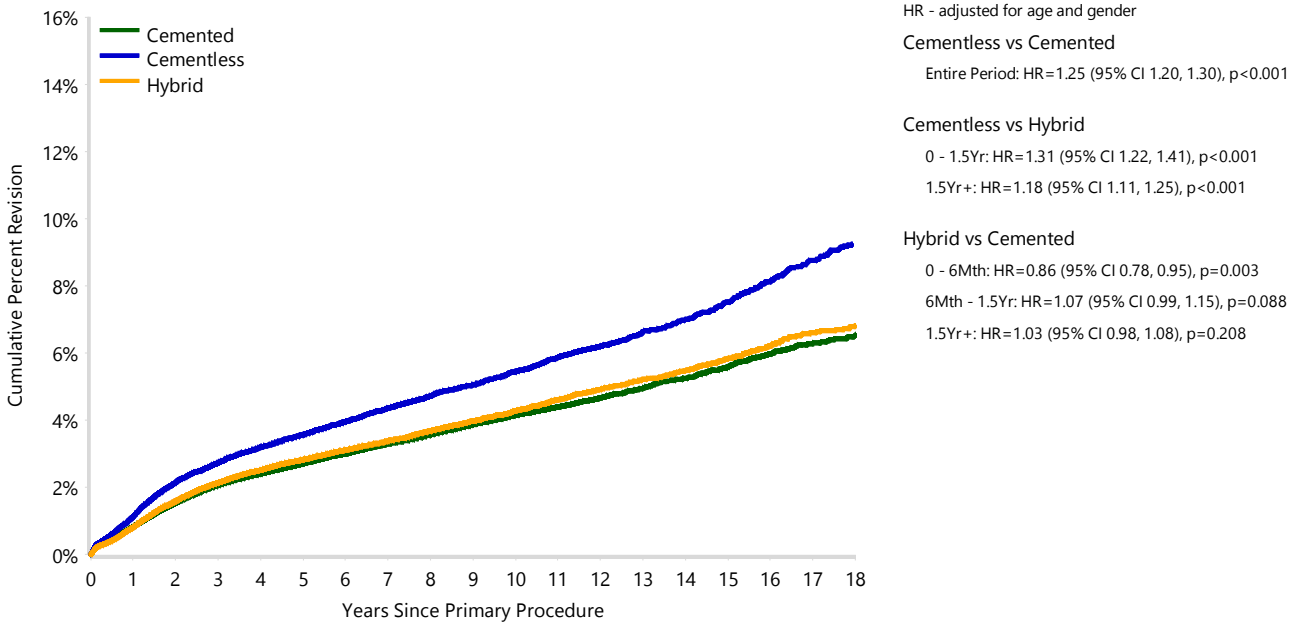
Note: Restricted to modern prostheses.

Table KT40 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	7520	261102	0.8 (0.8, 0.9)	2.1 (2.0, 2.1)	2.7 (2.6, 2.8)	4.1 (4.0, 4.3)	5.6 (5.4, 5.8)	7.1 (6.8, 7.5)
Cementless	3715	102365	1.1 (1.1, 1.2)	2.7 (2.6, 2.9)	3.6 (3.4, 3.7)	5.4 (5.2, 5.6)	7.5 (7.2, 7.8)	9.8 (9.2, 10.3)
Hybrid	4029	128686	0.8 (0.8, 0.9)	2.1 (2.1, 2.2)	2.8 (2.7, 2.9)	4.3 (4.1, 4.4)	5.8 (5.6, 6.1)	7.2 (6.7, 7.6)
TOTAL	15264	492153						

Note: Excludes cementless Genesis II Oxinium femoral prostheses. Restricted to modern prostheses

Figure KT38 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	261102	232427	178540	132389	48619	13667	2668
Cementless	102365	85337	58642	40579	22993	6798	1662
Hybrid	128686	115167	90832	71245	28838	7179	1321

Note: Restricted to modern prostheses

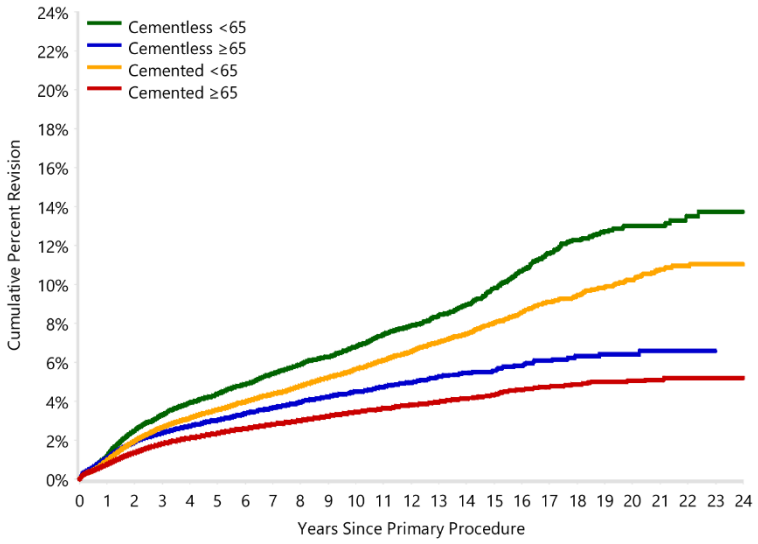
Primary Total Knee Replacement

Table KT41 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)

Tibial Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	3779	81358	1.1 (1.0, 1.1)	3.0 (2.9, 3.1)	4.0 (3.8, 4.2)	6.2 (6.0, 6.4)	8.9 (8.6, 9.3)	11.6 (11.0, 12.2)
	≥65	3960	148126	0.9 (0.9, 1.0)	2.1 (2.0, 2.2)	2.7 (2.6, 2.8)	3.9 (3.8, 4.1)	4.9 (4.7, 5.1)	5.7 (5.3, 6.0)
Cemented	<65	3319	80309	1.0 (0.9, 1.1)	2.6 (2.5, 2.8)	3.5 (3.4, 3.7)	5.6 (5.4, 5.9)	8.0 (7.6, 8.3)	10.3 (9.7, 11.0)
	≥65	4253	182466	0.8 (0.7, 0.8)	1.8 (1.7, 1.9)	2.3 (2.3, 2.4)	3.4 (3.3, 3.5)	4.3 (4.1, 4.5)	5.0 (4.7, 5.3)
TOTAL		15311	492259						

Note: Restricted to modern prostheses

Figure KT39 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)



HR - adjusted for gender

Cementless <65 vs Cementless ≥65

- 0 - 6Mth: HR=0.93 (95% CI 0.81, 1.08), p=0.367
- 6Mth - 1Yr: HR=1.48 (95% CI 1.28, 1.72), p<0.001
- 1Yr - 1.5Yr: HR=1.70 (95% CI 1.48, 1.96), p<0.001
- 1.5Yr - 2.5Yr: HR=1.46 (95% CI 1.28, 1.67), p<0.001
- 2.5Yr - 4Yr: HR=1.63 (95% CI 1.41, 1.89), p<0.001
- 4Yr - 5.5Yr: HR=1.49 (95% CI 1.23, 1.79), p<0.001
- 5.5Yr - 6Yr: HR=1.38 (95% CI 0.94, 2.03), p=0.100
- 6Yr - 10Yr: HR=1.77 (95% CI 1.53, 2.04), p<0.001
- 10Yr - 15Yr: HR=2.59 (95% CI 2.18, 3.07), p<0.001
- 15Yr - 15.5Yr: HR=2.61 (95% CI 1.44, 4.71), p=0.001
- 15.5Yr+: HR=3.47 (95% CI 2.56, 4.69), p<0.001

Cementless <65 vs Cemented <65

- Entire Period: HR=1.23 (95% CI 1.17, 1.30), p<0.001

Cementless ≥65 vs Cemented ≥65

- Entire Period: HR=1.30 (95% CI 1.24, 1.37), p<0.001

Cemented <65 vs Cemented ≥65

- 0 - 6Mth: HR=1.02 (95% CI 0.93, 1.11), p=0.722
- 6Mth - 1.5Yr: HR=1.64 (95% CI 1.53, 1.76), p<0.001
- 1.5Yr - 2Yr: HR=1.70 (95% CI 1.53, 1.90), p<0.001
- 2Yr - 2.5Yr: HR=1.42 (95% CI 1.26, 1.60), p<0.001
- 2.5Yr - 4Yr: HR=1.63 (95% CI 1.49, 1.79), p<0.001
- 4Yr - 5.5Yr: HR=1.66 (95% CI 1.48, 1.86), p<0.001
- 5.5Yr - 6Yr: HR=2.12 (95% CI 1.69, 2.65), p<0.001
- 6Yr - 7Yr: HR=1.89 (95% CI 1.61, 2.23), p<0.001
- 7Yr - 8Yr: HR=2.12 (95% CI 1.76, 2.56), p<0.001
- 8Yr - 9Yr: HR=1.75 (95% CI 1.44, 2.12), p<0.001
- 9Yr - 12Yr: HR=2.31 (95% CI 1.99, 2.67), p<0.001
- 12Yr+: HR=3.03 (95% CI 2.54, 3.62), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	40217	34082	23829	16861	10593	3689	1071
	≥65	63846	52699	35700	24129	12670	3211	611
Cemented	<65	121450	109547	87160	67676	28261	8840	2087
	≥65	266746	236695	181386	135607	48973	11938	1903

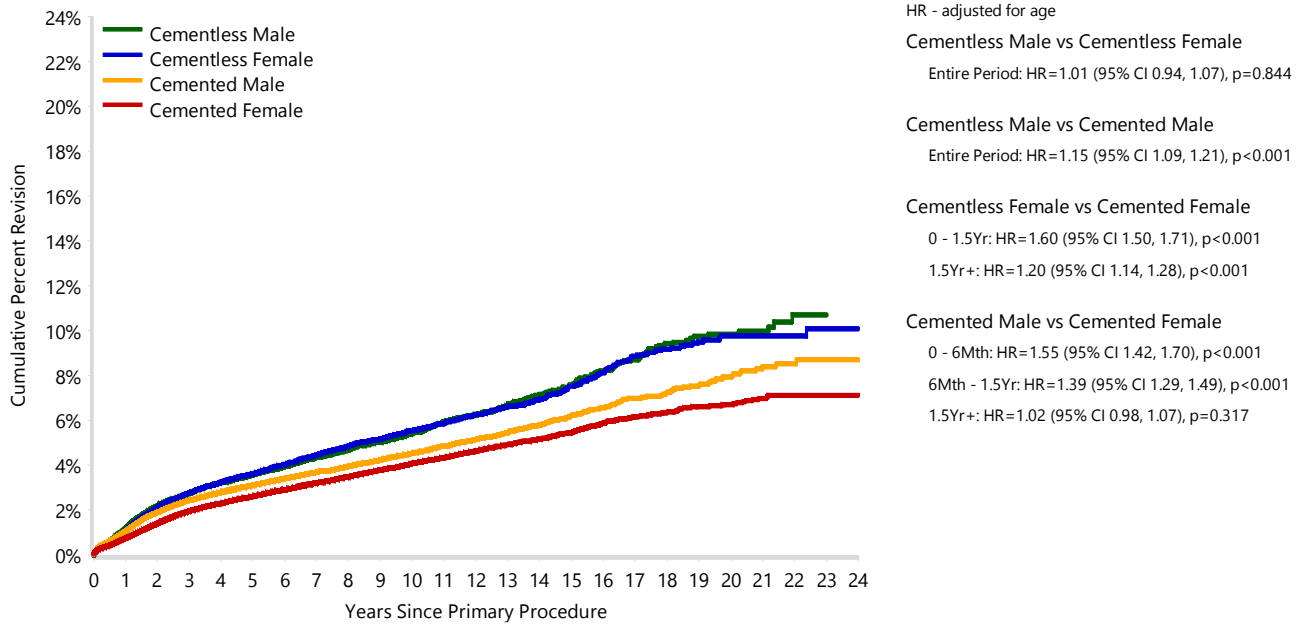
Note: Restricted to modern prostheses

Table KT42 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Gender (Primary Diagnosis OA)

Tibial Fixation	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	3775	110917	1.1 (1.0, 1.2)	2.6 (2.5, 2.7)	3.3 (3.2, 3.4)	4.9 (4.7, 5.0)	6.8 (6.5, 7.1)	8.8 (8.2, 9.4)
	Female	3964	118567	0.8 (0.8, 0.9)	2.3 (2.2, 2.4)	3.0 (2.9, 3.1)	4.7 (4.5, 4.8)	6.4 (6.1, 6.6)	8.0 (7.6, 8.5)
Cemented	Male	3499	109459	1.1 (1.0, 1.1)	2.4 (2.3, 2.5)	3.0 (2.9, 3.2)	4.5 (4.3, 4.7)	6.2 (5.9, 6.5)	7.9 (7.3, 8.6)
	Female	4073	153316	0.7 (0.6, 0.7)	1.8 (1.8, 1.9)	2.5 (2.4, 2.6)	3.9 (3.8, 4.0)	5.2 (5.0, 5.4)	6.6 (6.2, 7.0)
TOTAL		15311	492259						

Note: Restricted to modern prostheses

Figure KT40 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Gender (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	55230	45786	30816	20534	11184	3216	731
	Female	48833	40995	28713	20456	12079	3684	951
Cemented	Male	165146	147151	113747	84870	30397	7809	1491
	Female	223050	199091	154799	118413	46837	12969	2499

Note: Restricted to modern prostheses

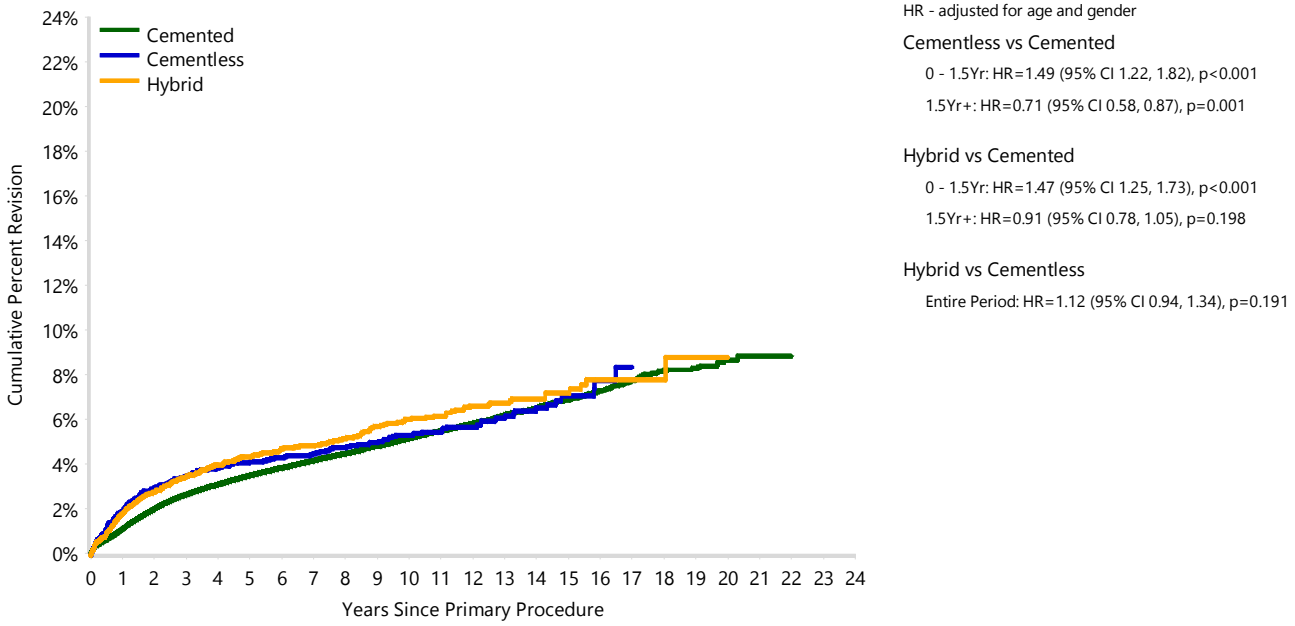
Primary Total Knee Replacement

Table KT43 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	6391	146096	1.1 (1.1, 1.2)	2.7 (2.6, 2.8)	3.5 (3.4, 3.6)	5.2 (5.1, 5.4)	7.0 (6.7, 7.2)	8.7 (8.2, 9.3)
Cementless	197	3962	2.0 (1.6, 2.5)	3.5 (3.0, 4.2)	4.2 (3.6, 4.9)	5.4 (4.6, 6.2)	7.1 (6.0, 8.4)	
Hybrid	345	6958	1.9 (1.6, 2.2)	3.5 (3.1, 4.0)	4.4 (3.9, 5.0)	6.1 (5.5, 6.8)	7.3 (6.4, 8.2)	8.9 (7.3, 10.8)
TOTAL	6933	157016						

Note: Restricted to modern prostheses

Figure KT41 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	146096	135955	117032	98385	44355	11454	797
Cementless	3962	3683	3172	2693	1450	416	3
Hybrid	6958	6228	5209	4244	2277	549	62

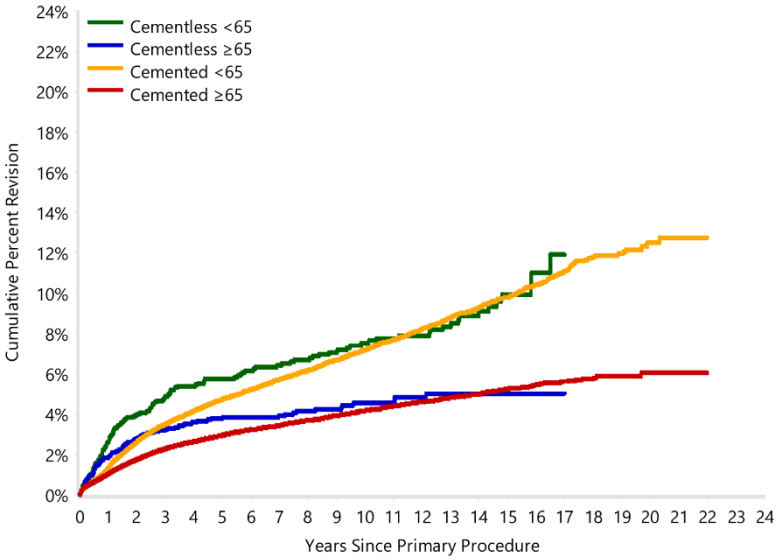
Note: Restricted to modern prostheses

Table KT44 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)

Tibial Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	144	2128	2.6 (2.0, 3.4)	4.9 (4.0, 5.9)	5.7 (4.8, 6.9)	7.5 (6.3, 8.9)	9.9 (8.2, 12.0)	
	≥65	122	3323	1.8 (1.4, 2.4)	3.2 (2.6, 3.9)	3.8 (3.2, 4.6)	4.5 (3.8, 5.5)	5.0 (4.1, 6.2)	
Cemented	<65	3235	50615	1.3 (1.2, 1.4)	3.5 (3.3, 3.7)	4.7 (4.5, 4.9)	7.2 (6.9, 7.5)	9.8 (9.4, 10.2)	12.5 (11.7, 13.3)
	≥65	3432	100950	1.0 (1.0, 1.1)	2.3 (2.2, 2.4)	2.9 (2.8, 3.1)	4.2 (4.0, 4.3)	5.2 (5.0, 5.5)	6.0 (5.6, 6.6)
TOTAL		6933	157016						

Note: Restricted to modern prostheses.

Figure KT42 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)



HR - adjusted for gender

Cementless <65 vs Cementless ≥65
- 0 - 3Mth: HR=0.91 (95% CI 0.50, 1.66), p=0.752
- 3Mth - 6Mth: HR=2.92 (95% CI 1.70, 5.02), p<0.001
- 6Mth - 9Mth: HR=1.93 (95% CI 1.02, 3.63), p=0.042
- 9Mth+: HR=1.71 (95% CI 1.31, 2.23), p<0.001

Cementless <65 vs Cemented <65
- 0 - 1.5Yr: HR=1.73 (95% CI 1.37, 2.20), p<0.001
- 1.5Yr+: HR=0.76 (95% CI 0.60, 0.96), p=0.023

Cementless ≥65 vs Cemented ≥65
- 0 - 2.5Yr: HR=1.36 (95% CI 1.11, 1.66), p=0.002
- 2.5Yr+: HR=0.82 (95% CI 0.62, 1.07), p=0.140

Cemented <65 vs Cemented ≥65
- 0 - 3Mth: HR=0.94 (95% CI 0.80, 1.10), p=0.413
- 3Mth - 1Yr: HR=1.51 (95% CI 1.34, 1.71), p<0.001
- 1Yr - 2Yr: HR=1.80 (95% CI 1.61, 2.01), p<0.001
- 2Yr - 2.5Yr: HR=1.70 (95% CI 1.43, 2.03), p<0.001
- 2.5Yr - 5Yr: HR=1.81 (95% CI 1.63, 2.02), p<0.001
- 5Yr - 5.5Yr: HR=1.36 (95% CI 1.02, 1.82), p=0.036
- 5.5Yr+: HR=2.29 (95% CI 2.08, 2.52), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	2128	1936	1589	1220	798	255	5
	≥65	3323	2974	2366	1698	788	206	1
Cemented	<65	50615	47274	41283	35611	17977	5472	444
	≥65	100950	93682	80175	66793	28519	6486	412

Note: Restricted to modern prostheses.

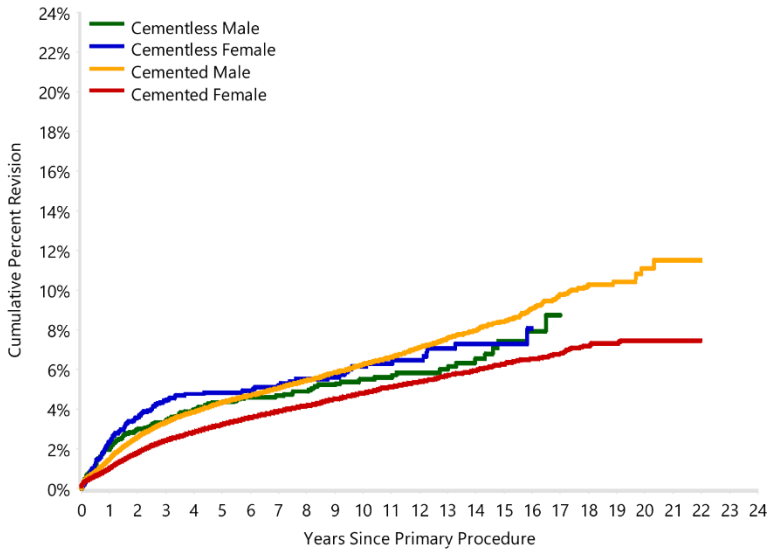
Primary Total Knee Replacement

Table KT45 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Gender (Primary Diagnosis OA)

Tibial Fixation	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	142	2980	2.0 (1.5, 2.6)	3.4 (2.8, 4.2)	4.4 (3.6, 5.2)	5.5 (4.6, 6.5)	7.4 (6.0, 9.1)	
	Female	124	2471	2.3 (1.8, 3.0)	4.4 (3.6, 5.3)	4.8 (4.0, 5.8)	6.1 (5.1, 7.4)	7.3 (6.0, 8.9)	
Cemented	Male	3358	65290	1.4 (1.4, 1.5)	3.3 (3.1, 3.4)	4.3 (4.1, 4.4)	6.1 (5.9, 6.4)	8.3 (7.9, 8.7)	11.0 (10.0, 12.0)
	Female	3309	86275	0.9 (0.8, 0.9)	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	4.6 (4.4, 4.7)	6.0 (5.8, 6.3)	7.2 (6.8, 7.7)
TOTAL		6933	157016						

Note: Restricted to modern prostheses

Figure KT43 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Gender (Primary Diagnosis OA)



HR - adjusted for age

Cementless Male vs Cementless Female
- Entire Period: HR=0.86 (95% CI 0.68, 1.10), p=0.224

Cementless Male vs Cemented Male
- 0 - 1.5Yr: HR=1.24 (95% CI 0.99, 1.56), p=0.063
- 1.5Yr+: HR=0.66 (95% CI 0.52, 0.85), p<0.001

Cementless Female vs Cemented Female
- 0 - 1Mth: HR=2.18 (95% CI 1.65, 2.89), p<0.001
- 1Mth - 6Mth: HR=2.08 (95% CI 1.64, 2.64), p<0.001
- 6Mth - 9Mth: HR=2.30 (95% CI 1.74, 3.05), p<0.001
- 9Mth - 1Yr: HR=1.78 (95% CI 1.36, 2.32), p<0.001
- 1Yr - 1.5Yr: HR=1.85 (95% CI 1.46, 2.33), p<0.001
- 1.5Yr - 2Yr: HR=1.66 (95% CI 1.30, 2.12), p<0.001
- 2Yr - 3.5Yr: HR=1.51 (95% CI 1.22, 1.88), p<0.001
- 3.5Yr+: HR=0.81 (95% CI 0.60, 1.08), p=0.152

Cemented Male vs Cemented Female
- 0 - 3Mth: HR=1.78 (95% CI 1.53, 2.08), p<0.001
- 3Mth - 1.5Yr: HR=1.50 (95% CI 1.37, 1.65), p<0.001
- 1.5Yr - 2Yr: HR=1.35 (95% CI 1.14, 1.59), p<0.001
- 2Yr - 2.5Yr: HR=1.12 (95% CI 0.94, 1.34), p=0.192
- 2.5Yr+: HR=1.27 (95% CI 1.18, 1.36), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	2980	2724	2237	1718	935	260	1
	Female	2471	2186	1718	1200	651	201	5
Cemented	Male	65290	60348	51362	42653	18737	4665	317
	Female	86275	80608	70096	59751	27759	7293	539

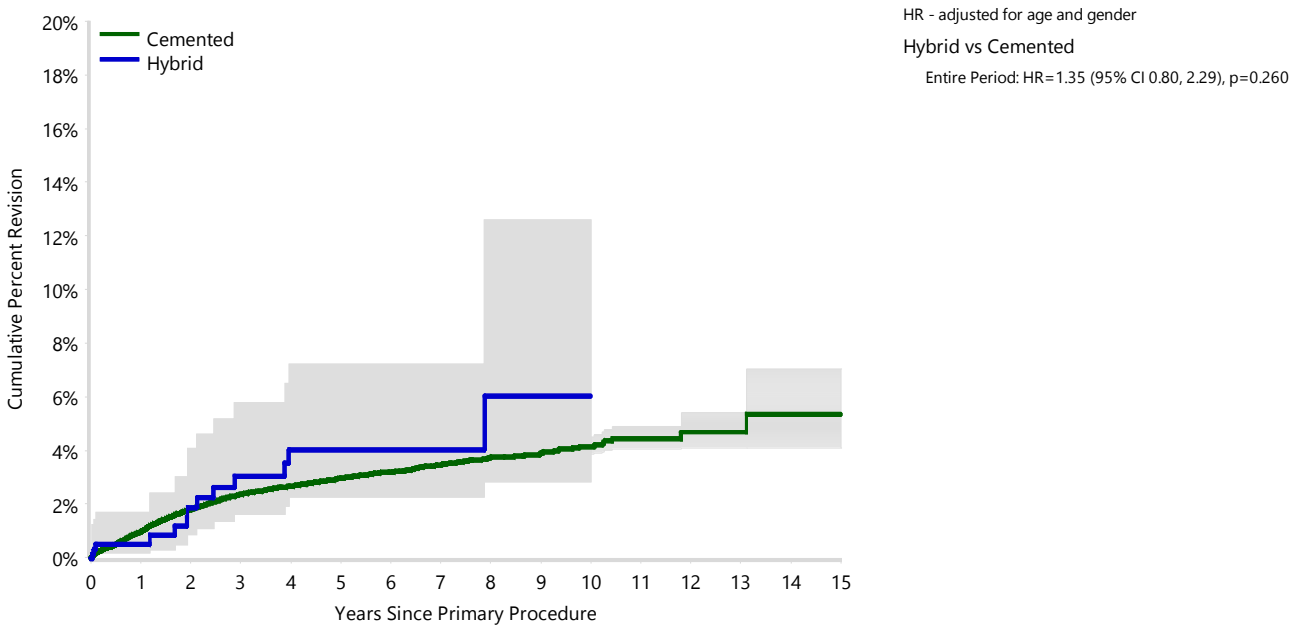
Note: Restricted to modern prostheses

Table KT46 Cumulative Percent Revision of Medial Pivot Design Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	1288	50919	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.0 (2.8, 3.2)	4.2 (3.9, 4.5)	5.4 (4.1, 7.0)	
Cementless	2	54	2.0 (0.3, 13.1)	2.0 (0.3, 13.1)	2.0 (0.3, 13.1)	2.0 (0.3, 13.1)	5.7 (1.4, 22.4)	
Hybrid	14	559	0.6 (0.2, 1.7)	3.1 (1.6, 5.8)	4.1 (2.3, 7.2)	6.1 (2.9, 12.6)		
TOTAL	1304	51532						

Note: Restricted to modern prostheses

Figure KT44 Cumulative Percent Revision of Medial Pivot Design Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	50919	43591	30482	19830	1645	63	0
Hybrid	559	305	230	117	45	1	0

Note: Restricted to modern prostheses. Cementless procedures excluded due to low numbers.

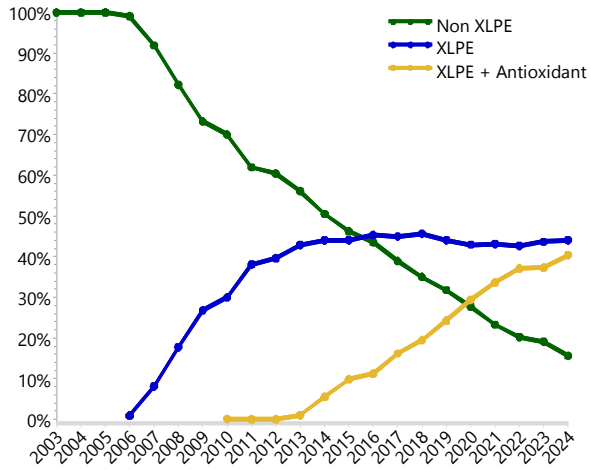
Primary Total Knee Replacement

BEARING SURFACE

Tibial Bearing Surface

There are two main polyethylene types used in primary total knee replacement procedures: cross-linked polyethylene (XLPE) and non cross-linked polyethylene (non XLPE). XLPE has been classified as ultrahigh molecular weight polyethylene that has been irradiated by high dose (≥50kGy) gamma or electron beam radiation. XLPE includes a sub-group which has antioxidant added. Use of non XLPE has decreased with time and in 2024 only 15.6% of procedures use non XLPE (Figure KT45).

Figure KT45 Primary Total Knee Replacement by Polyethylene Type



There are 421,851 primary total knee procedures for osteoarthritis that have used XLPE. When adjusted for age, gender, fixation, bearing mobility, and patella usage, non XLPE group has a lower rate of revision compared to the XLPE group for the first 3 months. After 3 months, this reverses and the XLPE group has a lower rate of revision compared to the non XLPE group (Table KT47 and Figure KT47). The major reason for this later difference is a reduced cumulative incidence of loosening (Figure KT48).

Primary total knee procedures that use non XLPE have a higher rate of revision for loosening than procedures that use XLPE (Table KT48 and Figure KT49). Procedures with XLPE have a higher rate of revision for infection in the first 6 months compared to non XLPE. From 6 months onwards XLPE has a lower rate of revision for infection compared to non XLPE (Table KT49 and Figure KT50).

The difference between XLPE and non XLPE is more evident in younger patients. The 15-year cumulative percent revision rate for patients aged <65 years for XLPE is 7.1% and for non XLPE is 10.0%. For patients aged ≥65 years, the 15 year cumulative percent revision for XLPE is 4.2% and for non XLPE is 5.2% (Table KT50 and Figure KT51).

When XLPE and non XLPE are compared by prosthesis stability, there is a higher rate of revision for non XLPE after 3 months for both minimally and posterior stabilised designs.

The outcomes of two prosthesis combinations used with both XLPE and non XLPE and with >10,000 procedures in each group are shown in Table KT51 and Table KT52.

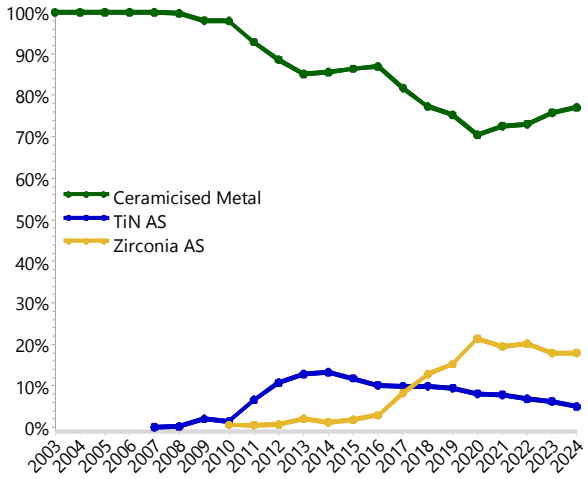
When considering the XLPE sub-types there is no difference when XLPE is compared to XLPE with antioxidant (Table KT53 and Figure KT52). The most common reasons for revision of XLPE and XLPE with antioxidant are shown in Figure KT53.

When the subtypes of XLPE are compared by prosthesis stability, there is a higher early rate of revision for XLPE with antioxidant for minimally stabilised designs (before 3 months and between 1 and 1.5 years only) and no difference outside of these times, while XLPE has a higher rate of revision when posterior stabilised designs are considered (Table KT54 and Table KT55; Table KT56 and Table KT57).

Femoral Bearing Surface

In addition to the regularly used cobalt chrome metal, there are different materials used for the femoral bearing surface. These are often referred to as 'alternate surface' (AS) or 'ceramic surface' components. These can be made of a ceramicised metal or have a zirconia or titanium nitride coating. They are suggested for use in patients who have a metal allergy. The use of primary total knee procedures with an AS femoral component is shown in Figure KT46.

Figure KT46 Primary Total Knee Replacement by AS Femoral Material



Note: TiN (titanium nitride) surface

There are 86,257 procedures with an AS femoral component. When adjusted for age, gender, fixation, stability, bearing mobility, patella usage, and polyethylene type, procedures using an AS femoral component have a higher rate of revision compared to when these are not used (Table KT58 and Figure KT54). There are more revisions for loosening, pain and for patella erosion where an AS femoral component is used (Figure KT55).

When femoral bearing surface is analysed by prosthesis stability, there is a higher rate of revision for both minimally stabilised and posterior stabilised components with an AS,

but no difference is seen with medial pivot designs (where there are few for comparison) (Table KT59 and Table KT60).

There is variation in the revision rate depending on the type of material used in the AS. In 2024, there were 4 femoral prostheses used that used a zirconia-based AS, 11 that used a TiN (titanium nitride) surface, and 6 with a ceramicised metal surface.

Compared to non AS femoral components ceramicised metal prostheses have a higher rate of revision. TiN AS femoral prostheses also have a higher rate of revision compared to non AS femoral components, but only for the first 1.5 years. There is little difference when Zirconia AS prostheses are compared to non AS femoral components (Table KT61 and Figure KT56).

The types of revision are shown in Figure KT57. The most common reasons for revision are loosening and infection for all femoral bearing surface materials.

When revision for loosening is assessed, compared to non AS femoral components, ceramicised metal has a higher rate of revision for the first 5 years only, TiN AS has a higher rate of revision for the first 2.5 years only, and there is no difference for Zirconia AS. However, Zirconia AS has a lower rate of revision compared to ceramicised metal and when compared to TiN AS (Table KT62 and Figure KT58).

There are two prosthesis combinations that have >300 procedures in both AS and non AS femoral component groups. The outcomes of these components are shown in Table KT63 and Table KT64.

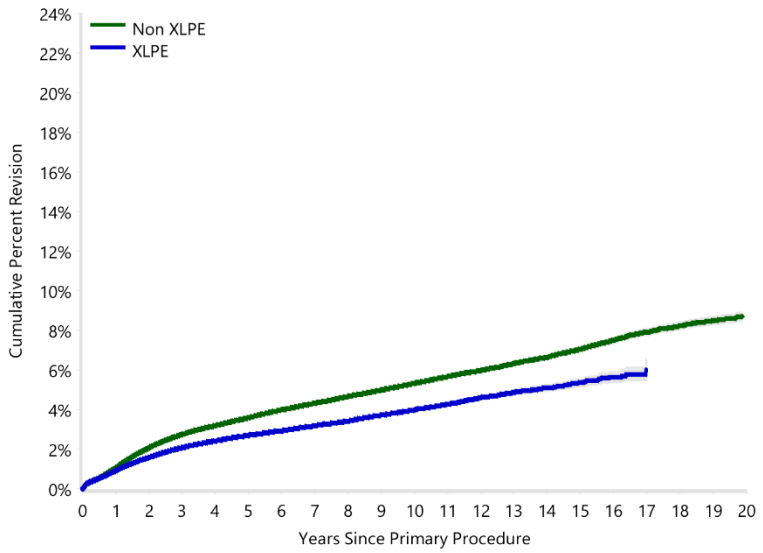
Primary Total Knee Replacement

Table KT47 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	13604	283046	1.1 (1.0, 1.1)	2.7 (2.7, 2.8)	3.6 (3.5, 3.7)	5.3 (5.2, 5.4)	7.1 (6.9, 7.2)	8.7 (8.5, 9.0)
XLPE	10266	421851	0.9 (0.9, 0.9)	2.1 (2.0, 2.1)	2.7 (2.6, 2.8)	4.0 (3.9, 4.1)	5.4 (5.1, 5.6)	
TOTAL	23870	704897						

Note: Restricted to modern prostheses. Includes 143,220 procedures using cross-linked polyethylene with antioxidant
Excludes 1,452 procedures with unknown polyethylene

Figure KT47 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

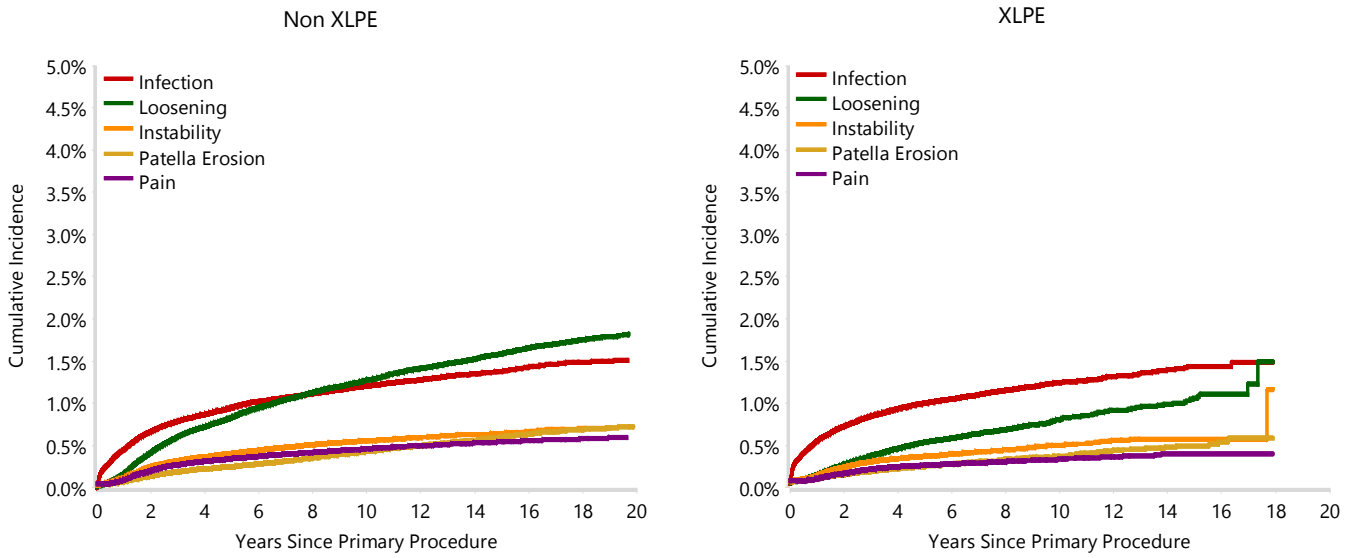


HR - age, gender, fixation, bearing mobility, and patella usage
Non XLPE vs XLPE
0 - 3Mth: HR=0.89 (95% CI 0.82, 0.96), p=0.005
3Mth-1Yr: HR=1.23 (95% CI 1.16, 1.31), p<0.001
1-1.5Yr: HR=1.49 (95% CI 1.39, 1.61), p<0.001
1.5Yr+: HR=1.33 (95% CI 1.28, 1.38), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	283046	267792	234376	199999	105145	35991	6540
XLPE	421851	358861	253083	171828	45785	4291	0

Note: Restricted to modern prostheses

Figure KT48 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

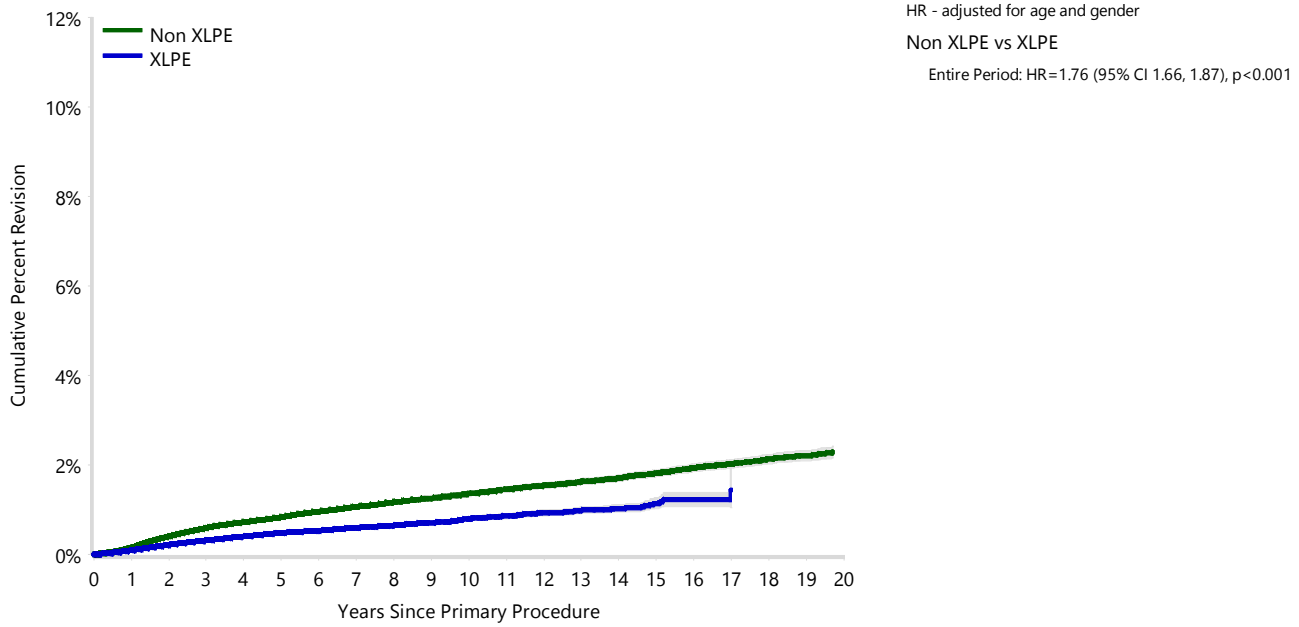
Primary Total Knee Replacement

Table KT48 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Loosening)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	3309	283046	0.2 (0.1, 0.2)	0.6 (0.6, 0.6)	0.8 (0.8, 0.9)	1.4 (1.3, 1.4)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)
XLPE	1774	421851	0.1 (0.1, 0.1)	0.3 (0.3, 0.3)	0.5 (0.5, 0.5)	0.8 (0.7, 0.8)	1.1 (1.0, 1.3)	
TOTAL	5083	704897						

Note: Restricted to modern prostheses
Includes 143,220 procedures using cross-linked polyethylene with antioxidant
Excludes 1,452 procedures with unknown polyethylene

Figure KT49 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	283046	267792	234376	199999	105145	35991	6540
XLPE	421851	358861	253083	171828	45785	4291	0

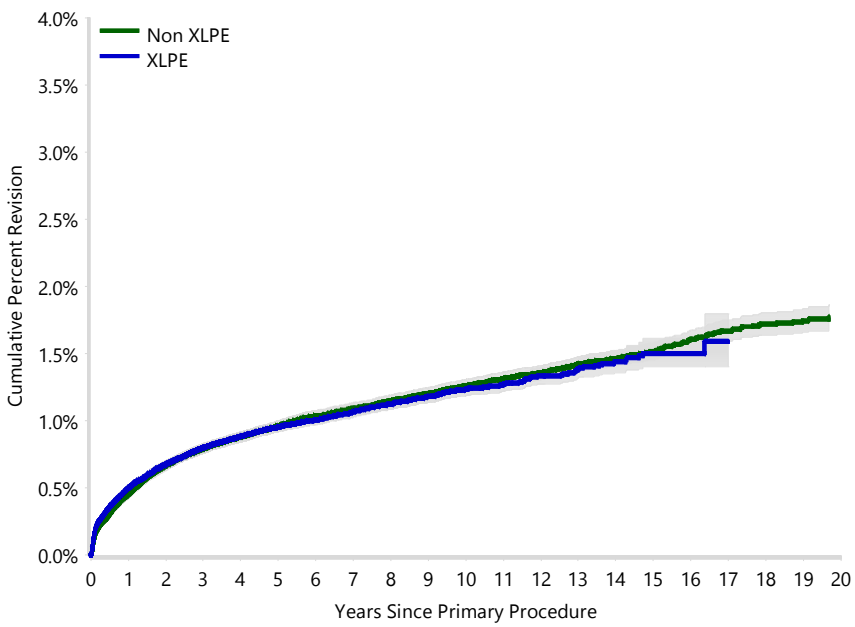
Note: Restricted to modern prostheses
Includes 143,220 procedures using cross-linked polyethylene with antioxidant
Excludes 1,452 procedures with unknown polyethylene

Table KT49 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Infection)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	3200	283046	0.5 (0.4, 0.5)	0.8 (0.8, 0.8)	1.0 (0.9, 1.0)	1.3 (1.2, 1.3)	1.5 (1.5, 1.6)	1.8 (1.7, 1.9)
XLPE	3609	421851	0.5 (0.5, 0.5)	0.8 (0.8, 0.8)	1.0 (0.9, 1.0)	1.2 (1.2, 1.3)	1.5 (1.4, 1.6)	
TOTAL	6809	704897						

Note: Restricted to modern prostheses. Includes 143,220 procedures using cross-linked polyethylene with antioxidant. Excludes 1,452 procedures with unknown polyethylene

Figure KT50 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Infection)



HR - adjusted for age and gender

XLPE vs Non XLPE

0 - 6Mth: HR=1.17 (95% CI 1.08, 1.27), p<0.001

6Mth+: HR=0.90 (95% CI 0.85, 0.96), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	283046	267792	234376	199999	105145	35991	6540
XLPE	421851	358861	253083	171828	45785	4291	0

Note: Restricted to modern prostheses. Includes 143,220 procedures using cross-linked polyethylene with antioxidant. Excludes 1,452 procedures with unknown polyethylene

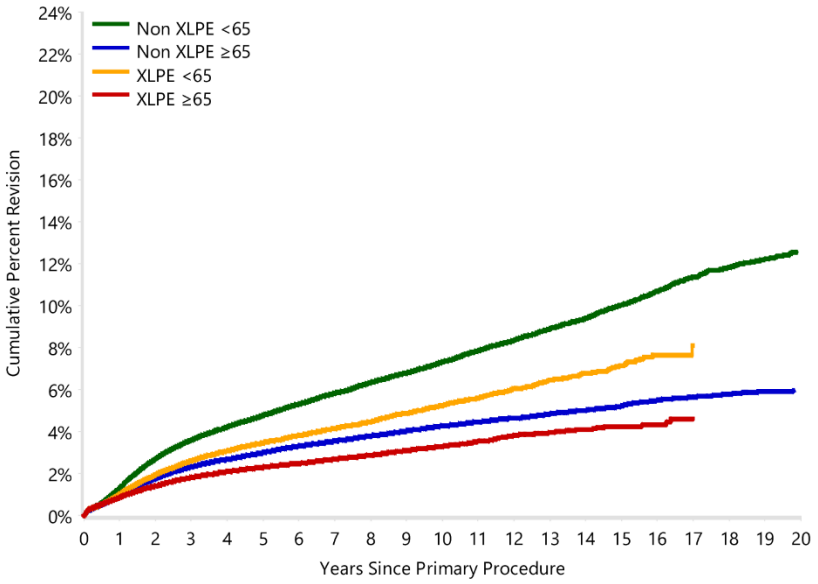
Primary Total Knee Replacement

Table KT50 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Age (Primary Diagnosis OA)

Polyethylene Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE		**13604**	**283046**	**1.1 (1.0, 1.1)**	**2.7 (2.7, 2.8)**	**3.6 (3.5, 3.7)**	**5.3 (5.2, 5.4)**	**7.1 (6.9, 7.2)**	**8.7 (8.5, 9.0)**
	<65	6701	93594	1.3 (1.2, 1.4)	3.6 (3.5, 3.7)	4.8 (4.6, 4.9)	7.3 (7.1, 7.5)	10.0 (9.8, 10.3)	12.6 (12.2, 13.0)
	≥65	6903	189452	0.9 (0.9, 1.0)	2.3 (2.2, 2.4)	3.0 (2.9, 3.1)	4.3 (4.2, 4.4)	5.2 (5.1, 5.4)	6.0 (5.7, 6.2)
XLPE		**10266**	**421851**	**0.9 (0.9, 0.9)**	**2.1 (2.0, 2.1)**	**2.7 (2.6, 2.8)**	**4.0 (3.9, 4.1)**	**5.4 (5.1, 5.6)**	
	<65	4508	138660	1.0 (1.0, 1.1)	2.6 (2.5, 2.7)	3.5 (3.4, 3.6)	5.2 (5.1, 5.4)	7.1 (6.8, 7.5)	
	≥65	5758	283191	0.9 (0.8, 0.9)	1.8 (1.8, 1.9)	2.3 (2.2, 2.4)	3.3 (3.2, 3.4)	4.2 (4.0, 4.5)	
TOTAL		**23870**	**704897**						

Note: Restricted to modern prostheses. Includes 143,220 procedures using cross-linked polyethylene with antioxidant. Excludes 1,452 procedures with unknown polyethylene

Figure KT51 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Age (Primary Diagnosis OA)



HR - adjusted for age and gender

Non XLPE <65 vs Non XLPE ≥65
- 0 - 6Mth: HR=1.16 (95% CI 1.06, 1.28), p=0.002
- 6Mth - 9Mth: HR=1.57 (95% CI 1.38, 1.79), p<0.001
- 9Mth - 1.5Yr: HR=1.70 (95% CI 1.58, 1.83), p<0.001
- 1.5Yr - 2Yr: HR=1.80 (95% CI 1.62, 1.99), p<0.001
- 2Yr - 2.5Yr: HR=1.60 (95% CI 1.42, 1.79), p<0.001
- 2.5Yr - 3.5Yr: HR=1.65 (95% CI 1.50, 1.82), p<0.001
- 3.5Yr - 6Yr: HR=1.85 (95% CI 1.72, 2.00), p<0.001
- 6Yr - 10Yr: HR=2.07 (95% CI 1.91, 2.23), p<0.001
- 10Yr - 12.5Yr: HR=2.54 (95% CI 2.23, 2.89), p<0.001
- 12.5Yr - 15.5Yr: HR=2.62 (95% CI 2.24, 3.07), p<0.001
- 15.5Yr+: HR=3.92 (95% CI 3.01, 5.09), p<0.001

Non XLPE <65 vs XLPE <65
- 0 - 6Mth: HR=1.09 (95% CI 0.99, 1.21), p=0.077
- 6Mth - 1Yr: HR=1.49 (95% CI 1.35, 1.64), p<0.001
- 1Yr - 2.5Yr: HR=1.48 (95% CI 1.38, 1.57), p<0.001
- 2.5Yr+: HR=1.44 (95% CI 1.36, 1.52), p<0.001

Non XLPE ≥65 vs XLPE ≥65
- 0 - 3Mth: HR=0.86 (95% CI 0.79, 0.93), p<0.001
- 3Mth+: HR=1.36 (95% CI 1.31, 1.42), p<0.001

XLPE <65 vs XLPE ≥65
- 0 - 3Mth: HR=0.93 (95% CI 0.85, 1.01), p=0.093
- 3Mth - 6Mth: HR=1.27 (95% CI 1.12, 1.44), p<0.001
- 6Mth - 1Yr: HR=1.41 (95% CI 1.28, 1.54), p<0.001
- 1Yr - 2Yr: HR=1.72 (95% CI 1.60, 1.85), p<0.001
- 2Yr+: HR=1.72 (95% CI 1.63, 1.82), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	**<65**	93594	88991	79079	68894	40429	16326	3612
	≥65	189452	178801	155297	131105	64716	19665	2928
XLPE	**<65**	138660	119388	86256	60036	18086	2023	0
	≥65	283191	239473	166827	111792	27699	2268	0

Note: Restricted to modern prostheses.

Table KT51 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and Polyethylene Type (Primary Diagnosis OA)

Prosthesis Combination	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Genesis II Oxinium PS/ Genesis II	Non XLPE	1028	11643	1.6 (1.4, 1.8)	3.9 (3.6, 4.3)	5.3 (4.9, 5.7)	7.4 (7.0, 8.0)	9.8 (9.2, 10.4)	12.3 (11.2, 13.5)
	XLPE	552	11058	1.3 (1.1, 1.5)	3.3 (2.9, 3.6)	4.4 (4.0, 4.8)	6.6 (6.0, 7.2)		
Triathlon CR/Triathlon	Non XLPE	431	12064	0.7 (0.6, 0.9)	1.8 (1.6, 2.1)	2.3 (2.1, 2.6)	3.4 (3.0, 3.7)	4.5 (4.0, 4.9)	
	XLPE	3929	175353	0.8 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.3, 2.4)	3.5 (3.4, 3.7)	4.8 (4.5, 5.1)	
TOTAL		5940	210118						

Note: Restricted to modern prostheses. Only prosthesis combinations have more than 10,000 procedures in both groups are listed

Table KT52 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Polyethylene Type (Primary Diagnosis OA)

Comparison	HR- adjusted for age and gender
Genesis II Oxinium PS/Genesis II Non XLPE vs Genesis II Oxinium PS/Genesis II XLPE	Entire Period: HR=1.13 (95% CI 1.01, 1.26), p=0.026
Triathlon CR/Triathlon Non XLPE vs Triathlon CR/Triathlon XLPE	Entire Period: HR=0.97 (95% CI 0.87, 1.07), p=0.524

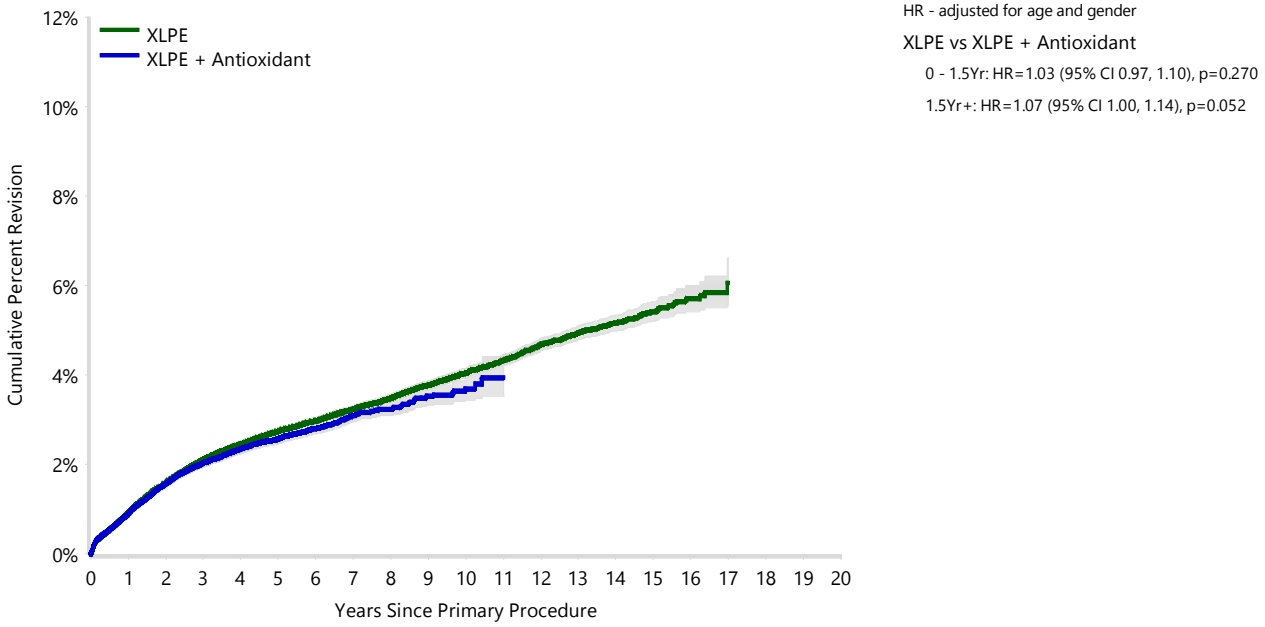
Primary Total Knee Replacement

Table KT53 Cumulative Percent Revision of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	7583	278631	0.9 (0.9, 1.0)	2.1 (2.1, 2.2)	2.7 (2.7, 2.8)	4.0 (3.9, 4.1)	5.4 (5.2, 5.6)	
XLPE + Antioxidant	2683	143220	0.9 (0.9, 1.0)	2.0 (1.9, 2.1)	2.6 (2.5, 2.7)	3.7 (3.4, 4.0)		
TOTAL	10266	421851						

Note: Restricted to modern prostheses.

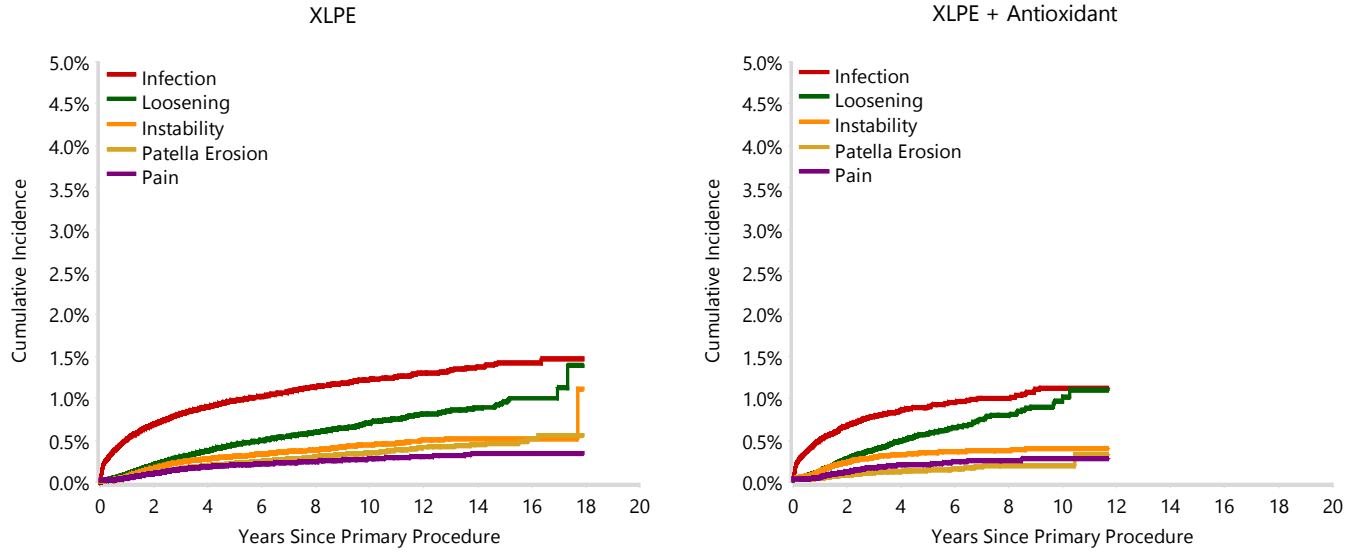
Figure KT52 Cumulative Percent Revision of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	278631	244852	186285	137812	44188	4291	0
XLPE + Antioxidant	143220	114009	66798	34016	1597	0	0

Note: Restricted to modern prostheses.

Figure KT53 Cumulative Incidence Revision Diagnosis of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Primary Total Knee Replacement

Table KT54 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Stability	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised		**15299**	**491102**	**0.9 (0.9, 0.9)**	**2.2 (2.2, 2.3)**	**2.9 (2.9, 3.0)**	**4.4 (4.4, 4.5)**	**6.1 (5.9, 6.2)**	**7.7 (7.5, 8.0)**
	Non XLPE	8467	168644	1.0 (0.9, 1.0)	2.7 (2.6, 2.7)	3.5 (3.4, 3.6)	5.2 (5.1, 5.3)	6.9 (6.7, 7.1)	8.6 (8.3, 8.8)
	XLPE	6832	322458	0.9 (0.8, 0.9)	1.9 (1.9, 2.0)	2.5 (2.4, 2.6)	3.7 (3.5, 3.8)	5.0 (4.7, 5.2)	
Posterior Stabilised		**6932**	**156865**	**1.2 (1.1, 1.2)**	**2.7 (2.6, 2.8)**	**3.6 (3.5, 3.7)**	**5.3 (5.1, 5.4)**	**7.0 (6.8, 7.2)**	**8.7 (8.3, 9.2)**
	Non XLPE	3557	59048	1.3 (1.2, 1.4)	3.1 (2.9, 3.2)	4.1 (3.9, 4.3)	5.9 (5.7, 6.1)	7.7 (7.4, 8.0)	9.4 (8.9, 10.0)
	XLPE	3375	97817	1.1 (1.0, 1.2)	2.5 (2.4, 2.6)	3.2 (3.1, 3.4)	4.7 (4.6, 4.9)	6.2 (5.8, 6.6)	
Medial Pivot Design		**1304**	**51532**	**1.0 (0.9, 1.1)**	**2.4 (2.2, 2.5)**	**3.0 (2.8, 3.2)**	**4.2 (3.9, 4.5)**	**6.0 (4.5, 7.9)**	
	Non XLPE	1301	51220	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.0 (2.8, 3.2)	4.2 (3.9, 4.5)	6.0 (4.5, 7.9)	
	XLPE	3	312						
TOTAL		**23535**	**699499**						

Note: Restricted to modern prostheses.
XLPE includes 143,220 procedures using XLPE with Antioxidant.
Excludes 1,452 procedures with unknown polyethylene.

Table KT55 Comparisons of Revision Rates for Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Comparison	HR -adjusted for age and gender
Minimally Stabilised Non XLPE vs Minimally Stabilised XLPE	0 - 3Mth: HR=0.87 (95% CI 0.78, 0.97), p=0.011
	3Mth – 1Yr: HR= 1.27 (95% CI 1.17, 1.37), p<0.001
	1Yr – 1.5Yr: 1.69 (95% CI 1.54, 1.85), p<0.001
	1.5Yr+: HR= 1.52 (95% CI 1.46, 1.59), p<0.001
Posterior Stabilised Non XLPE vs Posterior Stabilised XLPE	0 - 3Mth: HR= 0.94 (95% CI 0.81, 1.10), p=0.460
	3Mth – 1.5Yr: HR= 1.40 (95% CI 1.28, 1.54), p<0.001
	1.5Yr+: HR= 1.29 (95% CI 1.21, 1.37), p<0.001

Note: Restricted to modern prostheses.
XLPE includes 143,220 procedures using XLPE with Antioxidant.
Excludes 1,452 procedures with unknown polyethylene

Table KT56 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Stability	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Minimally Stabilised		**6832**	**322458**	**0.9 (0.8, 0.9)**	**1.9 (1.9, 2.0)**	**2.5 (2.4, 2.6)**	**3.7 (3.5, 3.8)**	**5.0 (4.7, 5.2)**
	XLPE	4754	204671	0.8 (0.8, 0.9)	1.9 (1.8, 2.0)	2.5 (2.4, 2.6)	3.7 (3.6, 3.8)	5.0 (4.7, 5.3)
	XLPE + Antioxidant	2078	117787	0.9 (0.8, 0.9)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.3 (3.1, 3.5)	
Posterior Stabilised		**3375**	**97817**	**1.1 (1.0, 1.2)**	**2.5 (2.4, 2.6)**	**3.2 (3.1, 3.4)**	**4.7 (4.6, 4.9)**	**6.2 (5.8, 6.6)**
	XLPE	2792	73066	1.1 (1.1, 1.2)	2.6 (2.5, 2.7)	3.4 (3.2, 3.5)	4.8 (4.6, 5.0)	6.3 (5.9, 6.7)
	XLPE + Antioxidant	583	24751	1.0 (0.8, 1.1)	2.2 (2.0, 2.4)	2.7 (2.5, 3.0)	4.7 (4.0, 5.4)	
TOTAL		**10207**	**420275**					

Note: Restricted to modern prostheses.
Excludes 1,452 procedures with unknown polyethylene

Table KT57 Comparisons of Revision Rates for Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Comparison	HR -adjusted for age and gender
Minimally Stabilised XLPE vs Minimally Stabilised XLPE + Antioxidant	0 - 3Mth: HR=0.85 (95% CI 0.75, 0.96), p=0.009
	3Mth – 1.5Yr: HR= 1.05 (95% CI 0.97, 1.14), p=0.255
	1.5Yr – 2Yr: 0.81 (95% CI 0.69, 0.95), p=0.009
	2Yr – 2.5Yr: HR= 0.97 (95% CI 0.80, 1.17), p=0.732
	2.5Yr+: HR= 1.11 (95% CI 0.99, 1.24), p=0.064
Posterior Stabilised XLPE vs Posterior Stabilised XLPE+ Antioxidant	Entire Period: HR= 1.13 (95% CI 1.03, 1.24), p=0.008

Note: Restricted to modern prostheses.
Excludes 1,452 procedures with unknown polyethylene

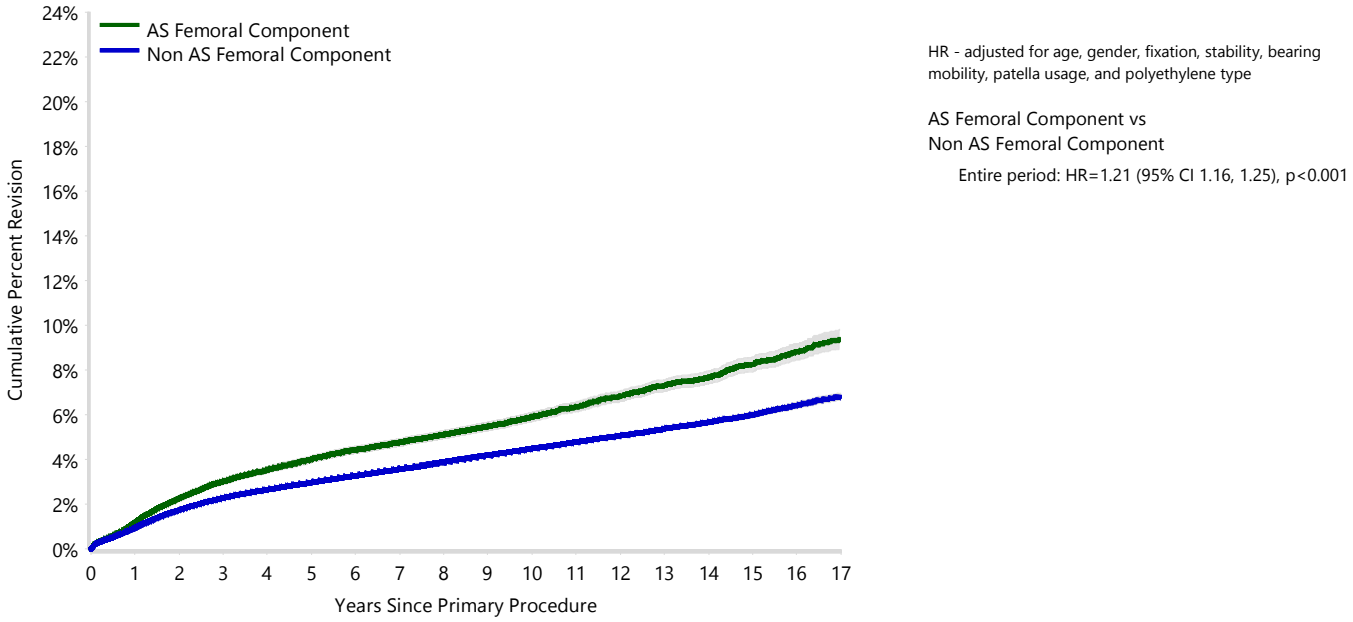
Primary Total Knee Replacement

Table KT58 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)

Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AS Femoral Component	4109	86257	1.2 (1.1, 1.3)	3.0 (2.9, 3.2)	4.0 (3.9, 4.2)	5.9 (5.7, 6.1)	8.3 (7.9, 8.6)	10.6 (10.0, 11.3)
Non AS Femoral Component	19781	620092	0.9 (0.9, 1.0)	2.3 (2.2, 2.3)	3.0 (2.9, 3.0)	4.5 (4.4, 4.6)	6.0 (5.9, 6.1)	7.5 (7.3, 7.8)
TOTAL	23890	706349						

Note: Restricted to modern prostheses.

Figure KT54 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AS Femoral Component	86257	78621	64324	51596	23433	6672	890
Non AS Femoral Component	620092	548979	423397	320396	127548	33629	5654

Note: Restricted to modern prostheses.

Table KT59 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Bearing Surface and Stability (Primary Diagnosis OA)

Stability	Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised		**15311**	**492259**	**0.9 (0.9, 0.9)**	**2.2 (2.2, 2.3)**	**2.9 (2.9, 3.0)**	**4.4 (4.4, 4.5)**	**6.1 (5.9, 6.2)**	**7.7 (7.5, 8.0)**
	AS Femoral Component	1551	38284	1.1 (1.0, 1.2)	2.7 (2.6, 2.9)	3.5 (3.3, 3.7)	5.5 (5.2, 5.8)	7.8 (7.2, 8.3)	9.9 (9.1, 10.8)
	Non AS Femoral Component	13760	453975	0.9 (0.9, 0.9)	2.2 (2.1, 2.2)	2.9 (2.8, 2.9)	4.4 (4.3, 4.4)	5.9 (5.8, 6.1)	7.5 (7.2, 7.7)
Posterior Stabilised		**6933**	**157016**	**1.2 (1.1, 1.2)**	**2.7 (2.6, 2.8)**	**3.6 (3.5, 3.7)**	**5.3 (5.1, 5.4)**	**7.0 (6.8, 7.2)**	**8.7 (8.3, 9.2)**
	AS Femoral Component	2486	46722	1.2 (1.1, 1.3)	3.2 (3.1, 3.4)	4.3 (4.1, 4.5)	6.2 (5.9, 6.5)	8.6 (8.1, 9.0)	11.2 (10.1, 12.4)
	Non AS Femoral Component	4447	110294	1.1 (1.1, 1.2)	2.5 (2.4, 2.6)	3.3 (3.2, 3.4)	4.9 (4.7, 5.0)	6.3 (6.1, 6.5)	7.6 (7.2, 8.1)
Medial Pivot Design		**1304**	**51532**	**1.0 (0.9, 1.1)**	**2.4 (2.2, 2.5)**	**3.0 (2.8, 3.2)**	**4.2 (3.9, 4.5)**	**6.0 (4.5, 7.9)**	
	AS Femoral Component	7	164	0.6 (0.1, 4.3)	2.9 (1.1, 7.5)	2.9 (1.1, 7.5)	4.1 (1.7, 9.8)		
	Non AS Femoral Component	1297	51368	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.0 (2.8, 3.2)	4.2 (3.9, 4.5)	5.4 (4.1, 7.1)	
TOTAL		23548	700807						

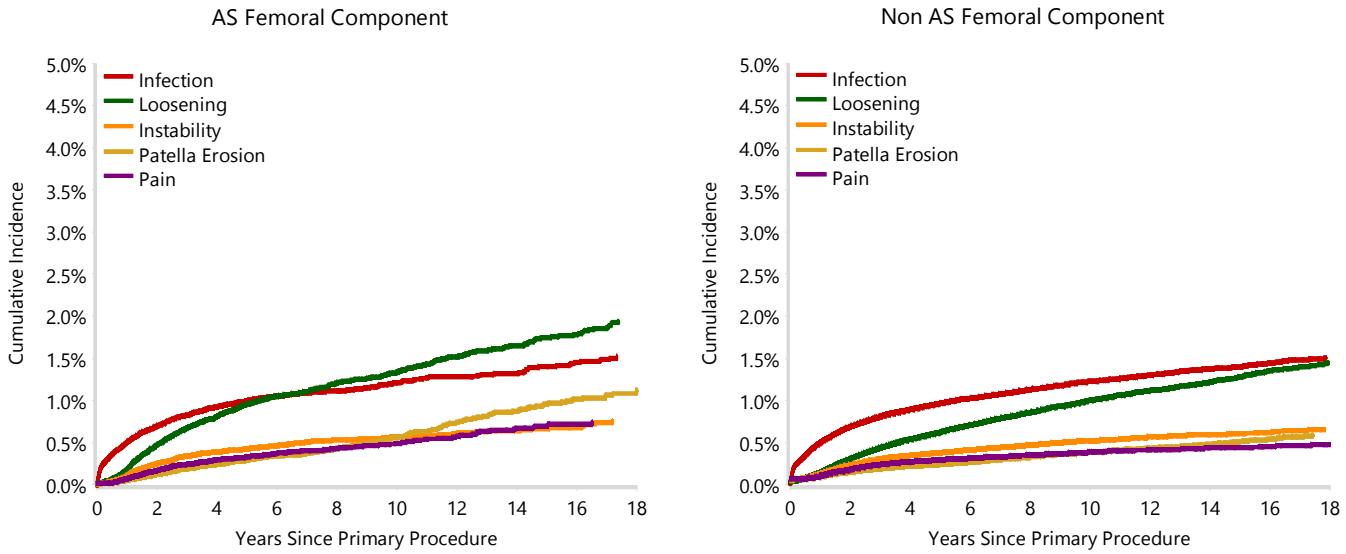
Note: Restricted to modern prostheses. Excludes 1,452 procedures with unknown polyethylene.

Table KT60 Comparisons of Revision Rates for Primary Total Knee Replacement by Stability and Femoral Bearing Surface (Primary Diagnosis OA)

Comparison	HR- adjusted for age and gender
Minimally Stabilised AS Femoral Component vs Minimally Stabilised Non AS Femoral Component	Entire Period: HR=1.18 (95% CI 1.12, 1.25), p<0.001
Posterior Stabilised AS Femoral Component vs Posterior Stabilised Non AS Femoral Component	0 - 9Mth: HR=0.86 (95% CI 0.76, 0.96), p=0.009
	9Mth - 1.5Yr: HR=1.36 (95% CI 1.20, 1.53), p<0.001
	1.5Yr - 2Yr: HR=1.43 (95% CI 1.21, 1.69), p<0.001
	2Yr+: HR=1.23 (95% CI 1.15, 1.32), p<0.001
Medial Pivot Design AS Femoral Component vs Medial Pivot Design Non AS Femoral Component	Entire Period: HR=1.15 (95% CI 0.54, 2.45), p=0.720

Note: Restricted to modern prostheses. Excludes 1,452 procedures with unknown polyethylene.

Figure KT55 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)



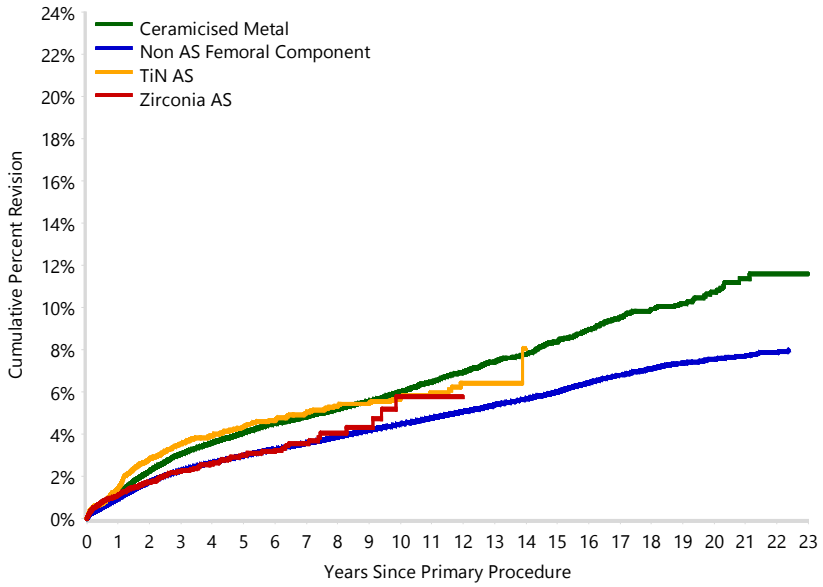
Note: Restricted to modern prostheses.

Table KT61 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)

Femoral Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	3599	71264	1.2 (1.1, 1.2)	3.1 (2.9, 3.2)	4.1 (3.9, 4.2)	6.0 (5.8, 6.2)	8.4 (8.1, 8.7)	10.7 (10.1, 11.4)
Non AS Femoral Component	19781	620092	0.9 (0.9, 1.0)	2.3 (2.2, 2.3)	3.0 (2.9, 3.0)	4.5 (4.4, 4.6)	6.0 (5.9, 6.1)	7.5 (7.3, 7.8)
TiN AS	312	6735	1.4 (1.2, 1.8)	3.5 (3.1, 4.0)	4.4 (3.9, 4.9)	5.7 (5.0, 6.3)		
Zirconia AS	198	8258	1.1 (0.9, 1.4)	2.3 (1.9, 2.6)	3.0 (2.6, 3.5)	5.8 (4.1, 8.0)		
TOTAL	23890	706349						

Note: Restricted to modern prostheses.

Figure KT56 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)



HR - adjusted for age and gender

Ceramicised Metal vs Non AS Femoral Component
Entire Period: HR=1.26 (95% CI 1.21, 1.30), p<0.001

TiN AS vs Non AS Femoral Component
0 - 1.5Yr: HR=1.70 (95% CI 1.45, 2.00), p<0.001
1.5Yr+: HR=1.13 (95% CI 0.97, 1.32), p=0.122

Zirconia AS vs Non AS Femoral Component
0 - 6Mth: HR=1.50 (95% CI 1.17, 1.92), p=0.001
6Mth - 2Yr: HR=0.75 (95% CI 0.58, 0.95), p=0.019
2Yr+: HR=0.98 (95% CI 0.77, 1.24), p=0.849

TiN AS vs Ceramicised Metal
0 - 1.5Yr: HR=1.35 (95% CI 1.15, 1.59), p<0.001
1.5Yr+: HR=0.90 (95% CI 0.77, 1.06), p=0.194

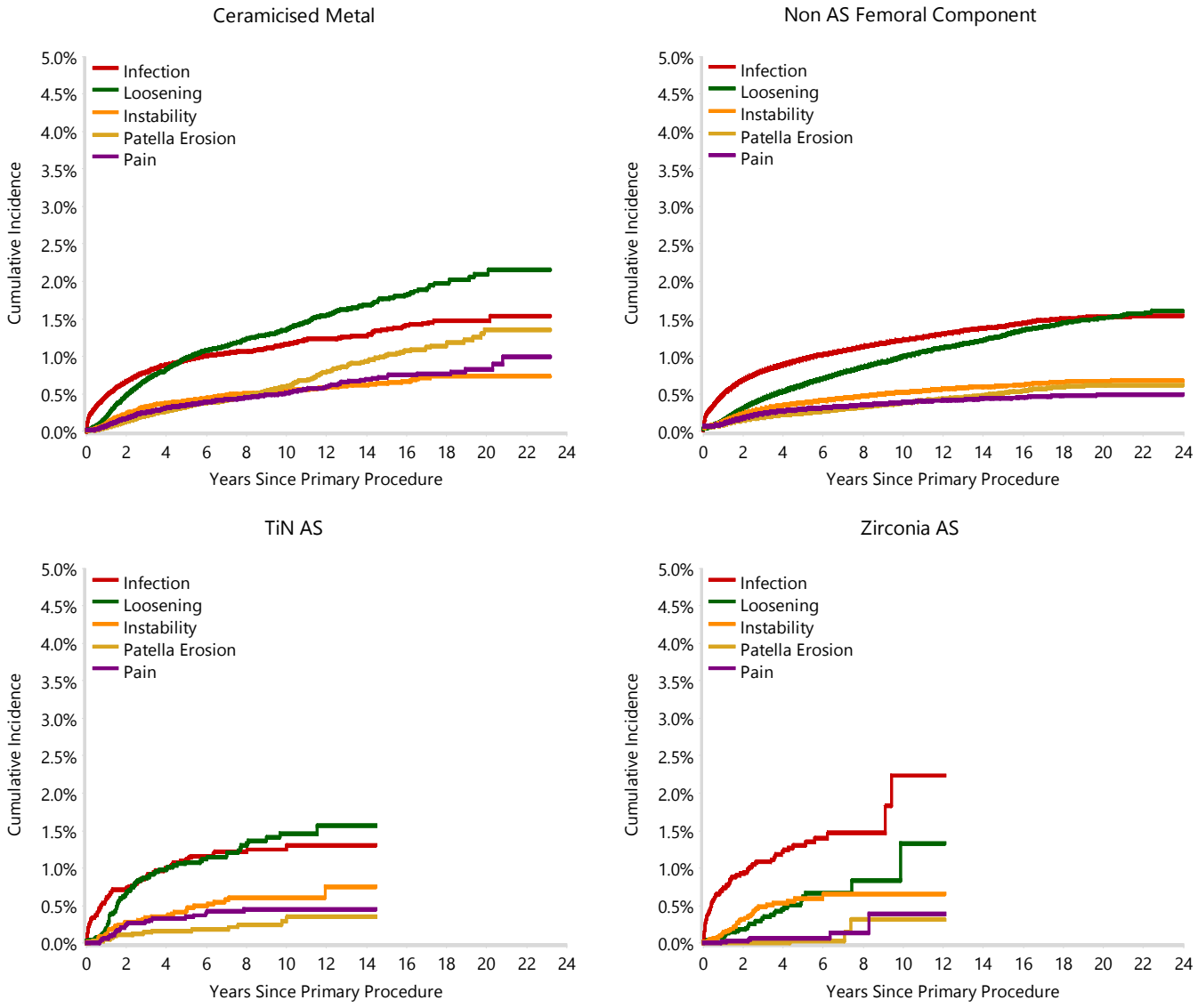
Zirconia AS vs Ceramicised Metal
0 - 6Mth: HR=1.19 (95% CI 0.93, 1.53), p=0.162
6Mth - 2Yr: HR=0.59 (95% CI 0.46, 0.76), p<0.001

TiN AS vs Zirconia AS
Entire Period: HR=1.43 (95% CI 1.19, 1.71), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	71264	65315	54438	45042	21811	6643	890
Non AS Femoral Component	620092	548979	423397	320396	127548	33629	5654
TiN AS	6735	6294	5272	4239	1464	29	0
Zirconia AS	8258	7012	4614	2315	158	0	0

Note: Restricted to modern prostheses.

Figure KT57 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)



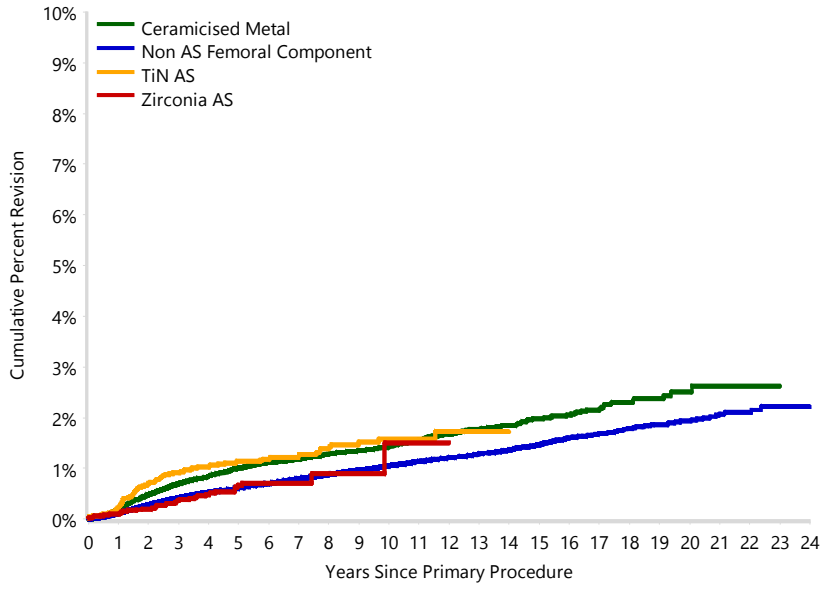
Note: Restricted to modern prostheses.

Table KT62 Cumulative Percent Revision of AS Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA, Revision for Loosening)

AS Femoral Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	828	71264	0.2 (0.2, 0.2)	0.7 (0.6, 0.8)	1.0 (0.9, 1.1)	1.4 (1.3, 1.5)	2.0 (1.8, 2.2)	2.5 (2.2, 2.8)
Non AS Femoral Component	4150	620092	0.1 (0.1, 0.1)	0.4 (0.4, 0.4)	0.6 (0.6, 0.6)	1.0 (1.0, 1.1)	1.4 (1.4, 1.5)	1.9 (1.8, 2.1)
TiN AS	78	6735	0.2 (0.1, 0.3)	0.9 (0.7, 1.2)	1.1 (0.9, 1.4)	1.6 (1.2, 2.0)		
Zirconia AS	34	8258	0.1 (0.0, 0.2)	0.3 (0.2, 0.5)	0.6 (0.4, 0.9)	1.5 (0.6, 3.5)		
TOTAL	5090	706349						

Note: Restricted to modern prostheses

Figure KT58 Cumulative Percent Revision of AS Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA, Revision for Loosening)



HR - adjusted for age and gender

Ceramicised Metal vs Non AS Femoral Component
- 0 - 1.5Yr: HR=1.65 (95% CI 1.43, 1.90), p<0.001
- 1.5Yr - 2.5Yr: HR=1.32 (95% CI 1.10, 1.59), p=0.003
- 2.5Yr - 5Yr: HR=1.46 (95% CI 1.26, 1.69), p<0.001
- 5Yr+: HR=0.94 (95% CI 0.82, 1.08), p=0.414

TiN AS vs Non AS Femoral Component
- 0 - 1.5Yr: HR=2.42 (95% CI 1.70, 3.46), p<0.001
- 1.5Yr - 2.5Yr: HR=2.23 (95% CI 1.43, 3.47), p<0.001
- 2.5Yr+: HR=0.97 (95% CI 0.67, 1.42), p=0.893

Zirconia AS vs Non AS Femoral Component
- Entire Period: HR=0.88 (95% CI 0.63, 1.23), p=0.454

TiN AS vs Ceramicised Metal
- Entire Period: HR=1.18 (95% CI 0.94, 1.49), p=0.154

Zirconia AS vs Ceramicised Metal
- Entire Period: HR=0.61 (95% CI 0.43, 0.86), p=0.005

TiN AS vs Zirconia AS
- Entire Period: HR=1.82 (95% CI 1.22, 2.73), p=0.003

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	71264	65315	54438	45042	21811	6643	890
Non AS Femoral Component	620092	548979	423397	320396	127548	33629	5654
TiN AS	6735	6294	5272	4239	1464	29	0
Zirconia AS	8258	7012	4614	2315	158	0	0

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Table KT63 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Type and Femoral Bearing Surface (Primary Diagnosis OA)

Prosthesis Combination	Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Columbus/Columbus	AS Femoral Component	164	7394	1.0 (0.8, 1.3)	2.1 (1.8, 2.5)	3.0 (2.5, 3.5)		
	Non AS Femoral Component	112	1008	2.0 (1.3, 3.1)	6.5 (5.1, 8.2)	7.9 (6.4, 9.8)	10.7 (8.9, 12.9)	13.0 (10.8, 15.7)
E.Motion/E.Motion	AS Femoral Component	24	489	1.9 (1.0, 3.5)	3.8 (2.4, 6.0)	3.8 (2.4, 6.0)	7.0 (4.5, 10.9)	
	Non AS Femoral Component	53	545	3.1 (2.0, 5.0)	7.3 (5.4, 9.8)	8.8 (6.7, 11.6)	10.2 (7.9, 13.2)	
TOTAL		353	9436					

Note: Restricted to modern prostheses.

Table KT64 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Femoral Bearing Surface (Primary Diagnosis OA)

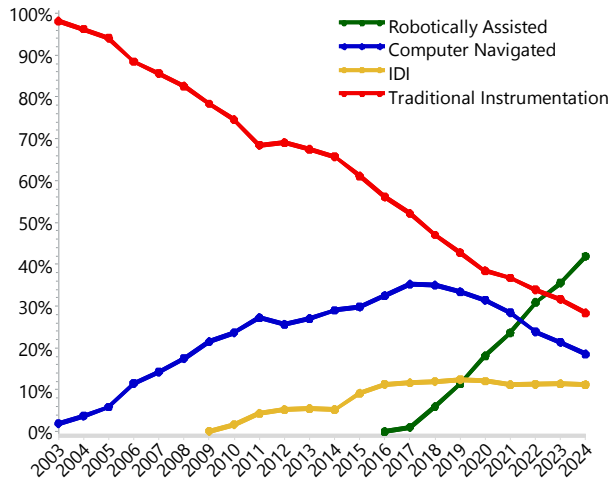
Comparison	HR- adjusted for age and gender
Columbus/Columbus AS Femoral Component vs Columbus/Columbus Non AS Femoral Component	Entire Period: HR=0.36 (95% CI 0.27, 0.46), p<0.001
E.Motion/E.Motion AS Femoral Component vs E.Motion/E.Motion Non AS Femoral Component	Entire Period: HR=0.56 (95% CI 0.35, 0.91), p=0.020

Note: Restricted to modern prostheses

SURGEON ASSISTIVE TOOLS

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 28.3% of primary total knee procedures in 2024. The change in use of each assistive tool is shown in Figure KT59. Results for primary total knee replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016 (when robotic assistance was introduced). Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

Figure KT59 Primary Total Knee Replacement by Surgeon Assistive Tool (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Computer Navigation

There have been 183,685 primary total knee replacement procedures using computer navigation. In 2024, computer navigation was used in 18.5% of all primary total knee replacement procedures.

When adjusted for age, gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability, there is no difference in the rate of revision when procedures using computer navigation are compared to procedures using traditional instrumentation. Comparisons are made from 2015 when BMI data collection commenced (Table KT65, Figure KT60 and Figure KT61).

Using the same adjustments, there is a lower rate of revision for patients aged <65 years when computer navigation is used compared to traditional instrumentation. There is no difference when these comparisons are repeated for patients aged ≥65 years (Table KT66 and Figure KT62).

The outcomes of five prosthesis combinations used with computer navigation and with traditional instrumentation, and that have >5,000 procedures in each group, are shown in Table KT67 and Table KT68.

Image Derived Instrumentation (IDI)

IDI is the use of custom-made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient.

There have been 63,510 primary total knee replacement procedures undertaken using IDI since 2009. In 2024, IDI was used in 11.2% of all primary total knee replacement procedures.

When procedures using IDI are compared to procedures using traditional instrumentation with adjustment for age, gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability, IDI usage has a higher rate of revision. Comparisons are made from 2015 when BMI data collection commenced (Table KT69 and Figure KT63). There is an increased proportion of revision for loosening when IDI is used (Figure KT64).

The effect of IDI on revision varies with age. Using the same adjustments, for patients aged ≥65 years where IDI is used, there is a higher rate of revision compared to traditional instrumentation. There is no difference with IDI use for patients aged <65 years (Table KT70 and Figure KT65).

The outcomes of three prosthesis combinations used with IDI and with traditional instrumentation, and that have >5,000 procedures in each group, are shown in Table KT71 and Table KT72.

Robotic Assistance

Robotic assistance has been recorded for 100,753 total knee replacements since 2016. In 2024, robotic assistance was used in 41.9% of all primary total knee replacement procedures. There are 5 robotic systems that are used with a small number of prostheses, and many of these systems have limited follow-up.

When adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and stability, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation. Comparisons are made from 2016 when robotic assistance commenced (Table KT73 and Figure KT66). Reasons for revision when robotic assistance is used are shown in Figure KT67. Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years or for patients aged ≥65 years when robotic assistance is used compared to traditional instrumentation (Table KT74 and Figure KT68).

The outcomes of two prosthesis combinations used with robotic assistance and traditional instrumentation with >5000 procedures in each group are shown in Table KT75 and Table KT76.

Primary Total Knee Replacement

When adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and stability, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation.

Surgeon Assistive Tools Compared
Total knee procedures since 2016 for osteoarthritis using XLPE with the use of assistive tools and adjusted for age, gender, ASA, BMI, patella component usage and stability are compared in Table KT75 and Figure KT69.

With these restrictions, there is no difference in the rate of revision when procedures using computer navigation, IDI, robotic assistance and traditional instrumentation are compared.

Prosthesis-Specific Analysis
There are two prosthesis combinations using XLPE that have used at least three assistive methods that have over 10,000 procedures in each group. The analyses for these two prostheses have been adjusted for age, gender, ASA, BMI, patella component usage and tibial fixation.

There is no difference in the rate of revision when the Persona CR/Persona combination is used with robotic assistance compared to when computer navigation is used, and when compared to procedures using traditional instrumentation (Table KT78 and Figure KT70).

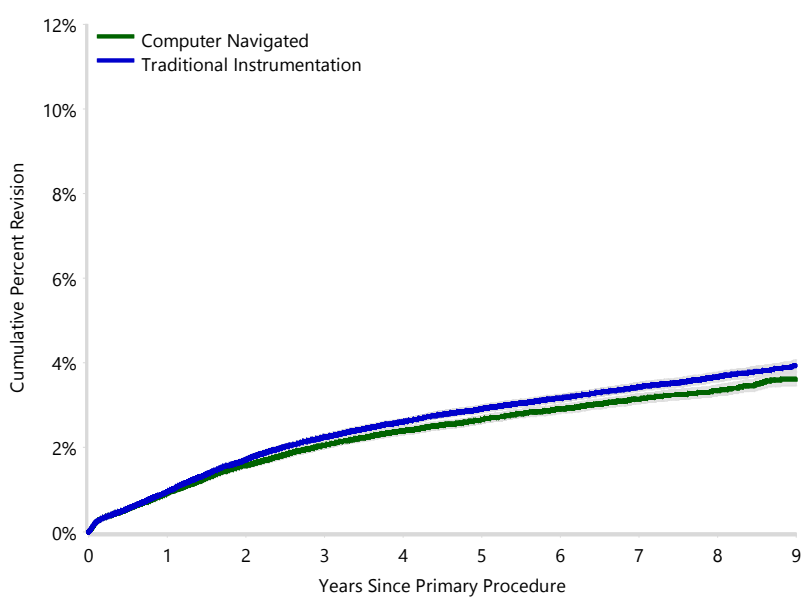
The Triathlon CR/Triathlon combination also shows no difference when procedures using any of the types of assistive tools are compared (Table KT79 and Figure KT71).

Table KT65 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	3243	136187	0.9 (0.9, 1.0)	2.1 (2.0, 2.1)	2.7 (2.6, 2.8)	3.2 (3.0, 3.3)	3.6 (3.5, 3.8)
Traditional Instrumentation	4969	191216	1.0 (0.9, 1.0)	2.2 (2.2, 2.3)	2.9 (2.8, 3.0)	3.4 (3.3, 3.5)	3.9 (3.8, 4.1)
TOTAL	8212	327403					

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT60 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

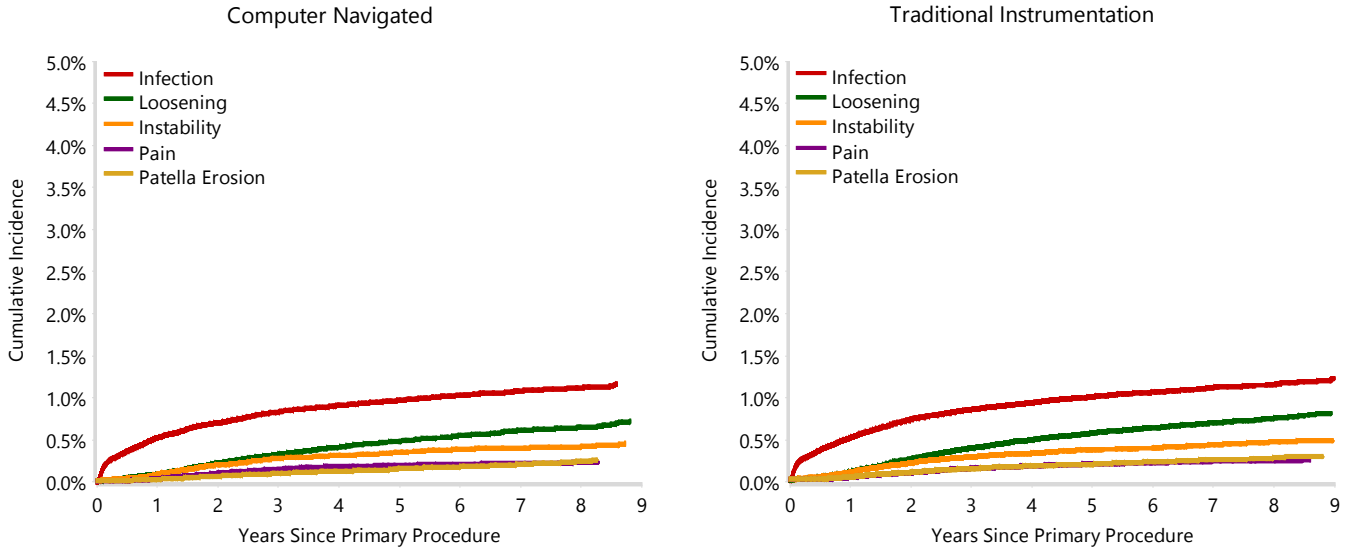
Traditional Instrumentation vs Computer Navigated

Entire period: HR=1.02 (95% CI 0.98, 1.07), p=0.336

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	136187	121911	91940	60356	30303	7488
Traditional Instrumentation	191216	169607	126209	86304	47452	13483

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT61 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnoses OA)



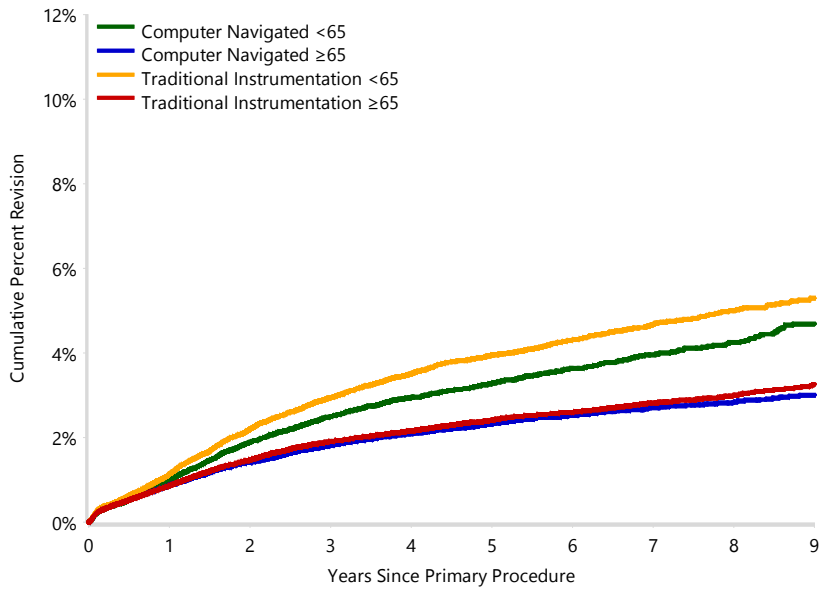
Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Table KT66 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	<65	1395	45655	1.0 (0.9, 1.1)	2.5 (2.4, 2.7)	3.3 (3.1, 3.5)	4.0 (3.7, 4.2)	4.7 (4.4, 5.0)
	≥65	1848	90532	0.9 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)	2.7 (2.6, 2.8)	3.0 (2.8, 3.2)
Traditional Instrumentation	<65	2170	60526	1.1 (1.1, 1.2)	2.9 (2.8, 3.1)	4.0 (3.8, 4.1)	4.7 (4.5, 4.9)	5.3 (5.0, 5.6)
	≥65	2799	130690	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.3 (3.1, 3.4)
TOTAL		8212	327403					

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT62 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Computer Navigated <65 vs Traditional Instrumentation <65

Entire period: HR=0.92 (95% CI 0.86, 0.98), p=0.016

Computer Navigated ≥65 vs Traditional Instrumentation ≥65

Entire period: HR=1.03 (95% CI 0.97, 1.10), p=0.262

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Computer Navigated	<65	45655	41312	31983	21726	11463	2912
	≥65	90532	80599	59957	38630	18840	4576
Traditional Instrumentation	<65	60526	54271	41257	28742	16640	4918
	≥65	130690	115336	84952	57562	30812	8565

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Table KT67 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Apex Knee CR/Apex Knee	Computer Navigated	89	5485	0.8 (0.6, 1.1)	1.5 (1.1, 1.8)	1.7 (1.4, 2.2)	2.2 (1.7, 2.7)	2.4 (1.9, 3.1)	2.4 (1.9, 3.1)
	Traditional Instrumentation	123	7204	0.7 (0.5, 0.9)	1.1 (0.9, 1.4)	1.4 (1.1, 1.7)	1.8 (1.5, 2.2)	2.2 (1.8, 2.7)	2.8 (2.2, 3.6)
Attune CR/Attune	Computer Navigated	210	10460	0.8 (0.7, 1.0)	1.4 (1.2, 1.7)	1.8 (1.5, 2.1)	2.3 (2.0, 2.6)	2.7 (2.3, 3.1)	3.0 (2.5, 3.6)
	Traditional Instrumentation	502	20049	0.9 (0.8, 1.0)	1.6 (1.5, 1.8)	2.1 (1.9, 2.4)	2.8 (2.6, 3.1)	3.4 (3.1, 3.8)	3.8 (3.4, 4.3)
Attune PS/Attune	Computer Navigated	158	6670	1.0 (0.7, 1.2)	1.7 (1.4, 2.0)	2.2 (1.9, 2.6)	2.6 (2.2, 3.1)	3.3 (2.7, 4.0)	4.1 (3.0, 5.6)
	Traditional Instrumentation	217	8294	0.8 (0.7, 1.1)	1.6 (1.3, 1.9)	2.2 (1.9, 2.5)	2.8 (2.4, 3.2)	3.8 (3.3, 4.4)	4.4 (3.8, 5.2)
Persona CR/Persona	Computer Navigated	316	18046	0.9 (0.7, 1.0)	1.5 (1.4, 1.7)	1.8 (1.6, 2.0)	2.3 (2.0, 2.6)	2.7 (2.3, 3.1)	3.0 (2.3, 3.7)
	Traditional Instrumentation	398	24930	0.9 (0.8, 1.0)	1.5 (1.4, 1.7)	2.0 (1.8, 2.2)	2.5 (2.3, 2.8)	2.7 (2.3, 3.1)	2.7 (2.3, 3.1)
Triathlon CR/Triathlon	Computer Navigated	1158	55572	0.8 (0.8, 0.9)	1.4 (1.3, 1.5)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)	2.7 (2.5, 2.9)	3.1 (2.9, 3.3)
	Traditional Instrumentation	731	31425	0.8 (0.7, 0.9)	1.4 (1.3, 1.6)	1.9 (1.7, 2.0)	2.5 (2.3, 2.7)	2.9 (2.7, 3.1)	3.3 (3.0, 3.6)
TOTAL		3902	188135						

Note: Restricted to modern prostheses.
Only prosthesis combinations with >5,000 procedures in both groups have been listed.
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Table KT68 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Comparison	HR – adjusted for age, gender, ASA, BMI, patella component usage and surgeon volume
Apex Knee CR/Apex Knee Computer Navigated vs Apex Knee CR/Apex Knee Traditional Instrumentation	Entire Period: HR=1.02 (95% CI 0.75, 1.38), p=0.914
Attune CR/Attune Computer Navigated vs Attune CR/Attune Traditional Instrumentation	Entire Period: HR=0.83 (95% CI 0.70, 0.99), p=0.033
Attune PS/Attune Computer Navigated vs Attune PS/Attune Traditional Instrumentation	Entire Period: HR=0.99 (95% CI 0.79, 1.23), p=0.901
Persona CR/Persona Computer Navigated vs Persona CR/Persona Traditional Instrumentation	Entire Period: HR=1.00 (95% CI 0.86, 1.16), p=0.975
Triathlon CR/Triathlon Computer Navigated vs Triathlon CR/Triathlon Traditional Instrumentation	Entire Period: HR=0.92 (95% CI 0.83, 1.01), p=0.087

Note: Restricted to modern prostheses.
Only prosthesis combinations with >5,000 procedures in both groups have been listed.
In addition, Apex Knee CR/Apex Knee and Triathlon CR/Triathlon adjusted for bearing surface.

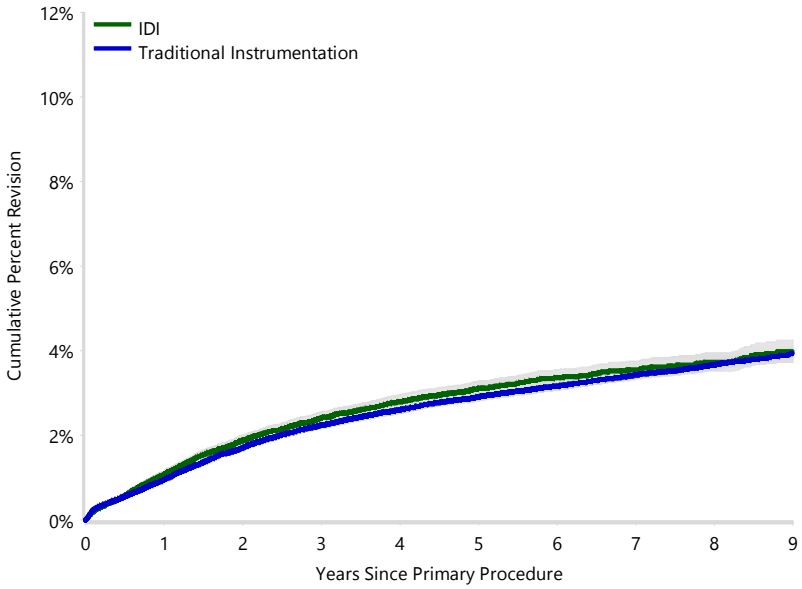
Primary Total Knee Replacement

Table KT69 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	1403	55017	1.1 (1.0, 1.2)	2.4 (2.3, 2.6)	3.1 (2.9, 3.3)	3.6 (3.4, 3.8)	3.7 (3.5, 4.0)	4.0 (3.7, 4.3)
Traditional Instrumentation	4969	191216	1.0 (0.9, 1.0)	2.2 (2.2, 2.3)	2.9 (2.8, 3.0)	3.4 (3.3, 3.5)	3.7 (3.6, 3.8)	3.9 (3.8, 4.1)
TOTAL	6372	246233						

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT63 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

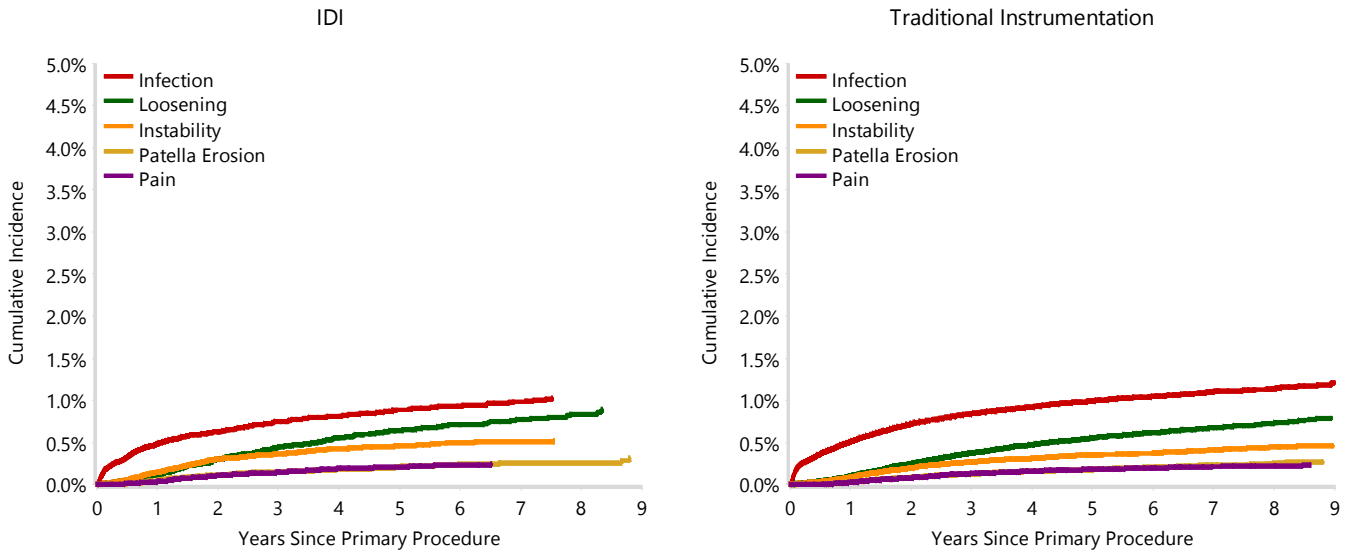
IDI vs Traditional Instrumentation

Entire period: HR=1.07 (95% CI 1.00, 1.14), p=0.047

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	55017	47133	33063	21048	10293	5977	2426
Traditional Instrumentation	191216	169607	126209	86304	47452	29491	13483

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT64 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

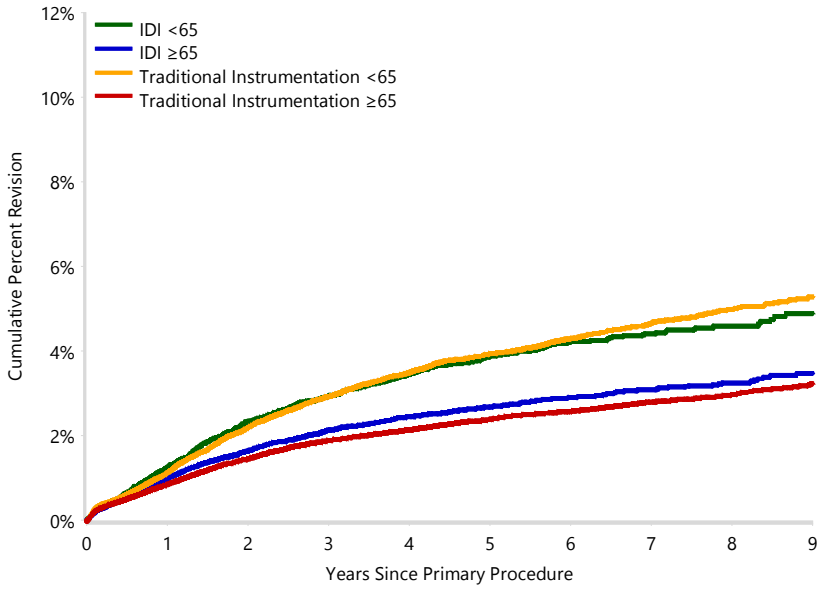
Primary Total Knee Replacement

Table KT70 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	<65	596	18457	1.2 (1.1, 1.4)	2.9 (2.7, 3.2)	3.9 (3.6, 4.2)	4.4 (4.1, 4.8)	4.6 (4.2, 5.0)	4.9 (4.4, 5.4)
	≥65	807	36560	1.0 (0.9, 1.1)	2.1 (2.0, 2.3)	2.7 (2.5, 2.9)	3.1 (2.9, 3.3)	3.3 (3.0, 3.5)	3.5 (3.2, 3.8)
Traditional Instrumentation	<65	2170	60526	1.1 (1.1, 1.2)	2.9 (2.8, 3.1)	4.0 (3.8, 4.1)	4.7 (4.5, 4.9)	5.0 (4.8, 5.2)	5.3 (5.0, 5.6)
	≥65	2799	130690	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.0 (2.9, 3.1)	3.3 (3.1, 3.4)
TOTAL		6372	246233						

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT65 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

IDI <65 vs Traditional Instrumentation <65

Entire period: HR=1.00 (95% CI 0.91, 1.10), p=0.998

IDI ≥65 vs Traditional Instrumentation ≥65

Entire period: HR=1.13 (95% CI 1.04, 1.23), p=0.003

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	<65	18457	15988	11618	7582	3842	2275	954
	≥65	36560	31145	21445	13466	6451	3702	1472
Traditional Instrumentation	<65	60526	54271	41257	28742	16640	10632	4918
	≥65	130690	115336	84952	57562	30812	18859	8565

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Table KT71 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Evolution/Evolution	IDI	161	5084	1.1 (0.8, 1.4)	1.9 (1.6, 2.3)	2.6 (2.2, 3.1)	3.2 (2.7, 3.8)	3.7 (3.2, 4.4)	3.9 (3.3, 4.7)
	Traditional Instrumentation	96	5085	0.7 (0.5, 0.9)	1.4 (1.1, 1.8)	1.8 (1.4, 2.2)	2.1 (1.7, 2.6)	2.3 (1.9, 2.8)	2.7 (2.1, 3.5)
GMK Sphere Primary/GMK Primary	IDI	418	18067	1.2 (1.1, 1.4)	2.0 (1.8, 2.2)	2.5 (2.3, 2.8)	3.1 (2.8, 3.4)	3.6 (3.2, 4.0)	3.8 (3.4, 4.3)
	Traditional Instrumentation	194	7006	1.2 (0.9, 1.5)	2.3 (1.9, 2.7)	2.8 (2.4, 3.3)	3.5 (3.0, 4.1)	4.3 (3.6, 5.0)	4.7 (3.9, 5.6)
Persona CR/Persona	IDI	145	8537	1.0 (0.8, 1.2)	1.5 (1.2, 1.8)	1.9 (1.6, 2.3)	2.4 (2.0, 2.8)	2.4 (2.1, 2.9)	
	Traditional Instrumentation	398	24930	0.9 (0.8, 1.0)	1.5 (1.4, 1.7)	2.0 (1.8, 2.2)	2.5 (2.3, 2.8)	2.7 (2.3, 3.1)	2.7 (2.3, 3.1)
TOTAL		1412	68709						

Note: Restricted to modern prostheses.
Only prosthesis combinations with >5,000 procedures in both groups are listed.
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Table KT72 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Comparison	HR -adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and surgeon volume.
Evolution/Evolution IDI vs Evolution/ Evolution Traditional Instrumentation	Entire Period: HR=1.59 (95% CI 1.19, 2.13, p=0.002
GMK Sphere Primary/GMK Primary IDI vs GMK Sphere Primary/ GMK Primary Traditional Instrumentation	0-9Mth: HR=1.37 (95% CI 1.00, 1.88), p=0.051
	9Mth+: HR=0.72 (95% CI 0.58, 0.88), p=0.002
Persona CR/Persona IDI vs Persona CR/ Persona Traditional Instrumentation	Entire Period: HR=0.95 (95% CI 0.78, 1.15), p=0.584

Note: Restricted to modern prostheses.
Only prosthesis combinations with >5,000 procedures in both groups are listed.
In addition, GMK Sphere Primary/GMK Primary adjusted for bearing surface.

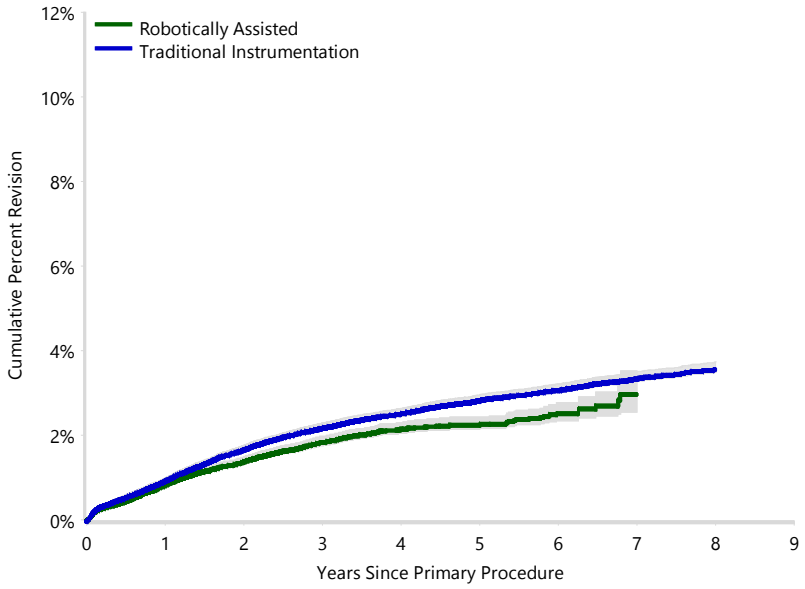
Primary Total Knee Replacement

Table KT73 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	1355	100081	0.8 (0.8, 0.9)	1.9 (1.8, 2.0)	2.3 (2.1, 2.4)	2.6 (2.4, 2.8)	3.0 (2.6, 3.5)	
Traditional Instrumentation	4268	174552	1.0 (0.9, 1.0)	2.2 (2.1, 2.3)	2.9 (2.8, 3.0)	3.1 (3.0, 3.2)	3.4 (3.3, 3.5)	3.6 (3.5, 3.7)
TOTAL	5623	274633						

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Figure KT66 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

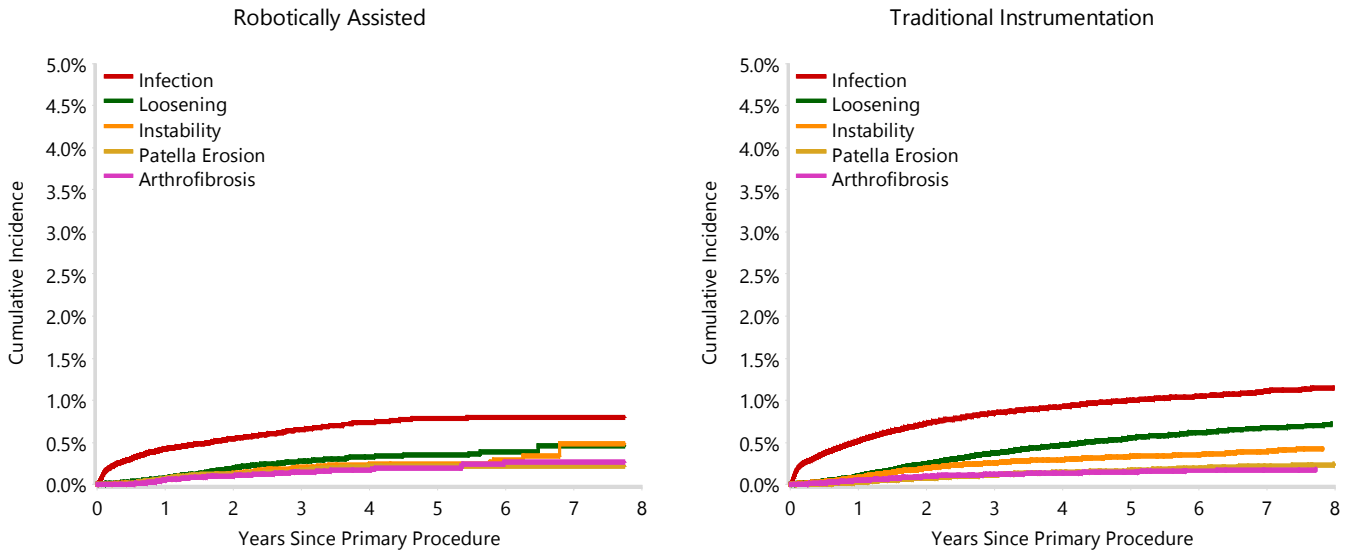
Robotically Assisted vs Traditional Instrumentation

Entire period: HR=1.00 (95% CI 0.93, 1.07), p=0.972

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	100081	70532	29120	7934	2809	372	8
Traditional Instrumentation	174552	153191	110369	71099	51626	33071	15573

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Figure KT67 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnoses OA)



Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

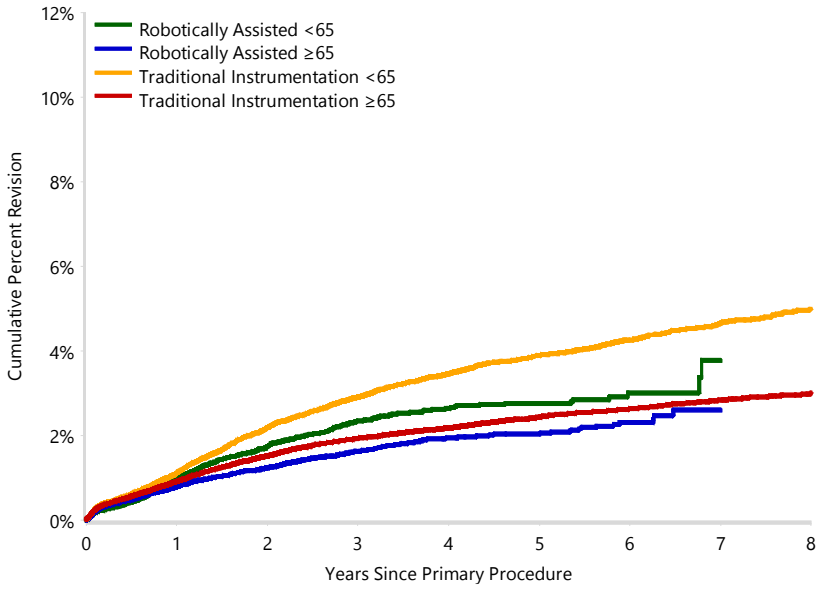
Primary Total Knee Replacement

Table KT74 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	<65	550	33193	1.0 (0.9, 1.1)	2.3 (2.1, 2.6)	2.8 (2.5, 3.0)	3.0 (2.7, 3.4)	3.8 (2.8, 5.1)	
	≥65	805	66888	0.8 (0.7, 0.9)	1.6 (1.5, 1.8)	2.0 (1.9, 2.2)	2.3 (2.1, 2.6)	2.6 (2.2, 3.0)	
Traditional Instrumentation	<65	1845	55035	1.1 (1.0, 1.2)	2.9 (2.7, 3.0)	3.9 (3.7, 4.1)	4.2 (4.0, 4.4)	4.6 (4.4, 4.8)	5.0 (4.7, 5.2)
	≥65	2423	119517	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.6 (2.5, 2.7)	2.8 (2.7, 2.9)	3.0 (2.8, 3.1)
TOTAL		5623	274633						

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella usage and mobility

Figure KT68 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)



HR - adjusted for gender, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Robotically Assisted <65 vs Traditional Instrumentation <65

Entire period: HR=0.91 (95% CI 0.82, 1.00), p=0.062

Robotically Assisted ≥65 vs Traditional Instrumentation ≥65

Entire period: HR=1.09 (95% CI 1.00, 1.19), p=0.060

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	<65	33193	23853	10260	2788	1038	147	5
	≥65	66888	46679	18860	5146	1771	225	3
Traditional Instrumentation	<65	55035	48865	35999	23605	17614	11602	5661
	≥65	119517	104326	74370	47494	34012	21469	9912

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Table KT75 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tools	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Persona CR/Persona	Robotically Assisted	334	24575	0.8 (0.7, 1.0)	1.5 (1.3, 1.7)	2.1 (1.9, 2.4)	2.4 (2.1, 2.8)		
	Traditional Instrumentation	398	24930	0.9 (0.8, 1.0)	1.5 (1.4, 1.7)	2.0 (1.8, 2.2)	2.5 (2.3, 2.8)	2.7 (2.3, 3.1)	2.7 (2.3, 3.1)
Triathlon CR/Triathlon	Robotically Assisted	728	58421	0.8 (0.7, 0.9)	1.3 (1.2, 1.4)	1.6 (1.5, 1.8)	2.0 (1.8, 2.1)	2.3 (2.0, 2.8)	
	Traditional Instrumentation	731	31425	0.8 (0.7, 0.9)	1.4 (1.3, 1.6)	1.9 (1.7, 2.0)	2.5 (2.3, 2.7)	2.9 (2.7, 3.1)	3.3 (3.0, 3.6)
TOTAL		2191	139351						

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability
Only prosthesis combinations with >5,000 procedures in both groups have been listed

Table KT76 Comparisons of Revision Rates for Primary Total Knee Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Comparison	HR -adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and surgeon volume
Persona CR/Persona Robotically Assisted vs Persona CR/Persona Traditional Instrumentation	Entire Period: HR=1.03 (95% CI 0.87, 1.21), p=0.766
Triathlon CR/Triathlon Robotically Assisted vs Triathlon CR/Triathlon Traditional Instrumentation	0 - 1.5Yr: HR=1.07 (95% CI 0.93, 1.23), p=0.371
	1.5Yr+: HR=0.75 (95% CI 0.63, 0.90), p=0.002

Note: Restricted to modern prostheses. Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability
Only prosthesis combinations with >5,000 procedures in both groups have been listed

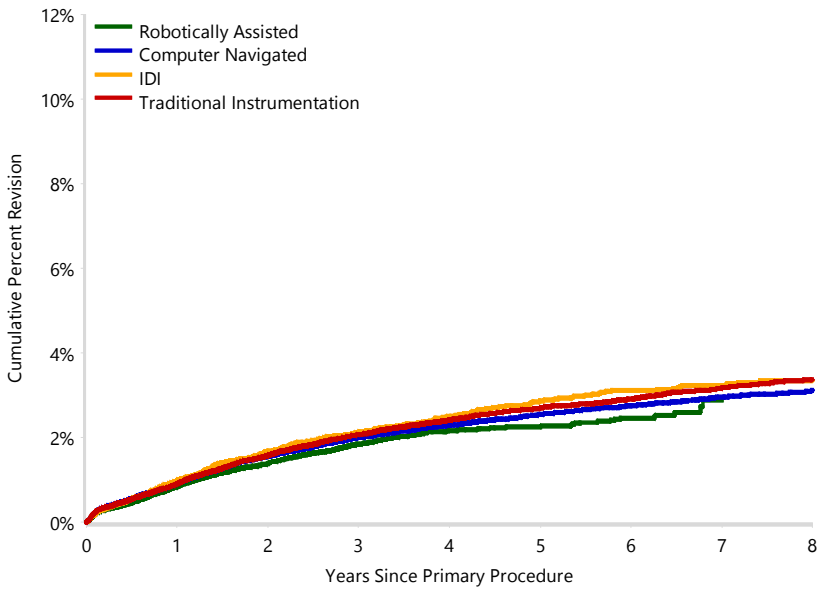
Primary Total Knee Replacement

Table KT77 Cumulative Percent Revision of Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	1328	99426	0.8 (0.8, 0.9)	1.9 (1.7, 2.0)	2.3 (2.1, 2.4)	2.5 (2.3, 2.7)	2.9 (2.4, 3.4)	
Computer Navigated	2259	104945	0.9 (0.9, 1.0)	2.0 (1.9, 2.1)	2.5 (2.4, 2.7)	2.8 (2.6, 2.9)	3.0 (2.8, 3.1)	3.1 (3.0, 3.3)
IDI	451	19584	1.0 (0.9, 1.1)	2.1 (1.9, 2.4)	2.9 (2.6, 3.2)	3.1 (2.8, 3.4)	3.2 (2.9, 3.6)	3.3 (3.0, 3.7)
Traditional Instrumentation	2363	108742	0.9 (0.9, 1.0)	2.1 (2.0, 2.2)	2.7 (2.6, 2.8)	2.9 (2.8, 3.0)	3.2 (3.0, 3.3)	3.4 (3.2, 3.5)
TOTAL	6401	332697						

Note: Restricted to modern prostheses.
Only procedures with known ASA, BMI, patella component usage, surgeon volume and stability are included
Excludes 344 medial pivot design and hinged prostheses due to small numbers of revisions

Figure KT69 Cumulative Percent Revision of Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, patella component usage, surgeon volume and stability

Computer Navigated vs IDI
Entire Period: HR=0.94 (95% CI 0.85, 1.04), p=0.241

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=0.98 (95% CI 0.92, 1.04), p=0.461

IDI vs Traditional Instrumentation
Entire Period: HR=1.04 (95% CI 0.94, 1.15), p=0.450

Robotically Assisted vs Computer Navigated
Entire Period: HR=1.03 (95% CI 0.96, 1.11), p=0.362

Robotically Assisted vs IDI
Entire Period: HR=0.97 (95% CI 0.87, 1.08), p=0.615

Robotically Assisted vs Traditional Instrumentation
Entire Period: HR=1.01 (95% CI 0.94, 1.09), p=0.764

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	99426	69982	28670	7670	2726	367	8
Computer Navigated	104945	92262	66843	40781	28248	16835	7136
IDI	19584	16886	11920	7353	5082	3088	1355
Traditional Instrumentation	108742	93081	63234	38107	26829	16627	7439

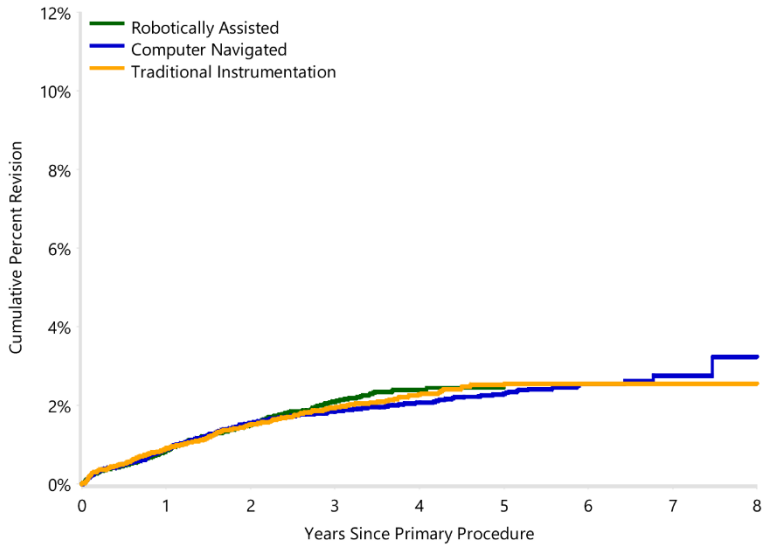
Note: Restricted to modern prostheses.

Table KT78 Cumulative Percent Revision of Persona CR/Persona Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	333	24439	0.8 (0.7, 1.0)	2.1 (1.9, 2.4)	2.4 (2.1, 2.8)			
Computer Navigated	311	17556	0.9 (0.7, 1.0)	1.8 (1.6, 2.1)	2.3 (2.0, 2.6)	2.5 (2.2, 2.9)	2.8 (2.3, 3.2)	3.2 (2.4, 4.4)
Traditional Instrumentation	375	24057	0.9 (0.8, 1.0)	1.9 (1.7, 2.2)	2.5 (2.2, 2.8)	2.6 (2.3, 2.9)	2.6 (2.3, 2.9)	2.6 (2.3, 2.9)
TOTAL	1019	66052						

Note: Restricted to modern prostheses.
Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability
Excludes 8,410 procedures using IDI and 1 posterior stabilised procedure.

Figure KT70 Cumulative Percent Revision of Persona CR/Persona Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, patella component usage, surgeon volume, and tibial fixation

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=0.97 (95% CI 0.83, 1.13), p=0.690

Robotically Assisted vs Computer Navigated
Entire Period: HR=1.03 (95% CI 0.88, 1.22), p=0.703

Robotically Assisted vs Traditional Instrumentation
Entire Period: HR=1.00 (95% CI 0.85, 1.18), p=0.990

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	24439	17007	10335	5073	1752	144	1	0	0
Computer Navigated	17556	14607	11745	9828	7174	4381	1954	552	60
Traditional Instrumentation	24057	18645	13088	8586	4787	2390	1031	350	89

Note: Restricted to modern prostheses.

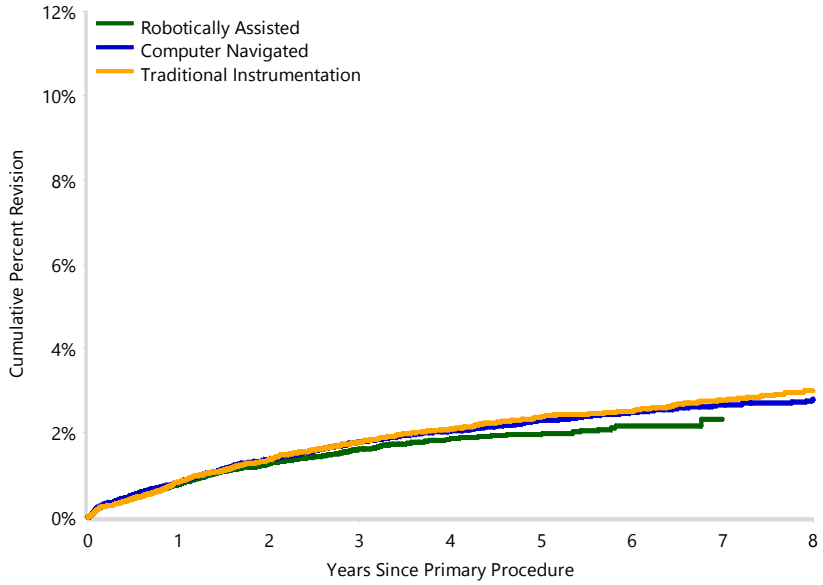
Primary Total Knee Replacement

Table KT79 Cumulative Percent Revision of Triathlon CR/Triathlon XLPE Primary Total Knee Replacement Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Robotically Assisted	720	57971	0.8 (0.7, 0.9)	1.3 (1.2, 1.4)	1.6 (1.5, 1.7)	2.0 (1.8, 2.1)	2.3 (2.0, 2.8)
Computer Navigated	929	47478	0.8 (0.7, 0.9)	1.4 (1.3, 1.5)	1.8 (1.7, 1.9)	2.3 (2.1, 2.5)	2.7 (2.5, 2.8)
Traditional Instrumentation	526	25103	0.8 (0.7, 1.0)	1.4 (1.2, 1.5)	1.8 (1.6, 2.0)	2.4 (2.2, 2.6)	2.8 (2.5, 3.1)
TOTAL	2175	130552					

Note: Restricted to modern prostheses
Excludes 45 procedures using IDI and 10 posterior stabilised procedures
Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability.

Figure KT71 Cumulative Percent Revision of Triathlon CR/Triathlon XLPE Primary Total Knee Replacement Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, gender, ASA, BMI, patella component usage, surgeon volume and tibial fixation

Computer Navigated vs Traditional Instrumentation
Entire Period: HR=0.95 (95% CI 0.85, 1.06), p=0.331

Robotically Assisted vs Computer Navigated
Entire Period: HR=0.95 (95% CI 0.85, 1.06), p=0.329

Robotically Assisted vs Traditional Instrumentation
Entire Period: HR=0.90 (95% CI 0.79, 1.02), p=0.089

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Robotically Assisted	57971	42271	28874	19493	5881	318	7
Computer Navigated	47478	41933	35625	30410	20034	9230	4133
Traditional Instrumentation	25103	22332	19332	16910	11853	5545	2679

Note: Restricted to modern prostheses
Excludes 45 procedures using IDI and 10 posterior stabilised procedures
Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability.

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Shoulder Replacement

Shoulder Replacement

Categories of Shoulder Replacement

Shoulder replacement is grouped into three broad categories: primary partial, primary total, and revision shoulder replacement.

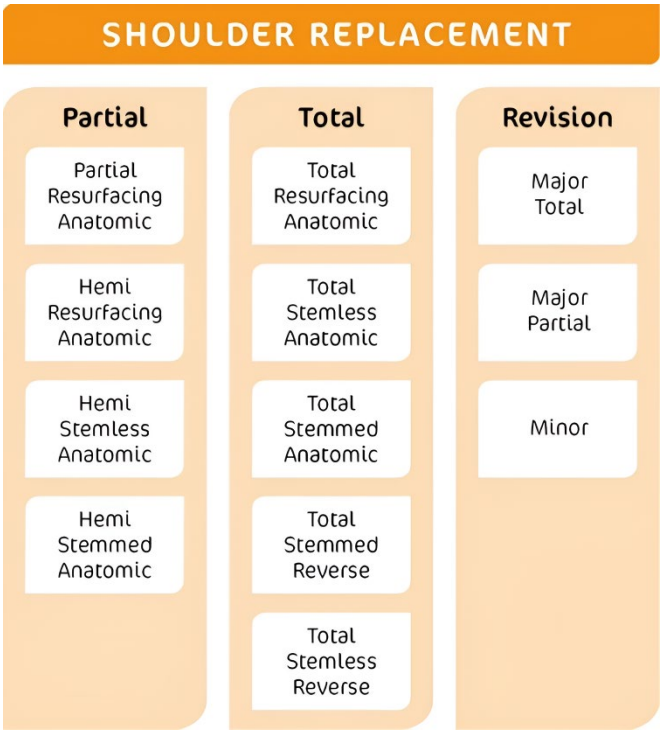
A primary replacement is an initial procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface.

Primary partial and primary total shoulder replacements are further categorised into subclasses depending on the type of prosthesis used. Partial shoulder subclasses include partial resurfacing anatomic, hemi resurfacing anatomic, hemi stemless anatomic and hemi stemmed anatomic.

Primary total shoulder replacement is subcategorised into five classes. These are defined by the type of prosthesis used. The use of stemless anatomic shoulder replacement has been growing considerably. As such mid head humeral prostheses are now classified as stemless anatomic and stemless reverse to reflect their differing polarity.

Total shoulder subclasses include total resurfacing anatomic, total stemless anatomic, total stemmed anatomic, total stemmed reverse and total stemless reverse. Definitions for each of these classes are detailed in the subsequent sections.

Revision shoulder replacements are re-operations of previous shoulder replacements where one or more of the prosthetic components are replaced, removed, or another component is added. Revisions include subsequent operations of primary partial, primary total, or previous revision procedures. Shoulder revision procedures are categorised into three subclasses: major total, major partial and minor shoulder replacement.



Detailed demographic information on shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Executive Summary Reference Tables

Table S1 and Table ST2 index the analyses within this chapter. Variables are listed, and where there is a significant finding for a comparison, a red diamond is shown in the table. There are hyperlinks to the relevant tables and figures.

Throughout this chapter, CPR figures showing no significant differences will not be displayed. This will be noted at the foot of the relevant CPR table.

These figures and their corresponding tables will instead be published in the **Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report**.

Table S1 Indexing Significant Characteristic Comparisons: Total Shoulder Anatomic Replacements

Characteristic	Variable	Total Stemless Anatomic		Total Stemmed Anatomic	
		Significant HR	Figure No.	Significant HR	Figure No.
	Primary Diagnosis				
	Procedure Year	NT			
	Procedure Year and Cemented All Polyethylene Glenoid*	NT			
Patient					
	Age			♦	Figure ST23
	Gender	♦	Figure ST10	♦	Figure ST24
	Gender by Age	♦	Figure ST12	♦	Figure ST25
	ASA Score				
	ASA by Gender	NT		♦	Figure ST26
	BMI Category				
	BMI by Gender*	♦	Figure ST13	♦	Figure ST27
	Glenoid Morphology				
Prosthesis					
	Fixation	♦	Figure ST14		
	Glenoid Type	♦	Figure ST15	♦	Figure ST28
	Bearing Surface			♦	Figure ST29
	Humeral Head Size			♦	Figure ST30
	Humeral Head Size and Bearing Surface*	NT		♦	Figure ST31 Figure ST32
Implant Sizing Variations					
	Augmented Glenoid			♦	Figure ST34
	Glenoid Morphology by Augmented Glenoid				
	Humeral Stem Length	NT		♦	Figure ST36
Surgeon Assistive Tools					
	IDI			♦	Figure ST38
	IDI by Glenoid Morphology*	♦	Figure ST16		
Operative Technique					
	Rotator Cuff Repair*				

♦ Significant Hazard Ratio difference between categories where $p<0.05$

N T Not tested: Insufficient numbers to make statistical comparisons

*New analysis for this year's Annual Report

Table S2 Indexing Significant Characteristic Comparisons: Total Stemmed Reverse Shoulder Replacements

Characteristic	Variable	Total Stemmed Reverse					
		Osteoarthritis		Rotator Cuff Arthropathy		Fracture	
		Significant HR	Figure No.	Significant HR	Figure No.	Significant HR	Figure No.
	Primary Diagnosis	♦	Figure ST45	♦	Figure ST45	♦	Figure ST45
	Procedure year	♦	Figure ST46	♦	Figure ST47		
Patient							
	Age	♦	Figure ST49	♦	Figure ST50	♦	Figure ST51
	Gender	♦	Figure ST52	♦	Figure ST53	♦	Figure ST54
	ASA Score	♦	Figure ST56	♦	Figure ST57	♦	Figure ST58
	BMI Category	♦	Figure ST59	♦	Figure ST60	♦	Figure ST61
	Glenoid Morphology						
Prosthesis							
	Fixation			♦	Figure ST62		
	Bearing Surface	♦	Figure ST63				
	Glenosphere Size	♦	Figure ST64			♦	Figure ST65
Implant Sizing Variations							
	Glenoid Augmentation	♦	Figure ST66				
	Glenoid Augmentation and Glenoid Morphology	♦	Figure ST67 Figure ST68	♦	Figure ST69		
	Humeral Stem Type	NT		NT		♦	Figure ST70
	Humeral Stem Type and Fixation	NT		NT		♦	Figure ST71
	Humeral Stem Length	♦	Figure ST72				
	Glenosphere Lateralisation						
Surgeon Assistive Tools							
	IDI	♦	Figure ST74				
Operative Technique							
	Rotator Cuff Repair*			♦	Figure ST75	♦	Figure ST76

♦ Significant Hazard Ratio difference between categories where $p<0.05$

N T Not tested: Insufficient numbers to make statistical comparisons

*New analysis for this year's Annual Report

Use of Shoulder Replacement

There are 107,581 shoulder replacements with a procedure date up to and including 31 December 2024. This is an additional 11,795 shoulder procedures since the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

Registry shoulder data collection commenced in 2004, and full national collection was implemented by November 2007.

The number of shoulder replacement procedures undertaken in 2024 increased by 730 (6.9%) compared to the previous year and has increased by 328.9% since 2008.

When considering all shoulder replacement procedures currently recorded by the Registry, primary total shoulder replacement is the most common, followed by primary partial and revision procedures (Table S3).

In 2024, the proportion of revision procedures has declined to 7.5%. This equates to 383 fewer revisions compared to the peak of 10.9% in 2012.

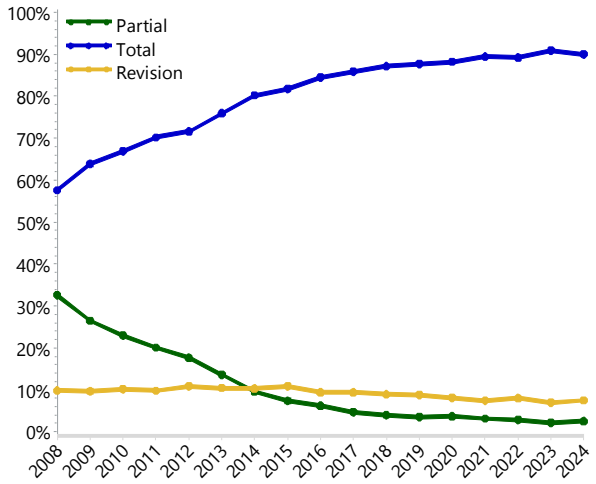
Table S3 Number of Shoulder Replacements

Shoulder Category	Number	Percent
Partial	8404	7.8
Total	89719	83.4
Revision	9458	8.8
TOTAL	**107581**	**100.0**

Since 2008, there has been a proportional increase in the use of total shoulder replacement, a decline in the use of partial shoulder replacement and a decrease in the proportion of revision procedures (Figure S1).

The proportion of total shoulder replacements has increased from 57.6% in 2008 to 90.0% in 2024.

Figure S1 Proportion of Shoulder Replacements



Shoulder Replacement

ASA and BMI in Shoulder Replacement

Data are reported on shoulder replacement procedures for both the American Society of Anaesthesiologists Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of shoulder replacement surgery. The Registry commenced collection of ASA score in 2012 and BMI data in 2015.

There are ASA score data on 86,095 and BMI data on 74,380 shoulder replacement procedures. Since its initial collection, ASA score has been recorded for 96.6% of procedures. BMI has been recorded for 92.8% of procedures since collection commenced.

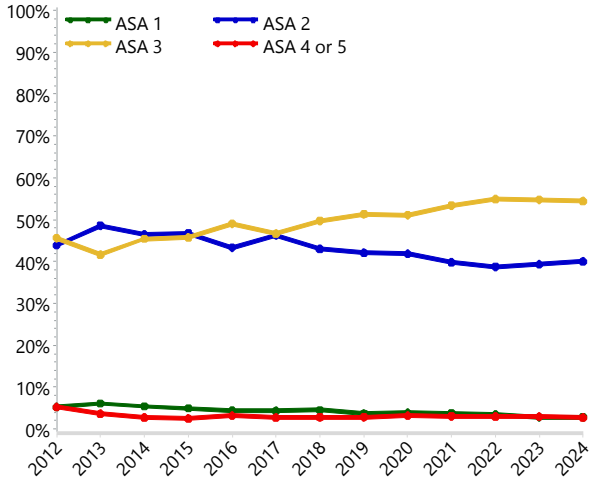
ASA SCORE

There are five ASA score classifications: [5]

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

Whilst the proportions of normal and severely ill are not changing, ASA 3 is increasing with time (Figure S2).

Figure S2 Proportion of Shoulder Replacements by ASA Score



BMI CATEGORY

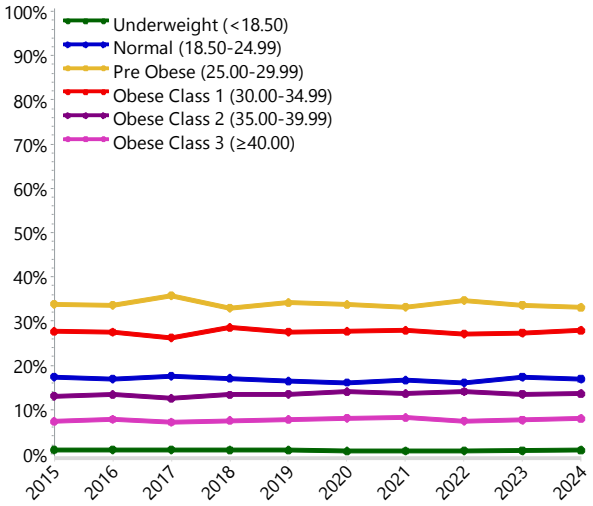
BMI for adults is classified into six main categories: [6]

Underweight	<18.5
Normal	18.5 – 24.9
Pre-obese	25.0 – 29.9
Obese Class 1	30.0 – 34.9
Obese Class 2	35.0 – 39.9
Obese Class 3	≥40.0

For all shoulder replacements, the majority of procedures the proportions of BMI classes over time are not changing (Figure S3).

Additional ASA and BMI data can be found in the Primary Partial, Primary Total and Revision Shoulder Data Supplementary Report

Figure S3 Proportion of Shoulder Replacements by BMI Category



[5] https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system

[6] https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity/contents/measuring-overweight-and-obesity

CT Scan and Glenoid Morphology

Data are reported on shoulder replacement procedures for both CT scans and glenoid morphology. The Registry commenced collection of CT scan usage and glenoid morphology in January 2017.

CT SCANS

There is a difference depending on the class of shoulder replacement. Total shoulder replacement procedures have a higher proportion of CT scans compared to revision shoulder replacement and partial shoulder replacement. CT utilisation for shoulder replacement cases has risen from under 60% in 2017 to 84% in 2024 (Figure S4). In contrast, the relative percentages of glenoid morphology categories have not changed (Figure S5).

A CT scan was undertaken in 74.2% of all reported shoulder replacements.

GLENOID MORPHOLOGY

There are 5 glenoid morphology categories based on the Walch classification:[7]

A1. Humeral head centred – minor erosion

A2. Humeral head centred – major erosion

B1. Humeral head posteriorly subluxated narrowing of the posterior joint space, subchondral sclerosis and osteophytes

B2. Humeral head posteriorly subluxated – posterior rim erosion with a biconcave glenoid

C. Glenoid retroversion of more than 25 degrees, regardless of the erosion

The most common glenoid morphology category is A1 for all shoulder procedure categories. The second most common is A2 for total and revision shoulder replacement with A2 and B2 for partial shoulder replacement (Figure S5).

Additional CT scan and glenoid morphology data can be found in the Primary **Partial, Primary Total and Revision Shoulder Data Supplementary Report**

Figure S4 Proportion of Shoulder Replacements by CT Scan Usage

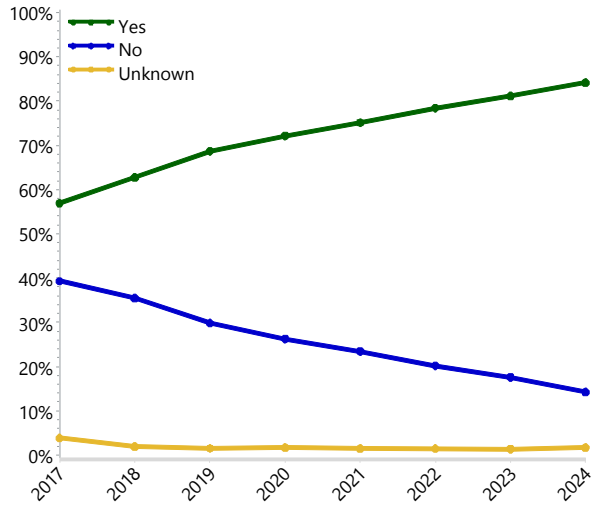
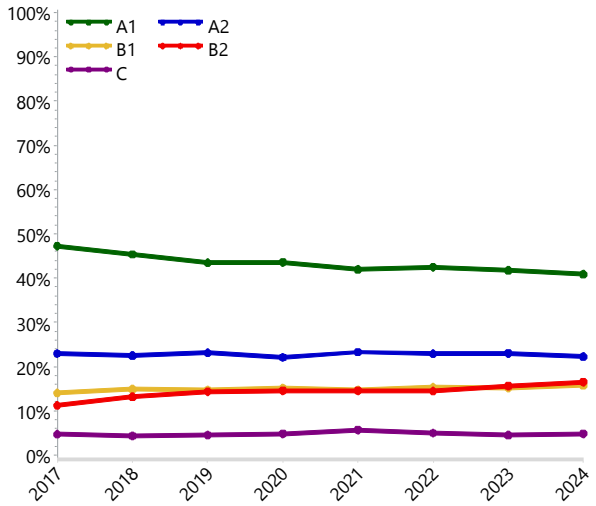


Figure S5 Proportion of Shoulder Replacements by Glenoid Morphology



[7] Walch G, Badet R, Boulahia A, Khoury A. Morphologic study of the glenoid in primary glenohumeral osteoarthritis. J Arthroplasty. 1999 Sep 1;14(6):756-60.

Primary Partial Shoulder Replacement Summary

Introduction

This section provides summary information on partial shoulder replacement. Detailed information on partial shoulders is available on the AOANJRR website as a separate supplementary report.

Classes of Partial Shoulder Replacement

Primary partial shoulder replacement is subcategorised into four main classes. These are defined by the type of prostheses used.

Partial resurfacing anatomic involves the use of one or more button prostheses to replace part of the natural articulating surface, on one or both sides of the shoulder joint.

Hemi resurfacing anatomic involves the use of a humeral prosthesis that replaces the humeral articular surface only, without resecting the humeral head.

Hemi stemless anatomic involves resection of part of the humeral head and replacement with a humeral head and an epiphyseal fixation prosthesis.

Hemi stemmed anatomic involves the resection of the humeral head and replacement with a humeral head and a humeral stem prosthesis. A humeral stem prosthesis may have either metaphyseal or diaphyseal fixation.

Use of Partial Shoulder Replacement

There are 8,404 primary partial shoulder replacement procedures. This is an additional 297 procedures compared to the number reported last year.

For further information on the **closure of the database** please see the **Glossary** of this report.

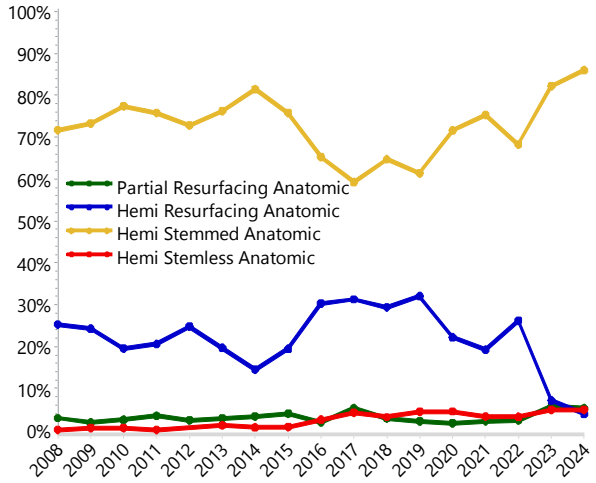
The most common class of primary partial shoulder replacement is hemi stemmed anatomic. This accounts for 73.3% of all partial shoulder replacements, followed by hemi resurfacing anatomic (22.4%), partial resurfacing anatomic (2.8%), and hemi stemless anatomic (1.5%) (Table SP1).

Over the last 9 years hemi stemmed anatomic replacements increased in use by 10.2% while hemi resurfacing anatomic declined by 15.6%. The number of hemi stemmed anatomic procedures decreased from 616 in 2008 to 246 in 2024. The number of hemi resurfacing anatomic procedures decreased from 217 in 2008 to 11 in 2024 (Figure SP1).

Table SP1 Primary Partial Shoulder Replacement by Class

Shoulder Class	Number	Percent
Partial Resurfacing Anatomic	239	2.8
Hemi Resurfacing Anatomic	1885	22.4
Hemi Stemmed Anatomic	6158	73.3
Hemi Stemless Anatomic	122	1.5
TOTAL	**8404**	**100.0**

Figure SP1 Primary Partial Shoulder Replacement by Class



Detailed demographic information on primary partial shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Primary Hemi Stemmed Anatomic Shoulder Replacement

There are 6,158 primary hemi stemmed anatomic shoulder replacement procedures. This is an additional 251 procedures compared to the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

This procedure is more commonly undertaken in females (65.5%). The mean age is 71.4 years for females and 61.6 years for males (Table SP2 and Figure SP2).

The most common primary diagnosis is fracture (52.2%), followed by osteoarthritis (32.3%). In 2024, the number of primary hemi stemmed anatomic shoulder replacements undertaken for fracture decreased by 92.1% compared to 2008. In 2024, the number of primary hemi stemmed anatomic shoulder replacements undertaken for osteoarthritis decreased by 9.6% compared to 2008 (Figure SP3).

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the following analyses, unless clearly specified.

The cumulative percent revision at 16 years for primary hemi stemmed anatomic shoulder replacement procedures undertaken for fracture is 17.0% and osteoarthritis is 12.3%. There is a higher rate of revision in the first 1.5 years when primary hemi stemmed anatomic shoulder replacement is performed for fracture compared to osteoarthritis. After this time, there is no difference (Table SP4 and Figure SP4).

There are 418 revisions of primary hemi stemmed anatomic shoulder replacement. Reasons for revision vary depending on the primary diagnosis. Revision for rotator cuff insufficiency occurs more frequently in primary hemi stemmed anatomic shoulder replacement undertaken for fracture (27.8%), whereas revision for glenoid erosion occurs more frequently in procedures undertaken for osteoarthritis (27.7%).

The most common type of revision is to a total shoulder replacement for both primary diagnoses (71.8% for fracture and 65.3% for osteoarthritis). Most are revised to a total reverse shoulder replacement (97.8% when used for fracture and 86.4% for osteoarthritis). Glenoid component only revision occurs more frequently in procedures undertaken for osteoarthritis (18.8% compared to 3.9% for fracture).

The outcomes of 12 prosthesis combinations with more than 20 procedures used in primary hemi stemmed anatomic shoulder replacement are listed in Table SP5.

A special clinical assessment including hemi stemmed anatomic implants with pyrocarbon humeral heads for patients with osteoarthritis under the age of 60 years is detailed in Figure ST77.

Figure SP2 Primary Hemi Stemmed Anatomic Shoulder Replacement by Gender

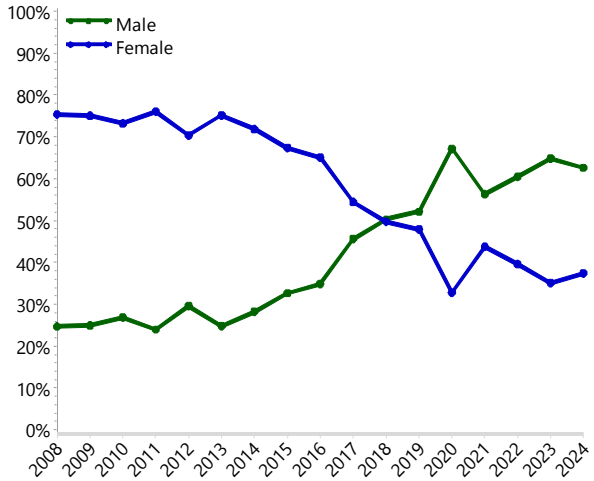


Table SP2 Age and Gender of Primary Hemi Stemmed Anatomic Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	2127	34.5%	14	94	62	61.6	13.8
Female	4031	65.5%	13	101	73	71.4	11.8
TOTAL	**6158**	**100.0%**	**13**	**101**	**69**	**68.0**	**13.4**

Primary Partial Shoulder Replacement Summary

Figure SP3 **Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis**

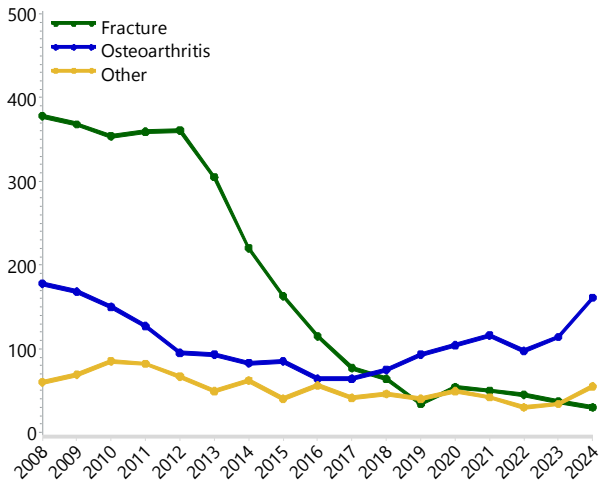


Table SP3 **Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis**

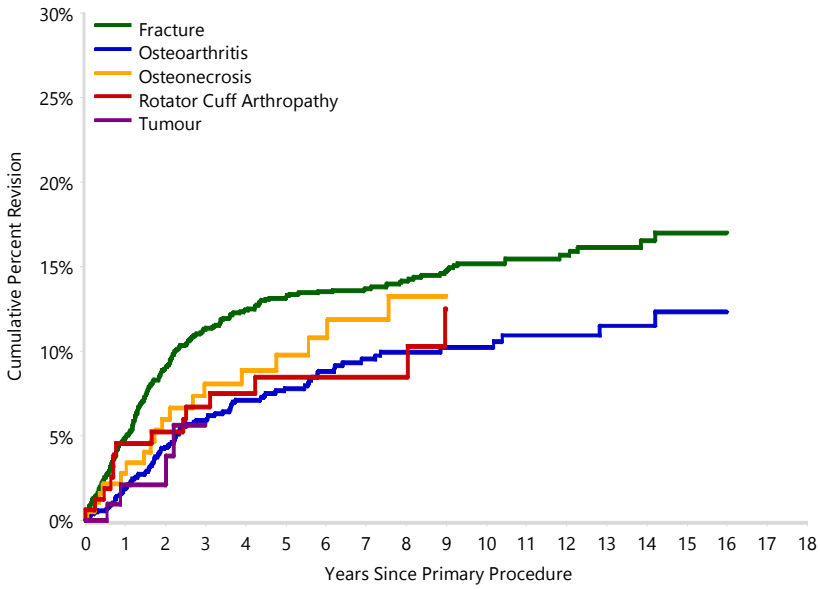
Primary Diagnosis	Number	Percent
Fracture	3213	52.2
Osteoarthritis	1986	32.3
Rotator Cuff Arthropathy	273	4.4
Osteonecrosis	249	4.0
Tumour	210	3.4
Rheumatoid Arthritis	105	1.7
Instability	89	1.4
Other Inflammatory Arthritis	30	0.5
Other	3	0.0
TOTAL	**6158**	**100.0**

Table SP4 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	255	1895	4.9 (4.0, 6.0)	11.4 (10.0, 12.9)	13.2 (11.7, 14.9)	13.7 (12.1, 15.4)	15.2 (13.5, 17.1)	16.5 (14.6, 18.8)
Osteoarthritis	101	1388	2.0 (1.3, 2.9)	5.9 (4.7, 7.4)	7.8 (6.3, 9.6)	9.5 (7.8, 11.7)	10.2 (8.4, 12.5)	11.5 (9.2, 14.3)
Osteonecrosis	20	192	2.8 (1.2, 6.6)	8.1 (4.8, 13.5)	9.8 (6.0, 15.8)	11.9 (7.4, 18.7)		
Rotator Cuff Arthropathy	15	159	4.6 (2.2, 9.3)	6.7 (3.7, 12.1)	8.5 (4.9, 14.5)	8.5 (4.9, 14.5)		
Tumour	8	142	2.1 (0.5, 8.2)	5.6 (2.1, 14.8)				
Other (4)	19	151	4.9 (2.4, 10.1)	9.7 (5.7, 16.1)	10.5 (6.4, 17.2)	11.9 (7.3, 19.2)		
TOTAL	418	3927						

Note: Only primary diagnoses with >100 procedures have been listed. Restricted to modern prostheses

Figure SP4 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis



HR - adjusted for age and gender

Fracture vs Osteoarthritis

0 - 6Mth: HR=3.48 (95% CI 1.92, 6.31), p<0.001

6Mth - 1.5Yr: HR=2.41 (95% CI 1.61, 3.62), p<0.001

1.5Yr+: HR=1.13 (95% CI 0.84, 1.52), p=0.427

Osteonecrosis vs Osteoarthritis

Entire Period: HR=1.01 (95% CI 0.61, 1.65), p=0.976

Rotator Cuff Arthropathy vs Osteoarthritis

Entire Period: HR=1.44 (95% CI 0.83, 2.49), p=0.196

Tumour vs Osteoarthritis

Entire Period: HR=1.03 (95% CI 0.49, 2.14), p=0.937

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	1895	1706	1389	1159	956	638	189
Osteoarthritis	1388	1183	895	636	444	278	119
Osteonecrosis	192	160	128	94	69	39	19
Rotator Cuff Arthropathy	159	144	115	87	62	33	6
Tumour	142	83	43	28	16	6	1

Note: Only primary diagnoses with >100 procedures have been listed. Restricted to modern prostheses

Primary Partial Shoulder Replacement Summary

Table SP5 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Prosthesis Combinations

Humeral Head	Humeral Stem	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	56	671	2.4 (1.5, 3.9)	6.6 (4.9, 8.8)	7.3 (5.5, 9.6)	8.1 (6.2, 10.6)	8.9 (6.8, 11.5)	9.9 (7.6, 12.8)
Affinis	Affinis	10	64	8.0 (3.4, 18.2)	13.3 (6.9, 24.9)	17.6 (9.8, 30.5)	17.6 (9.8, 30.5)	17.6 (9.8, 30.5)	
Ascend Flex	Ascend Flex	4	53	6.7 (2.2, 19.3)	6.7 (2.2, 19.3)	10.3 (3.9, 25.8)	10.3 (3.9, 25.8)		
Ascend Flex PyC	Aequalis Flex Revive	5	24	21.3 (9.4, 43.9)	21.3 (9.4, 43.9)				
	Ascend Flex	37	892	1.1 (0.6, 2.1)	4.2 (2.9, 6.1)	5.9 (4.1, 8.4)	8.0 (5.3, 11.8)		
Comprehensive	Comprehensive	16	178	4.2 (2.0, 8.7)	10.2 (6.2, 16.4)	10.2 (6.2, 16.4)	11.5 (7.1, 18.3)		
Delta Xtend	Delta Xtend	14	79	6.4 (2.7, 14.7)	16.0 (9.4, 26.5)	16.0 (9.4, 26.5)	17.9 (10.8, 29.0)	20.5 (12.4, 32.7)	
Equinoxe	Equinoxe	13	99	6.5 (3.0, 13.9)	13.5 (7.9, 22.7)	15.7 (9.2, 25.8)	15.7 (9.2, 25.8)		
Global Unite	Global Unite	43	227	6.8 (4.1, 11.0)	16.8 (12.3, 22.6)	20.1 (15.2, 26.3)	20.1 (15.2, 26.3)	22.0 (16.6, 28.8)	
Mutars	Mutars	3	67	0.0 (0.0, 0.0)	3.0 (0.4, 19.6)	8.4 (2.0, 31.2)	16.0 (5.1, 44.6)		
SMR	SMR	186	1290	4.0 (3.0, 5.2)	10.2 (8.6, 12.0)	12.6 (10.9, 14.7)	13.7 (11.8, 15.8)	16.0 (13.9, 18.3)	17.8 (15.4, 20.6)
SMR CTA	SMR	28	271	5.0 (2.9, 8.4)	9.4 (6.3, 13.8)	10.9 (7.6, 15.7)	10.9 (7.6, 15.7)	13.3 (9.1, 19.4)	
Other (4)		3	12	28.7 (10.2, 65.6)					
TOTAL		418	3927						

Note: Only prostheses with >20 procedures have been listed. Restricted to modern prostheses

More information regarding partial shoulder procedures is available in the 'Partial Shoulder Arthroplasty Supplementary Report' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Primary Total Shoulder Replacement

Classes of Total Shoulder Replacement

Primary total shoulder replacement is subcategorised into five classes. These are defined by the type of prosthesis used. The stemless anatomic class of shoulder replacement has increased considerably. As such, mid head humeral prostheses are now classified as stemless anatomic and stemless reverse to reflect their differing polarity.

Total Resurfacing Anatomic involves glenoid replacement and the use of a humeral prosthesis that replaces the humeral articular surface without resecting the humeral head.

Total Stemless Anatomic involves glenoid replacement combined with resection of the humeral head and replacement with a humeral head and an epiphyseal fixation prosthesis.

Total Stemmed Anatomic involves glenoid replacement combined with resection of the humeral head and replacement with humeral head and humeral stem prostheses. A humeral stem prosthesis may have metaphyseal or diaphyseal fixation.

Total Stemmed Reverse involves glenoid replacement with a glenosphere prosthesis combined with resection of the humeral head and replacement with humeral cup and humeral stem prosthesis. A humeral stem prosthesis may have metaphyseal or diaphyseal fixation.

Total Stemless Reverse involves glenoid replacement with a glenosphere combined with resection of the humeral head and replacement by a humeral cup and an epiphyseal fixation humeral prosthesis.

Primary total resurfacing anatomic shoulder replacement is no longer used. Therefore, detailed information on primary total resurfacing anatomic shoulder replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2025

Primary total stemmed reverse shoulder replacement accounts for 74.4% of all primary total shoulder replacements.

Use of Total Shoulder Replacement

There are 89,484 primary total shoulder replacement procedures. Of these, total stemmed reverse is the most common, followed by total stemmed anatomic and total stemless anatomic. There have been no total resurfacing anatomic replacements in 2024.

The use of different prosthesis classes has changed over time with a major increase in the use of total stemmed reverse shoulder and a corresponding decline in the use of total stemmed anatomic shoulder replacement (**Table ST1**). Total stemless reverse replacements have been undertaken in Australia since 2016 (Figure ST1).

Figure ST1 Primary Total Shoulder Replacement by Class

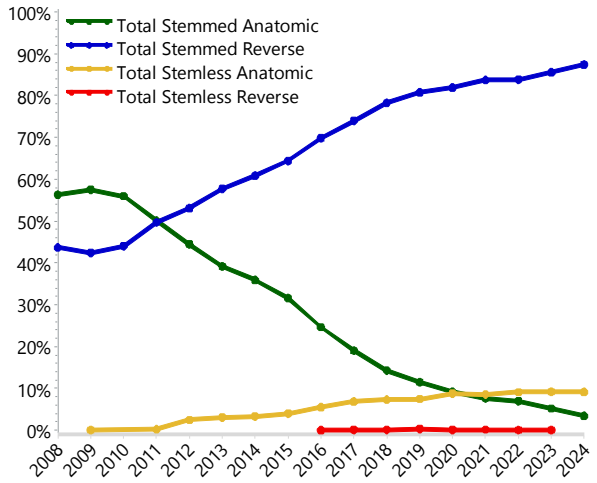


Table ST1 Primary Total Shoulder Replacement by Class

Shoulder Class	Number	Percent
Total Stemmed Anatomic	16893	18.9
Total Stemmed Reverse	66607	74.4
Total Stemless Anatomic	5916	6.6
Total Stemless Reverse	68	0.1
TOTAL	89484	100.0

Note: Excludes 235 total resurfacing procedures

Primary Total Shoulder Replacement

Primary total shoulder replacement is undertaken more often in females, and this is true of all classes except for total stemless reverse, although numbers in this class are small (Table ST2). The percentage of males undergoing primary total shoulder replacement has increased by 3.1% since 2016. The mean age for females is higher than for males (Table ST3).

Most patients are aged ≥65 years. The proportion of the class of shoulder replacement varies between age groups, with total stemmed reverse predominating in the older age cohorts (Table ST4).

Osteoarthritis is the most common primary diagnosis followed by rotator cuff arthropathy and fracture (Table ST5).

Since 2016, the primary diagnosis osteoarthritis has decreased in proportion by 9.9% and rotator cuff arthropathy has increased by 10.6%.

The percentage of prostheses utilising highly cross-linked polyethylene (XLPE) and non-highly cross-linked polyethylene (non XLPE) in 2024 for primary total shoulder replacement was 39.4% and 50.7%, respectively. The relative percentages had XLPE increase (6.3%) and non XLPE decrease (4.5%) compared to 2023 proportions.

To keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

The rate of revision varies by class with total stemmed reverse and total stemless anatomic having a lower cumulative percent revision at 10 years than total stemmed anatomic shoulder replacement with a polyethylene glenoid. A polyethylene glenoid includes all glenoid types except modular metal backed glenoids (Table ST6 and Figure ST2). There are no primary total stemmed anatomic shoulder replacements with modular metal backed glenoids undertaken in 2024.

Detailed demographic information on primary total shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee & Shoulder Arthroplasty' on the AOANJRR website:
https://aoanjrr.sahmri.com/annual-reports-2025

Table ST2 Primary Total Shoulder Replacement by Class and Gender

Shoulder Class	Male		Female		TOTAL	
	N	Row%	N	Row%	N	Row%
Total Stemmed Anatomic	7284	43.1	9609	56.9	16893	100.0
Total Stemmed Reverse	25664	38.5	40943	61.5	66607	100.0
Total Stemless Anatomic	2955	49.9	2961	50.1	5916	100.0
Total Stemless Reverse	47	69.1	21	30.9	68	100.0
TOTAL	**35950**	**40.2**	**53534**	**59.8**	**89484**	**100.0**

Table ST3 Age and Gender of Primary Total Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	35950	40.2%	14	100	71	70.1	9.0
Female	53534	59.8%	12	103	74	73.4	8.3
TOTAL	**89484**	**100.0%**	**12**	**103**	**73**	**72.1**	**8.7**

Table ST4 Primary Total Shoulder Replacement by Class and Age

Shoulder Class	<55		55-64		65-74		≥75		TOTAL	
	N	Row%	N	Row%	N	Row%	N	Row%	N	Row%
Total Stemmed Anatomic	995	5.9	4045	23.9	7435	44.0	4418	26.2	16893	100.0
Total Stemmed Reverse	1156	1.7	7639	11.5	26223	39.4	31589	47.4	66607	100.0
Total Stemless Anatomic	640	10.8	1680	28.4	2505	42.3	1091	18.4	5916	100.0
TOTAL	**2791**	**3.1**	**13364**	**14.9**	**36163**	**40.4**	**37098**	**41.5**	**89416**	**100.0**

Note: Restricted to modern prostheses

Table ST5 Primary Total Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Osteoarthritis	50453	56.4
Rotator Cuff Arthropathy	24922	27.9
Fracture	10053	11.2
Rheumatoid Arthritis	1390	1.6
Osteonecrosis	1138	1.3
Instability	737	0.8
Other Inflammatory Arthritis	469	0.5
Tumour	302	0.3
Other	20	0.0
TOTAL	**89484**	**100.0**

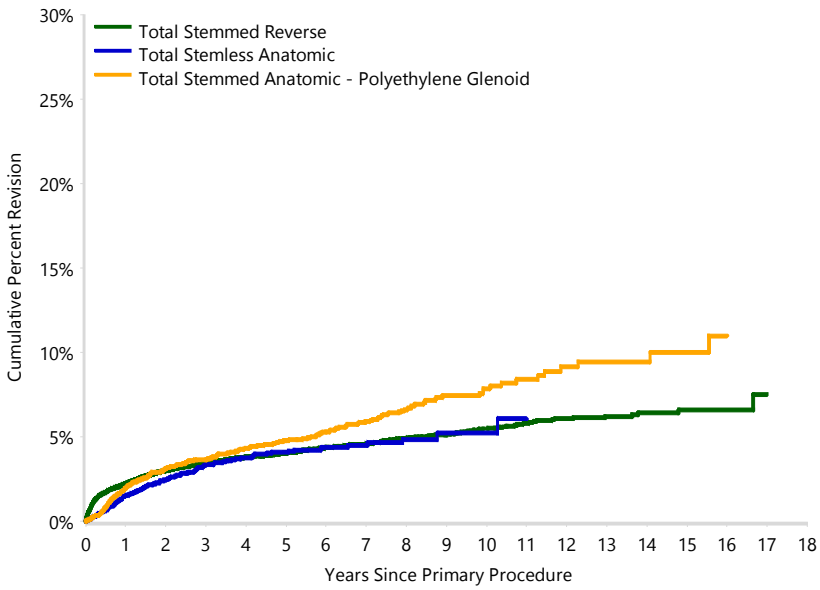
Primary Total Shoulder Replacement

Table ST6 Cumulative Percent Revision of Primary Total Shoulder Replacement by Class (All Diagnoses)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Total Stemmed Reverse	2363	64636	2.2 (2.1, 2.4)	3.4 (3.3, 3.6)	4.0 (3.9, 4.2)	4.6 (4.4, 4.8)	5.5 (5.2, 5.8)	6.4 (5.9, 7.0)
Total Stemless Anatomic	172	5547	1.5 (1.2, 1.9)	3.4 (2.8, 3.9)	4.1 (3.5, 4.8)	4.5 (3.8, 5.3)	5.2 (4.2, 6.5)	
Total Stemmed Anatomic - Polyethylene Glenoid	288	5413	2.0 (1.6, 2.4)	3.7 (3.2, 4.2)	4.8 (4.2, 5.5)	5.9 (5.2, 6.7)	7.9 (6.9, 9.0)	9.5 (8.0, 11.2)
TOTAL	2823	75596						

Note: Restricted to modern prostheses.

Figure ST2 Cumulative Percent Revision of Primary Total Shoulder Replacement by Class (All Diagnoses)



HR - adjusted for age and gender

Total Stemmed Reverse vs
Total Stemless Anatomic

0 - 3Mth: HR=6.00 (95% CI 4.22, 8.52), p<0.001

3Mth+: HR=0.98 (95% CI 0.83, 1.16), p=0.818

Total Stemmed Anatomic - Polyethylene Glenoid vs
Total Stemmed Reverse

0 - 3Mth: HR=0.21 (95% CI 0.13, 0.33), p<0.001

3Mth+: HR=1.41 (95% CI 1.24, 1.61), p<0.001

Total Stemmed Anatomic - Polyethylene Glenoid vs
Total Stemless Anatomic

Entire Period: HR=1.38 (95% CI 1.14, 1.66), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Total Stemmed Reverse	64636	53660	36956	23672	13305	4641	724
Total Stemless Anatomic	5547	4533	2863	1601	720	122	0
Total Stemmed Anatomic - Polyethylene Glenoid	5413	4943	3941	2944	1859	632	169

Note: Restricted to modern prostheses.

Demographics of Total Shoulder Replacement Over Time

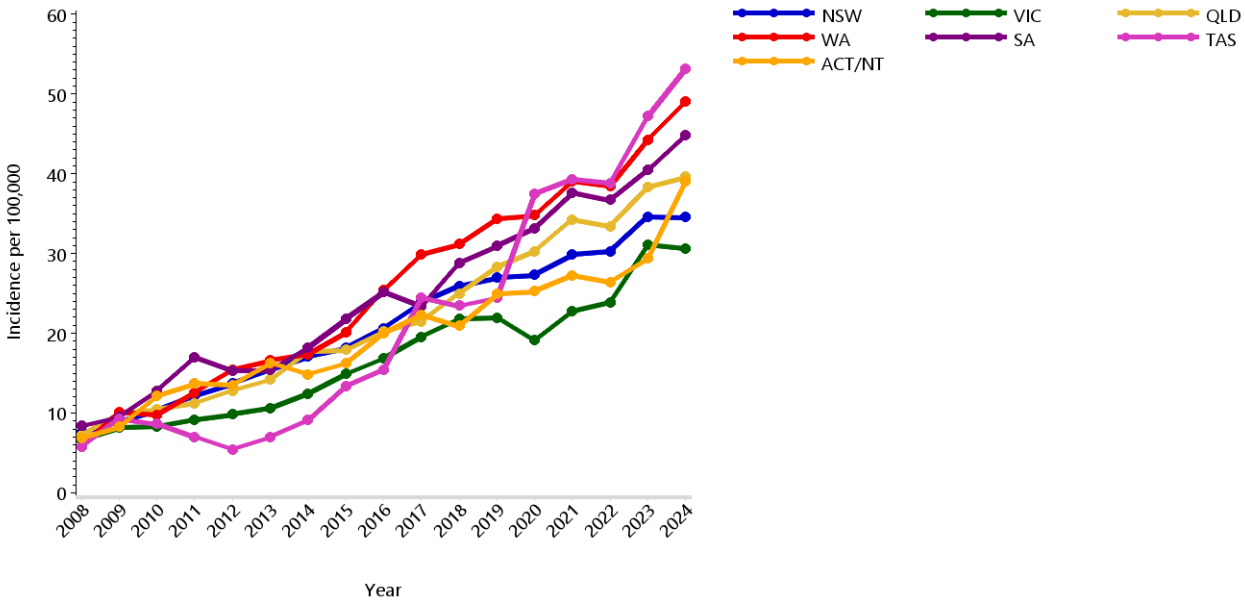
The overall population-based incidence of primary total shoulder replacement has steadily increased from 7.1 per 100,000 in 2008 to 37.4 per 100,000 in 2024. The incidence by state and territory confirms similar increases across the country (Figure ST3).

In 2024, primary total shoulder replacement is undertaken more commonly in private hospitals with (75.1%) which has remained consistent since 2008 (Figure ST4). However, when assessed by volume of primary total shoulder replacement per hospital, the lowest 2 quartiles of hospitals represented 36.7% of cases in 2008 and reduced to 4.1% in 2024 (Figure ST5).

The proportion of primary total shoulder replacements per surgeon has also changed, with the highest quartile of surgeon volume undertaking 52.2% of all cases in 2024, in comparison to 9.6% in 2008 (Figure ST6).

As volumes of surgeons performing total primary shoulder replacement and numbers of procedures have increased over time, the experience (number of years since first reported shoulder replacement procedure) of orthopaedic surgeons performing most of the shoulder replacement has also grown. In 2024, 81% of primary total shoulder replacements are completed by orthopaedic surgeons with ≥8 years' experience (Figure ST7).

Figure ST3 Incidence of Primary Total Shoulder Replacement per 100,000 from 2008 to 2024



Primary Total Shoulder Replacement

Figure ST4 Primary Total Shoulder Replacement by Hospital Setting

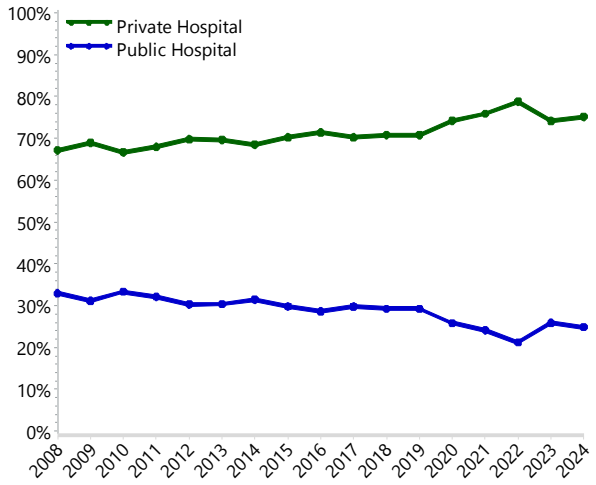


Figure ST5 Primary Total Shoulder Replacement by Hospital Volume

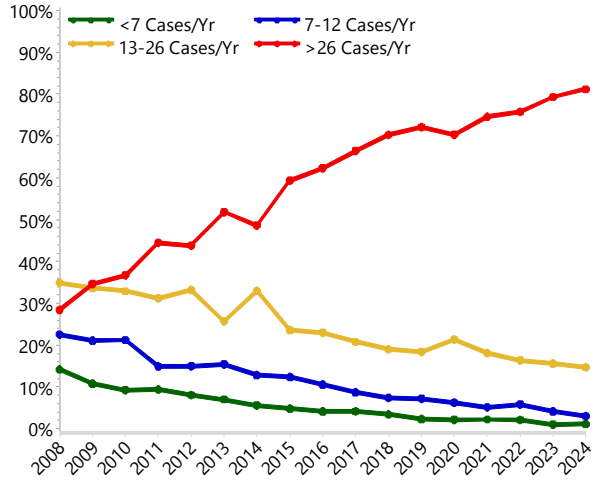


Figure ST6 Primary Total Shoulder Replacement by Surgeon Volume

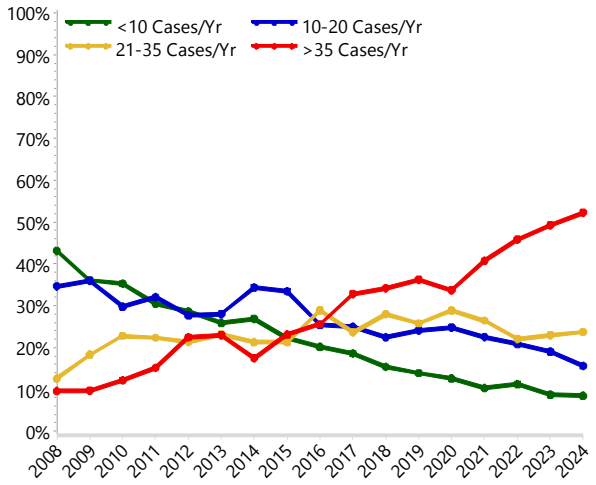
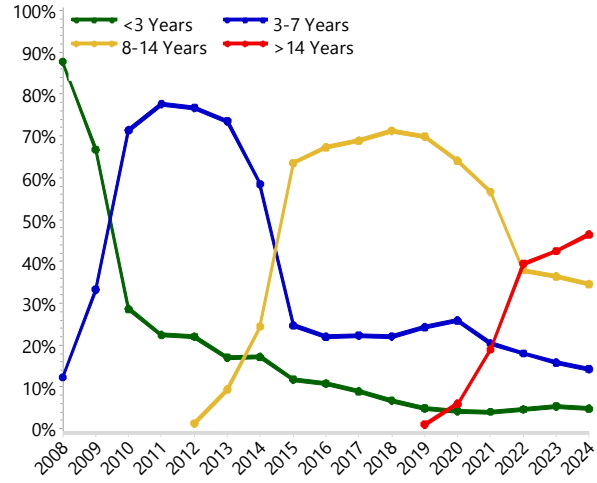


Figure ST7 Primary Total Shoulder Replacement by Surgeon Experience



Primary Total Stemless Anatomic Shoulder Replacement

DEMOGRAPHICS

There are 5,916 primary total stemless anatomic shoulder replacements. This is an additional 929 procedures compared to the previous report.

For further information on the **closure of the database** please see the **Glossary** of this report.

The use of primary total stemless anatomic shoulder replacement has increased by 1208.45% since its first full year of use in 2012.

Primary total stemless anatomic shoulder replacement is more commonly performed in patients aged 65–74 years. Primary total stemless anatomic shoulder replacements are undertaken more often in females who are older on average than males (Table ST7). However, in 2024 52% of primary total stemless shoulder replacements are undertaken in men. In 2024, 33.3% of total stemless shoulder replacements are cementless, 66.3% are hybrid (glenoid cemented) and 0.3% are cemented.

XLPE is more common in 2024 for total stemless anatomic replacement glenoid components (57.2%), compared to 42.8% for non XLPE.

Osteoarthritis is the most common primary diagnosis.

The most used total stemless anatomic prostheses are listed in Table ST8 and Table ST9.

Table ST7 Age and Gender of Primary Total Stemless Anatomic Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	2955	49.9%	31	95	65	64.1	9.4
Female	2961	50.1%	32	94	69	68.6	8.4
TOTAL	**5916**	**100.0%**	**31**	**95**	**67**	**66.3**	**9.2**

Primary Total Shoulder Replacement

Table ST8 Most Used Humeral Stem Prostheses in Primary Total Stemless Anatomic Shoulder Replacement

2011		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
2	Simpliciti	378	Affinis	400	Affinis	467	Affinis	481	Affinis
2	TESS	202	Simpliciti	216	Simpliciti	266	Simpliciti	284	Simpliciti
1	Affinis	58	Comprehensive	48	Comprehensive	72	Global Icon	66	Comprehensive
		21	Global Icon	37	Global Icon	50	Comprehensive	53	Global Icon
		6	Equinoxe	19	Equinoxe	25	Equinoxe	43	Equinoxe
		6	SMR	6	SMR	4	SMR	2	SMR
Most Used									
5	(3) 100.0%	671	(6) 100.0%	726	(6) 100.0%	884	(6) 100.0%	929	(6) 100.0%

Table ST9 Most Used Glenoid Prostheses in Primary Total Stemless Anatomic Shoulder Replacement

2011		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
2	Aequalis	349	Affinis	365	Affinis	435	Affinis	441	Affinis
1	Affinis	202	Perform	216	Perform	266	Perform	287	Perform
1	Comprehensive	51	Comprehensive	72	Global	104	Global	89	Global
1	TESS	50	Global	37	Comprehensive	36	Comprehensive	44	Comprehensive
		6	Alliance	19	Equinoxe	25	Equinoxe	43	Equinoxe
		6	Equinoxe	11	Alliance	14	Alliance	22	Alliance
		4	SMR	4	SMR L1	2	SMR	3	SMR
		2	SMR L1	2	SMR	2	SMR L1		
		1	Custom Made (Comprehensive)						
Most Used									
5	(4) 100.0%	671	(9) 100.0%	726	(8) 100.0%	884	(8) 100.0%	929	(7) 100.0%

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

The usage and availability of prostheses change with time, reflecting design change and surgeon preference. In order to keep Registry data contemporaneous, only procedures utilising prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

At 10 years, the cumulative percent revision for primary total stemless anatomic shoulder replacement undertaken for osteoarthritis is 5.2%.

The most common diagnosis for primary total stemless shoulder replacement is osteoarthritis. There is no difference in the rate of revision when osteonecrosis is compared to osteoarthritis. The number of procedures undertaken for other diagnoses is small (Table ST10).

Reason for Revision

The main reasons for revision are instability/dislocation, rotator cuff insufficiency, loosening and infection (Table ST11 and Figure ST8). Males have a higher cumulative incidence of rotator cuff insufficiency after 7 years, whereas females have a higher cumulative incidence of instability/dislocation. Compared to 2016, instability/dislocation has increased by 37.9%, and loosening by 16.7%, while infection decreased by 27.3%, and rotator cuff insufficiency reduced by 18.2%.

Type of Revision

The most common types of revision involve replacement of both the humeral and glenoid components (Table ST12). Overall, 89.7% of total stemless anatomic shoulder replacements are revised to a total reverse shoulder replacement. A humeral/glenoid 1st revision has increased in proportion by 3.0% and humeral alone revisions have reduced in proportion by 9.1% since 2016.

Prosthesis Types

The outcomes of humeral stem and glenoid prosthesis combinations with >30 procedures used in primary total stemless anatomic shoulder replacement are listed in Table ST13.

Primary Total Shoulder Replacement

Table ST10 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	161	5318	1.5 (1.2, 1.9)	3.3 (2.8, 3.9)	4.0 (3.4, 4.7)	4.4 (3.7, 5.2)	5.2 (4.1, 6.5)	
Osteonecrosis	6	97	1.1 (0.2, 7.6)	5.3 (2.0, 13.7)	10.0 (4.4, 21.6)	10.0 (4.4, 21.6)		
Other (5)	5	132	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)			
TOTAL	172	5547						

Note: Restricted to modern prostheses
Only primary diagnoses with >50 procedures have been listed
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST11 Primary Total Stemless Anatomic Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Instability/Dislocation	60	34.9
Rotator Cuff Insufficiency	44	25.6
Loosening	28	16.3
Infection	24	14.0
Pain	6	3.5
Fracture	3	1.7
Lysis	2	1.2
Arthrofibrosis	2	1.2
Malposition	2	1.2
Other	1	0.6
TOTAL	172	100.0

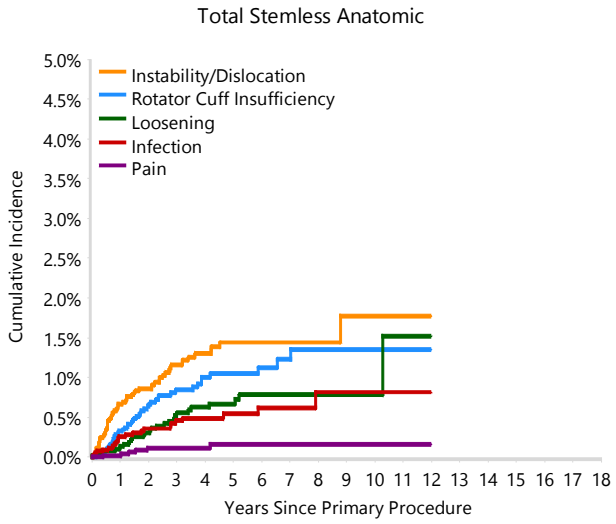
Note: Restricted to modern prostheses

Table ST12 Primary Total Stemless Anatomic Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral/Glenoid	138	80.2
Cement Spacer	12	7.0
Head Only	11	6.4
Humeral Component	7	4.1
Removal of Prostheses	2	1.2
Cement Only	1	0.6
Reoperation	1	0.6
TOTAL	172	100.0

Note: Restricted to modern prostheses

Figure ST8 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement (All Diagnoses)



Note: Restricted to modern prostheses

Table ST13 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Affinis	Affinis	114	3253	1.6 (1.2, 2.1)	3.6 (3.0, 4.4)	4.3 (3.5, 5.2)	4.6 (3.8, 5.5)	5.3 (4.2, 6.7)	
	Global	1	184	0.6 (0.1, 4.2)	0.6 (0.1, 4.2)				
Comprehensive	Alliance	0	53	0.0 (0.0, 0.0)					
	Comprehensive	24	321	4.9 (3.0, 8.0)	7.5 (4.9, 11.4)	9.5 (6.3, 14.1)			
Equinoxe	Equinoxe	2	95	0.0 (0.0, 0.0)					
Global Icon	Global	3	226	1.1 (0.3, 4.2)	2.1 (0.6, 6.8)				
SMR	SMR	6	59	3.5 (0.9, 13.2)	8.9 (3.8, 20.0)	8.9 (3.8, 20.0)	13.4 (5.7, 29.8)		
Simpliciti	Perform	22	1350	0.9 (0.5, 1.6)	1.7 (1.0, 2.7)	2.6 (1.6, 4.2)			
Other (3)		0	6	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
TOTAL		172	5547						

Note: Restricted to modern prostheses. Only prostheses with >30 procedures have been listed

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

There are 5,318 (95.9%) primary total stemless anatomic shoulder replacement procedures with a primary diagnosis of osteoarthritis.

The cumulative percent revision of primary total stemless anatomic shoulder replacement for osteoarthritis at 10 years is 5.2% (Table ST14).

The main reasons for revision are instability/dislocation (34.2%), rotator cuff insufficiency (25.5%), loosening (17.4%) and infection (14.3%) (Table ST15 and Figure ST9). The most common types of revision involve replacement of both the humeral and glenoid component with 93.8% being revised to a total stemmed reverse shoulder replacement (Table ST16).

Age and Gender

Females have a higher rate of revision for total stemless anatomic shoulder replacement compared to males (Table ST17 and Figure ST10). Males are more commonly revised for rotator cuff insufficiency after 7 years and females for instability/dislocation (Figure ST11).

Age alone is not a risk factor for revision (Table ST17). When gender is stratified by age, younger males have higher rates of revision compared males aged 65-74 years (Table ST17 and Figure ST12). There is no difference in the risk of revision risk for females.

The rate of revision is higher for females compared to males for osteoarthritis.

ASA and BMI

Most patients have an ASA score of 2 or 3. The cumulative percent revision at 7 years is 4.1% for ASA 2 patients and 5.3% for ASA 3 patients (Table ST18). ASA score is not a risk factor for revision.

The most common BMI categories are pre-obese and obese class 1. BMI is not a risk factor for revision (Table ST19). However, when BMI is stratified by gender, obese females have a higher rate of revision than obese males (Table ST20 and Figure ST13).

Glenoid Morphology

Glenoid morphology is not a risk factor for revision (Table ST21).

Table ST14 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement (Primary Diagnosis OA)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Total Stemless Anatomic	161	5318	1.5 (1.2, 1.9)	3.3 (2.8, 3.9)	4.0 (3.4, 4.7)	4.4 (3.7, 5.2)	5.2 (4.1, 6.5)	
TOTAL	161	5318						

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Table ST15 Primary Total Stemless Anatomic Shoulder Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Instability/Dislocation	55	34.2
Rotator Cuff Insufficiency	41	25.5
Loosening	28	17.4
Infection	23	14.3
Pain	5	3.1
Fracture	3	1.9
Lysis	2	1.2
Arthrofibrosis	2	1.2
Malposition	2	1.2
TOTAL	161	100.0

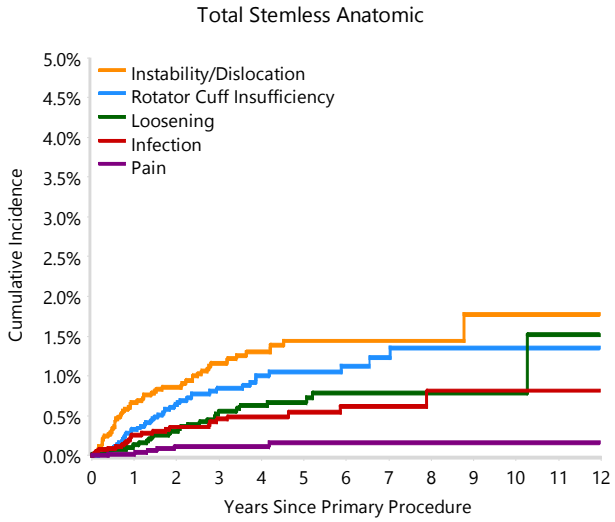
Note: Restricted to modern prostheses

Table ST16 Primary Total Stemless Anatomic Shoulder Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Humeral/Glenoid	130	80.7
Head Only	11	6.8
Cement Spacer	11	6.8
Humeral Component	7	4.3
Cement Only	1	0.6
Removal of Prostheses	1	0.6
TOTAL	161	100.0

Note: Restricted to modern prostheses

Figure ST9 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement (Primary Diagnosis OA)



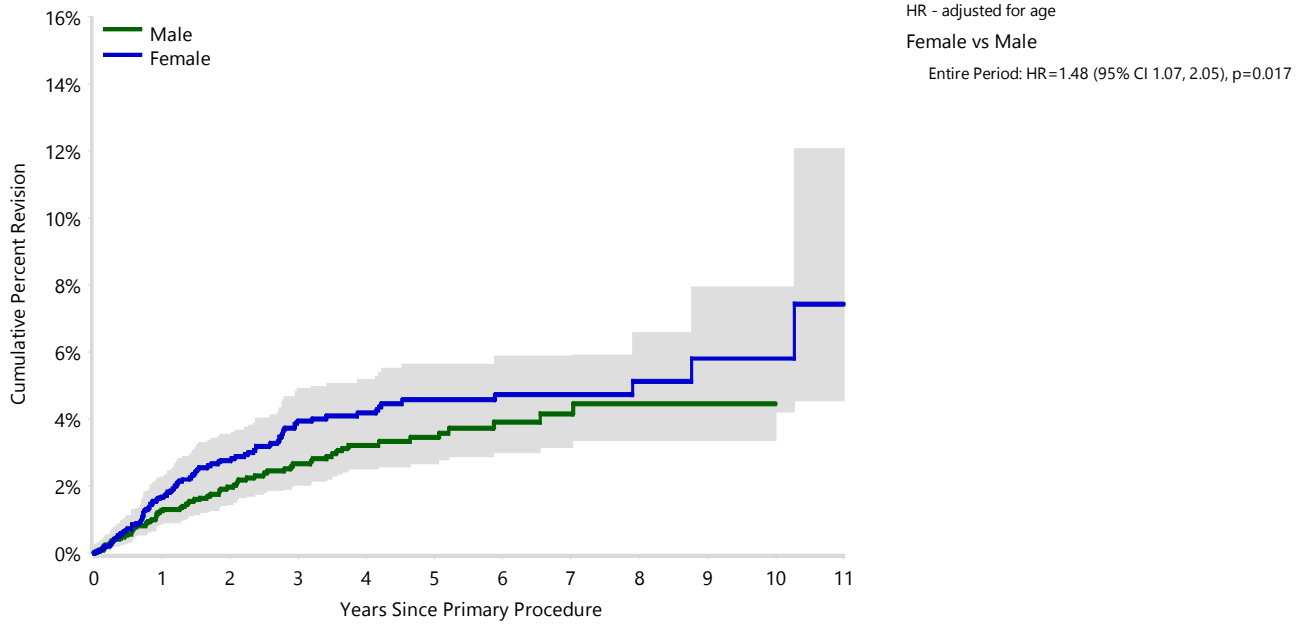
Note: Restricted to modern prostheses

Table ST17 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Age and Gender (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male		**70**	**2699**	**1.3 (0.9, 1.8)**	**2.7 (2.0, 3.5)**	**3.4 (2.7, 4.4)**	**4.2 (3.2, 5.4)**	**4.5 (3.4, 5.9)**	
	<65	41	1322	1.4 (0.8, 2.2)	3.2 (2.2, 4.6)	4.4 (3.2, 6.1)	5.6 (3.9, 8.0)		
	≥65	29	1377	1.2 (0.7, 2.0)	2.2 (1.5, 3.2)	2.6 (1.7, 3.8)	2.8 (1.9, 4.2)		
Female		**91**	**2619**	**1.7 (1.2, 2.3)**	**3.9 (3.2, 4.9)**	**4.6 (3.7, 5.7)**	**4.7 (3.8, 5.9)**	**5.8 (4.2, 8.0)**	
	<65	28	733	1.6 (0.8, 2.9)	4.8 (3.2, 7.1)	5.5 (3.8, 8.1)	5.5 (3.8, 8.1)		
	≥65	63	1886	1.7 (1.2, 2.5)	3.6 (2.8, 4.7)	4.2 (3.3, 5.5)	4.4 (3.4, 5.8)	5.3 (3.6, 7.7)	
TOTAL		**161**	**5318**						

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST10 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)

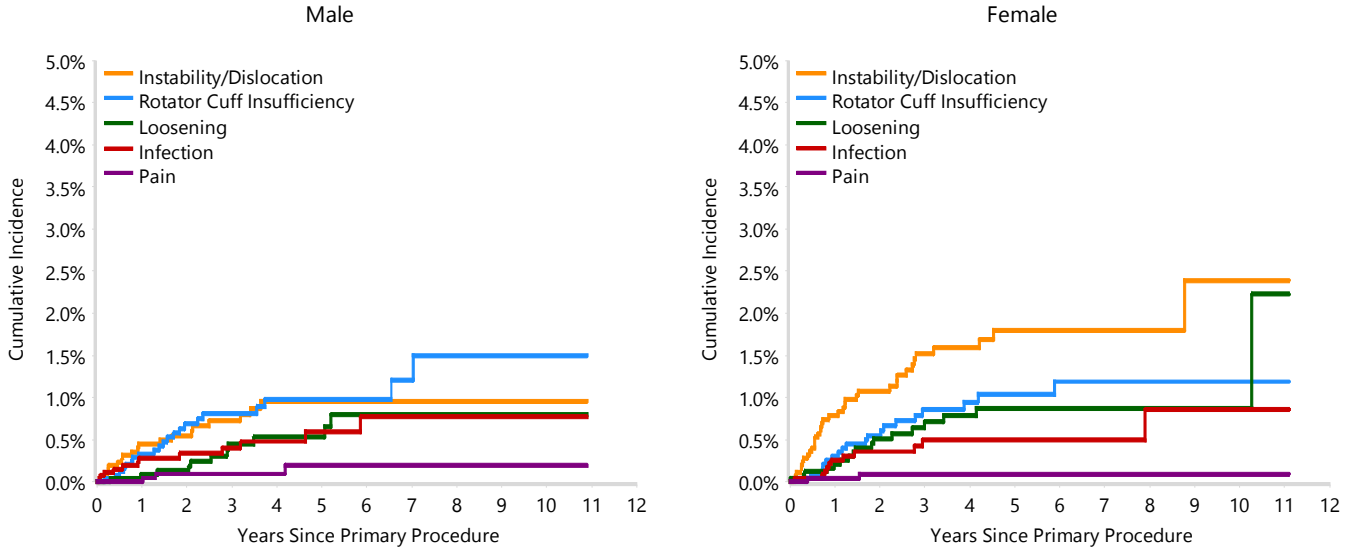


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male	2699	2201	1367	722	314	49	0
Female	2619	2144	1375	806	377	67	0

Note: Restricted to modern prostheses

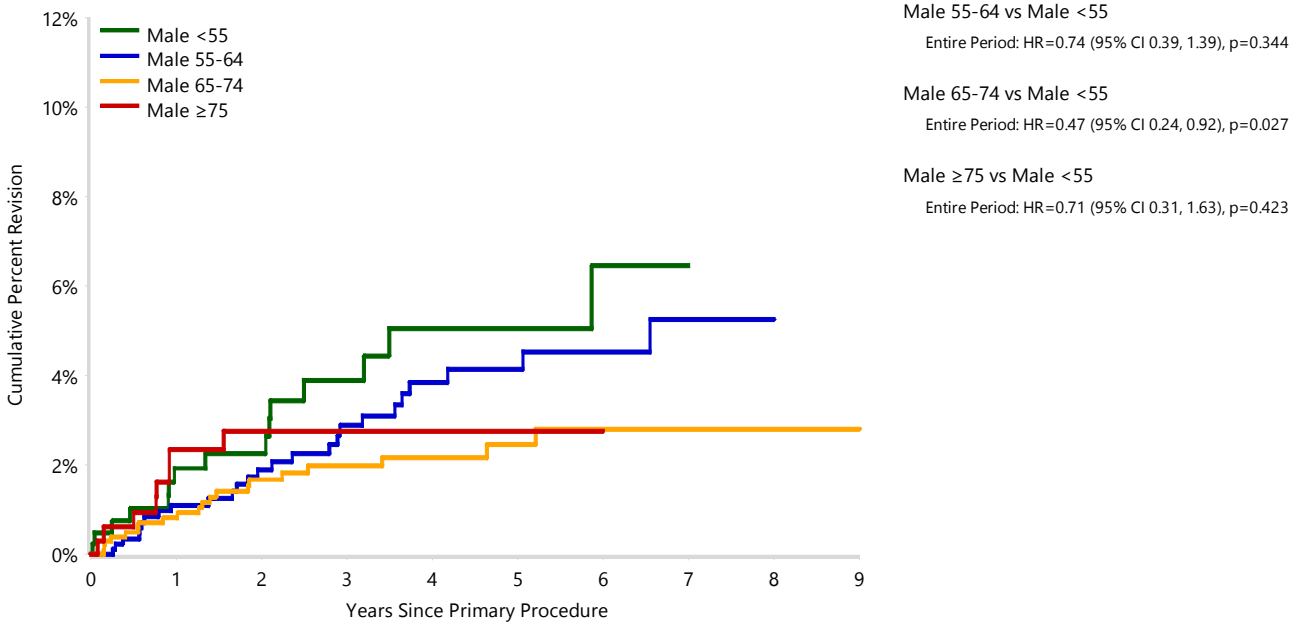
Primary Total Shoulder Replacement

Figure ST11 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure ST12 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement in Males by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male	**<55**	412	321	185	90	45	5	0
	55-64	910	734	464	250	104	15	0
	65-74	1044	881	556	302	132	22	0
	≥75	333	265	162	80	33	7	0

Note: Restricted to modern prostheses

Table ST18 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ASA 1	8	361	0.9 (0.3, 2.8)	1.6 (0.7, 3.8)	2.4 (1.1, 5.0)	2.9 (1.4, 5.7)	2.9 (1.4, 5.7)	
ASA 2	70	2600	1.2 (0.8, 1.7)	2.3 (1.7, 3.0)	3.0 (2.3, 3.9)	3.8 (2.9, 4.8)	4.1 (3.2, 5.3)	4.1 (3.2, 5.3)
ASA 3	79	2201	1.9 (1.4, 2.6)	2.7 (2.0, 3.5)	3.9 (3.1, 5.0)	4.7 (3.7, 6.0)	5.3 (4.2, 6.8)	6.3 (4.7, 8.6)
ASA 4	2	56	3.8 (1.0, 14.5)	3.8 (1.0, 14.5)	3.8 (1.0, 14.5)	3.8 (1.0, 14.5)		
TOTAL	159	5218						

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST19 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Underweight	0	16	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
Normal	19	697	1.1 (0.5, 2.3)	2.6 (1.6, 4.3)	3.1 (1.9, 5.0)	3.1 (1.9, 5.0)	3.5 (2.2, 5.6)	3.5 (2.2, 5.6)
Pre Obese	45	1758	1.1 (0.7, 1.8)	1.8 (1.3, 2.7)	2.9 (2.1, 4.0)	3.4 (2.5, 4.6)	3.7 (2.7, 5.0)	4.0 (2.9, 5.5)
Obese Class 1	51	1487	1.6 (1.0, 2.4)	2.7 (2.0, 3.8)	3.7 (2.7, 5.0)	4.3 (3.2, 5.8)	4.7 (3.5, 6.3)	5.3 (3.9, 7.2)
Obese Class 2	27	715	2.6 (1.6, 4.1)	3.4 (2.2, 5.1)	4.3 (2.9, 6.4)	4.3 (2.9, 6.4)	4.7 (3.2, 7.0)	5.2 (3.5, 7.8)
Obese Class 3	9	365	1.5 (0.6, 3.6)	1.5 (0.6, 3.6)	2.9 (1.4, 5.9)	3.5 (1.8, 6.8)	3.5 (1.8, 6.8)	3.5 (1.8, 6.8)
TOTAL	151	5038						

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

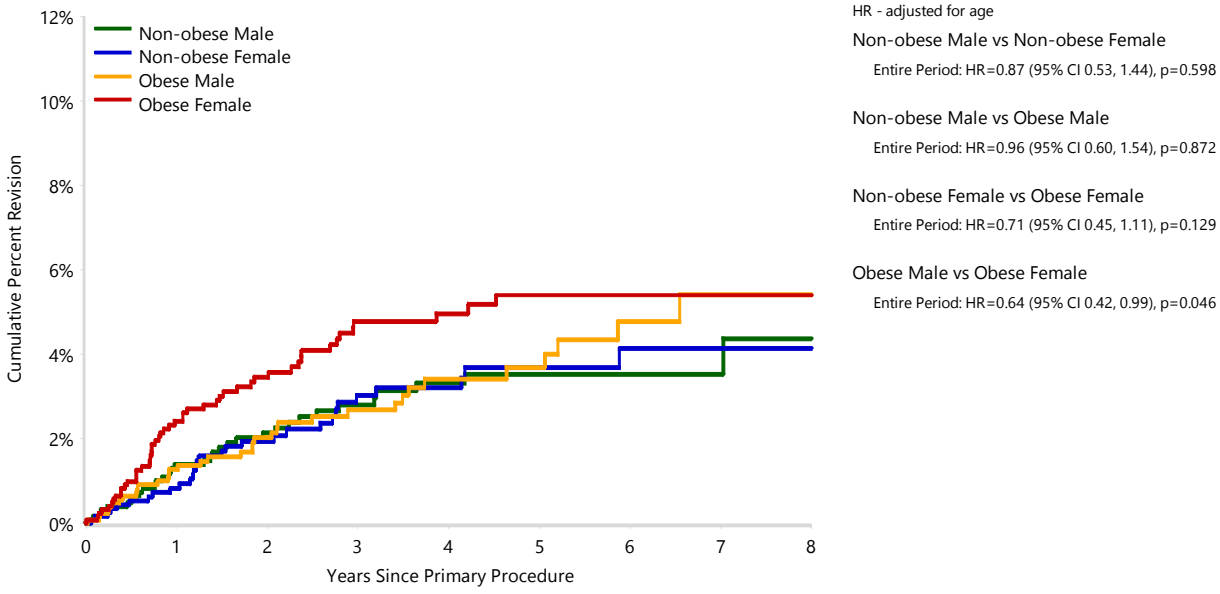
Primary Total Shoulder Replacement

Table ST20 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category and Gender (Primary Diagnosis OA)

BMI Category	Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Non-obese	Male	33	1281	1.4 (0.9, 2.3)	2.1 (1.4, 3.2)	2.8 (1.9, 4.1)	3.3 (2.3, 4.7)	3.5 (2.5, 5.0)	3.5 (2.5, 5.0)
	Female	31	1190	0.8 (0.4, 1.6)	1.9 (1.2, 3.0)	3.0 (2.1, 4.5)	3.2 (2.2, 4.7)	3.7 (2.5, 5.4)	4.1 (2.8, 6.1)
Obese	Male	36	1298	1.3 (0.8, 2.1)	2.0 (1.3, 3.1)	2.7 (1.8, 3.9)	3.4 (2.4, 4.9)	3.7 (2.6, 5.3)	4.8 (3.3, 7.0)
	Female	51	1269	2.4 (1.7, 3.5)	3.5 (2.5, 4.7)	4.8 (3.6, 6.3)	5.0 (3.7, 6.6)	5.4 (4.1, 7.1)	5.4 (4.1, 7.1)
TOTAL		151	5038						

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Non-obese group includes underweight, normal and pre-obese
Obese group includes obese class 1, 2 and 3

Figure ST13 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category and Gender (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Non-obese	Male	1281	1034	809	638	477	312	204
	Female	1190	953	736	570	435	314	203
Obese	Male	1298	1050	831	620	453	313	204
	Female	1269	1038	822	662	504	365	239

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Non-obese group includes underweight, normal and pre-obese
Obese group includes obese class 1, 2 and 3

Table ST21 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Morphology (Primary Diagnosis OA)

Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
A1	43	1665	1.2 (0.8, 1.9)	1.9 (1.3, 2.8)	3.0 (2.1, 4.2)	3.3 (2.4, 4.7)	4.2 (3.0, 5.8)
A2	29	820	2.2 (1.4, 3.6)	3.0 (2.0, 4.6)	4.1 (2.8, 5.9)	4.4 (3.0, 6.3)	4.7 (3.2, 6.9)
B1	23	945	1.3 (0.7, 2.3)	2.1 (1.3, 3.4)	3.0 (2.0, 4.6)	3.3 (2.2, 5.0)	3.3 (2.2, 5.0)
B2	21	847	1.1 (0.5, 2.2)	2.0 (1.1, 3.4)	2.8 (1.7, 4.6)	3.5 (2.2, 5.5)	3.5 (2.2, 5.5)
C	2	113	1.2 (0.2, 8.1)	2.4 (0.6, 9.1)	2.4 (0.6, 9.1)		
TOTAL	**118**	**4390**					

Note: Restricted to modern prostheses
Excludes 17 procedures where a glenoid morphology of B3 was recorded
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

The majority of primary total stemless anatomic shoulder replacement procedures utilise hybrid (cementless humeral component with a cemented glenoid) fixation. Cemented primary stemless anatomic prostheses have a higher revision rate than hybrid fixation procedures (Table ST22 and Figure ST14).

Glenoid Types

There are four types of glenoids: all with polyethylene bearing surface but differing methods of fixation to bone. Non-modular metal back glenoids have a polyethylene bearing surface with backside integrated metallic coating. Hybrid metal/polyethylene glenoids have a polyethylene bearing surface and one or more metallic fixation pegs. Cemented polyethylene glenoids with a modified central peg are all polyethylene but the central peg is further engineered for additional fixation to bone. All polyethylene glenoids are polyethylene fixed by cemented pegs or keels alone without further fixation features.

Cemented all polyethylene glenoids are the most common type of glenoid used (Table ST23). Non modular metal backed glenoids have a higher risk of revision than both cemented all polyethylene glenoids and modified central peg glenoids (Figure ST15).

Bearing Surface

There is no difference in the rate of revision when ceramic/non XLPE, ceramic/XLPE, metal/XLPE and metal/non XLPE bearing surfaces (humeral head/glenoid) are compared (Table ST24).

Humeral Heads

Humeral head size is not a risk factor for revision of primary total stemless anatomic shoulder replacement (Table ST25).

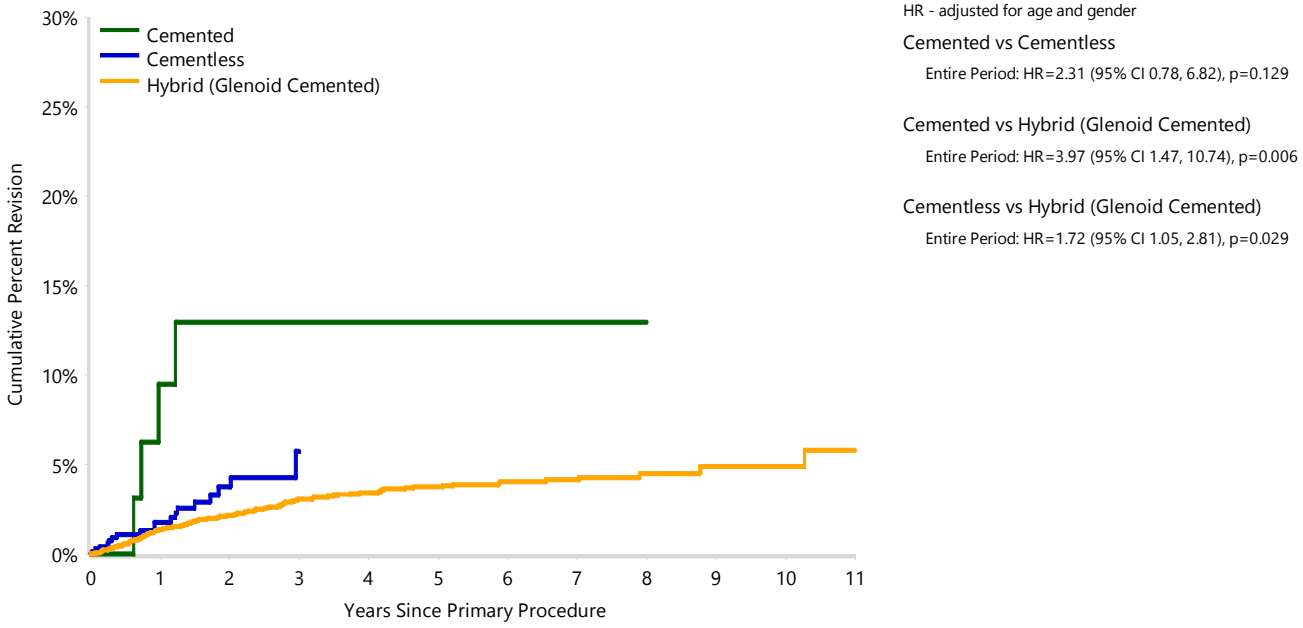
Humeral head size is not a risk factor for revision of primary total stemless anatomic shoulder replacement.

Table ST22 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented	4	34	9.5 (3.2, 26.6)	13.0 (5.1, 31.0)	13.0 (5.1, 31.0)	13.0 (5.1, 31.0)		
Cementless	19	708	1.8 (1.0, 3.3)	5.7 (3.1, 10.6)				
Hybrid (Glenoid Cemented)	138	4576	1.4 (1.1, 1.8)	3.1 (2.5, 3.7)	3.7 (3.1, 4.4)	4.2 (3.5, 5.0)	4.9 (3.9, 6.3)	
TOTAL	161	5318						

Note: Restricted to modern prostheses

Figure ST14 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented	34	28	19	10	7	0	0
Cementless	708	407	64	0	0	0	0
Hybrid (Glenoid Cemented)	4576	3910	2659	1518	684	116	0

Note: Restricted to modern prostheses

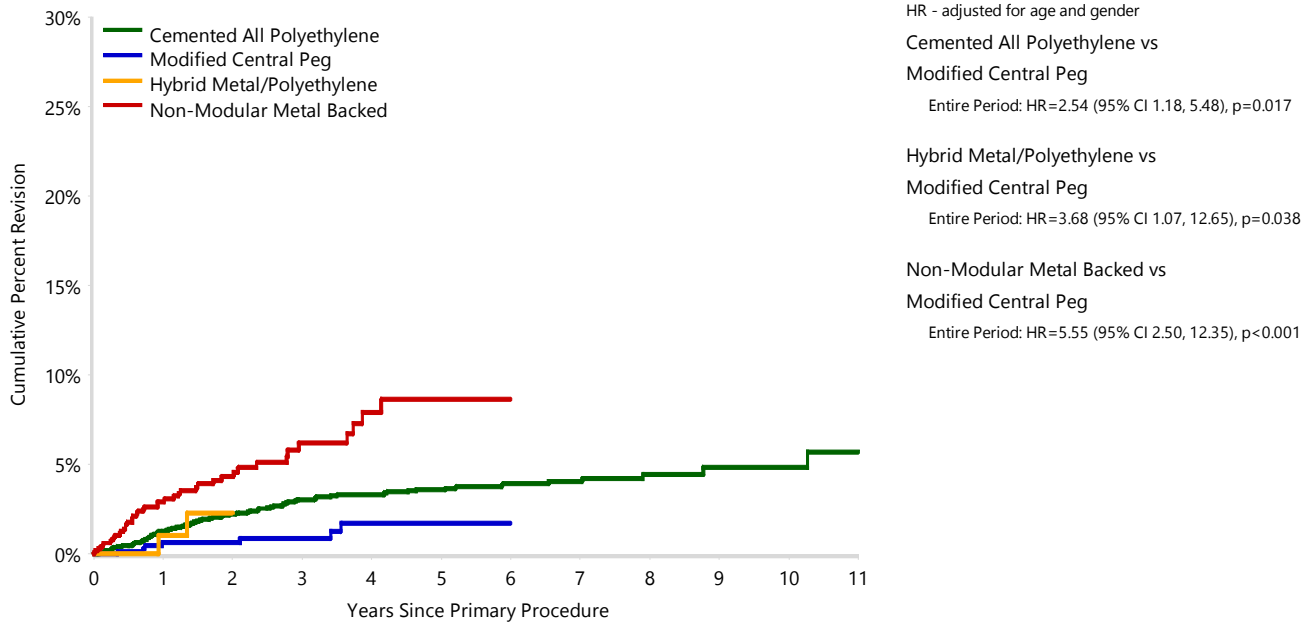
Primary Total Shoulder Replacement

Table ST23 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented All Polyethylene	107	3367	1.3 (0.9, 1.7)	3.0 (2.5, 3.8)	3.6 (2.9, 4.4)	4.1 (3.3, 5.0)	4.8 (3.7, 6.2)	
Modified Central Peg	7	782	0.6 (0.2, 1.7)	0.9 (0.4, 2.1)	1.7 (0.8, 3.9)			
Hybrid Metal/Polyethylene	4	154	1.0 (0.1, 7.1)					
Non-Modular Metal Backed	43	1015	2.9 (2.0, 4.3)	6.2 (4.4, 8.7)	8.6 (6.0, 12.4)			
TOTAL	161	5318						

Note: Restricted to modern prostheses

Figure ST15 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented All Polyethylene	3367	3005	2206	1322	661	116	0
Modified Central Peg	782	587	272	105	3	0	0
Hybrid Metal/Polyethylene	154	93	25	3	0	0	0
Non-Modular Metal Backed	1015	660	239	98	27	0	0

Note: Restricted to modern prostheses

Table ST24 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Ceramic/Non XLPE	27	523	1.2 (0.5, 2.5)	3.7 (2.4, 5.7)	4.5 (3.0, 6.6)	5.1 (3.5, 7.4)	5.1 (3.5, 7.4)	
Ceramic/XLPE	80	2759	1.5 (1.1, 2.0)	3.3 (2.6, 4.2)	3.8 (3.1, 4.8)	3.8 (3.1, 4.8)		
Metal/Non XLPE	48	1776	1.6 (1.1, 2.4)	3.1 (2.3, 4.3)	4.2 (3.1, 5.7)	4.6 (3.3, 6.3)		
Metal/XLPE	6	260	1.3 (0.4, 4.1)	2.7 (1.1, 6.4)	2.7 (1.1, 6.4)			
TOTAL	161	5318						

Note: Restricted to modern prostheses. Reported as humeral head/glenoid
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST25 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)

Humeral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<44mm	62	1655	1.7 (1.2, 2.5)	4.4 (3.4, 5.7)	4.6 (3.6, 6.0)	4.9 (3.7, 6.3)	6.2 (4.3, 9.1)	
44-50mm	70	2688	1.3 (0.9, 1.8)	2.8 (2.2, 3.6)	3.6 (2.8, 4.6)	3.8 (3.0, 4.9)	4.1 (3.2, 5.4)	
>50mm	29	970	1.5 (0.9, 2.6)	2.9 (1.9, 4.4)	4.2 (2.8, 6.3)	5.5 (3.5, 8.6)		
TOTAL	161	5313						

Note: Restricted to modern prostheses
Excludes 5 procedures with unknown head size
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Augmentation

A glenoid component is categorised as augmented if the backside has been modified for glenoid deformity (e.g. wedged, stepped, angulated, or lateralised). Augmented glenoids are not a revision risk factor (Table ST26). When stratified by glenoid morphology there continued to be no difference in revision rates between augmented and non-augmented glenoids (Table ST27).

Table ST26 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA, Excluding Modular Metal Backed Glenoids)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Augmented	2	163	0.0 (0.0, 0.0)	1.9 (0.5, 7.6)				
Non-augmented	159	5141	1.5 (1.2, 1.9)	3.3 (2.8, 4.0)	4.0 (3.4, 4.8)	4.5 (3.8, 5.3)	5.2 (4.2, 6.5)	
TOTAL	161	5304						

Note: Excludes 941 procedures with unknown glenoid augmentation or glenoid morphology. Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST27 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Morphology and Glenoid Augmentation (Primary Diagnosis OA, Excluding Modular Metal Backed Glenoids)

Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
A	Augmented	0	10	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Non-augmented	72	2469	1.6 (1.1, 2.2)	2.3 (1.7, 3.0)	3.4 (2.6, 4.3)	3.7 (2.9, 4.7)	4.4 (3.4, 5.6)
B	Augmented	2	129	0.0 (0.0, 0.0)	1.1 (0.2, 7.4)	2.5 (0.6, 9.7)		
	Non-augmented	42	1658	1.3 (0.8, 2.0)	2.1 (1.5, 3.0)	3.0 (2.1, 4.1)	3.4 (2.5, 4.7)	3.4 (2.5, 4.7)
C	Augmented	0	12	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
	Non-augmented	2	99	1.4 (0.2, 9.2)	2.7 (0.7, 10.4)	2.7 (0.7, 10.4)	2.7 (0.7, 10.4)	2.7 (0.7, 10.4)
TOTAL		118	4377					

Note: Excludes 941 procedures with unknown glenoid augmentation or glenoid morphology. Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

SURGEON ASSISTIVE TOOLS

An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient. There are 1,643 total stemless anatomic shoulder replacements for osteoarthritis utilising an IDI since their first use in 2016. In 2024, IDI are used in 46.7% of all total stemless anatomic shoulder replacement procedures. There is no difference in the rate of revision when IDI is used compared to when IDI is not used (Table ST28).

When stratified by glenoid morphology, the use of an IDI increases the rate of revision for glenoid morphology class A. There is no difference in revision rates for glenoid morphology class B. There are insufficient numbers to analyse IDI usage in glenoid morphology class C (Table ST29, Table ST30, Figure ST16 and Table ST31).

Table ST28 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage (Primary Diagnosis OA)

IDI Use	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
IDI Used	51	1734	1.9 (1.3, 2.7)	3.0 (2.2, 4.1)	4.3 (3.3, 5.8)	4.3 (3.3, 5.8)	
Traditional Instrumentation	95	3331	1.3 (0.9, 1.7)	2.0 (1.5, 2.6)	2.7 (2.2, 3.4)	3.6 (2.9, 4.4)	4.2 (3.3, 5.2)
TOTAL	146	5065					

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST29 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI and Glenoid Morphology Usage (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
IDI Used		49	1643	1.9 (1.3, 2.8)	3.0 (2.2, 4.2)	4.5 (3.3, 6.0)	4.5 (3.3, 6.0)	
	A1	20	616	2.1 (1.2, 3.7)	3.3 (2.0, 5.4)	5.2 (3.2, 8.2)	5.2 (3.2, 8.2)	
	A2	10	236	2.9 (1.3, 6.3)	3.5 (1.7, 7.2)	6.2 (3.3, 11.6)		
	B1	8	371	1.3 (0.5, 3.3)	2.5 (1.2, 5.3)	3.2 (1.6, 6.4)	3.2 (1.6, 6.4)	
	B2	10	382	1.6 (0.6, 3.7)	2.8 (1.4, 5.5)	3.7 (2.0, 6.8)	3.7 (2.0, 6.8)	
	C	1	38	4.5 (0.7, 28.1)	4.5 (0.7, 28.1)	4.5 (0.7, 28.1)		
Traditional Instrumentation		69	2747	1.1 (0.8, 1.6)	1.7 (1.3, 2.3)	2.5 (1.9, 3.3)	3.5 (2.7, 4.5)	4.3 (3.3, 5.8)
	A1	23	1049	0.7 (0.3, 1.5)	1.1 (0.6, 2.1)	2.0 (1.2, 3.3)	3.5 (2.2, 5.5)	5.0 (2.9, 8.4)
	A2	19	584	2.0 (1.1, 3.6)	2.9 (1.7, 4.7)	3.4 (2.1, 5.4)	4.2 (2.6, 6.7)	
	B1	15	574	1.3 (0.6, 2.7)	1.9 (1.0, 3.6)	3.0 (1.8, 5.0)	3.3 (2.0, 5.5)	
	B2	11	465	0.7 (0.2, 2.2)	1.3 (0.6, 3.2)	2.1 (1.0, 4.5)	3.1 (1.6, 6.1)	
	C	1	75	0.0 (0.0, 0.0)	1.6 (0.2, 10.9)	1.6 (0.2, 10.9)	1.6 (0.2, 10.9)	
TOTAL		118	4390					

Note: Restricted to modern prostheses

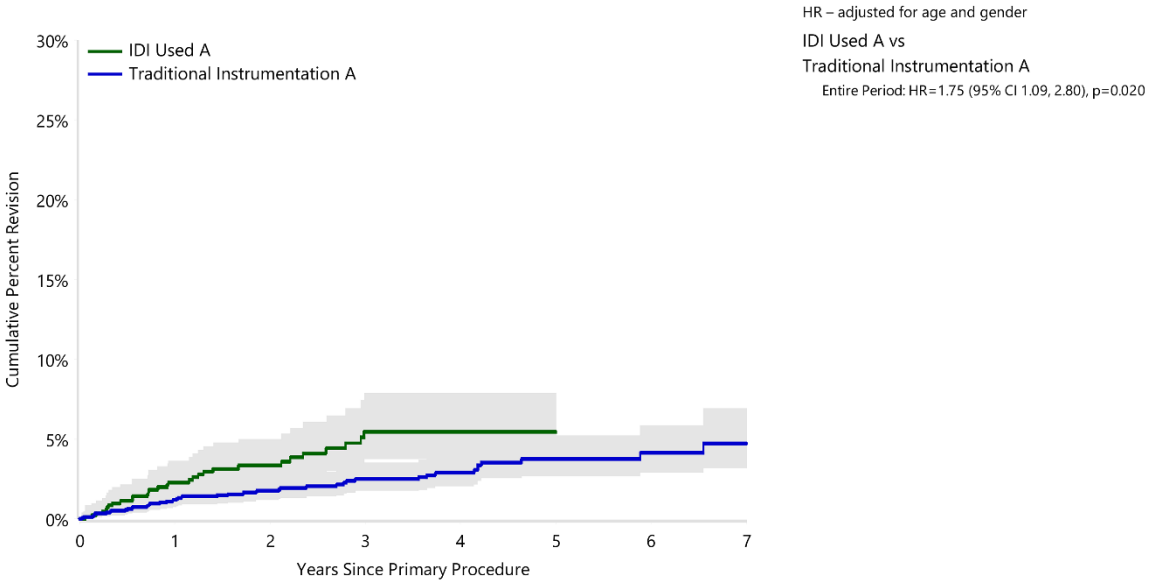
Primary Total Shoulder Replacement

Table ST30 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
IDI Used	A	30	852	2.3 (1.4, 3.7)	3.4 (2.2, 5.0)	5.5 (3.7, 7.9)	5.5 (3.7, 7.9)	
Traditional Instrumentation	A	42	1633	1.2 (0.8, 1.9)	1.7 (1.2, 2.6)	2.5 (1.8, 3.5)	3.8 (2.7, 5.2)	4.7 (3.2, 6.9)
TOTAL		72	2485					

Note: Restricted to modern prostheses

Figure ST16 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
IDI Used	A	852	631	429	268	93	8
Traditional Instrumentation	A	1633	1355	1064	840	405	102

Note: Restricted to modern prostheses

Table ST31 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
IDI Used	B	18	753	1.4 (0.7, 2.7)	2.7 (1.6, 4.4)	3.5 (2.2, 5.5)	3.5 (2.2, 5.5)	
Traditional Instrumentation	B	26	1039	1.0 (0.6, 1.9)	1.7 (1.0, 2.8)	2.6 (1.7, 4.0)	3.2 (2.1, 4.8)	3.9 (2.6, 6.0)
TOTAL		44	1792					

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OPERATIVE TECHNIQUE

Rotator Cuff Repair

A rotator cuff repair undertaken during the implantation of a primary total stemless anatomic shoulder replacement does not change the early rate of revision (Table ST32).

Table ST32 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis OA)

Rotator Cuff Repair	N Revised	N Total	1 Yr	3 Yrs	5 Yrs
Yes	11	607	1.6 (0.8, 3.4)	2.4 (1.2, 4.8)	
No	27	1418	1.4 (0.8, 2.3)	2.3 (1.6, 3.5)	3.6 (2.2, 5.7)
TOTAL	38	2025			

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcome of the most used primary total stemless anatomic prosthesis combinations >30 procedures are listed in Table ST33

Table ST33 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Affinis	Affinis	106	3101	1.5 (1.1, 2.0)	2.5 (2.0, 3.2)	3.5 (2.9, 4.4)	4.2 (3.4, 5.1)	4.5 (3.7, 5.5)
	Global	1	178	0.6 (0.1, 4.4)	0.6 (0.1, 4.4)	0.6 (0.1, 4.4)		
Comprehensive	Alliance	0	53	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Comprehensive	24	312	5.0 (3.1, 8.2)	5.8 (3.7, 9.2)	7.8 (5.1, 11.7)	9.8 (6.6, 14.6)	
Equinoxe	Equinoxe	2	86	0.0 (0.0, 0.0)	2.7 (0.4, 17.7)			
Global Icon	Global	3	219	1.1 (0.3, 4.3)	1.1 (0.3, 4.3)	2.2 (0.7, 7.1)		
SMR	SMR	5	57	3.6 (0.9, 13.5)	5.4 (1.8, 15.8)	7.2 (2.8, 18.2)	7.2 (2.8, 18.2)	11.9 (4.6, 28.8)
Simpliciti	Perform	20	1306	0.8 (0.4, 1.6)	1.4 (0.8, 2.3)	1.7 (1.0, 2.7)	2.3 (1.4, 3.7)	
Other (3)		0	6	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
TOTAL		161	5318					

Note: Restricted to modern prostheses.

Only prostheses with >30 procedures have been listed

Primary Total Shoulder Replacement

Primary Total Stemmed Anatomic Shoulder Replacement

DEMOGRAPHICS

There are 16,893 total stemmed anatomic shoulder replacement procedures. This is an additional 374 procedures compared to the previous report.

The majority of procedures are undertaken in females. However, the proportion of males has increased 0.3% since 2016. The mean age of females is older than males (Table ST34).

The majority of procedures are undertaken in the 65–74 year age group. The proportional use in patients aged ≥75 years has declined from 23.0% in 2022 to 19.4% in 2024.

Hybrid fixation with a cemented glenoid has increased from 55.8% in 2010 to 87.5% in 2024.

In 2024, non XLPE polyethylene is more commonly used (67.5%) in total stemmed anatomic replacement glenoids than XLPE (32.5%) (Figure ST17).

The most common type of fixation is hybrid fixation (cementless humerus and cemented glenoid) (Figure ST18).

The 10 most used humeral stem and glenoid prostheses are listed in Table ST35 and Table ST36.

Table ST34 Age and Gender of Primary Total Stemmed Anatomic Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	7284	43.1%	21	93	67	66.6	9.0
Female	9609	56.9%	19	96	71	70.2	8.5
TOTAL	**16893**	**100.0%**	**19**	**96**	**69**	**68.6**	**8.9**

Figure ST17 Primary Total Stemmed Anatomic Shoulder Replacement by Polyethylene Type

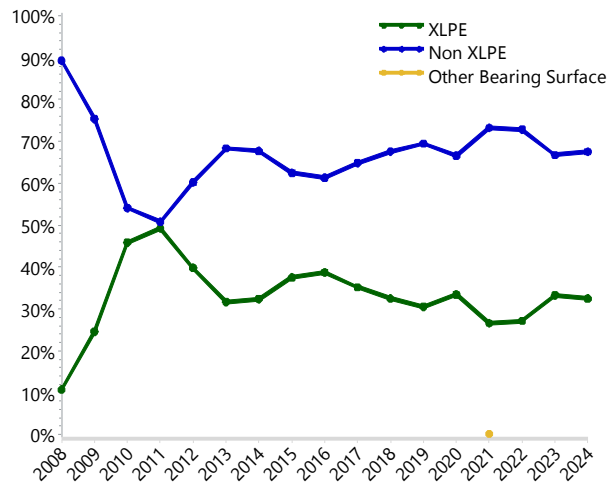


Figure ST18 Primary Total Stemmed Anatomic Shoulder Replacement by Fixation

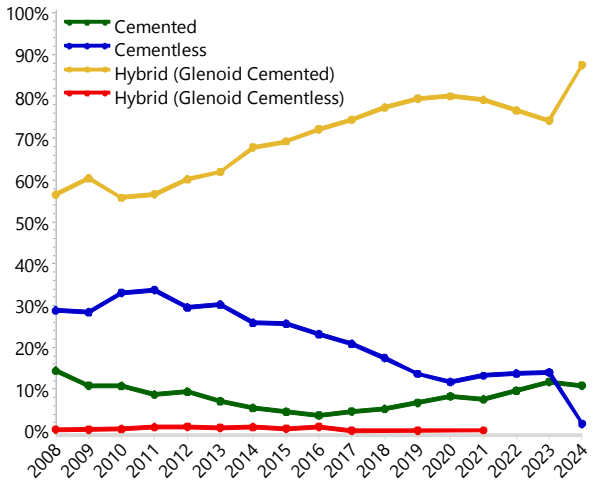


Table ST35 Most Used Humeral Stem Prostheses in Primary Total Stemmed Anatomic Shoulder Replacement

2008		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
298	SMR	179	Ascend Flex	186	Ascend Flex	158	Ascend Flex	129	Ascend Flex
167	Aequalis	92	Equinoxe	103	Global Unite	127	Global Unite	74	Global Unite
117	Global Advantage	92	Global Unite	86	Equinoxe	79	SMR	72	Comprehensive
91	Global AP	86	Comprehensive	77	SMR	62	Comprehensive	35	SMR
40	Bigliani/Flatow	83	SMR	71	Comprehensive	48	Equinoxe	23	Equinoxe
37	Bigliani/Flatow TM	56	Global AP	30	Global AP	23	Global AP	10	Affinis
32	Solar	4	Bigliani/Flatow TM	4	Affinis	1	Affinis	8	MSS
27	Affinis	3	Delta Xtend	2	Delta Xtend	1	Delta Xtend		
11	Univers 3D	2	Global Advantage	1	Bigliani/Flatow TM	1	MSS		
10	Cofield 2	1	Affinis						
10 Most Used									
830	(10) 97.9%	598	(10) 100.0%	560	(9) 100.0%	500	(9) 100.0%	351	(7) 100.0%
Remainder									
18	(7) 2.1%	0	(0) 0%	0	(0) 0%	0	(0) 0%	0	(0) 0%
TOTAL									
848	(17) 100.0%	598	(10) 100.0%	560	(9) 100.0%	500	(9) 100.0%	351	(7) 100.0%

Table ST36 Most Used Glenoid Prostheses in Primary Total Stemmed Anatomic Shoulder Replacement

2008		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
237	SMR L1	180	Perform	185	Perform	158	Perform	129	Perform
209	Global	151	Global	135	Global	151	Global	74	Global
167	Aequalis	92	Equinoxe	86	Equinoxe	65	SMR L1	55	Comprehensive
79	Bigliani/Flatow	73	Comprehensive	65	SMR L1	48	Comprehensive	35	SMR
57	SMR	70	SMR L1	61	Comprehensive	48	Equinoxe	23	Equinoxe
32	Solar	13	Alliance	12	SMR	14	Alliance	17	Alliance
27	Affinis	10	SMR	10	Alliance	14	SMR	10	Affinis
11	Univers 3D	3	Bigliani/Flatow	5	Affinis	1	Affinis	8	MSS
10	Cofield 2	2	SMR Axioma	1	Bigliani/Flatow	1	MSS		
7	Promos	1	Affinis						
10 Most Used									
836	(10) 98.6%	595	(10) 99.5%	560	(9) 100.0%	500	(9) 100.0%	351	(8) 100.0%
Remainder									
12	(6) 1.4%	3	(3) 0.5%	0	(0) 0%	0	(0) 0%	0	(0) 0%
TOTAL									
848	(16) 100.0%	598	(13) 100.0%	560	(9) 100.0%	500	(9) 100.0%	351	(8) 100.0%

Primary Total Shoulder Replacement

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

The usage and availability of prostheses change with time, reflecting design change and surgeon preference. In order to keep Registry data contemporaneous, only procedures utilising prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

This year, modern prostheses do not include modular metal backed glenoids with total stemmed anatomic shoulder replacements.

The most common diagnosis for primary total stemmed anatomic shoulder replacement is osteoarthritis (94.6%) (Table ST37). There is no difference in the rate of revision between osteoarthritis, osteonecrosis and rheumatoid arthritis (Table ST38).

Reason for Revision

The main reasons for revision are loosening, rotator cuff insufficiency, and instability/dislocation (Table ST39 and Figure ST19). Since 2016, revision for instability/dislocation increased in proportion by 42.1%. In contrast, loosening decreased by 25%, rotator cuff insufficiency by 8.6% and infection by 7.1%. The predominant reason for revision for both males and females is loosening (Figure ST20).

TYPE OF REVISION

The most common type of revision involves replacement of the humeral and glenoid components (75.3%) (Table ST40). Since 2016, isolated humeral or glenoid component, and head only revisions decreased by 10.7%, 3.6%, and 7.1%, respectively. Humeral/glenoid revisions have increased by 21.4%.

The majority of total stemmed anatomic replacements are revised to reverse replacements (89.4%) with 56.3% retaining the humeral stem.

Table ST37 Primary Total Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Osteoarthritis	5120	94.6
Osteonecrosis	103	1.9
Rheumatoid Arthritis	70	1.3
Fracture	35	0.6
Other Inflammatory Arthritis	32	0.6
Rotator Cuff Arthropathy	30	0.6
Instability	17	0.3
Tumour	6	0.1
TOTAL	5413	100.0

Table ST38 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Osteoarthritis	268	5120	2.0 (1.6, 2.4)	3.0 (2.6, 3.6)	3.6 (3.1, 4.1)	4.7 (4.1, 5.4)	5.8 (5.1, 6.6)
Osteonecrosis	4	103	1.0 (0.1, 7.0)	3.5 (1.1, 10.5)	3.5 (1.1, 10.5)	5.3 (2.0, 13.9)	
Rheumatoid Arthritis	5	70	2.9 (0.7, 11.1)	4.4 (1.4, 13.1)	4.4 (1.4, 13.1)	6.3 (2.4, 15.9)	6.3 (2.4, 15.9)
Fracture	5	35	3.1 (0.4, 20.2)	13.4 (5.2, 32.0)	17.0 (7.4, 36.3)	17.0 (7.4, 36.3)	17.0 (7.4, 36.3)
Other Inflammatory Arthritis	4	32	3.1 (0.4, 20.2)	3.1 (0.4, 20.2)	7.0 (1.8, 25.4)	11.7 (3.8, 32.4)	11.7 (3.8, 32.4)
Rotator Cuff Arthropathy	1	30	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	10.0 (1.5, 52.7)
Other (2)	1	23	0.0 (0.0, 0.0)	5.9 (0.9, 35.0)	5.9 (0.9, 35.0)	5.9 (0.9, 35.0)	5.9 (0.9, 35.0)
TOTAL	288	5413					

Note: Only primary diagnoses with >30 procedures have been listed
Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST39 Primary Total Stemmed Anatomic Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Loosening	82	28.5
Rotator Cuff Insufficiency	81	28.1
Instability/Dislocation	64	22.2
Infection	14	4.9
Pain	12	4.2
Fracture	8	2.8
Lysis	6	2.1
Incorrect Sizing	5	1.7
Arthrofibrosis	4	1.4
Implant Breakage Glenoid	4	1.4
Malposition	3	1.0
Implant Breakage Glenoid Insert	1	0.3
Dissociation	1	0.3
Wear Glenoid Insert	1	0.3
Other	2	0.7
TOTAL	288	100.0

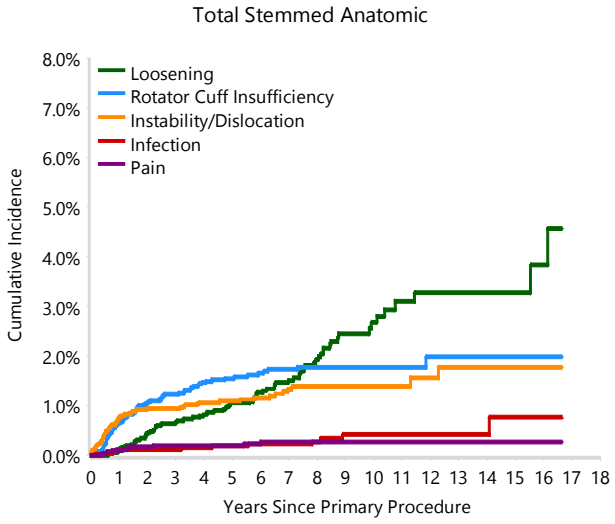
Note: Restricted to modern prostheses

Table ST40 Primary Total Stemmed Anatomic Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral/Glenoid	217	75.3
Head Only	29	10.1
Glenoid Component	14	4.9
Humeral Component	14	4.9
Cement Spacer	11	3.8
Removal of Prostheses	2	0.7
Reoperation	1	0.3
TOTAL	288	100.0

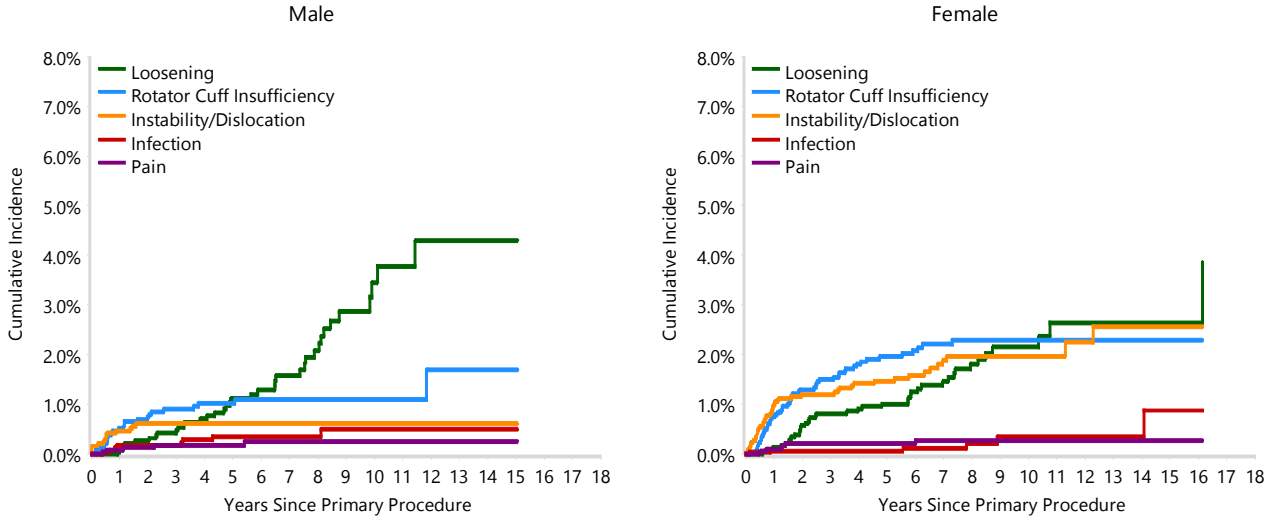
Note: Restricted to modern prostheses
Humeral heads are replaced when the humeral component is revised

Figure ST19 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement (All Diagnoses)



Note: Restricted to modern prostheses

Figure ST20 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Gender



Note: Restricted to modern prostheses

PROSTHESIS TYPES

The outcome of the most used humeral stem and glenoid prosthesis combinations >50 procedures used in primary total stemmed anatomic shoulder replacement are listed in Table ST41.

The most commonly used cementless prosthesis combinations are listed in Table ST42. Prosthesis combinations with hybrid (glenoid cemented) fixation are listed in Table ST43.

Table ST41 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Affinis	Affinis	22	208	0.0 (0.0, 0.0)	1.5 (0.5, 4.7)	2.6 (1.1, 6.1)	5.3 (2.9, 9.7)	6.5 (3.7, 11.1)
Ascend Flex	Perform	48	1473	0.9 (0.5, 1.5)	1.8 (1.2, 2.7)	2.4 (1.7, 3.4)	3.2 (2.3, 4.4)	4.5 (3.2, 6.1)
Comprehensive	Alliance	2	56	4.5 (1.1, 16.9)	4.5 (1.1, 16.9)	4.5 (1.1, 16.9)		
	Comprehensive	56	977	3.7 (2.7, 5.1)	4.6 (3.4, 6.1)	4.8 (3.6, 6.4)	5.5 (4.2, 7.2)	6.2 (4.7, 8.1)
Equinoxe	Equinoxe	84	758	3.0 (2.0, 4.5)	5.1 (3.7, 6.9)	6.3 (4.7, 8.4)	9.6 (7.5, 12.3)	13.3 (10.4, 16.8)
Global Unite	Global	37	1360	1.4 (0.9, 2.2)	1.9 (1.3, 2.9)	2.2 (1.5, 3.2)	2.7 (2.0, 3.9)	3.3 (2.4, 4.6)
SMR	SMR	37	562	2.2 (1.2, 3.8)	4.3 (2.9, 6.4)	4.7 (3.2, 6.9)	5.4 (3.7, 7.7)	6.1 (4.3, 8.6)
Other (4)		2	19	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	
TOTAL		288	5413					

Note: Restricted to modern prostheses.
Only prostheses with >50 procedures have been listed

Table ST42 Cumulative Percent Revision of Cementless Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Equinoxe	Equinoxe	10	57	7.0 (2.7, 17.6)	10.8 (5.0, 22.4)	10.8 (5.0, 22.4)	13.6 (6.6, 26.7)	13.6 (6.6, 26.7)
Other (3)		0	9	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
TOTAL		10	66					

Note: Restricted to modern prostheses.
Only prostheses with >10 procedures have been listed

Table ST43 Cumulative Percent Revision of Hybrid (Glenoid Cemented) Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Affinis	Affinis	20	193	0.0 (0.0, 0.0)	0.5 (0.1, 3.8)	1.6 (0.5, 5.0)	4.5 (2.3, 8.8)	5.7 (3.1, 10.3)
Ascend Flex	Perform	42	1255	0.8 (0.4, 1.5)	1.8 (1.2, 2.8)	2.6 (1.8, 3.7)	3.4 (2.5, 4.8)	4.3 (3.1, 6.0)
Comprehensive	Alliance	2	55	4.6 (1.2, 17.3)	4.6 (1.2, 17.3)	4.6 (1.2, 17.3)		
	Comprehensive	56	962	3.7 (2.7, 5.2)	4.7 (3.5, 6.2)	4.9 (3.7, 6.5)	5.6 (4.3, 7.3)	6.3 (4.8, 8.2)
Equinoxe	Equinoxe	71	670	2.6 (1.6, 4.1)	4.5 (3.1, 6.4)	5.7 (4.2, 7.9)	9.3 (7.1, 12.1)	13.5 (10.4, 17.5)
Global Unite	Global	32	1217	1.2 (0.7, 2.0)	1.7 (1.1, 2.7)	2.0 (1.4, 3.1)	2.6 (1.8, 3.8)	3.2 (2.3, 4.6)
SMR	SMR	34	538	2.3 (1.3, 4.0)	4.1 (2.7, 6.2)	4.5 (3.0, 6.7)	5.2 (3.6, 7.5)	5.7 (4.0, 8.2)
Other (4)		2	19	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	16.9 (4.5, 52.8)	
TOTAL		259	4909					

Note: Restricted to modern prostheses.
Only prostheses with >50 procedures have been listed

Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

There are 5,120 primary total stemmed anatomic shoulder replacement procedures with a primary diagnosis of osteoarthritis.

The cumulative percent revision of primary total stemmed anatomic shoulder replacement with a polyethylene glenoid for osteoarthritis at 14 years is 9.4%. A polyethylene glenoid includes all glenoid types except modular metal backed glenoids. There are no primary total stemmed anatomic shoulder replacements with modular metal backed glenoids undertaken in 2024 (Table ST44).

For primary total stemmed anatomic shoulder replacements undertaken prior to 2016, there is no difference in the rate of revision compared to those procedures performed in the period 2016-2024 (Table ST45). The most common reasons for revision are loosening (29.1%), rotator cuff insufficiency (27.6%), and instability/dislocation (23.1%) (Table ST46 and Figure ST21). Males are predominately revised for rotator cuff insufficiency while the reason for revision varies for females (Figure ST22).

The most common type of revision is of the humeral/glenoid component combination (75.4%) (Table ST47). Of note, a humeral component revision may include epiphysis and/or humeral stem and additional minor components, such as the humeral head/glenosphere and/or removal of the glenoid component. Primary total stemmed anatomic undertaken for osteoarthritis are revised to a total stemmed reverse shoulder replacement (89%) with retention of the original stem in 58.1% of occasions.

Age and Gender

Patients aged ≥65 years have a lower rate of revision compared to patients aged <65 years (Table ST48 and Figure ST23). Females have a higher rate of revision than males (Table ST49 and Figure ST24). When age is stratified by gender the rate of revision difference between age groups remains the same for males (Figure ST25). Females aged ≥65 years have a lower rate of revision compared to females aged <65 years.

Females have a higher rate of revision compared to males.

ASA and BMI

Most patients have an ASA score of 2 or 3. ASA score is not a risk factor for revision (Table ST50). Males with ASA scores 3-5 have a lower rate of revision than females with the same ASA scores (Table ST51 and Figure ST26).

The most common BMI categories are pre-obese and obese class 1. BMI is not a risk factor for revision (Table ST52). However, when gender is considered, obese and non-obese females had a higher rate of revision than their male counterparts (Table ST53 and Figure ST27).

Glenoid Morphology

The category of glenoid morphology is not a risk factor for revision (Table ST54).

Table ST44 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Polyethylene Glenoid	268	5120	2.0 (1.6, 2.4)	3.6 (3.1, 4.1)	4.7 (4.1, 5.4)	5.8 (5.1, 6.6)	7.7 (6.7, 8.9)	9.4 (7.8, 11.1)
TOTAL	**268**	**5120**						

Note: Restricted to modern prostheses
There were no procedures with metal-backed glenoids recorded in 2024

Table ST45 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Procedure Year (Primary Diagnosis OA)

Procedure Year	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Pre 2016	87	1211	1.4 (0.9, 2.3)	2.6 (1.8, 3.7)	3.1 (2.2, 4.2)	4.4 (3.4, 5.7)	4.9 (3.8, 6.3)
2016-2024	181	3909	2.2 (1.7, 2.7)	3.2 (2.7, 3.8)	3.7 (3.1, 4.4)	4.7 (4.0, 5.5)	6.4 (5.5, 7.5)
TOTAL	**268**	**5120**					

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST46 Primary Total Stemmed Anatomic Shoulder Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Loosening	78	29.1
Rotator Cuff Insufficiency	74	27.6
Instability/Dislocation	62	23.1
Pain	11	4.1
Infection	11	4.1
Fracture	7	2.6
Lysis	6	2.2
Incorrect Sizing	5	1.9
Implant Breakage Glenoid	4	1.5
Malposition	3	1.1
Arthrofibrosis	2	0.7
Implant Breakage Glenoid Insert	1	0.4
Dissociation	1	0.4
Wear Glenoid Insert	1	0.4
Other	2	0.7
TOTAL	268	100.0

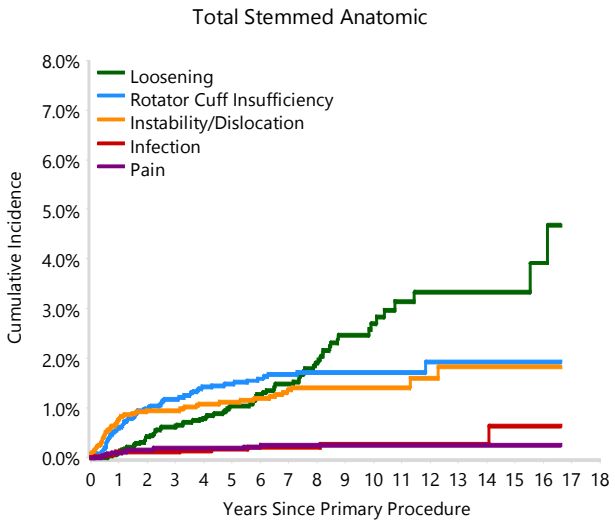
Note: Restricted to modern prostheses

Table ST47 Primary Total Stemmed Anatomic Shoulder Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Humeral/Glenoid	202	75.4
Head Only	28	10.4
Glenoid Component	13	4.9
Humeral Component	12	4.5
Cement Spacer	11	4.1
Removal of Prostheses	1	0.4
Reoperation	1	0.4
TOTAL	268	100.0

Note: Restricted to modern prostheses
Humeral heads are replaced when the humeral component is revised

Figure ST21 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses.

Primary Total Shoulder Replacement

Figure ST22 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)

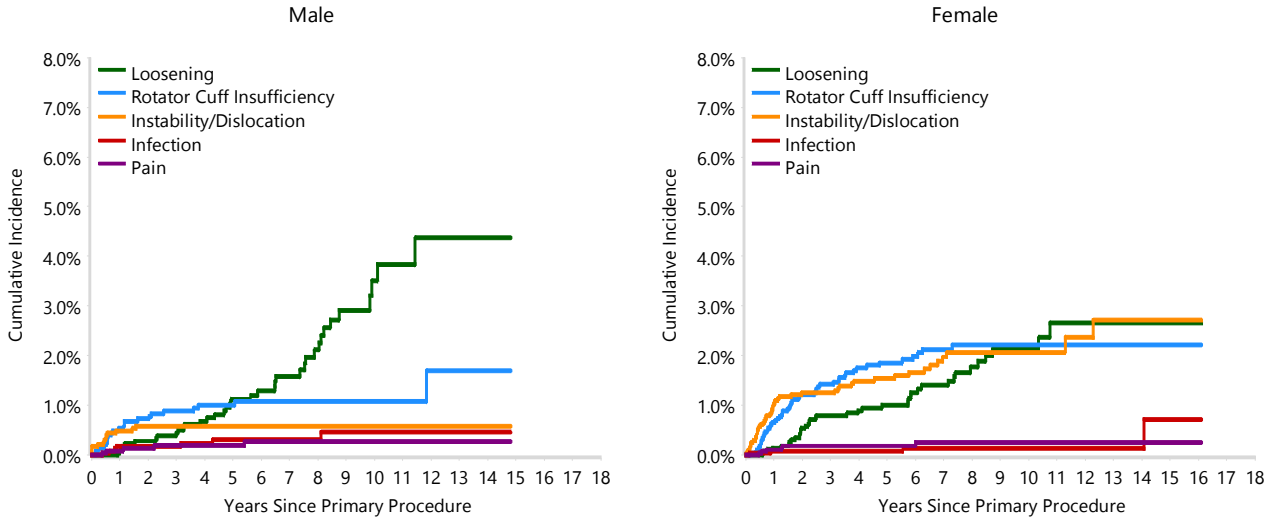
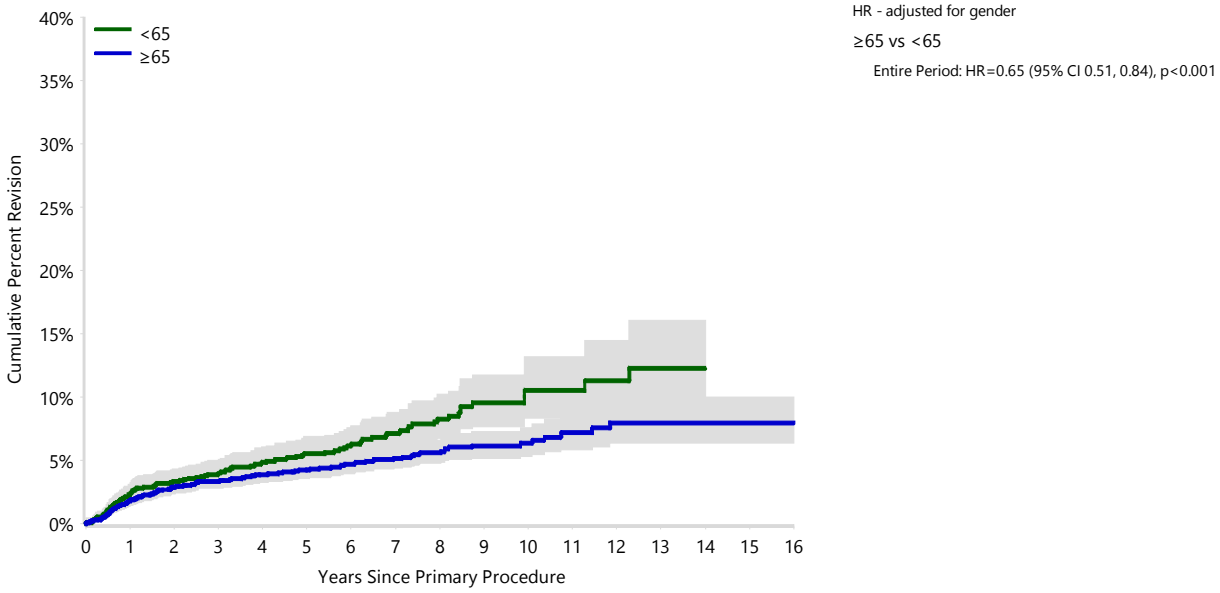


Table ST48 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<65	109	1698	2.3 (1.7, 3.2)	4.0 (3.1, 5.1)	5.5 (4.4, 6.9)	7.2 (5.8, 8.8)	10.5 (8.3, 13.2)	12.3 (9.3, 16.1)
≥65	159	3422	1.8 (1.4, 2.3)	3.4 (2.8, 4.1)	4.3 (3.6, 5.1)	5.2 (4.4, 6.1)	6.4 (5.3, 7.6)	8.0 (6.4, 10.0)
TOTAL	268	5120						

Note: Restricted to modern prostheses

Figure ST23 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<65	1698	1523	1214	885	558	178	53
≥65	3422	3158	2532	1914	1217	424	106

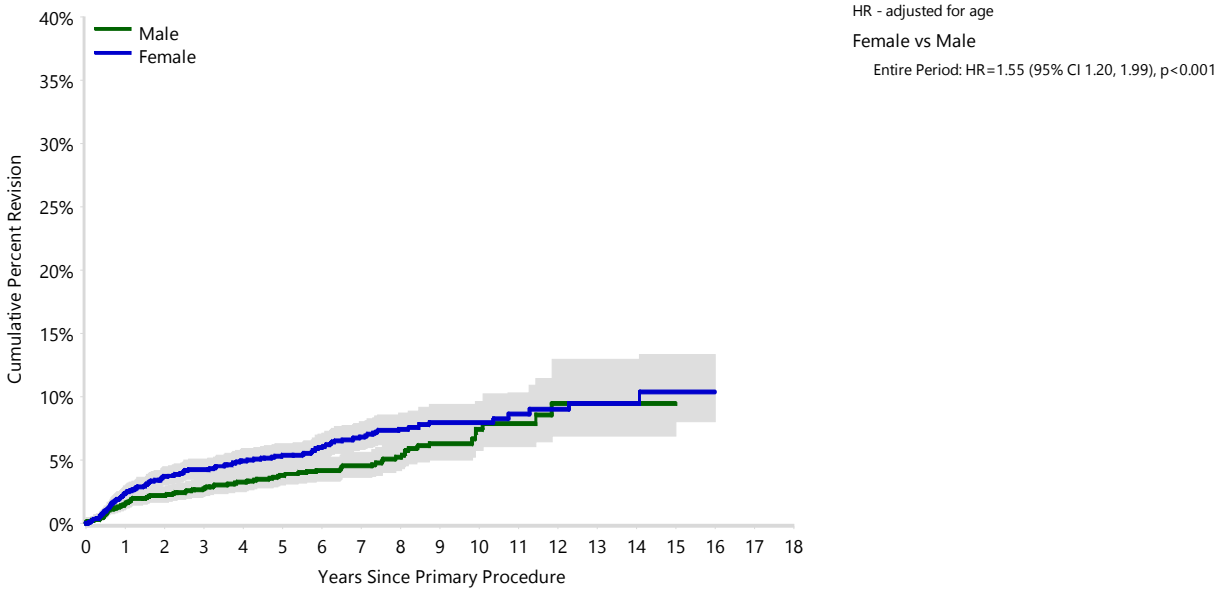
Note: Restricted to modern prostheses

Table ST49 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male		**99**	**2296**	**1.5 (1.1, 2.1)**	**2.8 (2.1, 3.5)**	**3.8 (3.1, 4.8)**	**4.5 (3.6, 5.6)**	**7.5 (5.8, 9.6)**	**9.5 (6.9, 13.0)**
	<65	49	979	1.5 (0.9, 2.5)	3.3 (2.3, 4.8)	4.7 (3.4, 6.5)	5.5 (4.0, 7.5)	9.8 (6.7, 14.0)	
	≥65	50	1317	1.6 (1.0, 2.4)	2.3 (1.6, 3.3)	3.2 (2.3, 4.4)	3.9 (2.8, 5.3)	5.9 (4.1, 8.3)	
Female		**169**	**2824**	**2.3 (1.8, 3.0)**	**4.2 (3.5, 5.1)**	**5.4 (4.5, 6.3)**	**6.8 (5.8, 8.0)**	**8.0 (6.8, 9.4)**	**9.5 (7.7, 11.7)**
	<65	60	719	3.5 (2.3, 5.1)	4.9 (3.5, 6.8)	6.6 (4.9, 8.9)	9.3 (7.0, 12.2)	11.6 (8.8, 15.3)	
	≥65	109	2105	2.0 (1.4, 2.7)	4.0 (3.2, 5.0)	4.9 (4.0, 6.0)	6.0 (4.9, 7.3)	6.8 (5.5, 8.2)	7.6 (6.0, 9.6)
TOTAL		**268**	**5120**						

Note: Restricted to modern prostheses

Figure ST24 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)

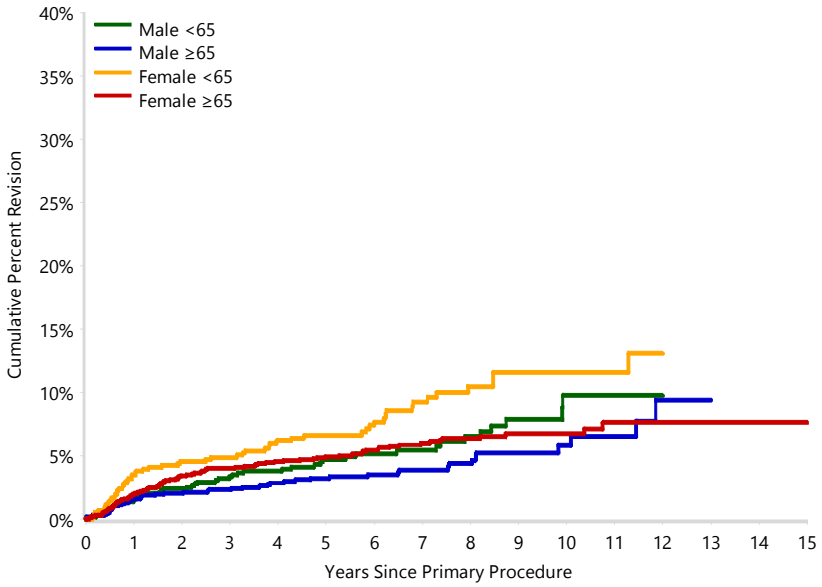


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male	2296	2101	1658	1203	754	235	56
Female	2824	2580	2088	1596	1021	367	103

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST25 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Gender and Age (Primary Diagnosis OA)



Male <65 vs Male ≥65
Entire Period: HR=1.39 (95% CI 0.93, 2.06), p=0.104

Male <65 vs Female <65
Entire Period: HR=0.64 (95% CI 0.44, 0.93), p=0.019

Male ≥65 vs Female ≥65
Entire Period: HR=0.75 (95% CI 0.54, 1.05), p=0.090

Female <65 vs Female ≥65
Entire Period: HR=1.63 (95% CI 1.19, 2.23), p=0.002

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Male	<65	979	881	672	477	302	92	26
	≥65	1317	1220	986	726	452	143	30
Female	<65	719	642	542	408	256	86	27
	≥65	2105	1938	1546	1188	765	281	76

Note: Restricted to modern prostheses

Table ST50 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ASA 1	14	295	2.5 (1.2, 5.1)	3.2 (1.7, 6.1)	3.6 (2.0, 6.7)	4.6 (2.6, 8.1)	5.3 (3.1, 9.1)	5.3 (3.1, 9.1)
ASA 2	119	2433	1.9 (1.4, 2.6)	3.0 (2.3, 3.8)	3.5 (2.8, 4.4)	4.4 (3.6, 5.4)	5.9 (4.8, 7.1)	6.5 (5.3, 7.9)
ASA 3	77	1757	2.1 (1.5, 2.9)	3.2 (2.4, 4.2)	3.7 (2.9, 4.8)	4.8 (3.8, 6.0)	5.7 (4.5, 7.2)	5.9 (4.7, 7.5)
ASA 4	2	49	2.2 (0.3, 14.4)	2.2 (0.3, 14.4)	2.2 (0.3, 14.4)	2.2 (0.3, 14.4)	8.3 (1.8, 33.3)	
ASA 5	0	1						
TOTAL	212	4535						

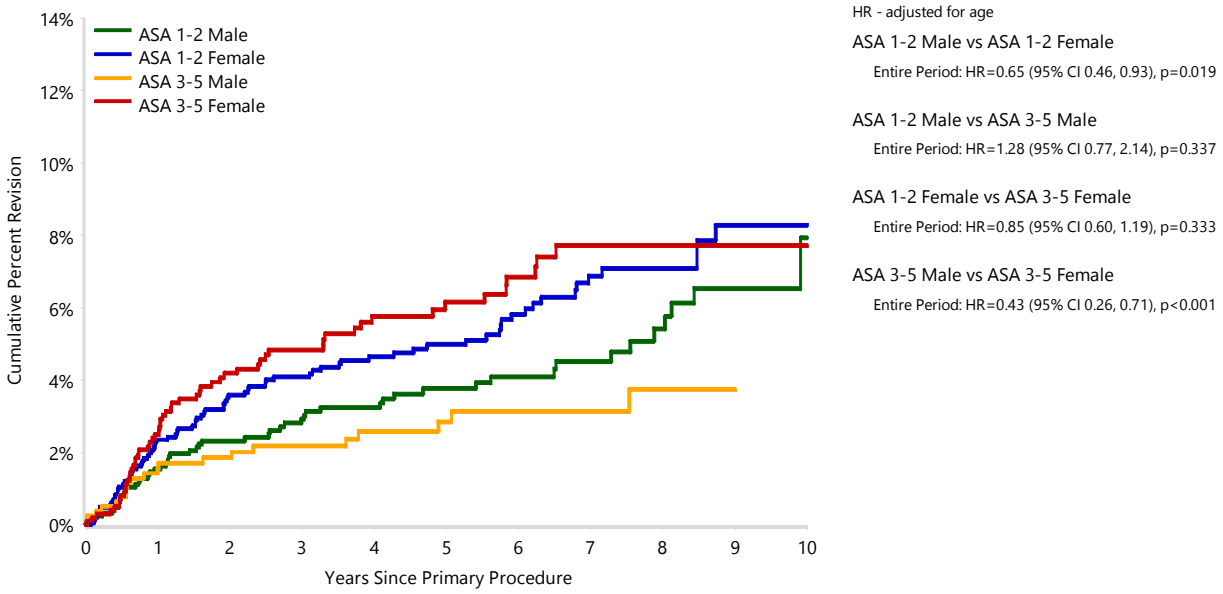
Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST51 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score and Gender (Primary Diagnosis OA)

ASA Score	Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ASA 1	Male	9	176	1.7 (0.6, 5.3)	3.0 (1.3, 7.0)	3.0 (1.3, 7.0)	4.7 (2.2, 9.7)	5.9 (2.9, 11.7)	5.9 (2.9, 11.7)
	Female	5	119	3.5 (1.3, 9.1)	3.5 (1.3, 9.1)	4.6 (1.9, 10.7)	4.6 (1.9, 10.7)		
ASA 2	Male	44	1101	1.5 (0.9, 2.5)	2.2 (1.5, 3.3)	2.9 (2.0, 4.2)	3.6 (2.6, 5.0)	4.3 (3.1, 6.0)	5.4 (3.8, 7.6)
	Female	75	1332	2.2 (1.6, 3.2)	3.6 (2.7, 4.8)	4.0 (3.1, 5.3)	5.0 (3.9, 6.4)	7.1 (5.6, 9.0)	7.3 (5.7, 9.3)
ASA 3	Male	20	772	1.5 (0.8, 2.6)	1.8 (1.0, 3.0)	2.1 (1.3, 3.5)	2.8 (1.8, 4.5)	3.1 (1.9, 4.9)	3.7 (2.2, 6.1)
	Female	57	985	2.6 (1.7, 3.8)	4.3 (3.1, 5.8)	4.9 (3.7, 6.6)	6.3 (4.8, 8.2)	7.6 (5.8, 9.9)	7.6 (5.8, 9.9)
ASA 4 or 5	Male	1	23	4.3 (0.6, 27.1)	4.3 (0.6, 27.1)	4.3 (0.6, 27.1)	4.3 (0.6, 27.1)	4.3 (0.6, 27.1)	
	Female	1	27	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	10.0 (1.5, 52.7)	
TOTAL		212	4535						

Note: Restricted to modern prostheses

Figure ST26 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score and Gender (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ASA 1-2	Male	1277	1167	1059	929	654	387	269
	Female	1451	1329	1203	1074	795	455	304
ASA 3-5	Male	795	717	620	523	355	192	132
	Female	1012	899	794	675	482	265	190

Note: Restricted to modern prostheses

Table ST52 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Underweight	0	13	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
Normal	37	590	2.8 (1.8, 4.6)	4.4 (3.0, 6.5)	5.3 (3.7, 7.6)	5.8 (4.1, 8.3)	5.8 (4.1, 8.3)	7.5 (5.3, 10.5)
Pre Obese	53	1291	1.4 (0.9, 2.3)	2.7 (1.9, 3.8)	3.1 (2.2, 4.3)	3.7 (2.7, 5.0)	4.1 (3.0, 5.5)	4.6 (3.5, 6.2)
Obese Class 1	61	1241	2.5 (1.8, 3.6)	3.3 (2.4, 4.5)	3.9 (2.9, 5.1)	4.2 (3.2, 5.6)	4.8 (3.7, 6.3)	5.2 (4.0, 6.8)
Obese Class 2	27	633	2.0 (1.1, 3.5)	2.7 (1.6, 4.3)	2.9 (1.8, 4.6)	3.9 (2.5, 5.9)	4.2 (2.7, 6.3)	5.5 (3.6, 8.2)
Obese Class 3	15	341	2.2 (1.0, 4.5)	3.2 (1.7, 5.8)	3.9 (2.2, 6.8)	4.8 (2.9, 8.1)	4.8 (2.9, 8.1)	4.8 (2.9, 8.1)
TOTAL	193	4109						

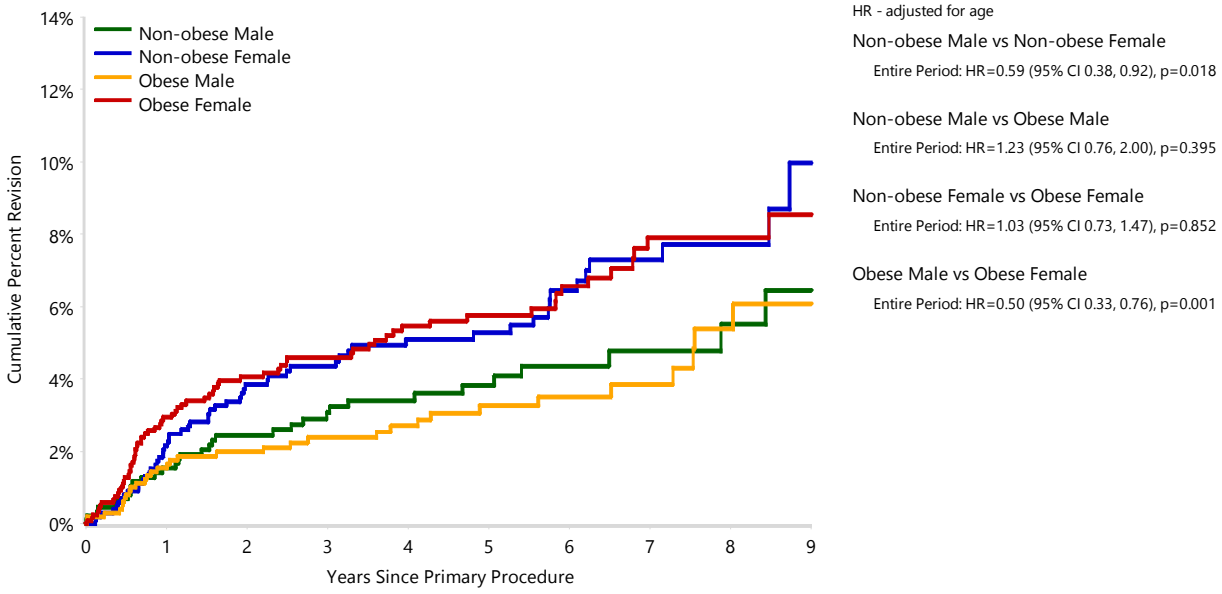
Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST53 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category and Gender (Primary Diagnosis OA)

BMI Category	Gender	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Non-obese	Male	33	875	1.5 (0.9, 2.6)	2.4 (1.6, 3.8)	3.1 (2.1, 4.6)	3.4 (2.3, 5.0)	3.8 (2.6, 5.5)	4.4 (3.0, 6.3)
	Female	57	1019	2.2 (1.4, 3.3)	3.8 (2.8, 5.3)	4.4 (3.2, 5.9)	5.1 (3.8, 6.8)	5.3 (4.0, 7.0)	6.4 (4.9, 8.5)
Obese	Male	33	1010	1.5 (0.9, 2.6)	2.0 (1.3, 3.1)	2.4 (1.6, 3.6)	2.7 (1.8, 4.0)	3.3 (2.2, 4.8)	3.5 (2.4, 5.1)
	Female	70	1205	2.9 (2.1, 4.1)	4.1 (3.1, 5.4)	4.6 (3.5, 6.0)	5.5 (4.2, 7.0)	5.8 (4.5, 7.4)	6.6 (5.1, 8.4)
TOTAL		193	4109						

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Figure ST27 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category and Gender (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Non-obese	Male	875	788	694	593	486	391	283
	Female	1019	916	811	692	576	485	356
Obese	Male	1010	913	806	683	571	457	343
	Female	1205	1078	958	833	711	584	439

Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤19 years

Table ST54 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Morphology (Primary Diagnosis OA)

Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
A1	54	1084	2.8 (1.9, 4.0)	3.7 (2.7, 5.1)	4.0 (2.9, 5.4)	4.4 (3.3, 6.0)	4.9 (3.6, 6.6)
A2	28	748	1.5 (0.9, 2.8)	2.8 (1.8, 4.4)	3.6 (2.4, 5.4)	4.1 (2.8, 6.1)	4.4 (3.0, 6.5)
B1	25	589	2.3 (1.4, 4.0)	3.4 (2.1, 5.3)	3.6 (2.3, 5.6)	4.8 (3.2, 7.3)	4.8 (3.2, 7.3)
B2	14	474	1.1 (0.5, 2.7)	1.9 (1.0, 3.8)	2.8 (1.6, 5.1)	3.2 (1.8, 5.7)	3.8 (2.2, 6.7)
C	1	88	1.2 (0.2, 8.4)	1.2 (0.2, 8.4)	1.2 (0.2, 8.4)	1.2 (0.2, 8.4)	1.2 (0.2, 8.4)
TOTAL	122	2983					

Note: Restricted to modern prostheses
Excludes 3 procedures with a recorded glenoid morphology of B3
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

There is no difference in the rate of revision when cemented and hybrid (glenoid cemented) fixation are compared. There are too few procedures using cementless fixation for a comparative analysis to be undertaken (analysis restricted to >100 procedures) (Table ST55).

Non-modular metal backed glenoids have a higher rate of revision than other polyethylene glenoids.

Glenoid Types and Bearing Surfaces

There are four types of glenoids, all with polyethylene bearing surface but differing methods of fixation to bone. Non-modular metal back glenoids have a polyethylene bearing surface with backside integrated metallic coating. Hybrid metal/polyethylene glenoids have a polyethylene bearing surface and one or more metallic fixation pegs. Cemented polyethylene glenoids with a modified central peg are all polyethylene but the central peg is further engineered for additional fixation to bone. All polyethylene glenoids are polyethylene fixed by cemented pegs or keels alone without further fixation features.

Modified central peg glenoids have a lower rate of revision compared to hybrid metal/polyethylene glenoids, cemented all polyethylene glenoids and non-modular metal backed glenoids for the first 6 months only (Table ST56 and Figure ST28).

Procedures with a metal/XLPE bearing surface (humeral head/glenoid) have a lower rate of revision compared to procedures with a metal/non XLPE bearing surface (Table ST57 and Figure ST29).

Metal/XLPE bearing surface has a lower rate of revision than metal/non XLPE.

Humeral Head Size

Humeral heads >50mm have a lower rate of revision compared to both <44mm and 44–50mm (Table ST58 and Figure ST30). When stratified by polyethylene type, both humeral sizes 44-50mm and >50mm, when combined with non XLPE polyethylene glenoids, have higher rates of revision than similar head sizes articulating with XLPE polyethylene glenoids (Table ST59, Figure ST31 and Figure ST32). The cumulative incidence revision diagnosis for the most common reasons for humeral head size revision is shown in Figure ST33.

Humeral head sizes <44mm have the highest rate of revision compared to ≥44mm head sizes.

Table ST55 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented	15	393	1.3 (0.6, 3.2)	3.1 (1.8, 5.6)	3.1 (1.8, 5.6)	6.2 (3.3, 11.5)		
Cementless	10	65	6.5 (2.5, 16.5)	10.2 (4.7, 21.3)	13.0 (6.3, 25.8)	13.0 (6.3, 25.8)		
Hybrid (Glenoid Cemented)	243	4662	2.0 (1.6, 2.4)	3.5 (3.0, 4.1)	4.7 (4.1, 5.4)	5.8 (5.0, 6.6)	7.4 (6.4, 8.6)	9.1 (7.6, 11.0)
TOTAL	268	5120						

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

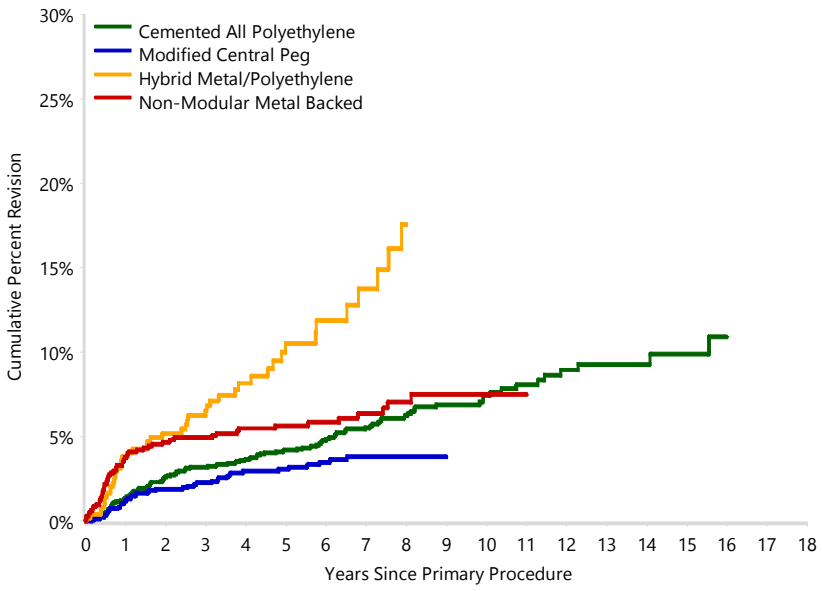
Primary Total Shoulder Replacement

Table ST56 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented All Polyethylene	121	2293	1.4 (0.9, 1.9)	3.2 (2.5, 4.1)	4.2 (3.4, 5.2)	5.5 (4.5, 6.8)	7.4 (6.1, 9.1)	9.3 (7.5, 11.5)
Modified Central Peg	42	1393	1.2 (0.7, 1.9)	2.3 (1.6, 3.2)	3.1 (2.2, 4.2)	3.8 (2.8, 5.2)		
Hybrid Metal/Polyethylene	50	497	3.8 (2.4, 6.0)	6.5 (4.6, 9.3)	10.5 (7.6, 14.4)	13.8 (9.9, 19.0)		
Non-Modular Metal Backed	55	937	3.8 (2.7, 5.2)	4.9 (3.7, 6.6)	5.7 (4.3, 7.4)	6.4 (4.8, 8.3)	7.5 (5.6, 10.0)	
TOTAL	268	5120						

Note: Restricted to modern prostheses

Figure ST28 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)



HR - adjusted for age and gender

Cemented All Polyethylene vs Modified Central Peg

Entire Period: HR=1.59 (95% CI 1.11, 2.27), p=0.011

Hybrid Metal/Polyethylene vs Modified Central Peg

Entire Period: HR=3.69 (95% CI 2.43, 5.59), p<0.001

Non-Modular Metal Backed vs Modified Central Peg

0 - 6Mth: HR=6.01 (95% CI 3.13, 11.55), p<0.001

6Mth+: HR=1.32 (95% CI 0.84, 2.08), p=0.224

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented All Polyethylene	2293	2110	1679	1292	865	500	158
Modified Central Peg	1393	1294	1030	785	500	15	0
Hybrid Metal/Polyethylene	497	435	320	173	86	10	0
Non-Modular Metal Backed	937	842	717	549	324	77	1

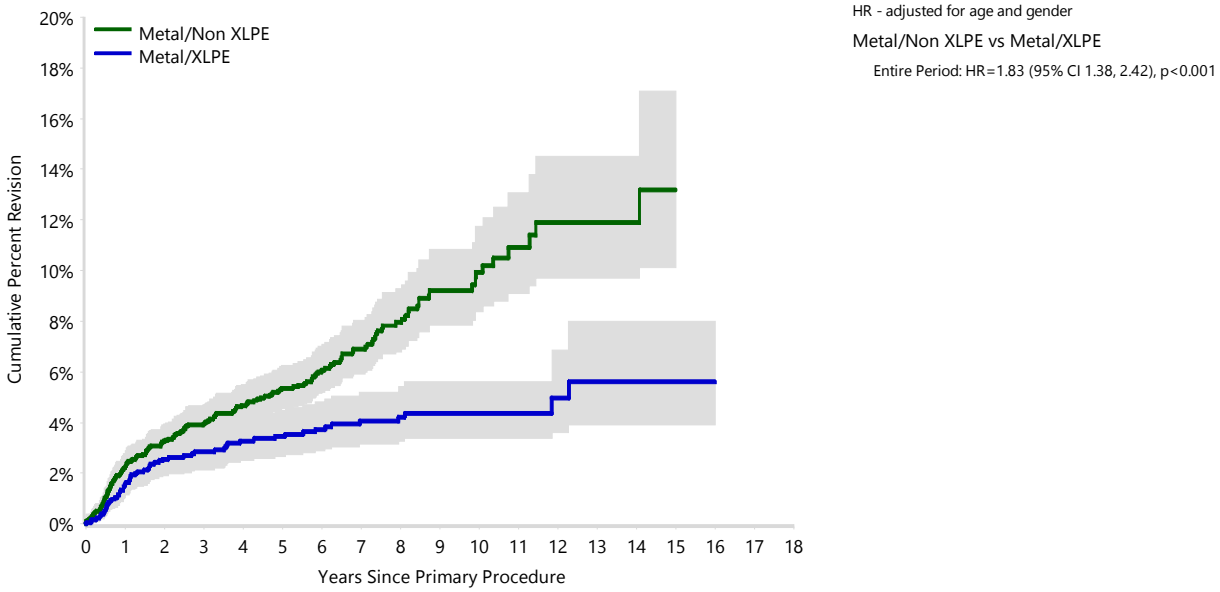
Note: Restricted to modern prostheses

Table ST57 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Ceramic/XLPE	1	1						
Metal/Non XLPE	201	3338	2.2 (1.8, 2.8)	3.9 (3.3, 4.7)	5.4 (4.6, 6.3)	6.9 (5.9, 8.0)	9.9 (8.4, 11.7)	11.9 (9.7, 14.5)
Metal/XLPE	66	1781	1.6 (1.1, 2.3)	2.8 (2.1, 3.8)	3.4 (2.7, 4.5)	4.1 (3.2, 5.2)	4.4 (3.4, 5.6)	5.6 (3.9, 8.0)
TOTAL	268	5120						

Note: Restricted to modern prostheses. Reported as humeral head/glenoid.

Figure ST29 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Metal/Non XLPE	3338	3036	2383	1694	978	362	68
Metal/XLPE	1781	1644	1363	1105	797	240	91

Note: Restricted to modern prostheses. Reported as humeral head/glenoid.

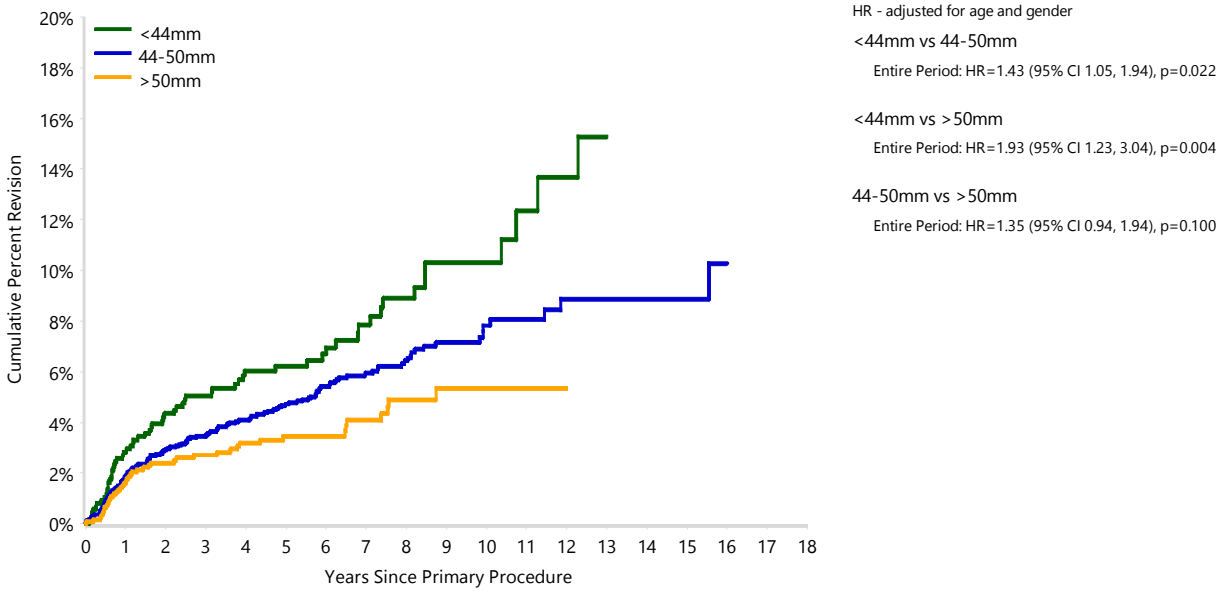
Primary Total Shoulder Replacement

Table ST58 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)

Humeral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<44mm	66	879	2.8 (1.9, 4.2)	5.0 (3.7, 6.8)	6.2 (4.7, 8.2)	7.9 (6.0, 10.3)	10.3 (7.8, 13.6)	
44-50mm	158	3005	1.9 (1.5, 2.5)	3.5 (2.9, 4.2)	4.7 (4.0, 5.6)	5.9 (5.0, 7.0)	7.8 (6.5, 9.4)	8.9 (7.2, 10.9)
>50mm	44	1234	1.6 (1.0, 2.5)	2.7 (1.9, 3.8)	3.5 (2.5, 4.8)	4.1 (3.0, 5.6)	5.3 (3.8, 7.5)	
TOTAL	268	5118						

Note: Restricted to modern prostheses
Excludes 2 procedures with unknown head size

Figure ST30 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<44mm	879	793	630	463	281	116	28
44-50mm	3005	2764	2222	1685	1093	393	109
>50mm	1234	1123	893	651	401	93	22

Note: Restricted to modern prostheses
Excludes 2 procedures with unknown head size

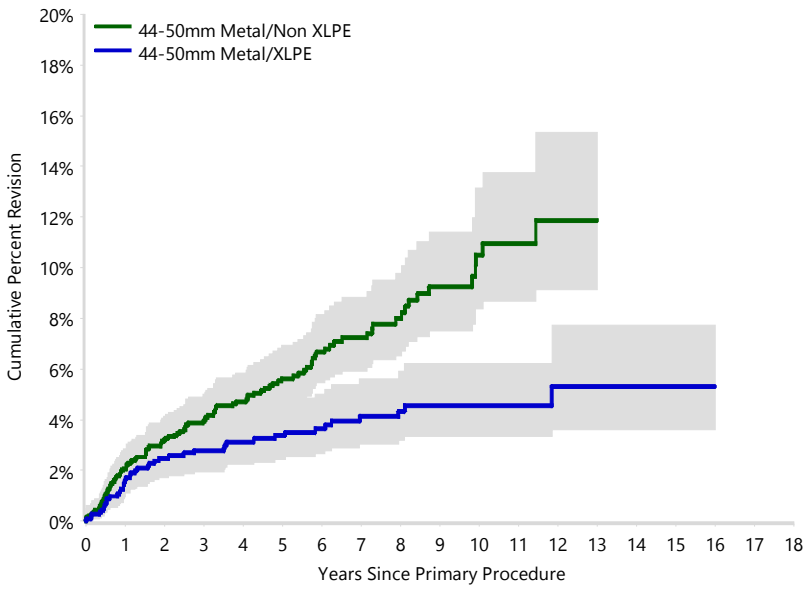
Table ST59 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)

Humeral Head Size	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
<44mm	Ceramic/XLPE	1	1						
	Metal/Non XLPE	54	764	2.8 (1.9, 4.3)	4.7 (3.3, 6.5)	5.9 (4.3, 8.0)	7.5 (5.5, 10.2)	10.4 (7.7, 14.1)	
	Metal/XLPE	11	114	2.7 (0.9, 8.1)	6.5 (3.2, 13.2)	7.7 (3.9, 14.8)	9.2 (4.8, 17.1)		
44-50mm	Metal/Non XLPE	115	1856	2.1 (1.5, 2.8)	3.9 (3.1, 5.0)	5.6 (4.6, 6.9)	7.2 (5.9, 8.8)	10.5 (8.4, 13.1)	
	Metal/XLPE	43	1149	1.6 (1.0, 2.6)	2.8 (2.0, 4.0)	3.4 (2.4, 4.7)	4.1 (3.0, 5.6)	4.6 (3.3, 6.2)	5.3 (3.6, 7.7)
>50mm	Metal/Non XLPE	32	717	1.9 (1.1, 3.2)	3.2 (2.1, 4.8)	4.1 (2.8, 6.1)	5.3 (3.6, 7.9)	7.8 (5.1, 11.7)	
	Metal/XLPE	12	517	1.2 (0.5, 2.7)	2.1 (1.1, 3.9)	2.6 (1.5, 4.6)	2.6 (1.5, 4.6)		
TOTAL		268	5118						

Note: Restricted to modern prostheses

<44mm head size comparison Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST31 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)



HR - adjusted for age and gender

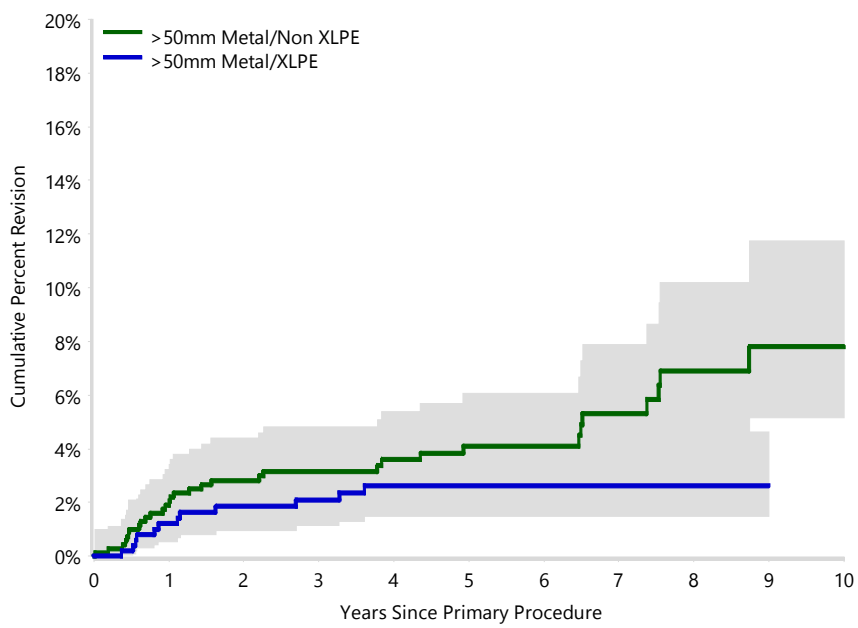
44-50mm Metal/Non XLPE vs 44-50mm Metal/XLPE

Entire Period: HR=1.95 (95% CI 1.37, 2.79), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
44-50mm	Metal/Non XLPE	1856	1699	1331	942	541	205	39
	Metal/XLPE	1149	1065	891	743	552	188	70

Note: Restricted to modern prostheses

Figure ST32 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)



HR - adjusted for age and gender

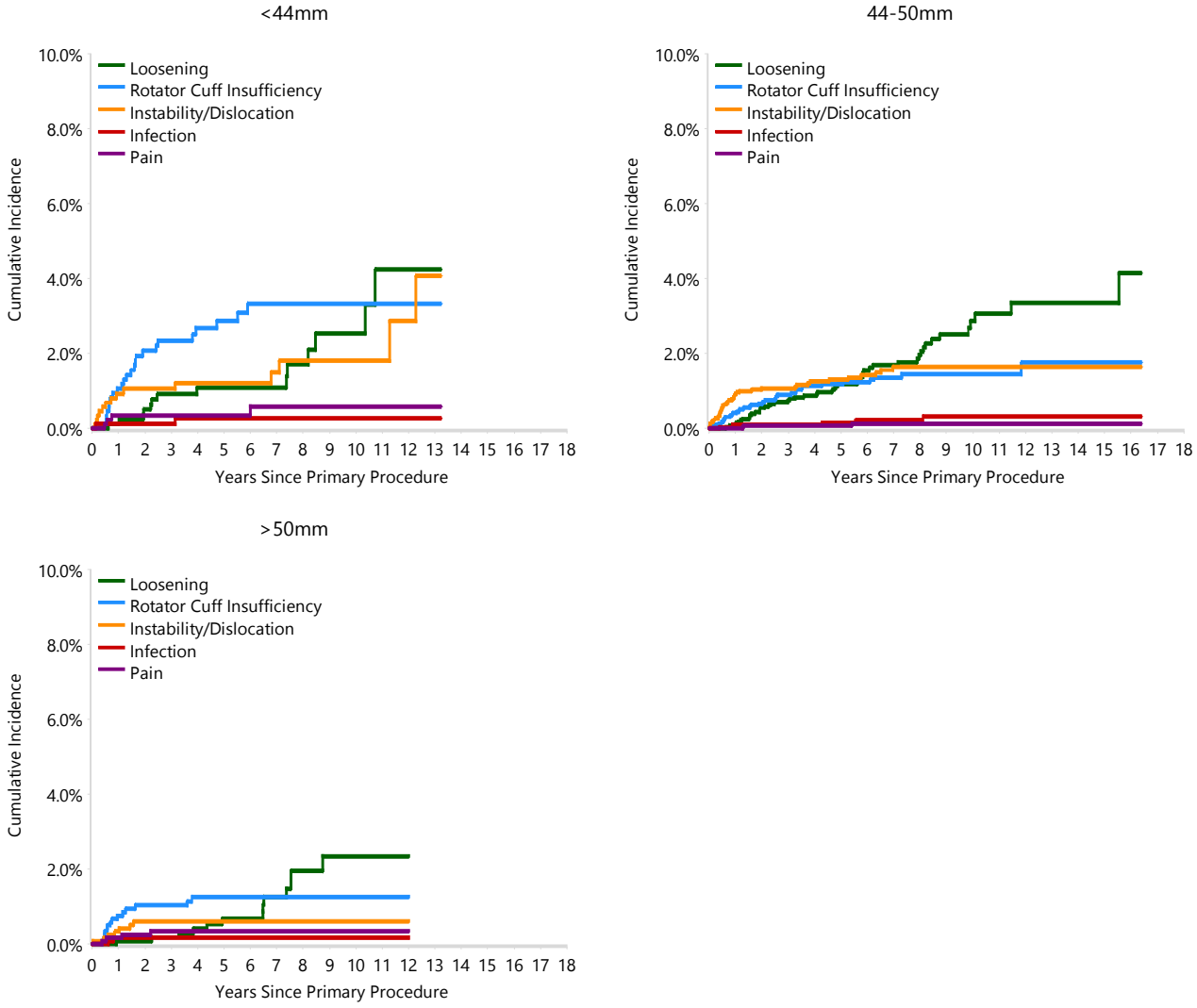
>50mm Metal/Non XLPE vs >50mm Metal/XLPE

Entire Period: HR=2.04 (95% CI 1.03, 4.03), p=0.040

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
>50mm	Metal/Non XLPE	717	648	512	355	201	56	8
	Metal/XLPE	517	475	381	296	200	37	14

Note: Restricted to modern prostheses

Figure ST33 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Augmentation

A glenoid component is categorised as augmented if the backside has been modified for glenoid deformity (e.g. wedged, stepped, angulated, or lateralised). Augmented glenoids have a higher rate of revision than non-augmented prostheses (Table ST60 and Figure ST34). The reasons for revision are shown in Figure ST35. There is no difference between augmented and non-augmented glenoids with differing glenoid morphology classes (Table ST61).

Humeral Stem Length

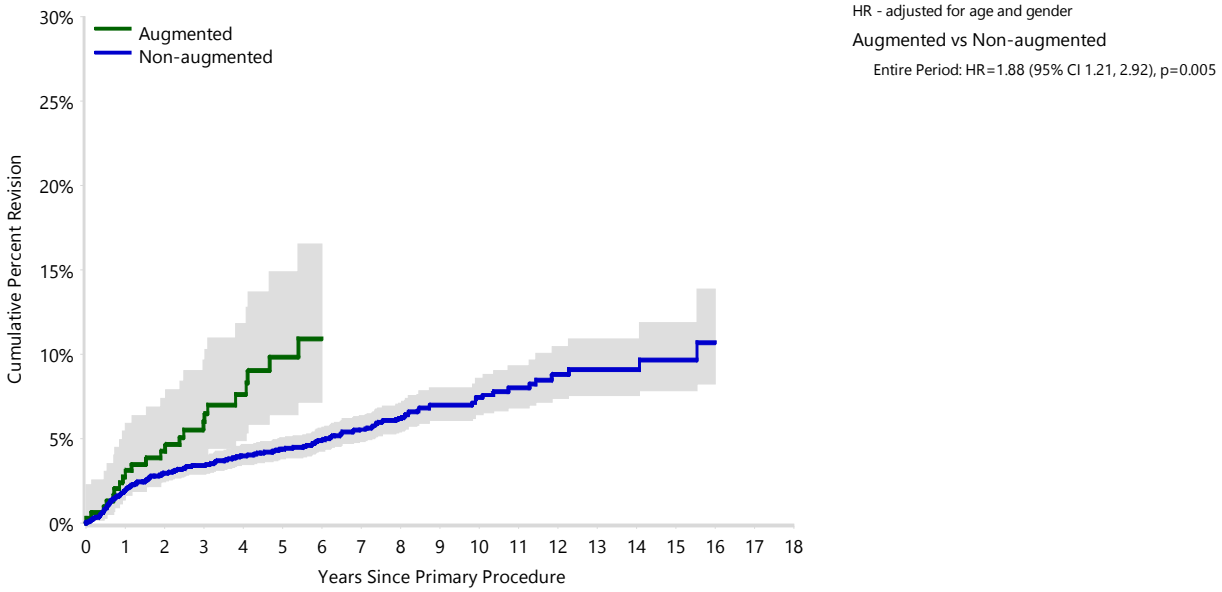
Humeral stem length is categorised as short if the size is <100mm or conventional if the size is ≥100mm. Humeral stem length is a revision risk for a short stem up to 9 months and a conventional stem after 1.5 years (Table ST62, Figure ST36 and Figure ST37).

Table ST60 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Augmented	23	307	2.8 (1.4, 5.4)	6.0 (3.7, 9.7)	9.8 (6.4, 14.9)			
Non-augmented	245	4799	1.9 (1.6, 2.4)	3.4 (2.9, 4.0)	4.4 (3.8, 5.1)	5.6 (4.8, 6.4)	7.4 (6.4, 8.6)	9.1 (7.6, 10.9)
TOTAL	268	5106						

Note: Restricted to modern prostheses.

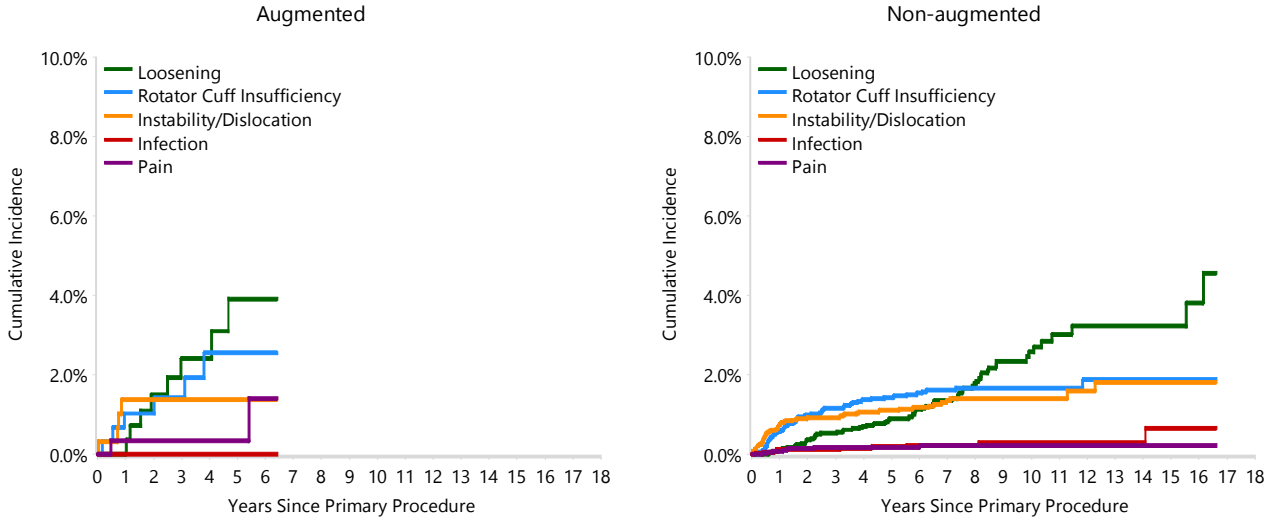
Figure ST34 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Augmented	307	271	192	103	27	0	0
Non-augmented	4799	4407	3554	2696	1748	602	159

Note: Restricted to modern prostheses

Figure ST35 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table ST61 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Morphology and Glenoid Augmentation (Primary Diagnosis OA)

Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
A	Augmented	5	54	1.9 (0.3, 12.6)	6.0 (2.0, 17.4)	8.6 (3.3, 21.5)	8.6 (3.3, 21.5)	12.9 (5.3, 29.9)
	Non-augmented	77	1767	2.3 (1.7, 3.1)	3.3 (2.5, 4.3)	3.7 (2.9, 4.8)	4.2 (3.3, 5.3)	4.5 (3.5, 5.7)
B	Augmented	9	179	1.8 (0.6, 5.6)	2.5 (1.0, 6.6)	3.3 (1.4, 7.9)	5.5 (2.6, 11.5)	7.1 (3.4, 14.3)
	Non-augmented	30	881	1.8 (1.1, 3.0)	2.8 (1.8, 4.2)	3.2 (2.2, 4.8)	3.9 (2.7, 5.6)	3.9 (2.7, 5.6)
C	Augmented	0	25	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
	Non-augmented	1	63	1.7 (0.2, 11.4)	1.7 (0.2, 11.4)	1.7 (0.2, 11.4)	1.7 (0.2, 11.4)	1.7 (0.2, 11.4)
TOTAL		122	2969					

Note: Restricted to modern prostheses
Excludes 2,151 procedures with unknown glenoid augmentation or glenoid morphology
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

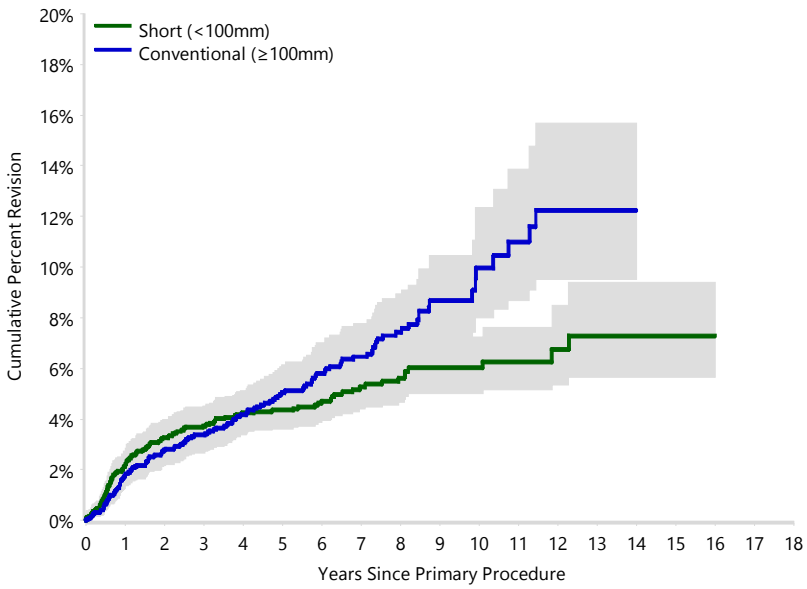
Primary Total Shoulder Replacement

Table ST62 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)

Humeral Stem Length	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Short (<100mm)	132	2889	2.2 (1.7, 2.8)	3.7 (3.1, 4.5)	4.3 (3.6, 5.2)	5.3 (4.4, 6.3)	6.0 (5.0, 7.3)	7.3 (5.6, 9.4)
Conventional (≥100mm)	136	2226	1.8 (1.3, 2.4)	3.4 (2.7, 4.2)	5.1 (4.1, 6.2)	6.5 (5.4, 7.8)	10.0 (8.0, 12.4)	12.2 (9.5, 15.7)
TOTAL	268	5115						

Note: Excludes 5 procedures with unknown humeral stem length
Restricted to modern prostheses

Figure ST36 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)

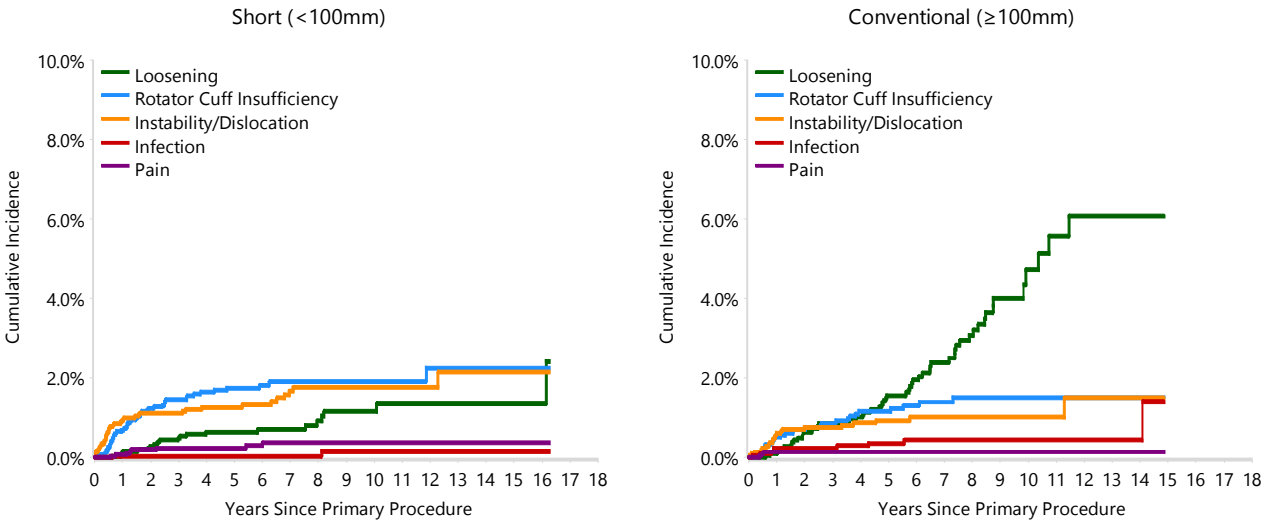


HR - adjusted for age and gender
Short (<100mm) vs Conventional (≥100mm)
0 - 9Mth: HR=1.61 (95% CI 1.00, 2.60), p=0.049
9Mth - 1.5Yr: HR=0.96 (95% CI 0.54, 1.70), p=0.891
1.5Yr+: HR=0.51 (95% CI 0.36, 0.71), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Short (<100mm)	2889	2592	2056	1510	918	399	100
Conventional (≥100mm)	2226	2088	1690	1289	857	203	59

Note: Excludes 5 procedures with unknown humeral stem length
Restricted to modern prostheses

Figure ST37 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

SURGEON ASSISTIVE TOOLS (SAT)

An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient. There are 863 total stemmed anatomic shoulder replacements for osteoarthritis utilising an IDI since their first use in 2014.

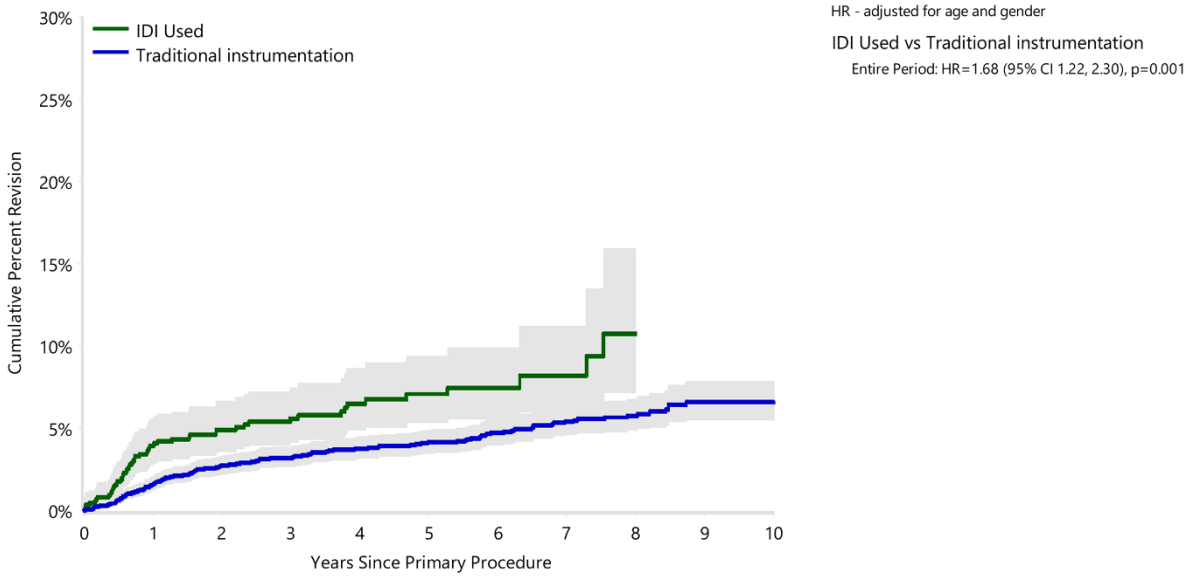
In 2024, IDI are used in 30.2% of total stemmed anatomic shoulder replacement procedures. There is an increase in the revision rate associated with IDI usage (Table ST63 and Figure ST38). IDI usage and glenoid morphology are listed in Table ST64. There is no difference in the rate of revision for IDI by glenoid morphology.

Table ST63 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage (Primary Diagnosis OA)

IDI Use	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI Used	53	863	3.9 (2.8, 5.5)	4.9 (3.6, 6.7)	5.6 (4.2, 7.5)	7.1 (5.3, 9.4)	8.2 (6.0, 11.2)	10.7 (7.2, 15.9)	
Traditional instrumentation	164	3685	1.6 (1.2, 2.1)	2.7 (2.2, 3.3)	3.2 (2.7, 3.9)	4.1 (3.5, 4.9)	5.4 (4.6, 6.4)	5.8 (4.9, 6.8)	6.6 (5.5, 7.8)
TOTAL	217	4548							

Note: Restricted to modern prostheses

Figure ST38 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI Used	863	734	634	503	264	89	43	22
Traditional Instrumentation	3685	3388	3050	2705	2026	1205	844	483

Note: Restricted to modern prostheses

Table ST64 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI Used	A1	10	195	4.4 (2.2, 8.6)	5.0 (2.6, 9.4)	5.0 (2.6, 9.4)	5.0 (2.6, 9.4)			
	A2	12	199	3.2 (1.4, 7.0)	4.4 (2.2, 8.6)	5.3 (2.8, 10.1)	8.1 (4.3, 14.9)			
	B1	10	137	3.9 (1.7, 9.2)	3.9 (1.7, 9.2)	4.9 (2.2, 10.7)				
	B2	8	170	2.6 (1.0, 6.8)	3.4 (1.4, 8.1)	5.3 (2.5, 10.8)	7.2 (3.4, 14.7)			
	C	0	34	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
Traditional Instrumentation	A1	44	889	2.5 (1.6, 3.7)	3.5 (2.4, 5.0)	3.8 (2.7, 5.3)	4.8 (3.5, 6.7)	7.5 (5.3, 10.4)		
	A2	16	549	1.0 (0.4, 2.3)	2.2 (1.2, 4.0)	3.0 (1.8, 5.1)	3.3 (2.0, 5.5)	4.3 (2.4, 7.7)		
	B1	15	452	1.9 (0.9, 3.7)	3.2 (1.9, 5.4)	3.2 (1.9, 5.4)	3.6 (2.1, 6.1)	5.3 (2.6, 10.8)		
	B2	6	304	0.4 (0.1, 2.5)	1.1 (0.4, 3.4)	1.6 (0.6, 4.2)	2.2 (0.9, 5.2)			
	C	1	54	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)			
TOTAL		122	2983							

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OPERATIVE TECHNIQUE

Rotator Cuff Repair

When the rotator cuff is repaired as part of a primary total stemmed anatomic replacement procedure, there is no difference in the rate of revision compared to when it is not repaired (Table ST65).

Table ST65 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis OA)

Rotator Cuff Repair	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Yes	6	226	2.7 (1.1, 6.5)					
No	13	566	2.1 (1.2, 4.0)	3.0 (1.8, 5.2)				
TOTAL	19	792						

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcome of the most used (>50 procedures) prosthesis combinations are listed in Table ST66. The most commonly used cementless prosthesis combinations are listed in Table ST67. The most commonly used prosthesis combinations with hybrid (glenoid cemented) fixation are listed in Table ST68.

Table ST66 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Affinis	Affinis	21	198	0.0 (0.0, 0.0)	2.2 (0.8, 5.7)	5.0 (2.7, 9.5)	6.3 (3.5, 11.0)	8.9 (5.4, 14.3)	12.0 (7.8, 18.3)
Ascend Flex	Perform	40	1385	0.9 (0.5, 1.6)	2.2 (1.5, 3.2)	2.7 (1.9, 3.9)	4.1 (2.8, 5.8)	4.9 (3.3, 7.0)	
Comprehensive	Alliance	2	54	4.6 (1.2, 17.3)	4.6 (1.2, 17.3)				
	Comprehensive	55	930	3.8 (2.7, 5.2)	5.0 (3.7, 6.6)	5.7 (4.3, 7.5)	6.4 (4.8, 8.4)	7.5 (5.6, 10.0)	
Equinoxe	Equinoxe	80	726	3.1 (2.0, 4.6)	6.3 (4.7, 8.4)	9.6 (7.4, 12.3)	12.8 (10.0, 16.4)	24.2 (18.1, 32.0)	
Global Unite	Global	32	1277	1.1 (0.7, 1.9)	1.9 (1.3, 2.9)	2.5 (1.7, 3.6)	3.1 (2.2, 4.4)		
SMR	SMR	36	533	2.3 (1.3, 4.0)	4.9 (3.4, 7.2)	5.6 (3.9, 8.0)	6.4 (4.5, 9.0)	7.0 (5.0, 9.7)	8.0 (5.7, 11.3)
Other (4)		2	17	19.2 (5.1, 57.7)	19.2 (5.1, 57.7)	19.2 (5.1, 57.7)			
TOTAL		268	5120						

Note: Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Table ST67 Cumulative Percent Revision of Cementless Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Equinoxe	Equinoxe	10	56	7.1 (2.7, 17.9)	11.0 (5.1, 22.8)	13.8 (6.7, 27.3)	13.8 (6.7, 27.3)		
Other (3)		0	9	0.0 (0.0, 0.0)					
TOTAL		10	65						

Note: Restricted to modern prostheses
Only prostheses with >10 procedures have been listed

Table ST68 Cumulative Percent Revision of Hybrid (Glenoid Cemented) Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Affinis	Affinis	20	186	0.0 (0.0, 0.0)	1.7 (0.6, 5.2)	4.7 (2.4, 9.1)	5.9 (3.2, 10.7)	8.6 (5.2, 14.1)	11.7 (7.5, 18.1)
Ascend Flex	Perform	34	1189	0.9 (0.5, 1.6)	2.2 (1.5, 3.3)	2.9 (2.0, 4.1)	3.8 (2.6, 5.4)	4.1 (2.8, 6.0)	
Comprehensive	Alliance	2	53	4.7 (1.2, 17.7)	4.7 (1.2, 17.7)				
	Comprehensive	55	919	3.8 (2.7, 5.3)	5.0 (3.8, 6.7)	5.7 (4.4, 7.5)	6.5 (4.9, 8.5)	7.6 (5.7, 10.1)	
Equinoxe	Equinoxe	68	640	2.7 (1.7, 4.3)	5.8 (4.2, 8.0)	9.3 (7.1, 12.2)	13.1 (10.1, 17.1)	24.2 (17.5, 32.9)	
Global Unite	Global	29	1145	1.1 (0.6, 1.9)	1.9 (1.2, 2.9)	2.5 (1.7, 3.7)	3.1 (2.2, 4.5)		
SMR	SMR	33	513	2.4 (1.4, 4.2)	4.7 (3.2, 7.0)	5.4 (3.7, 7.8)	5.9 (4.1, 8.5)	6.5 (4.6, 9.3)	7.7 (5.3, 10.9)
Other (4)		2	17	19.2 (5.1, 57.7)	19.2 (5.1, 57.7)	19.2 (5.1, 57.7)			
TOTAL		243	4662						

Note: Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Primary Total Shoulder Replacement

Primary Total Stemless Reverse Shoulder Replacement

There are 68 total stemless reverse shoulder replacements performed since 2015 (Table ST69). This procedure is predominantly undertaken in males for the treatment of osteoarthritis or rotator cuff arthropathy (Table ST70). CPR at 4 years is 3.1% and there have been 2 revisions (Table ST71).

Table ST69 Age and Gender of Primary Total Stemless Reverse Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	47	69.1%	44	79	69	68.3	6.0
Female	21	30.9%	52	82	70	70.0	6.3
TOTAL	**68**	**100.0%**	**44**	**82**	**69**	**68.8**	**6.1**

Table ST70 Primary Total Stemless Reverse Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Osteoarthritis	36	52.9
Rotator Cuff Arthropathy	30	44.1
Fracture	1	1.5
Rheumatoid Arthritis	1	1.5
TOTAL	**68**	**100.0**

Table ST71 Cumulative Percent Revision of Primary Total Stemless Reverse Shoulder Replacement (All Diagnoses)

Shoulder Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs
Total Stemless Reverse	2	68	1.5 (0.2, 10.0)	3.0 (0.8, 11.4)	3.0 (0.8, 11.4)	3.0 (0.8, 11.4)
TOTAL	**2**	**68**				

Primary Total Stemmed Reverse Shoulder Replacement

DEMOGRAPHICS

There are 66,607 primary total stemmed reverse shoulder replacement procedures. This is an increase of 9,257 procedures compared to the previous report.

For further information on the closure of the database please see the **Glossary** of this report.

Osteoarthritis is the most common diagnosis for primary total stemmed reverse shoulder replacement followed by rotator cuff arthropathy, and fracture (Figure ST39).

Primary total stemmed reverse shoulder replacement is more commonly undertaken in females, with females older on average than males (Table ST72). The percentage of male patients has increased by 5.2% compared to 2016.

The proportional use in patients aged ≥75 years has declined in recent years and is now similar to the proportional use in the 65–74 year age group.

The majority of procedures use cementless fixation followed by hybrid (humerus cemented) fixation. There has been little variation in the type of fixation used since 2008 (Figure ST40).

The polyethylene type used in total stemmed reverse shoulder replacement in 2024 is now almost equal in proportion between XLPE (49.2%) and non XLPE (50.8%) (Figure ST41).

The most commonly used humeral stems are listed in Table ST73. The most used glenoid prostheses are listed in Table ST74.

The most common primary diagnoses are osteoarthritis, rotator cuff arthropathy, and fracture.

Figure ST39 Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

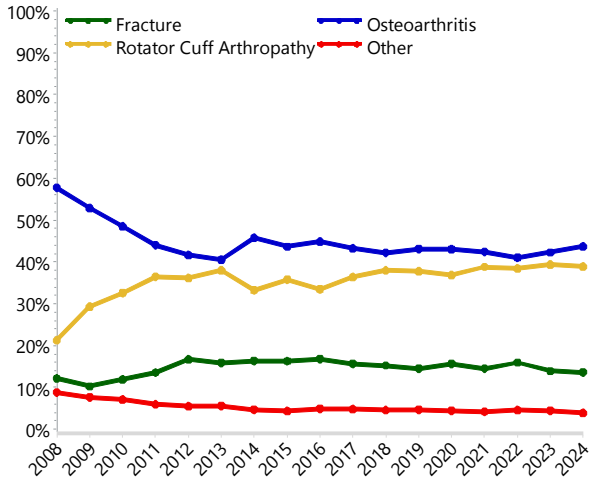


Table ST72 Age and Gender of Primary Total Stemmed Reverse Shoulder Replacement

Gender	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	25664	38.5%	14	100	72	71.9	8.3
Female	40943	61.5%	12	103	75	74.5	7.9
TOTAL	**66607**	**100.0%**	**12**	**103**	**74**	**73.5**	**8.2**

Primary Total Shoulder Replacement

Figure ST40 Total Stemmed Reverse Shoulder Replacement by Fixation

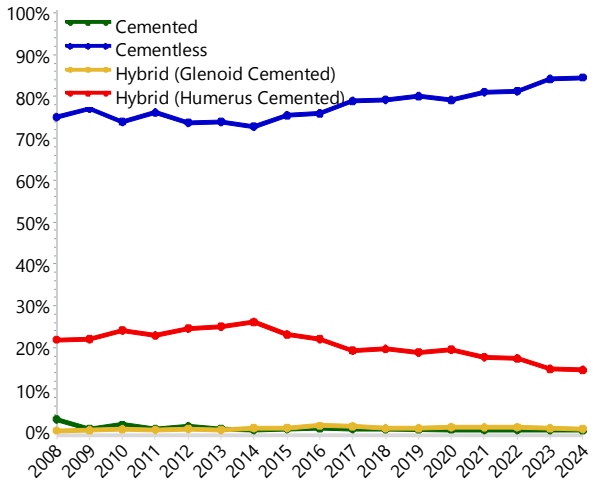


Figure ST41 Primary Total Stemmed Reverse Shoulder Replacement by Polyethylene Type

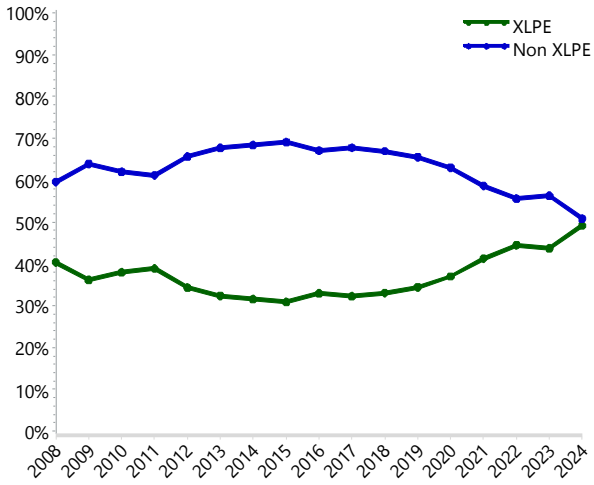


Table ST73 10 Most Used Humeral Stem Prostheses in Primary Total Stemmed Reverse Shoulder Replacement

2008		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
263	SMR	1234	SMR	1290	Comprehensive	1736	Comprehensive	2080	Comprehensive
252	Delta Xtend	1068	Comprehensive	1118	SMR	1359	Ascend Flex	1545	Ascend Flex
76	Aequalis	958	Equinoxe	1058	Equinoxe	1347	Equinoxe	1257	Equinoxe
42	Trabecular Metal	761	Ascend Flex	895	Ascend Flex	1088	SMR	1076	SMR
21	Delta CTA	711	Delta Xtend	692	Delta Xtend	773	Delta Xtend	821	AltiVate Reverse
2	Custom Made (Lima)	536	AltiVate Reverse	549	AltiVate Reverse	714	AltiVate Reverse	791	Delta Xtend
1	Generic Humeral Stem	344	Aequalis	387	Aequalis	363	Aequalis	332	Aequalis
1	Promos	294	Affinis	193	Global Unite	250	Global Unite	324	Global Unite
		246	Global Unite	149	Trabecular Metal	212	Trabecular Metal	296	MSS
		174	RSP	141	Affinis	114	Affinis	190	Trabecular Metal
10 Most Used									
658	(8) 100.0%	6326	(10) 96.1%	6472	(10) 96.7%	7956	(10) 96.7%	8712	(10) 98.0%
Remainder									
0	(0) 0%	254	(8) 3.9%	224	(7) 3.3%	269	(8) 3.3%	182	(8) 2.0%
TOTAL									
658	(8) 100.0%	6580	(18) 100.0%	6696	(17) 100.0%	8225	(18) 100.0%	8894	(18) 100.0%

Table ST74 10 Most Used Glenoid Prostheses in Primary Total Stemmed Reverse Shoulder Replacement

2008		2021		2022		2023		2024	
N	Model	N	Model	N	Model	N	Model	N	Model
264	SMR L1	1191	SMR L1	1337	Comprehensive Reverse	1844	Comprehensive Reverse	2171	Comprehensive Reverse
252	Delta Xtend	1115	Comprehensive Reverse	1057	Equinoxe	1347	Equinoxe	1257	Equinoxe
76	Aequalis	956	Delta Xtend	1034	SMR L1	1021	Delta Xtend	1135	Perform Reversed
42	Trabecular Metal	956	Equinoxe	912	Aequalis	944	SMR L1	1114	Delta Xtend
21	Delta CTA	920	Aequalis	886	Delta Xtend	936	Aequalis	913	RSP
1	Generic Metaglene	733	RSP	691	RSP	826	RSP	902	SMR L1
1	Promos	293	Affinis	392	Perform Reversed	820	Perform Reversed	777	Aequalis
1	SMR	200	Perform Reversed	140	Affinis	118	SMR	296	MSS
		114	Trabecular Metal	95	Trabecular Metal	114	Affinis	155	SMR
		32	SMR Axioma	42	MSS	100	MSS	83	Trabecular Metal
10 Most Used									
658	(8) 100.0%	6510	(10) 98.9%	6586	(10) 98.4%	8070	(10) 98.1%	8803	(10) 99.0%
Remainder									
0	(0) 0%	70	(8) 1.1%	110	(7) 1.6%	155	(12) 1.9%	91	(12) 1.0%
TOTAL									
658	(8) 100.0%	6580	(18) 100.0%	6696	(17) 100.0%	8225	(22) 100.0%	8894	(22) 100.0%

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included in the analyses, unless clearly specified.

Procedures undertaken for instability, rheumatoid arthritis and rotator cuff arthropathy have a higher risk of revision compared to those undertaken for osteoarthritis. Fracture also has a higher rate of revision compared to osteoarthritis, but only in the first 3 months (Table ST75 and Figure ST42).

Reason for Revision

The main reasons for revision are instability/dislocation, infection, loosening, and fracture (Table ST76, Figure ST43 and Figure ST44). Since 2016, the proportion of revisions for instability/dislocation has increased by 16.6%, but infection and loosening have decreased by 12.2% and 9.3%, respectively.

Type of Revision

The most common types of revision involve replacement of the humeral component, replacement of the cup/head, cup only, and replacement of the humeral/glenoid (Table ST77). The majority of total stemmed reverse revisions are to a total stemmed reverse (87.2%) with 12.8% to anatomic shoulder replacement categories. Compared to 2016, humeral component revision increased by 12.3% and humerus/glenoid by 5.5%. In contrast, cup/head only revisions decreased by 1.7% and isolated glenoid components also decreased by 4.1%.

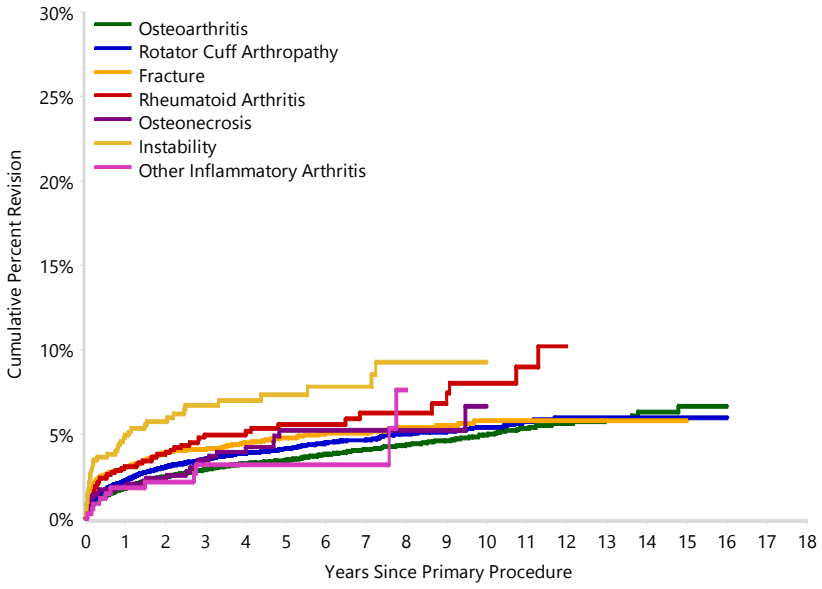
Primary Total Shoulder Replacement

Table ST75 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	898	27934	1.8 (1.7, 2.0)	2.9 (2.7, 3.2)	3.5 (3.2, 3.7)	4.1 (3.8, 4.4)	5.0 (4.6, 5.4)	6.3 (5.5, 7.3)
Rotator Cuff Arthropathy	885	24122	2.3 (2.1, 2.5)	3.5 (3.3, 3.8)	4.2 (3.9, 4.5)	4.7 (4.3, 5.0)	5.4 (5.0, 5.9)	6.0 (5.4, 6.6)
Fracture	406	9589	3.1 (2.7, 3.4)	4.1 (3.7, 4.6)	4.8 (4.3, 5.3)	5.1 (4.6, 5.6)	5.8 (5.1, 6.6)	5.8 (5.1, 6.6)
Rheumatoid Arthritis	54	1012	3.1 (2.2, 4.4)	5.0 (3.7, 6.6)	5.6 (4.2, 7.4)	6.3 (4.6, 8.4)	8.0 (5.7, 11.2)	
Osteonecrosis	29	710	1.9 (1.1, 3.2)	3.5 (2.3, 5.3)	5.2 (3.5, 7.7)	5.2 (3.5, 7.7)	6.7 (4.0, 11.1)	
Instability	44	637	5.0 (3.5, 7.0)	6.7 (4.9, 9.1)	7.4 (5.4, 10.0)	7.8 (5.7, 10.6)	9.3 (6.6, 12.9)	
Other Inflammatory Arthritis	11	340	1.8 (0.8, 4.0)	3.2 (1.7, 6.2)	3.2 (1.7, 6.2)	3.2 (1.7, 6.2)		
Other (2)	36	292	6.1 (3.8, 9.8)	14.0 (9.8, 19.9)	17.1 (12.0, 23.9)			
TOTAL	2363	64636						

Note: Only primary diagnoses with >300 procedures have been listed
Restricted to modern prostheses

Figure ST42 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



HR - adjusted for age and gender

Rotator Cuff Arthropathy vs Osteoarthritis
Entire Period: HR=1.13 (95% CI 1.03, 1.24), p=0.010

Fracture vs Osteoarthritis
0 - 3Mth: HR=2.65 (95% CI 2.25, 3.12), p<0.001
3Mth+: HR=1.16 (95% CI 0.99, 1.36), p=0.075

Rheumatoid Arthritis vs Osteoarthritis
Entire Period: HR=1.64 (95% CI 1.24, 2.16), p<0.001

Osteonecrosis vs Osteoarthritis
Entire Period: HR=1.33 (95% CI 0.92, 1.93), p=0.129

Instability vs Osteoarthritis
0 - 3Mth: HR=3.30 (95% CI 2.15, 5.06), p<0.001
3Mth+: HR=1.58 (95% CI 1.03, 2.41), p=0.035

Other Inflammatory Arthritis vs Osteoarthritis
Entire Period: HR=1.07 (95% CI 0.59, 1.94), p=0.817

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	27934	23352	16436	10750	6155	2235	388
Rotator Cuff Arthropathy	24122	19987	13594	8566	4691	1566	203
Fracture	9589	7875	5288	3272	1816	589	75
Rheumatoid Arthritis	1012	862	604	413	251	118	29
Osteonecrosis	710	600	410	284	159	50	11
Instability	637	503	341	226	138	56	12
Other Inflammatory Arthritis	340	290	184	104	57	18	4

Note: Only primary diagnoses with >300 procedures have been listed
Restricted to modern prostheses

Table ST76 Primary Total Stemmed Reverse Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Instability/Dislocation	747	31.6
Infection	608	25.7
Loosening	378	16.0
Fracture	257	10.9
Dissociation	84	3.6
Pain	49	2.1
Lysis	27	1.1
Arthrofibrosis	26	1.1
Malposition	25	1.1
Implant Breakage Glenoid	18	0.8
Incorrect Sizing	17	0.7
Heterotopic Bone	14	0.6
Metal Related Pathology	13	0.6
Rotator Cuff Insufficiency	9	0.4
Wear Humeral Cup	8	0.3
Implant Breakage Humeral	6	0.3
Tumour	5	0.2
Implant Breakage Glenoid Insert	3	0.1
Glenoid Erosion	2	0.1
Wear Glenoid Insert	1	0.0
Other	66	2.8
TOTAL	2363	100.0

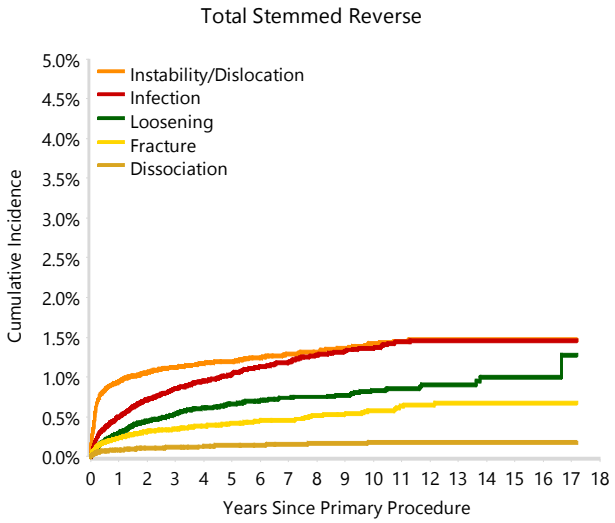
Note: Restricted to modern prostheses

Table ST77 Primary Total Stemmed Reverse Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral Component	625	26.4
Cup/Head	447	18.9
Cup Only	370	15.7
Humeral/Glenoid	234	9.9
Cement Spacer	217	9.2
Humeral Head Only	201	8.5
Glenoid Component	173	7.3
Removal of Prostheses	39	1.7
Minor Components	16	0.7
Glenosphere Only	15	0.6
Reoperation	10	0.4
Cement Only	10	0.4
Reinsertion of Components	4	0.2
Head/Insert	2	0.1
TOTAL	2363	100.0

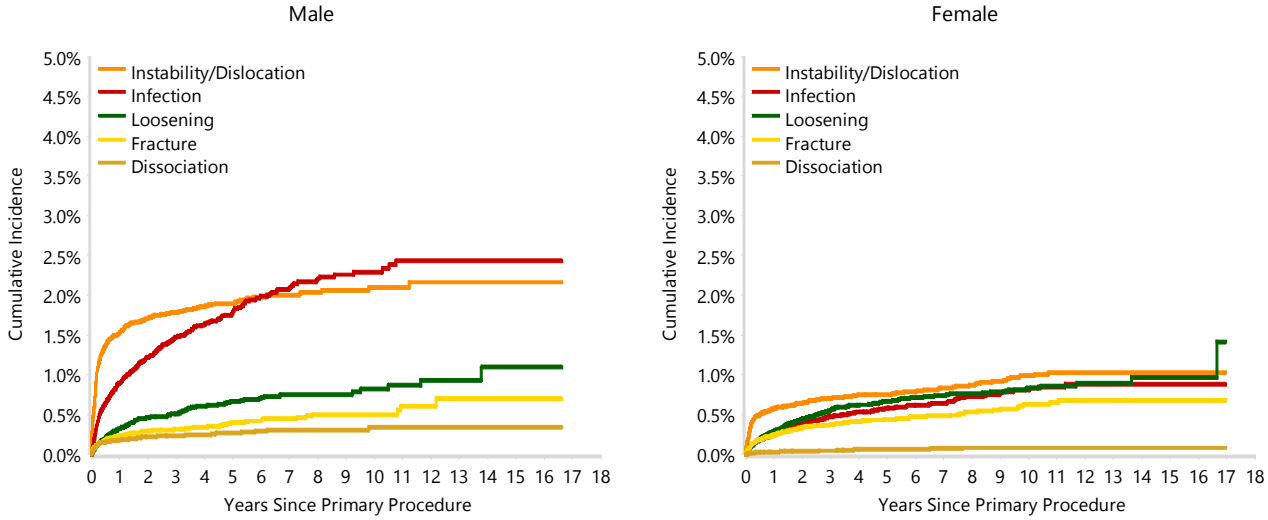
Note: Restricted to modern prostheses

Figure ST43 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement (All Diagnoses)



Note: Restricted to modern prostheses

Figure ST44 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Gender



Note: Restricted to modern prostheses

PROSTHESIS TYPES

The outcomes of humeral stem and glenoid prosthesis combinations (>50 procedures) used in primary total stemmed reverse shoulder replacement are listed in Table ST78. The most commonly used cementless prosthesis combinations are listed in Table ST79. The most commonly used prosthesis combinations with hybrid (humerus cemented) fixation are listed in Table ST80.

Table ST78 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	219	4555	2.1 (1.7, 2.6)	3.5 (3.0, 4.1)	4.4 (3.8, 5.1)	5.3 (4.6, 6.1)	6.7 (5.8, 7.7)	7.2 (6.1, 8.4)
	Perform Reversed	8	438	1.1 (0.4, 2.9)	2.4 (1.1, 5.3)	2.4 (1.1, 5.3)			
Aequalis Flex Revive	Perform Reversed	3	82	2.8 (0.7, 10.6)	5.6 (1.7, 17.7)				
Affinis	Affinis	79	2030	1.7 (1.3, 2.4)	3.4 (2.7, 4.3)	4.1 (3.3, 5.1)	4.7 (3.7, 6.0)		
AltiVate	RSP	3	150	2.2 (0.7, 6.7)					
AltiVate Reverse	RSP	82	2953	2.2 (1.7, 2.8)	3.6 (2.9, 4.6)	4.0 (3.1, 5.1)			
Ascend Flex	Aequalis	157	4084	2.5 (2.0, 3.0)	4.1 (3.5, 4.8)	4.9 (4.2, 5.8)	5.3 (4.4, 6.4)	5.7 (4.6, 7.2)	
	Perform Reversed	47	2299	2.1 (1.6, 2.9)	3.0 (2.2, 4.2)	3.0 (2.2, 4.2)			
Comprehensive	Comprehensive Reverse	159	8747	1.3 (1.0, 1.5)	2.0 (1.7, 2.3)	2.5 (2.1, 3.0)	2.7 (2.2, 3.3)	3.4 (2.2, 5.2)	
	Custom Made (Comprehensive)	6	87	6.0 (2.5, 13.8)	6.0 (2.5, 13.8)	7.8 (3.5, 16.8)	7.8 (3.5, 16.8)		
	Trabecular Metal	2	89	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	2.7 (0.7, 10.2)			
Delta Xtend	Delta Xtend	490	12331	2.2 (1.9, 2.5)	3.2 (2.9, 3.5)	3.7 (3.4, 4.1)	4.2 (3.9, 4.6)	5.0 (4.5, 5.5)	6.2 (5.3, 7.1)
Equinoxe	Equinoxe	271	7297	2.3 (2.0, 2.7)	3.6 (3.1, 4.1)	4.5 (3.9, 5.1)	6.2 (5.3, 7.2)		
Global Unite	Delta Xtend	53	1816	1.6 (1.1, 2.4)	3.0 (2.2, 4.0)	3.7 (2.8, 5.0)	4.2 (3.1, 5.7)		
MSS	MSS	8	530	1.5 (0.6, 3.7)	2.4 (1.1, 5.1)				
Mets	Mets	24	135	12.0 (7.4, 19.1)	17.7 (11.7, 26.5)				
RSP	RSP	84	1855	2.8 (2.1, 3.6)	4.2 (3.4, 5.2)	4.9 (3.9, 6.0)	4.9 (3.9, 6.0)		
SMR	Custom Made (Lima)	6	80	5.2 (2.0, 13.2)	6.6 (2.8, 15.2)	10.3 (4.3, 23.9)			
	SMR	4	306	1.0 (0.3, 3.1)					
	SMR Axioma	13	209	3.4 (1.6, 6.9)	6.8 (4.0, 11.5)	6.8 (4.0, 11.5)			
	SMR L1	504	11869	2.9 (2.6, 3.2)	3.9 (3.6, 4.3)	4.3 (3.9, 4.7)	4.6 (4.2, 5.1)	5.3 (4.8, 5.8)	6.0 (5.2, 6.9)
Trabecular Metal	Comprehensive Reverse	21	551	3.3 (2.0, 5.2)	4.6 (3.0, 7.1)	4.6 (3.0, 7.1)			
	Trabecular Metal	105	1988	2.5 (1.9, 3.3)	4.4 (3.5, 5.4)	5.1 (4.2, 6.3)	5.6 (4.6, 6.7)	6.4 (5.2, 7.9)	8.1 (5.6, 11.6)
Verso	Verso	7	40	15.3 (7.2, 31.0)	18.6 (9.3, 35.3)	18.6 (9.3, 35.3)			
Other (27)		8	115	5.6 (2.5, 12.0)	8.1 (4.1, 15.6)				
TOTAL		2363	64636						

Note: Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Table ST79 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	143	2537	2.1 (1.6, 2.8)	3.9 (3.2, 4.7)	4.9 (4.0, 5.8)	5.9 (4.9, 7.0)	7.5 (6.2, 8.9)	8.2 (6.8, 9.9)
	Perform Reversed	2	229	0.5 (0.1, 3.3)	0.5 (0.1, 3.3)				
Aequalis Flex Revive	Perform Reversed	1	67	1.7 (0.2, 11.4)	1.7 (0.2, 11.4)				
Affinis	Affinis	41	1006	1.6 (1.0, 2.6)	3.5 (2.5, 4.9)	4.3 (3.1, 5.8)	5.1 (3.6, 7.3)		
AltiVate	RSP	3	141	2.3 (0.8, 7.1)					
AltiVate Reverse	RSP	66	2451	2.1 (1.5, 2.8)	3.6 (2.8, 4.7)	4.0 (3.1, 5.3)			
Ascend Flex	Aequalis	142	3550	2.5 (2.0, 3.1)	4.3 (3.6, 5.1)	5.1 (4.3, 6.0)	5.6 (4.6, 6.7)	6.0 (4.8, 7.6)	
	Perform Reversed	42	2007	2.3 (1.7, 3.1)	2.9 (2.1, 4.1)	2.9 (2.1, 4.1)			
Comprehensive	Comprehensive Reverse	123	7447	1.1 (0.9, 1.4)	1.9 (1.5, 2.2)	2.3 (1.9, 2.8)	2.5 (2.0, 3.1)	2.5 (2.0, 3.1)	
	Custom Made (Comprehensive)	4	78	3.9 (1.3, 11.6)	3.9 (1.3, 11.6)	5.9 (2.2, 15.2)	5.9 (2.2, 15.2)		
	Trabecular Metal	2	73	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.2 (0.8, 12.1)			
Delta Xtend	Delta Xtend	346	8936	2.0 (1.7, 2.3)	3.1 (2.7, 3.5)	3.7 (3.3, 4.1)	4.2 (3.8, 4.7)	5.1 (4.5, 5.7)	6.6 (5.5, 8.0)
Equinoxe	Equinoxe	223	6276	2.2 (1.8, 2.6)	3.3 (2.8, 3.8)	4.2 (3.7, 4.9)	5.9 (4.9, 7.0)		
Global Unite	Delta Xtend	31	1192	1.2 (0.7, 2.0)	2.5 (1.7, 3.7)	3.5 (2.4, 5.2)	3.8 (2.6, 5.6)		
MSS	MSS	7	507	1.4 (0.5, 3.7)	2.3 (1.0, 5.1)				
RSP	RSP	59	1470	2.5 (1.8, 3.5)	3.7 (2.8, 4.8)	4.3 (3.3, 5.5)	4.3 (3.3, 5.5)		
SMR	Custom Made (Lima)	5	77	4.0 (1.3, 12.0)	5.6 (2.1, 14.2)	9.3 (3.6, 23.4)			
	SMR	4	302	1.0 (0.3, 3.1)					
	SMR Axioma	11	203	3.0 (1.3, 6.5)	6.0 (3.3, 10.6)	6.0 (3.3, 10.6)			
	SMR L1	466	11294	2.7 (2.5, 3.1)	3.8 (3.4, 4.2)	4.1 (3.8, 4.5)	4.5 (4.1, 5.0)	5.2 (4.7, 5.8)	6.0 (5.1, 6.9)
Trabecular Metal	Comprehensive Reverse	14	391	2.7 (1.5, 5.0)	4.5 (2.6, 7.6)	4.5 (2.6, 7.6)			
	Trabecular Metal	88	1600	2.7 (2.0, 3.7)	4.6 (3.7, 5.8)	5.4 (4.3, 6.6)	5.8 (4.7, 7.1)	6.6 (5.3, 8.2)	7.0 (5.5, 8.8)
Verso	Verso	7	38	16.2 (7.6, 32.5)	19.7 (9.8, 37.1)	19.7 (9.8, 37.1)			
Other (23)		7	79	6.7 (2.8, 15.3)	10.2 (4.9, 20.3)	10.2 (4.9, 20.3)			
TOTAL		1837	51951						

Note: Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Table ST80 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	75	1965	2.1 (1.6, 2.9)	3.0 (2.3, 3.9)	3.7 (2.9, 4.7)	4.4 (3.5, 5.6)	5.5 (4.2, 7.0)	
	Perform Reversed	6	206	1.9 (0.6, 6.1)					
Affinis	Affinis	36	965	2.0 (1.3, 3.1)	3.3 (2.3, 4.7)	4.0 (2.9, 5.5)	4.2 (3.0, 5.8)		
AltiVate Reverse	RSP	14	458	2.6 (1.5, 4.7)	3.7 (2.2, 6.3)				
Ascend Flex	Aequalis	12	496	1.9 (1.0, 3.6)	2.7 (1.5, 4.7)	2.7 (1.5, 4.7)			
	Perform Reversed	4	275	1.0 (0.2, 4.0)					
Comprehensive	Comprehensive Reverse	30	1217	1.9 (1.2, 2.8)	2.7 (1.8, 3.9)	3.5 (2.4, 5.2)	3.5 (2.4, 5.2)		
Delta Xtend	Delta Xtend	139	3285	2.7 (2.2, 3.3)	3.5 (2.9, 4.2)	3.9 (3.3, 4.7)	4.3 (3.6, 5.1)	4.9 (4.1, 5.8)	5.4 (4.4, 6.6)
Equinoxe	Equinoxe	42	964	2.8 (1.9, 4.1)	5.1 (3.7, 7.0)	5.5 (4.0, 7.6)	7.8 (4.9, 12.4)		
Global Unite	Delta Xtend	21	578	2.6 (1.5, 4.4)	4.1 (2.6, 6.3)	4.1 (2.6, 6.3)			
Mets	Mets	23	129	12.5 (7.7, 19.9)	18.6 (12.2, 27.7)				
RSP	RSP	25	357	4.0 (2.4, 6.6)	6.8 (4.5, 10.0)	7.6 (5.2, 11.1)	7.6 (5.2, 11.1)		
SMR	SMR L1	22	422	4.2 (2.6, 6.6)	5.6 (3.7, 8.5)	5.6 (3.7, 8.5)	5.6 (3.7, 8.5)	5.6 (3.7, 8.5)	
Trabecular Metal	Comprehensive Reverse	7	152	4.8 (2.3, 9.8)	4.8 (2.3, 9.8)				
	Trabecular Metal	15	354	1.7 (0.8, 3.8)	3.4 (1.9, 6.1)	4.3 (2.5, 7.4)	4.9 (2.9, 8.3)	6.3 (3.5, 11.3)	
Other (22)		8	109	6.9 (3.4, 14.1)					
TOTAL		479	11932						

Note: Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS, ROTATOR CUFF ARTHROPATHY AND FRACTURE– PATIENT CHARACTERISTICS

There are 27,934 primary total stemmed reverse shoulder replacement procedures with a primary diagnosis of osteoarthritis, 24,122 for rotator cuff arthropathy, and 9,589 for fracture. This year the 3 predominate primary diagnoses are being presented concurrently for the purpose of comparison.

The cumulative percent revision of primary total stemmed reverse shoulder replacement for osteoarthritis at 14 years is 6.3%, 6.0% for rotator cuff arthropathy, and 5.8% for fracture (Table ST81 and Figure ST45).

Compared to the pre-2016 period, total stemmed reverse replacements 2016-2023 have a lower rate of revision for osteoarthritis and for rotator cuff arthropathy, but not for fracture (Table ST82 and Figure ST46, and Figure ST47).

The most common reasons for revision are instability/dislocation (10.8% for osteoarthritis, 12% rotator cuff arthropathy and 8.2% for fracture), infection (11.7%, 9.7%, and 4.5%) and loosening (7.6%, 6.3%, and 2.3%, respectively) (Table ST83 and Figure ST48).

The most common types of revision are humeral component only (10.1% for osteoarthritis, 9.5% for rotator cuff arthropathy and 6.4% for fracture), replacement of both cup (liner) and glenosphere (8%, 7.7% and 3.4%), and cup only revisions (5.7%, 6.3%, and 3.9%, respectively) (Table ST84).

When only the humeral component is revised, this may be associated with exchange of the epiphysis and/or humeral stem and additional minor components such as the liner. Most revisions are to a total stemmed reverse replacement (84.7% for osteoarthritis, 87.2% for rotator cuff arthropathy and 94% for fracture).

Age and Gender

Primary total stemmed reverse shoulder replacement, when used for the management of osteoarthritis, is most common in patients aged ≥65 years. Patients aged ≥65 years have a lower rate of revision compared to patients aged <65 years for all three most common primary diagnoses (Table ST85, Figure ST49, Figure ST50 and Figure ST51).

Males have a higher rate of revision than females for osteoarthritis, rotator cuff arthropathy and fracture (Table ST81, Figure ST52, Figure ST53 and Figure ST54). Males are predominately revised for instability/dislocation and infection compared to loosening in females (Figure ST55).

Males have a higher rate of revision compared to females.

ASA and BMI

Patients with ASA scores 3-5 have higher rates of revision compared to patients with an ASA score of 1-2 for all primary diagnoses (Table ST87, Figure ST56, Figure ST57 and Figure ST58).

When the primary diagnosis is osteoarthritis, patients who are obese have a higher rate of revision compared to non-obese patients w for the first 9 months only. After this time, obese patients have a lower rate of revision than non-obese patients.

Obese patients undergoing total stemmed reverse shoulder replacement for fracture have a higher rate of revision than non-obese patients.

Obese patients undergoing a total stemmed reverse for rotator cuff arthropathy have an increased rate of revision for the first 3 months, and after this time there is no difference compared to non-obese patients (Table ST88, Figure ST59, Figure ST60 and Figure ST61).

Glenoid Morphology

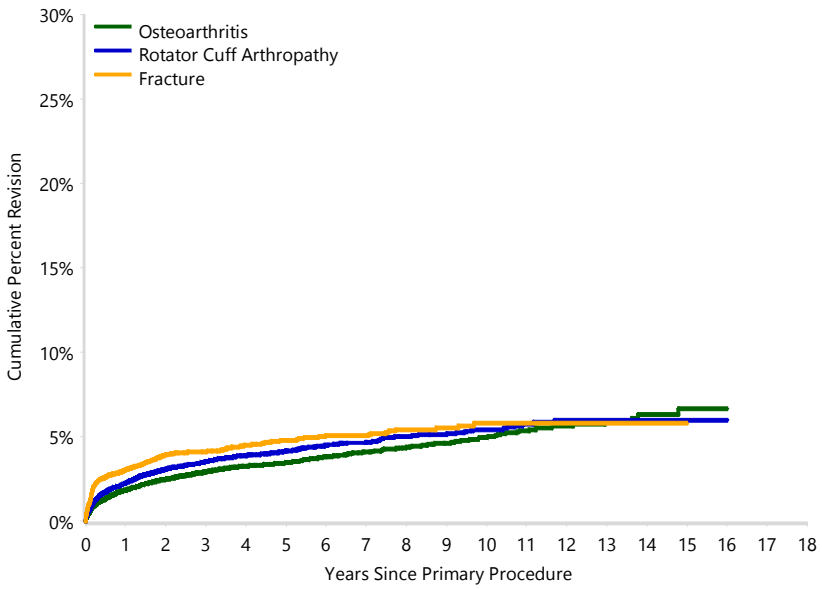
The outcome of the different morphology categories is presented in Table ST89. The category of glenoid morphology is not a risk factor for revision for any of the three primary diagnoses for total stemmed reverse shoulder replacement.

Table ST81 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	406	9589	3.1 (2.7, 3.4)	4.1 (3.7, 4.6)	4.8 (4.3, 5.3)	5.1 (4.6, 5.6)	5.8 (5.1, 6.6)	5.8 (5.1, 6.6)
Osteoarthritis	898	27934	1.8 (1.7, 2.0)	2.9 (2.7, 3.2)	3.5 (3.2, 3.7)	4.1 (3.8, 4.4)	5.0 (4.6, 5.4)	6.3 (5.5, 7.3)
Rotator Cuff Arthropathy	885	24122	2.3 (2.1, 2.5)	3.5 (3.3, 3.8)	4.2 (3.9, 4.5)	4.7 (4.3, 5.0)	5.4 (5.0, 5.9)	6.0 (5.4, 6.6)
TOTAL	2189	61645						

Note: Restricted to modern prostheses

Figure ST45 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



HR - adjusted for age and gender

Rotator Cuff Arthropathy vs Osteoarthritis

Entire Period: HR=1.13 (95% CI 1.03, 1.24), p=0.011

Fracture vs Osteoarthritis

0 - 3Mth: HR=2.68 (95% CI 2.27, 3.16), p<0.001

3Mth+: HR=1.16 (95% CI 0.99, 1.36), p=0.069

Fracture vs Rotator Cuff Arthropathy

0 - 3Mth: HR=2.38 (95% CI 2.01, 2.81), p<0.001

3Mth+: HR=1.03 (95% CI 0.88, 1.21), p=0.725

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	27934	23352	16436	10750	6155	2235	388
Rotator Cuff Arthropathy	24122	19987	13594	8566	4691	1566	203
Fracture	9589	7875	5288	3272	1816	589	75

Note: Restricted to modern prostheses

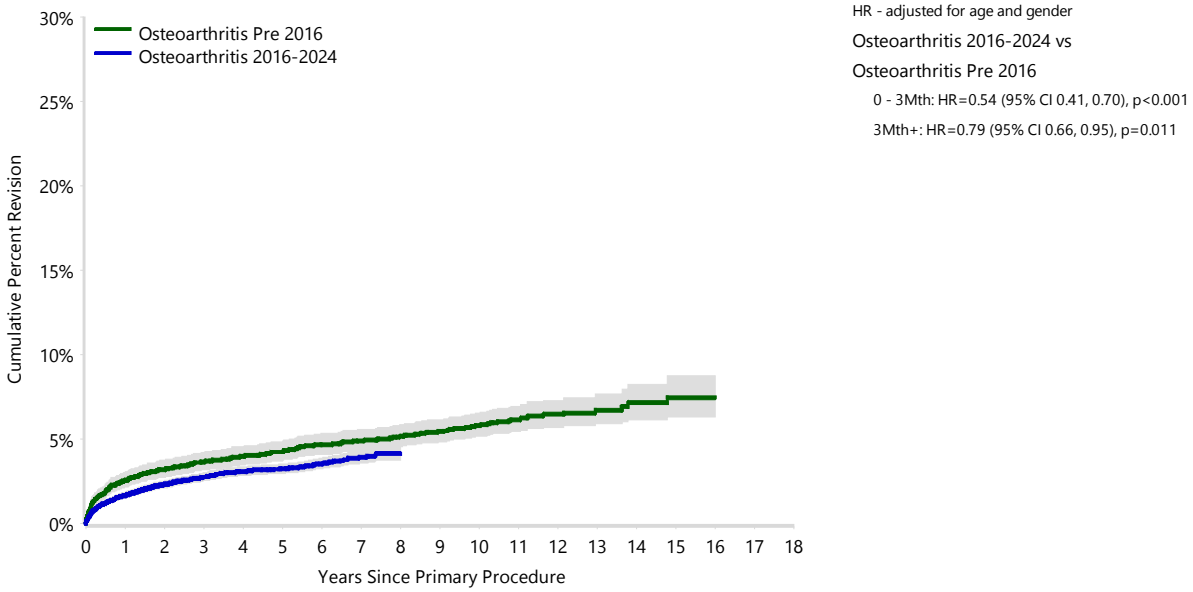
Primary Total Shoulder Replacement

Table ST82 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Procedure Year

Primary Diagnosis	Procedure Year	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis									
	Pre 2016	277	4923	2.6 (2.2, 3.1)	3.7 (3.2, 4.2)	4.2 (3.7, 4.9)	4.9 (4.3, 5.6)	5.8 (5.2, 6.6)	7.1 (6.2, 8.3)
	2016-2024	621	23011	1.7 (1.5, 1.8)	2.8 (2.5, 3.0)	3.3 (3.0, 3.5)	3.9 (3.6, 4.3)		
Rotator Cuff Arthropathy									
	Pre 2016	217	3703	2.8 (2.3, 3.4)	4.1 (3.5, 4.8)	5.0 (4.3, 5.8)	5.4 (4.7, 6.2)	6.2 (5.4, 7.0)	6.7 (5.8, 7.7)
	2016-2024	668	20419	2.2 (2.0, 2.4)	3.4 (3.1, 3.7)	3.9 (3.6, 4.3)	4.5 (4.2, 4.9)		
Fracture									
	Pre 2016	68	1592	2.5 (1.8, 3.4)	3.3 (2.5, 4.3)	3.7 (2.8, 4.7)	4.0 (3.1, 5.1)	4.8 (3.8, 6.1)	4.8 (3.8, 6.1)
	2016-2024	338	7997	3.2 (2.8, 3.6)	4.3 (3.9, 4.8)	5.1 (4.5, 5.7)	5.3 (4.8, 6.0)		
TOTAL		2189	61645						

Note: Restricted to modern prostheses.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

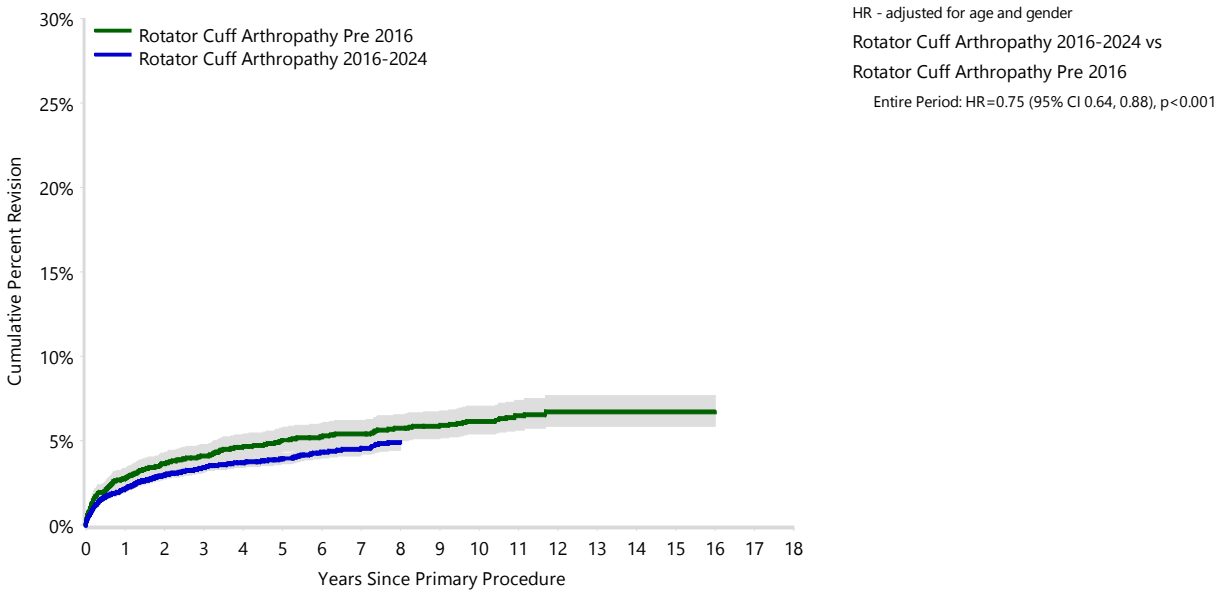
Figure ST46 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Procedure Year (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	Pre 2016	4923	4727	4450	4098	3622	2235	388
	2016-2024	23011	18625	11986	6652	2533	0	0

Note: Restricted to modern prostheses.

Figure ST47 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Procedure Year (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Rotator Cuff Arthropathy	Pre 2016	3703	3547	3307	3013	2699	1566	203
	2016-2024	20419	16440	10287	5553	1992	0	0

Note: Restricted to modern prostheses.

Table ST83 Primary Total Stemmed Reverse Shoulder Replacement by Reason for Revision and Primary Diagnosis

Reason for Revision	Osteoarthritis		Rotator Cuff Arthropathy		Fracture	
	N	Percent	N	Percent	N	Percent
Instability/Dislocation	237	10.8	180	8.2	262	12.0
Infection	256	11.7	99	4.5	212	9.7
Loosening	166	7.6	50	2.3	138	6.3
Fracture	91	4.2	45	2.1	104	4.8
Dissociation	28	1.3	6	0.3	41	1.9
Pain	20	0.9	4	0.2	24	1.1
Arthrofibrosis	12	0.5	8	0.4	5	0.2
Malposition	10	0.5	2	0.1	12	0.5
Lysis	12	0.5	2	0.1	10	0.5
Implant Breakage Glenoid	8	0.4	2	0.1	8	0.4
Incorrect Sizing	4	0.2	1	0.0	12	0.5
Heterotopic Bone	7	0.3	3	0.1	4	0.2
Metal Related Pathology	5	0.2	.	.	8	0.4
Rotator Cuff Insufficiency	5	0.2	.	.	4	0.2
Wear Humeral Cup	5	0.2	.	.	3	0.1
Implant Breakage Humeral	2	0.1	.	.	3	0.1
Glenoid Erosion	1	0.0	.	.	1	0.0
Implant Breakage Glenoid Insert	.	.	1	0.0	1	0.0
Tumour	.	.	1	0.0	.	.
Other	29	1.3	2	0.1	33	1.5
TOTAL	**898**	**41.0**	**406**	**18.5**	**885**	**40.4**

Note: Restricted to modern prostheses

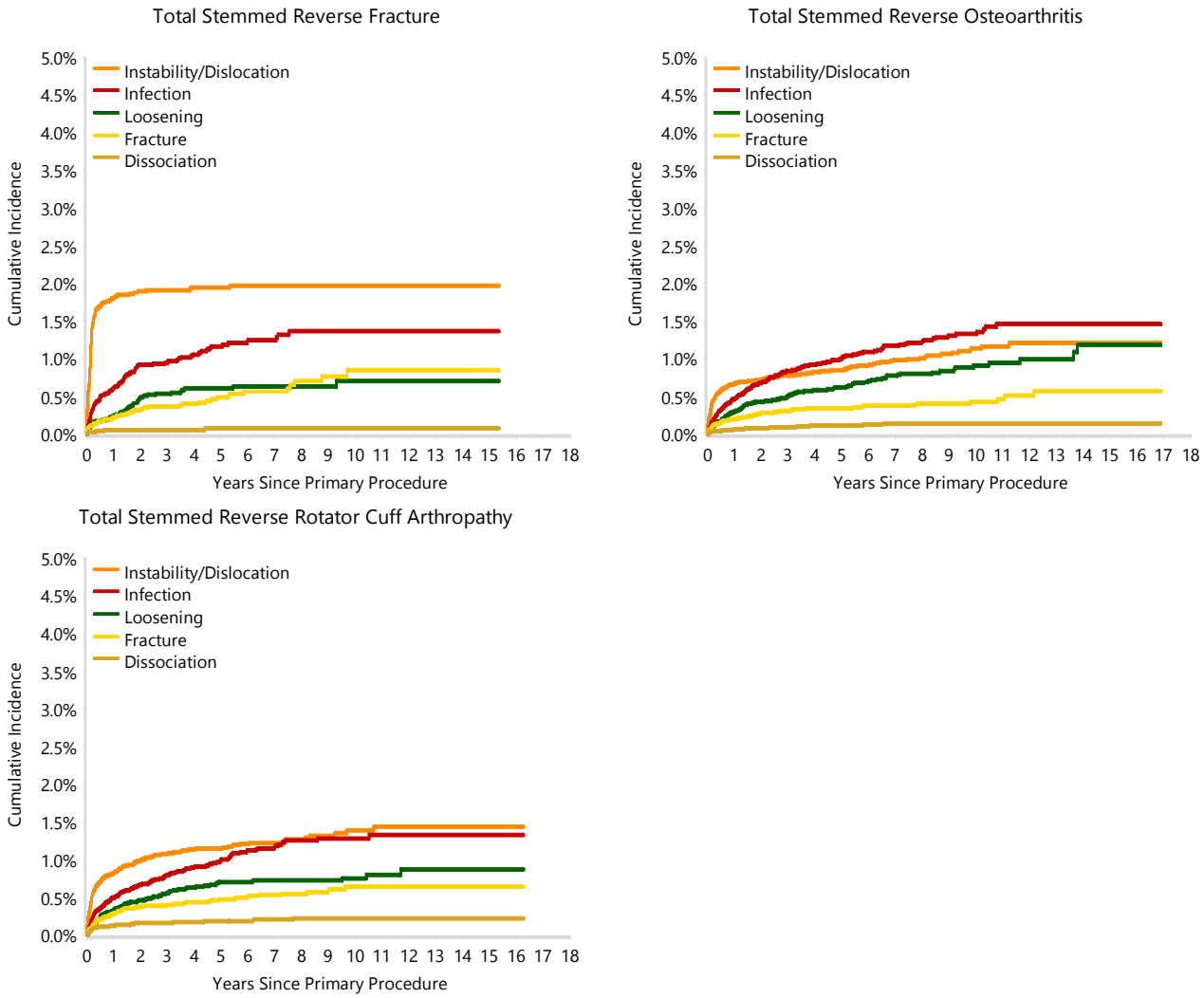
Primary Total Shoulder Replacement

Table ST84 Primary Total Stemmed Reverse Shoulder Replacement by Type of Revision and Primary Diagnosis

Type of Revision	Osteoarthritis		Rotator Cuff Arthropathy		Fracture	
	N	Total%	N	Total%	N	Total%
Humeral Component	220	10.1	141	6.4	207	9.5
Cup/Head	176	8.0	75	3.4	169	7.7
Cup Only	125	5.7	86	3.9	137	6.3
Humeral/Glenoid	90	4.1	33	1.5	97	4.4
Cement Spacer	102	4.7	31	1.4	68	3.1
Humeral Head Only	94	4.3	11	0.5	77	3.5
Glenoid Component	66	3.0	10	0.5	89	4.1
Removal of Prostheses	11	0.5	8	0.4	15	0.7
Glenosphere Only	3	0.1	1	0.0	10	0.5
Minor Components	5	0.2	6	0.3	3	0.1
Cement Only	5	0.2	1	0.0	4	0.2
Reoperation	1	0.0	2	0.1	5	0.2
Reinsertion of Components	.	.	.	.	3	0.1
Head/Insert	.	.	1	0.0	1	0.0
TOTAL	**898**	**41.0**	**406**	**18.5**	**885**	**40.4**

Note: Restricted to modern prostheses

Figure ST48 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



Note: Restricted to modern prostheses

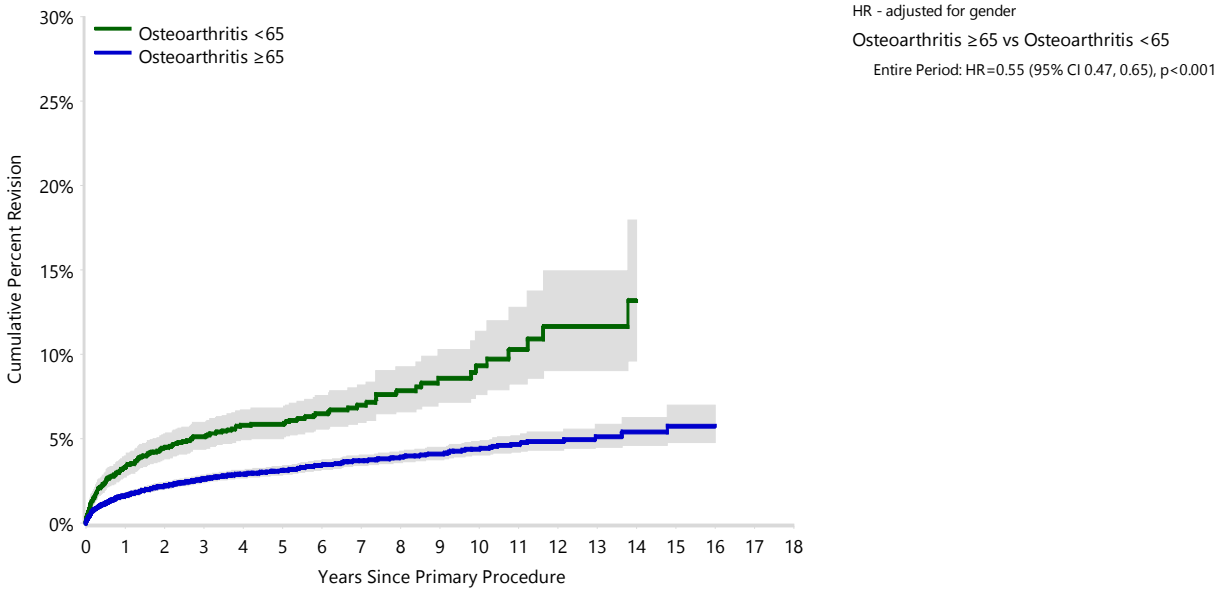
Primary Total Shoulder Replacement

Table ST85 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Age

Primary Diagnosis	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis									
	<65	192	3439	3.3 (2.8, 4.0)	5.1 (4.4, 6.0)	5.9 (5.0, 6.8)	7.0 (6.0, 8.2)	9.3 (7.6, 11.4)	13.2 (9.6, 17.9)
	≥65	706	24495	1.6 (1.5, 1.8)	2.6 (2.4, 2.9)	3.1 (2.9, 3.4)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)	5.4 (4.6, 6.3)
Rotator Cuff Arthropathy									
	<65	152	2929	2.9 (2.3, 3.6)	5.4 (4.5, 6.4)	6.2 (5.2, 7.3)	6.8 (5.8, 8.1)	8.1 (6.5, 10.1)	
	≥65	733	21193	2.2 (2.0, 2.4)	3.3 (3.0, 3.5)	3.9 (3.6, 4.2)	4.4 (4.1, 4.7)	5.1 (4.6, 5.6)	5.4 (4.8, 6.0)
Fracture									
	<65	107	1436	5.0 (4.0, 6.3)	7.0 (5.8, 8.6)	8.5 (7.0, 10.4)	9.2 (7.5, 11.3)	12.1 (9.1, 16.1)	
	≥65	299	8153	2.7 (2.4, 3.1)	3.6 (3.2, 4.1)	4.1 (3.7, 4.6)	4.3 (3.9, 4.9)	4.7 (4.2, 5.4)	4.7 (4.2, 5.4)
TOTAL		2189	61645						

Note: Restricted to modern prostheses

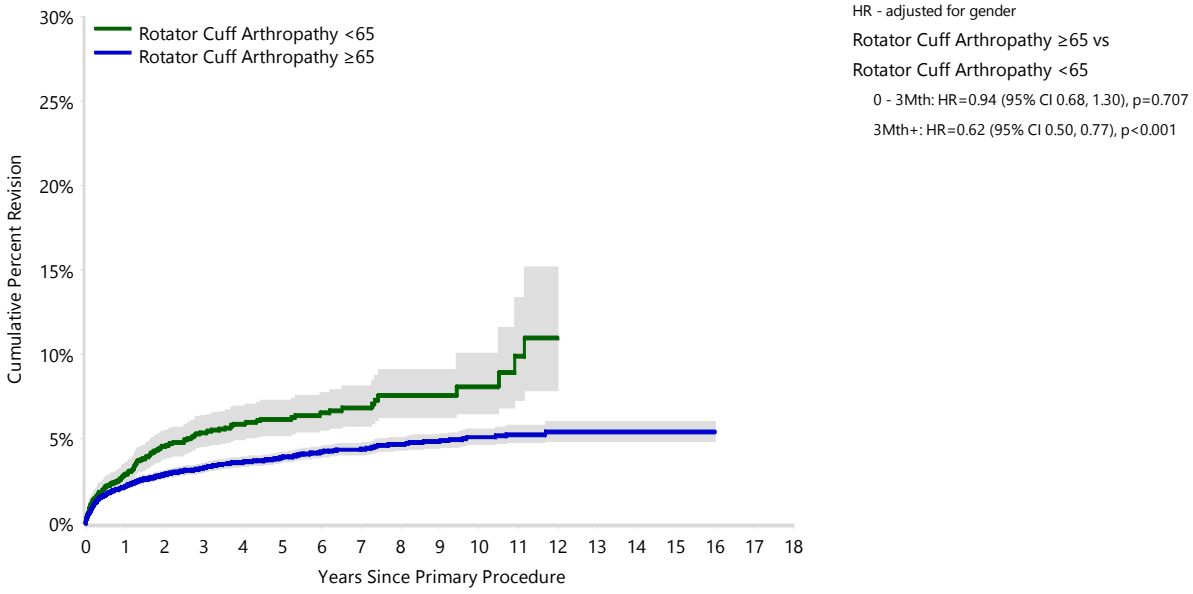
Figure ST49 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	<65	3439	2771	1895	1154	636	233	53
	≥65	24495	20581	14541	9596	5519	2002	335

Note: Restricted to modern prostheses

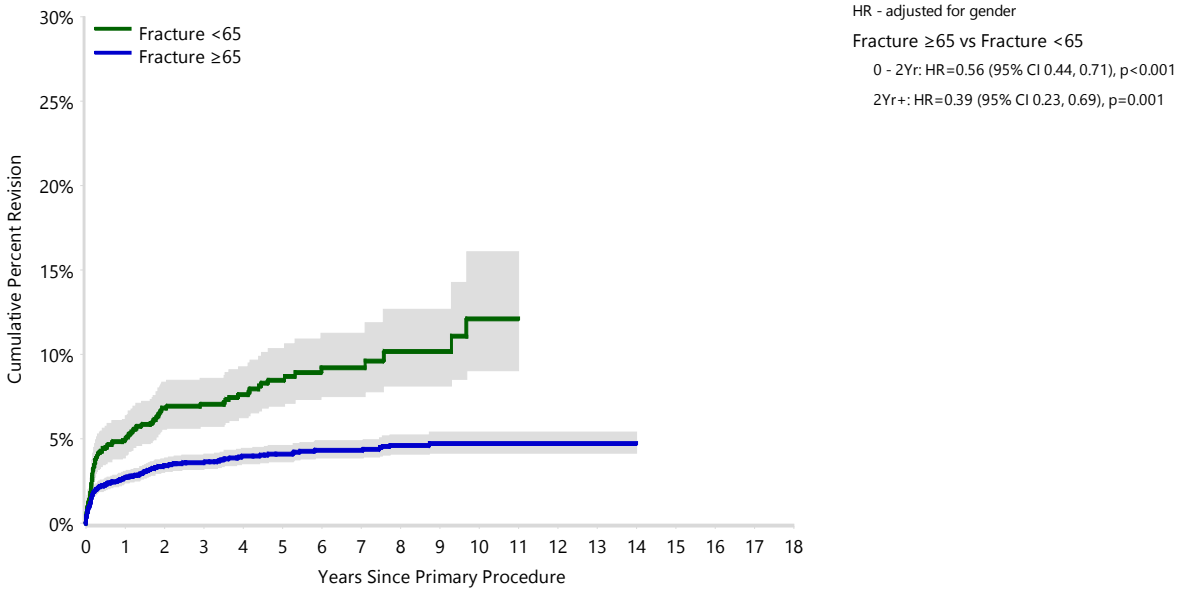
Figure ST50 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Rotator Cuff Arthropathy	<65	2929	2353	1443	876	458	132	22
	≥65	21193	17634	12151	7690	4233	1434	181

Note: Restricted to modern prostheses

Figure ST51 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	<65	1436	1139	746	432	227	68	18
	≥65	8153	6736	4542	2840	1589	521	57

Note: Restricted to modern prostheses

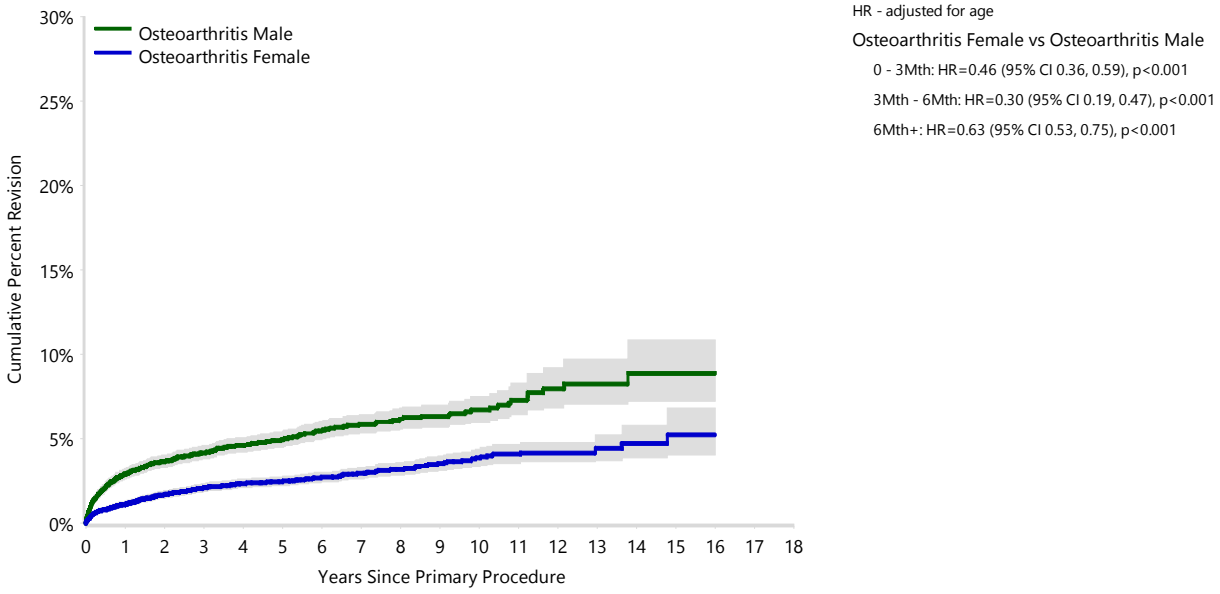
Primary Total Shoulder Replacement

Table ST86 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Gender

Primary Diagnosis	Gender	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis									
	Male	508	11176	2.9 (2.6, 3.3)	4.2 (3.8, 4.6)	4.9 (4.5, 5.4)	5.9 (5.3, 6.4)	6.7 (6.0, 7.5)	8.9 (7.3, 10.9)
	Female	390	16758	1.1 (1.0, 1.3)	2.1 (1.9, 2.4)	2.5 (2.2, 2.8)	3.0 (2.6, 3.3)	3.9 (3.4, 4.4)	4.7 (3.9, 5.8)
Rotator Cuff Arthropathy									
	Male	560	11390	3.1 (2.8, 3.4)	4.7 (4.3, 5.2)	5.7 (5.2, 6.2)	6.6 (6.0, 7.2)	7.3 (6.6, 8.1)	7.7 (6.8, 8.8)
	Female	325	12732	1.5 (1.3, 1.8)	2.4 (2.2, 2.8)	2.9 (2.5, 3.2)	3.0 (2.7, 3.4)	3.9 (3.3, 4.4)	4.5 (3.7, 5.3)
Fracture									
	Male	136	1635	7.0 (5.9, 8.4)	8.4 (7.1, 9.9)	9.4 (7.9, 11.1)	9.4 (7.9, 11.1)	10.2 (8.4, 12.3)	
	Female	270	7954	2.2 (1.9, 2.6)	3.3 (2.9, 3.7)	3.8 (3.4, 4.3)	4.2 (3.7, 4.7)	4.9 (4.2, 5.7)	4.9 (4.2, 5.7)
TOTAL		2189	61645						

Note: Restricted to modern prostheses

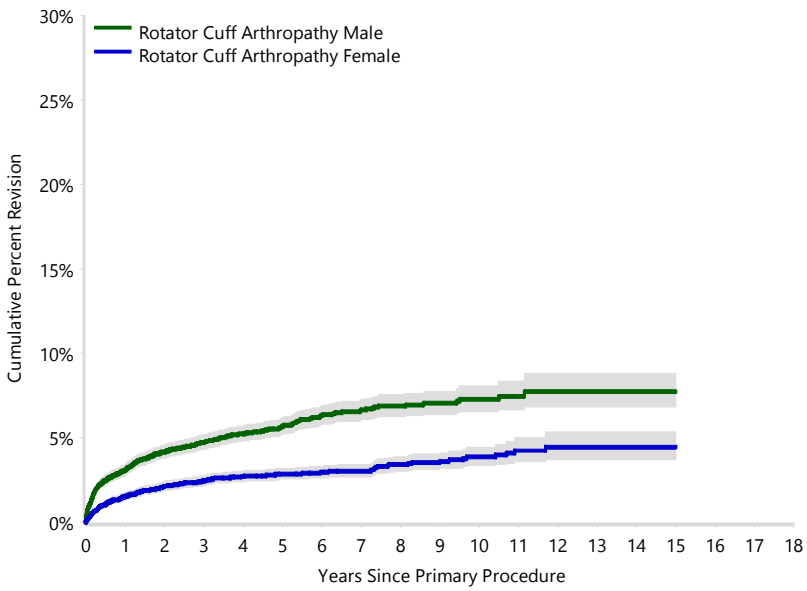
Figure ST52 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Gender (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	Male	11176	9224	6333	4010	2202	790	131
	Female	16758	14128	10103	6740	3953	1445	257

Note: Restricted to modern prostheses

Figure ST53 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Gender (Primary Diagnosis Rotator Cuff Arthropathy)

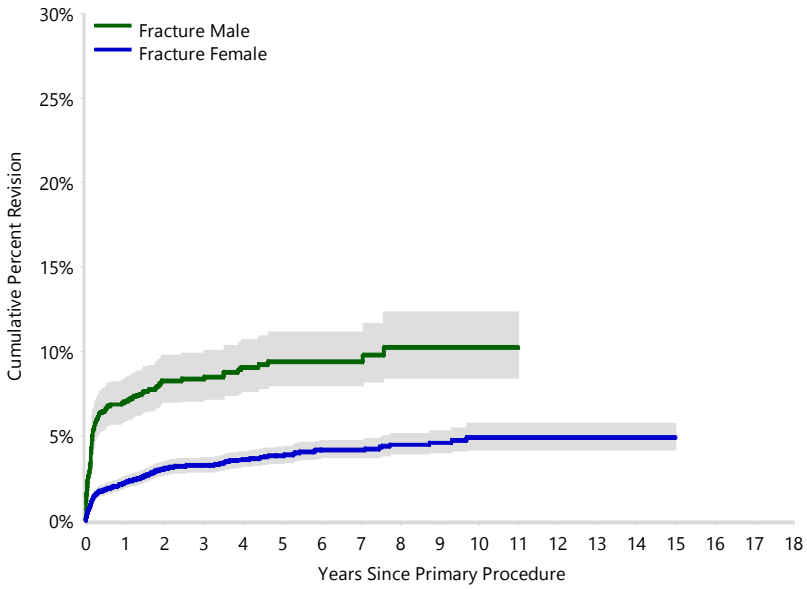


HR - adjusted for age
Rotator Cuff Arthropathy Female vs Rotator Cuff Arthropathy Male
0 - 3Mth: HR=0.38 (95% CI 0.29, 0.48), p<0.001
3Mth+: HR=0.60 (95% CI 0.51, 0.71), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Rotator Cuff Arthropathy	Male	11390	9254	6109	3662	1905	593	72
	Female	12732	10733	7485	4904	2786	973	131

Note: Restricted to modern prostheses

Figure ST54 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Gender (Primary Diagnosis Fracture)

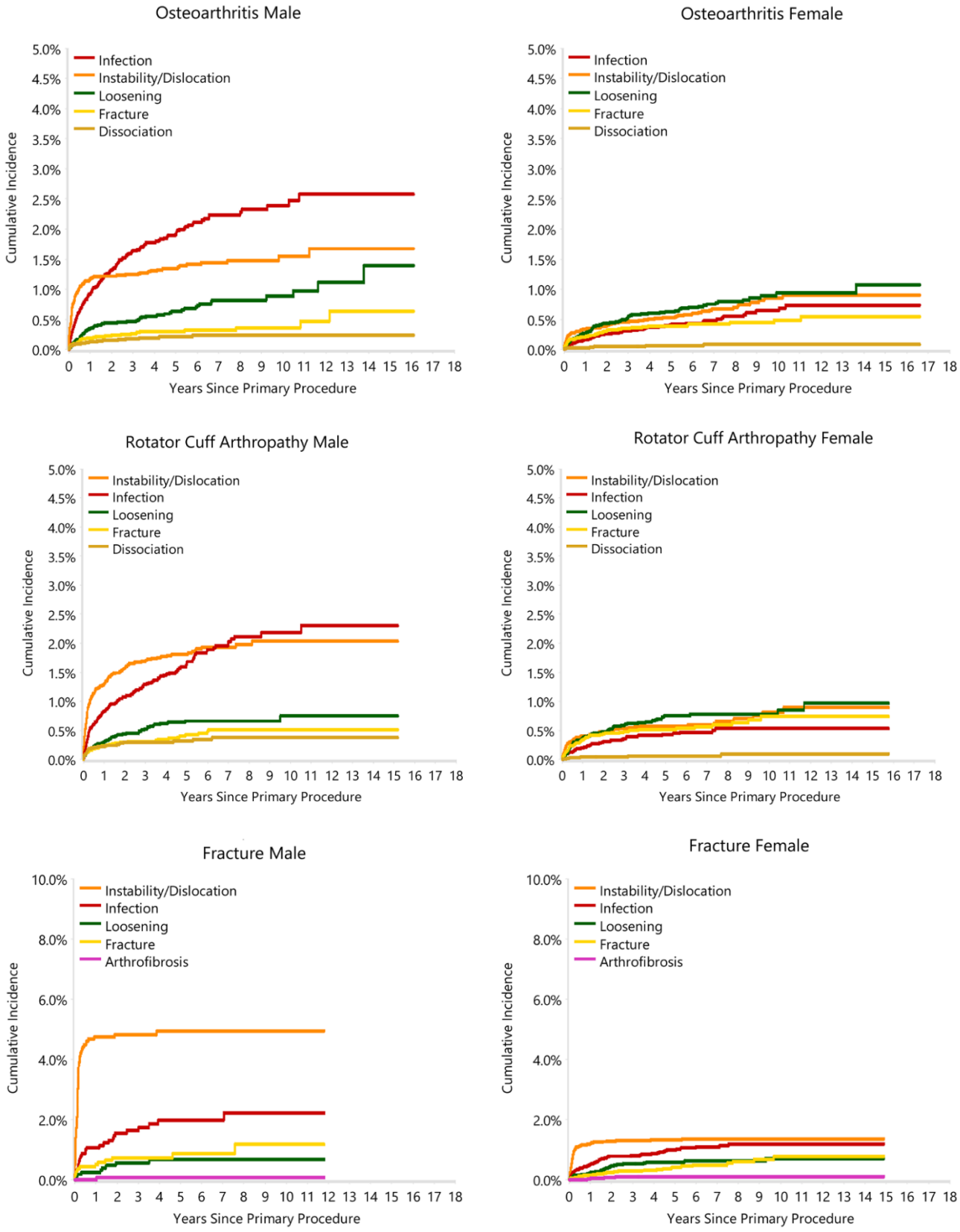


HR - adjusted for age
Fracture Female vs Fracture Male
0 - 2Wk: HR=0.21 (95% CI 0.12, 0.35), p<0.001
2Wk - 3Mth: HR=0.31 (95% CI 0.23, 0.43), p<0.001
3Mth+: HR=0.71 (95% CI 0.50, 0.99), p=0.046

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	Male	1635	1240	769	447	257	82	12
	Female	7954	6635	4519	2825	1559	507	63

Note: Restricted to modern prostheses

Figure ST55 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Primary Diagnosis and Gender



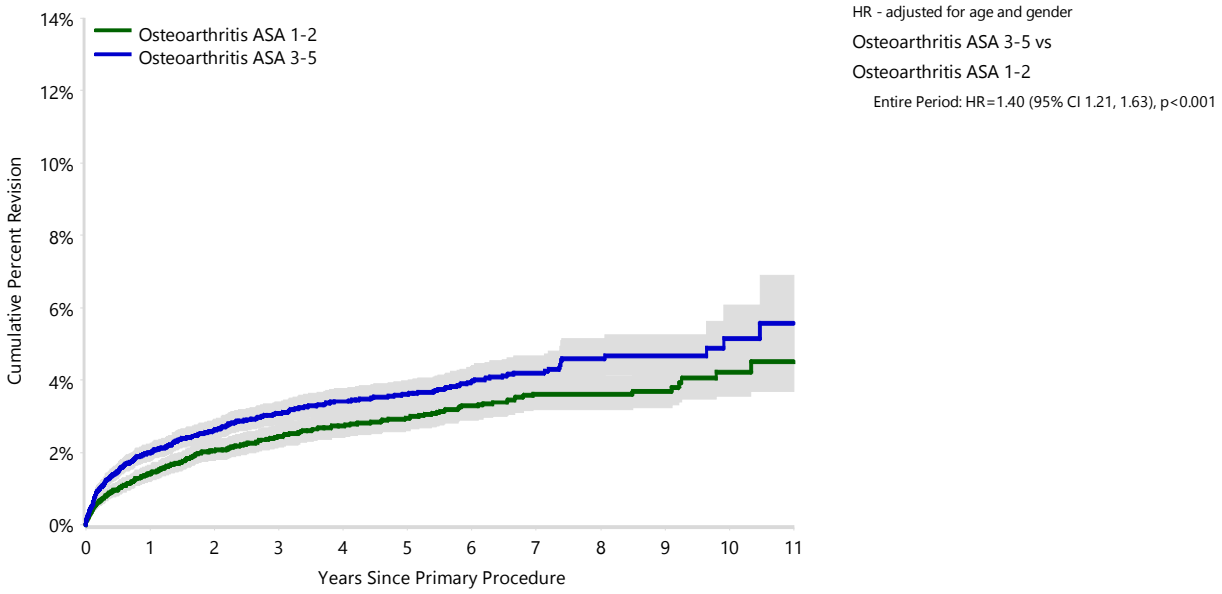
Note: Restricted to modern prostheses

Table ST87 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score

Primary Diagnosis	ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Osteoarthritis									
	ASA 1-2	291	11139	1.4 (1.2, 1.7)	2.1 (1.8, 2.4)	2.5 (2.2, 2.8)	3.0 (2.6, 3.3)	3.6 (3.2, 4.1)	4.2 (3.6, 5.0)
	ASA 3-5	438	14104	2.0 (1.8, 2.2)	2.6 (2.4, 2.9)	3.1 (2.8, 3.4)	3.6 (3.3, 4.0)	4.6 (4.1, 5.2)	5.1 (4.4, 6.1)
Rotator Cuff Arthropathy									
	ASA 1-2	305	9797	2.0 (1.7, 2.3)	2.6 (2.3, 3.0)	3.0 (2.6, 3.4)	3.6 (3.2, 4.0)	4.4 (3.8, 5.0)	4.8 (4.1, 5.6)
	ASA 3-5	470	12543	2.5 (2.2, 2.7)	3.4 (3.1, 3.7)	3.9 (3.6, 4.3)	4.5 (4.1, 4.9)	5.2 (4.7, 5.8)	5.3 (4.8, 6.0)
Fracture									
	ASA 1-2	123	3305	2.5 (2.0, 3.1)	3.4 (2.8, 4.1)	3.6 (3.0, 4.3)	4.4 (3.6, 5.2)	4.8 (3.9, 5.7)	4.8 (3.9, 5.7)
	ASA 3-5	239	5442	3.4 (2.9, 3.9)	4.3 (3.7, 4.9)	4.5 (3.9, 5.1)	5.1 (4.5, 5.8)	5.5 (4.7, 6.3)	6.4 (5.0, 8.0)
TOTAL		1866	56330						

Note: Restricted to modern prostheses

Figure ST56 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by ASA Score (Primary Diagnosis OA)

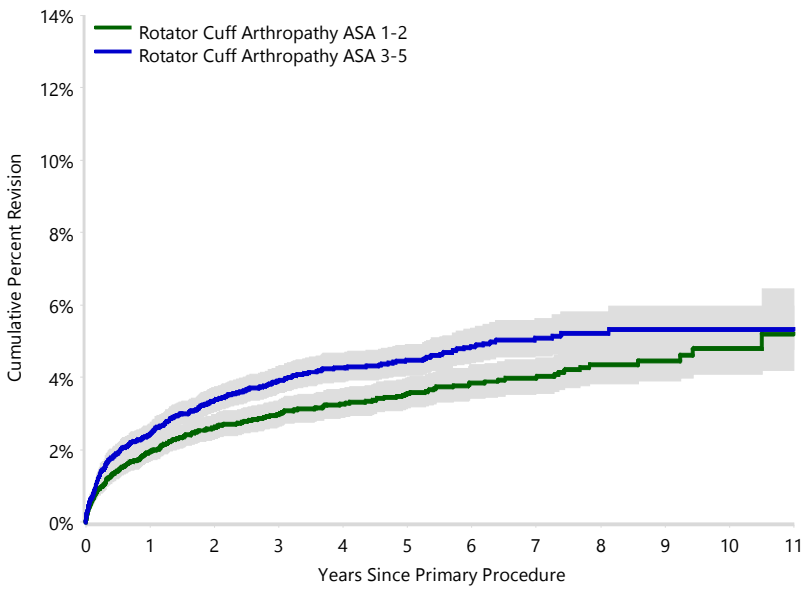


Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Osteoarthritis	ASA 1-2	11139	9319	7804	6568	4243	1483	474
	ASA 3-5	14102	11467	9238	7472	4328	1234	348

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST57 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score (Primary Diagnosis Rotator Cuff Arthropathy)



HR - adjusted for age and gender

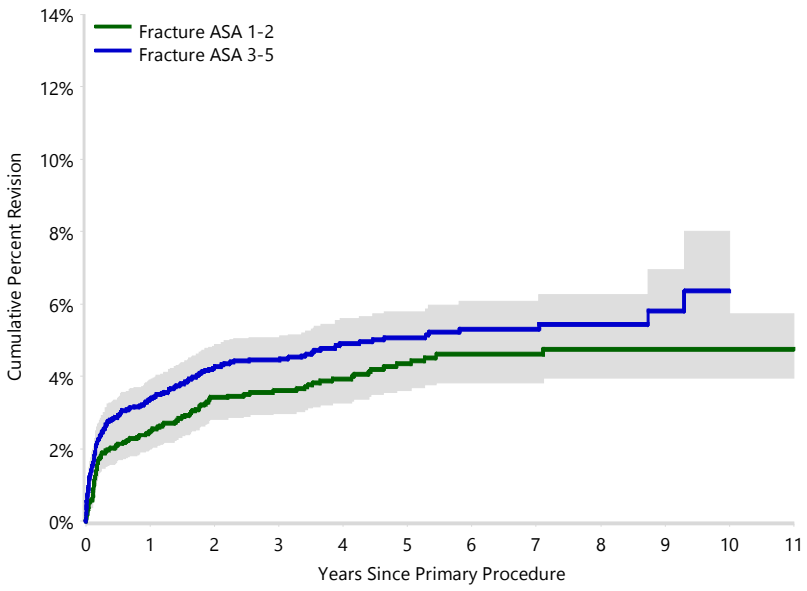
Rotator Cuff Arthropathy ASA 3-5 vs Rotator Cuff Arthropathy ASA 1-2

Entire Period: HR=1.35 (95% CI 1.17, 1.56), p<0.001

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Rotator Cuff Arthropathy	ASA 1-2	9797	8128	6723	5619	3542	1161	347
	ASA 3-5	12542	10148	8060	6381	3583	953	286

Note: Restricted to modern prostheses

Figure ST58 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score (Primary Diagnosis Fracture)



HR - adjusted for age and gender

Fracture ASA 3-5 vs Fracture ASA 1-2

Entire Period: HR=1.33 (95% CI 1.07, 1.66), p=0.011

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Fracture	ASA 1-2	3305	2742	2303	1907	1198	396	128
	ASA 3-5	5441	4355	3462	2689	1471	408	105

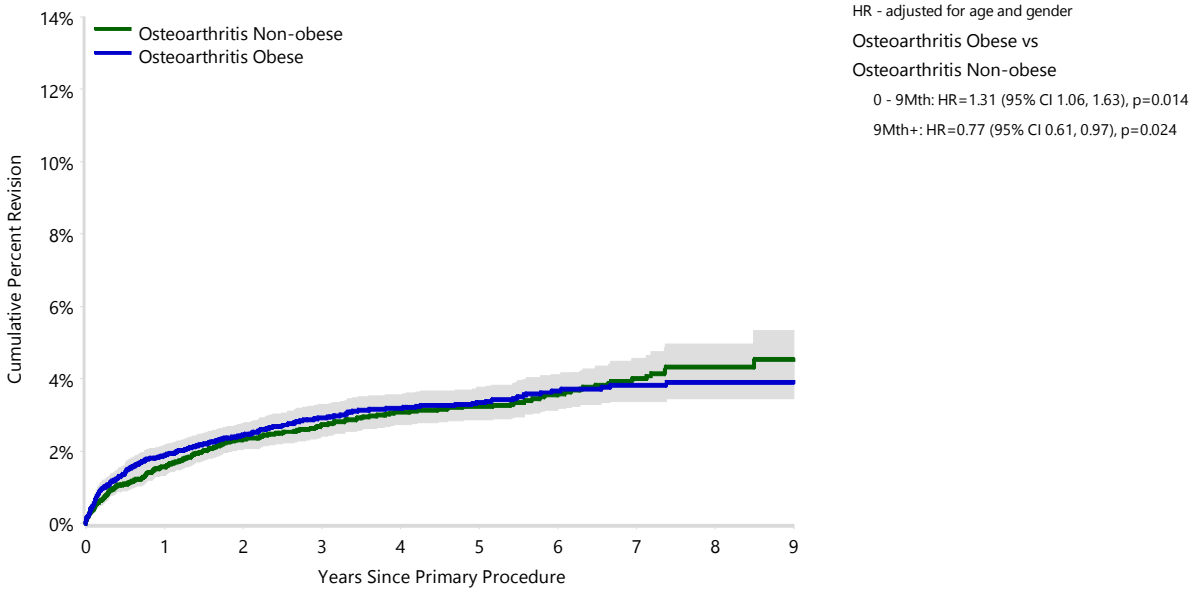
Note: Restricted to modern prostheses

Table ST88 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and BMI Category

Primary Diagnosis	BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Osteoarthritis									
	Non-obese	309	11354	1.6 (1.3, 1.8)	2.3 (2.0, 2.6)	2.7 (2.4, 3.1)	3.1 (2.7, 3.5)	3.2 (2.9, 3.7)	3.6 (3.2, 4.1)
	Obese	324	11591	1.9 (1.6, 2.2)	2.4 (2.2, 2.8)	2.9 (2.6, 3.3)	3.2 (2.8, 3.6)	3.4 (3.0, 3.8)	3.7 (3.3, 4.1)
Rotator Cuff Arthropathy									
	Non-obese	316	10991	1.9 (1.6, 2.2)	2.7 (2.4, 3.0)	3.0 (2.7, 3.4)	3.2 (2.9, 3.6)	3.4 (3.0, 3.8)	3.7 (3.3, 4.2)
	Obese	362	9552	2.5 (2.2, 2.8)	3.3 (3.0, 3.7)	3.9 (3.5, 4.3)	4.3 (3.9, 4.8)	4.6 (4.2, 5.2)	5.0 (4.5, 5.6)
Fracture									
	Non-obese	128	3786	2.5 (2.0, 3.0)	3.3 (2.8, 4.0)	3.4 (2.8, 4.1)	3.7 (3.1, 4.4)	4.0 (3.4, 4.9)	4.4 (3.6, 5.3)
	Obese	155	3059	3.8 (3.2, 4.6)	4.9 (4.2, 5.8)	5.2 (4.5, 6.2)	5.8 (5.0, 6.8)	6.1 (5.2, 7.2)	6.1 (5.2, 7.2)
TOTAL		1594	50333						

Note: BMI has not been presented for patients aged ≤19 years
Restricted to modern prostheses

Figure ST59 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by BMI Category (Primary Diagnosis OA)

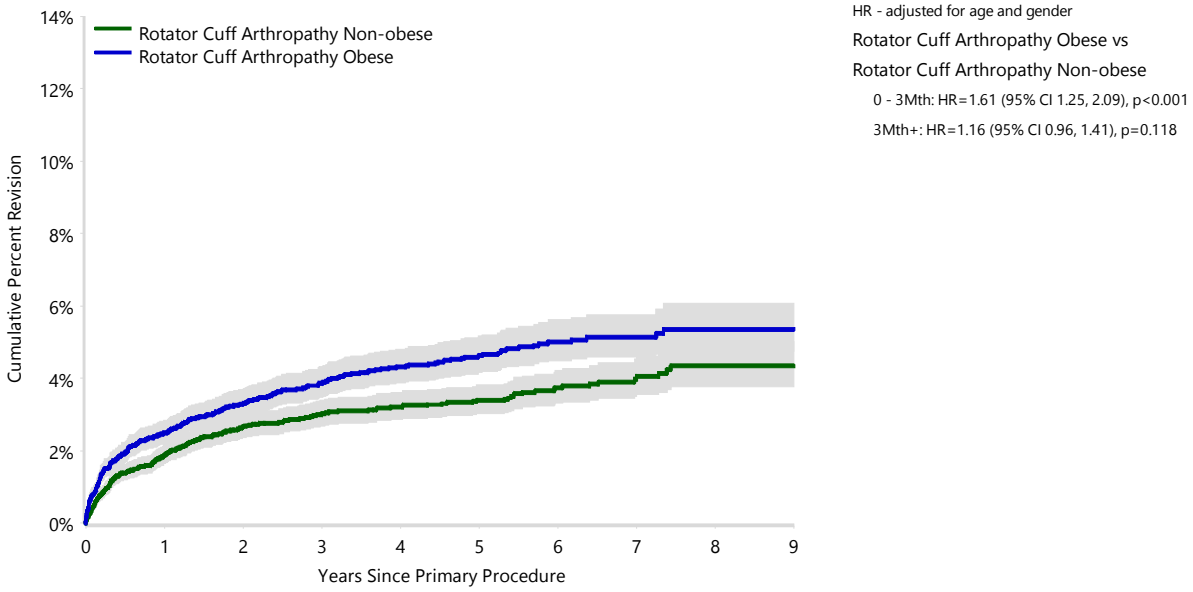


Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Osteoarthritis	Non-obese	11354	9255	7414	5993	4587	3437	2356
	Obese	11591	9341	7533	6054	4622	3379	2264

Note: BMI has not been presented for patients aged ≤19 years
Restricted to modern prostheses

Primary Total Shoulder Replacement

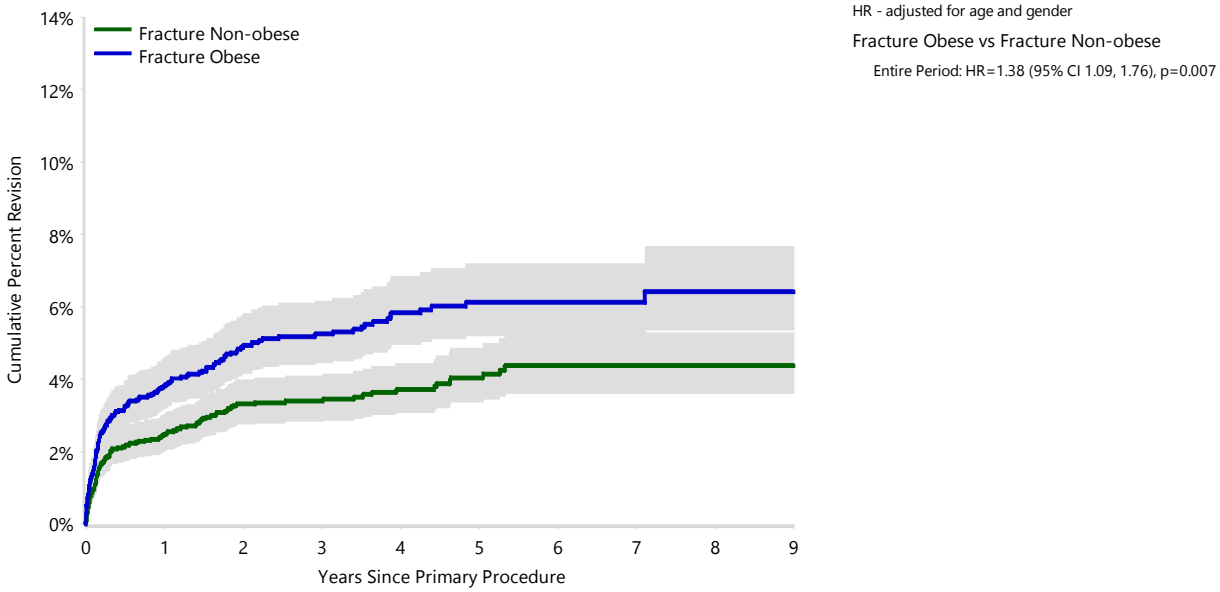
Figure ST60 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by BMI Category (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Rotator Cuff Arthropathy	Non-obese	10991	8870	7049	5582	4220	3141	2116
	Obese	9552	7719	6128	4903	3666	2656	1775

Note: BMI has not been presented for patients aged ≤19 years. Restricted to modern prostheses

Figure ST61 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by BMI Category (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Fracture	Non-obese	3786	3018	2371	1813	1369	978	654
	Obese	3059	2433	1948	1535	1143	811	580

Note: BMI has not been presented for patients aged ≤19 years. Restricted to modern prostheses

Table ST89 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenoid Morphology

Primary Diagnosis	Glenoid Morphology	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	A1	122	4786	1.6 (1.3, 2.1)	2.4 (2.0, 3.0)	2.8 (2.3, 3.4)	3.1 (2.5, 3.7)	3.3 (2.7, 3.9)
	A2	123	4533	1.6 (1.3, 2.1)	2.6 (2.2, 3.2)	3.1 (2.6, 3.8)	3.3 (2.7, 3.9)	3.4 (2.9, 4.2)
	B1	69	3133	1.7 (1.3, 2.3)	2.1 (1.7, 2.8)	2.4 (1.9, 3.1)	2.7 (2.1, 3.5)	2.7 (2.1, 3.5)
	B2	93	3740	1.4 (1.1, 1.9)	1.9 (1.5, 2.5)	2.7 (2.2, 3.4)	3.4 (2.7, 4.3)	3.6 (2.9, 4.5)
	C	34	1231	1.8 (1.2, 2.8)	2.4 (1.6, 3.5)	2.7 (1.9, 3.9)	3.2 (2.3, 4.6)	4.2 (2.9, 6.1)
Rotator Cuff Arthropathy								
	A1	262	8336	2.1 (1.8, 2.4)	2.8 (2.5, 3.3)	3.3 (2.9, 3.8)	3.8 (3.3, 4.3)	4.0 (3.5, 4.5)
	A2	129	4046	2.3 (1.8, 2.8)	3.3 (2.8, 4.0)	3.6 (3.0, 4.3)	3.8 (3.2, 4.5)	3.9 (3.3, 4.7)
	B1	65	2364	1.9 (1.4, 2.6)	2.8 (2.1, 3.6)	3.1 (2.4, 4.0)	3.1 (2.4, 4.0)	3.5 (2.6, 4.6)
	B2	51	1806	1.9 (1.4, 2.7)	2.6 (1.9, 3.5)	3.2 (2.4, 4.3)	3.6 (2.7, 4.8)	3.9 (2.9, 5.2)
	C	20	673	2.3 (1.4, 3.8)	2.9 (1.8, 4.6)	3.2 (2.0, 5.0)	3.2 (2.0, 5.0)	4.5 (2.7, 7.5)
Fracture								
	A1	181	4792	3.0 (2.5, 3.5)	3.9 (3.3, 4.5)	4.0 (3.5, 4.7)	4.3 (3.7, 5.0)	4.7 (4.0, 5.5)
	A2	19	518	2.4 (1.4, 4.2)	3.6 (2.2, 5.9)	3.6 (2.2, 5.9)	4.8 (2.9, 7.8)	4.8 (2.9, 7.8)
	B1	9	248	3.0 (1.4, 6.1)	3.7 (1.8, 7.5)	3.7 (1.8, 7.5)	4.9 (2.4, 9.8)	4.9 (2.4, 9.8)
	B2	8	148	3.5 (1.5, 8.3)	5.5 (2.6, 11.3)	5.5 (2.6, 11.3)	7.0 (3.4, 14.0)	
	C	1	55	1.9 (0.3, 12.9)	1.9 (0.3, 12.9)	1.9 (0.3, 12.9)	1.9 (0.3, 12.9)	1.9 (0.3, 12.9)
TOTAL		1186	40409					

Note: Restricted to modern prostheses
Excludes 119 procedures with a recorded glenoid morphology of B3
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

OUTCOME FOR OSTEOARTHRITIS, ROTATOR CUFF ARTHROPATHY AND FRACTURE – PROSTHESIS CHARACTERISTICS

Fixation

Fixation of either the glenoid or humeral components are not risk factors for revision of total stemmed reverse shoulder replacement procedures when undertaken for osteoarthritis or fracture. Cementing the glenoid component increases the rate of revision compared to cementless fixation for the primary diagnosis rotator cuff arthropathy (Table ST90 and Figure ST62).

Polyethylene Type and Bearing Surface

Non XLPE glenospheres increase the risk of revision in procedures for osteoarthritis but not rotator cuff arthropathy or fracture. Non XLPE humeral cups have an increased rate of revision compared to XLPE humeral cups for osteoarthritis only (Table ST91 and Figure ST63).

Glenosphere Size

Glenosphere sizes >40mm have a lower rate of revision compared to <38mm over the entire period for osteoarthritis, in contrast to fracture where <38mm humeral heads have the lower revision rate compared to >40mm (Table ST92, Figure ST64 and Figure ST65). Varying glenosphere size does not change the rate of revision in total stemmed reverse procedures for rotator cuff arthropathy.

Glenosphere sizes <38mm have a higher rate of revision compared to sizes >40mm.

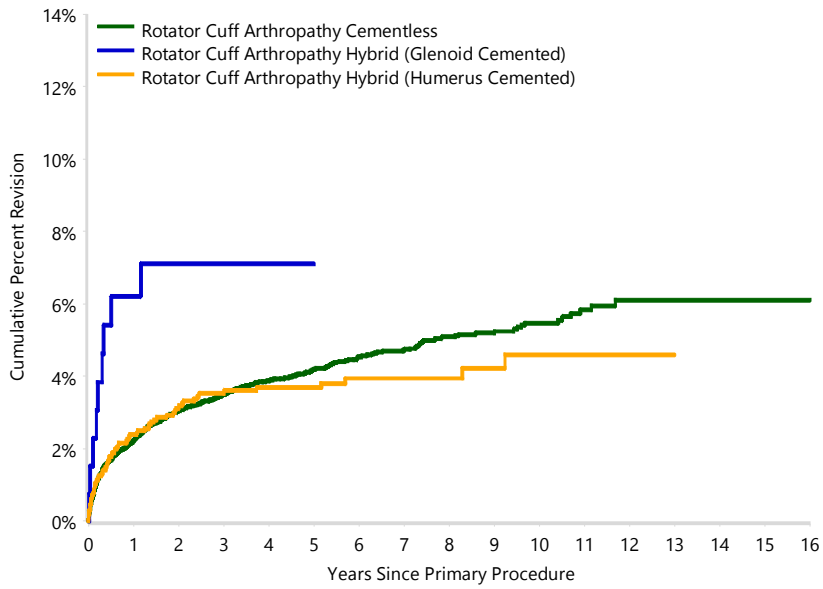
Primary Total Shoulder Replacement

Table ST90 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Fixation

Primary Diagnosis	Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	Cemented	4	113	0.9 (0.1, 6.1)	1.9 (0.5, 7.4)	1.9 (0.5, 7.4)	1.9 (0.5, 7.4)	3.2 (1.0, 9.8)
	Cementless	785	24803	1.8 (1.7, 2.0)	2.5 (2.3, 2.7)	2.9 (2.7, 3.2)	3.3 (3.0, 3.5)	3.5 (3.2, 3.7)
	Hybrid (Glenoid Cemented)	5	115	1.8 (0.5, 7.1)	2.8 (0.9, 8.6)	2.8 (0.9, 8.6)	4.5 (1.6, 11.9)	4.5 (1.6, 11.9)
	Hybrid (Humerus Cemented)	104	2903	1.9 (1.4, 2.4)	2.7 (2.2, 3.4)	3.1 (2.5, 3.8)	3.3 (2.7, 4.1)	3.4 (2.8, 4.2)
Rotator Cuff Arthropathy								
	Cemented	4	32	6.4 (1.6, 23.1)	6.4 (1.6, 23.1)	6.4 (1.6, 23.1)	10.4 (3.4, 29.2)	10.4 (3.4, 29.2)
	Cementless	803	22007	2.2 (2.0, 2.4)	3.1 (2.8, 3.3)	3.5 (3.2, 3.8)	3.9 (3.6, 4.2)	4.2 (3.9, 4.5)
	Hybrid (Glenoid Cemented)	9	132	6.2 (3.2, 12.1)	7.1 (3.8, 13.2)	7.1 (3.8, 13.2)	7.1 (3.8, 13.2)	7.1 (3.8, 13.2)
	Hybrid (Humerus Cemented)	69	1951	2.4 (1.8, 3.2)	3.1 (2.4, 4.0)	3.5 (2.8, 4.5)	3.7 (2.9, 4.7)	3.7 (2.9, 4.7)
Fracture								
	Cemented	6	120	3.4 (1.3, 8.8)	3.4 (1.3, 8.8)	3.4 (1.3, 8.8)	5.1 (2.0, 12.3)	7.1 (3.0, 16.1)
	Cementless	140	2921	3.6 (2.9, 4.3)	4.6 (3.8, 5.4)	4.7 (4.0, 5.6)	5.0 (4.2, 5.9)	5.3 (4.4, 6.2)
	Hybrid (Glenoid Cemented)	12	184	5.6 (3.0, 10.1)	6.3 (3.5, 11.1)	6.3 (3.5, 11.1)	7.7 (4.3, 13.5)	
	Hybrid (Humerus Cemented)	248	6364	2.7 (2.4, 3.2)	3.6 (3.1, 4.1)	3.8 (3.3, 4.3)	4.2 (3.7, 4.8)	4.4 (3.9, 5.0)
TOTAL		2189	61645					

Note: Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST62 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Fixation (Primary Diagnosis Rotator Cuff Arthropathy)



HR - adjusted for age and gender

Rotator Cuff Arthropathy Hybrid (Glenoid Cemented)
Rotator Cuff Arthropathy Cementless
Entire Period: HR=2.52 (95% CI 1.30, 4.87), p=0.006

Rotator Cuff Arthropathy Hybrid (Humerus Cemented
Rotator Cuff Arthropathy Cementless
Entire Period: HR=1.04 (95% CI 0.81, 1.33), p=0.774

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Rotator Cuff Arthropathy	Cementless	22007	18155	14833	12196	9695	7655
	Hybrid (Glenoid Cemented)	132	108	97	88	74	52
	Hybrid (Humerus Cemented)	1951	1696	1479	1286	1049	843

Note: Restricted to modern prostheses. Only combinations with >100 procedures have been listed

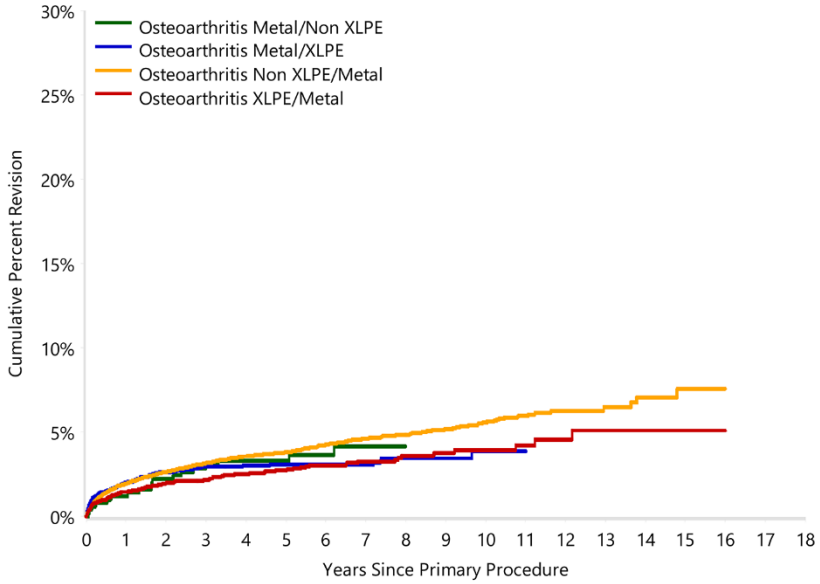
Table ST91 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Bearing Surface

Primary Diagnosis	Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis									
	Ceramic/Non XLPE	0	5	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Ceramic/XLPE	3	75	1.4 (0.2, 9.6)	4.7 (1.5, 13.9)				
	Metal/Non XLPE	19	502	1.2 (0.5, 2.7)	3.1 (1.9, 5.1)	3.3 (2.0, 5.3)	4.2 (2.6, 6.7)		
	Metal/XLPE	128	4490	2.0 (1.6, 2.4)	2.9 (2.5, 3.5)	3.1 (2.6, 3.7)	3.1 (2.6, 3.7)	3.9 (2.9, 5.1)	
	Non XLPE/Metal	604	16522	2.0 (1.8, 2.2)	3.2 (2.9, 3.5)	3.8 (3.5, 4.1)	4.6 (4.2, 5.0)	5.6 (5.0, 6.1)	7.1 (6.0, 8.3)
	XLPE/Metal	144	6331	1.5 (1.2, 1.8)	2.2 (1.8, 2.6)	2.7 (2.3, 3.3)	3.3 (2.7, 4.0)	3.9 (3.2, 4.9)	5.1 (3.7, 7.0)
Rotator Cuff Arthropathy									
	Ceramic/Non XLPE	0	10	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Ceramic/XLPE	1	71	0.0 (0.0, 0.0)	1.5 (0.2, 10.3)	1.5 (0.2, 10.3)			
	Metal/Non XLPE	22	467	2.4 (1.3, 4.2)	3.9 (2.5, 6.1)	4.7 (3.1, 7.2)	6.0 (3.5, 10.1)		
	Metal/XLPE	139	3804	2.5 (2.0, 3.1)	3.6 (3.0, 4.2)	3.8 (3.2, 4.5)	4.3 (3.6, 5.1)	4.9 (3.8, 6.2)	
	Non XLPE/Metal	579	14493	2.3 (2.1, 2.6)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)	4.9 (4.5, 5.4)	5.8 (5.2, 6.4)	6.3 (5.5, 7.0)
	XLPE/Metal	144	5265	1.9 (1.6, 2.3)	2.9 (2.5, 3.5)	3.7 (3.1, 4.5)	4.1 (3.3, 4.9)	4.8 (3.8, 6.2)	5.9 (4.3, 8.1)
Fracture									
	Ceramic/XLPE	0	4	0.0 (0.0, 0.0)					
	Metal/Non XLPE	13	285	1.8 (0.7, 4.2)	3.6 (2.0, 6.7)	5.0 (2.9, 8.6)	5.0 (2.9, 8.6)		
	Metal/XLPE	85	1592	4.0 (3.2, 5.2)	5.4 (4.3, 6.7)	5.7 (4.6, 7.1)	6.1 (4.9, 7.6)	6.1 (4.9, 7.6)	
	Non XLPE/Metal	242	5631	3.0 (2.5, 3.4)	4.0 (3.5, 4.6)	4.7 (4.2, 5.4)	5.1 (4.5, 5.8)	6.2 (5.3, 7.4)	6.2 (5.3, 7.4)
	XLPE/Metal	65	2065	2.7 (2.1, 3.5)	3.4 (2.7, 4.4)	3.8 (3.0, 4.9)	3.8 (3.0, 4.9)	3.8 (3.0, 4.9)	
	TOTAL	2188	61612						

Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere. Excludes procedures with unknown bearing surface
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Primary Total Shoulder Replacement

Figure ST63 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)



HR – adjusted for age and gender

Osteoarthritis Metal/XLPE vs
Osteoarthritis Metal/Non XLPE
0-1.5 Yr: HR=1.35 (95% CI 0.66, 2.78), p=0.412
1.5 Yr +: HR=0.31 (95% CI 0.15, 0.63), p=0.001

Osteoarthritis XLPE/Metal vs
Osteoarthritis Non XLPE/Metal
Entire Period: HR= 0.75 (95% CI 0.62, 0.90), p=0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	Metal/Non XLPE	502	484	447	281	146	7	0
	Metal/XLPE	4490	3921	2896	1837	864	192	4
	Non XLPE/Metal	16522	14111	10166	6883	4086	1595	265
	XLPE/Metal	6331	4764	2890	1739	1055	440	119

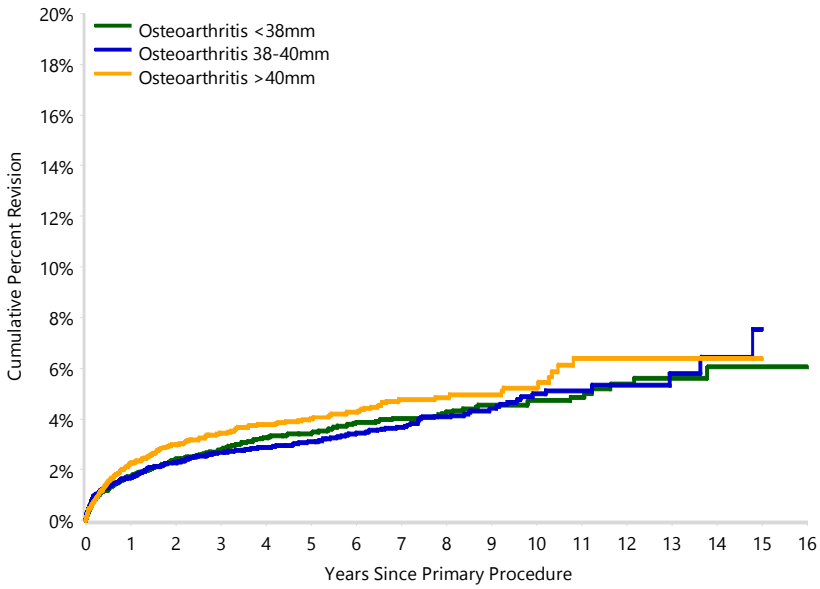
Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere.

Table ST92 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis OA)

Primary Diagnosis	Glenosphere Size	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Osteoarthritis									
	<38mm	306	9868	1.7 (1.5, 2.0)	2.4 (2.1, 2.8)	2.8 (2.5, 3.2)	3.4 (3.0, 3.9)	4.3 (3.8, 4.9)	4.7 (4.1, 5.4)
	38-40mm	314	10127	1.7 (1.4, 2.0)	2.3 (2.0, 2.6)	2.7 (2.4, 3.0)	3.1 (2.7, 3.5)	4.1 (3.6, 4.6)	5.0 (4.3, 5.8)
	>40mm	237	6199	2.3 (1.9, 2.7)	3.0 (2.6, 3.5)	3.5 (3.0, 4.0)	4.0 (3.5, 4.6)	4.9 (4.2, 5.6)	5.3 (4.5, 6.1)
Rotator Cuff Arthropathy									
	<38mm	283	8378	2.1 (1.8, 2.5)	2.9 (2.5, 3.3)	3.3 (2.9, 3.8)	4.0 (3.5, 4.5)	4.7 (4.1, 5.4)	5.5 (4.7, 6.5)
	38-40mm	314	8635	2.3 (2.0, 2.6)	3.1 (2.7, 3.5)	3.4 (3.1, 3.9)	4.0 (3.5, 4.5)	4.7 (4.2, 5.3)	4.8 (4.2, 5.4)
	>40mm	250	5811	2.4 (2.1, 2.9)	3.4 (3.0, 3.9)	3.9 (3.4, 4.4)	4.6 (4.1, 5.3)	5.8 (5.1, 6.7)	6.2 (5.3, 7.2)
Fracture									
	<38mm	135	4078	2.3 (1.8, 2.8)	3.0 (2.5, 3.7)	3.2 (2.7, 3.8)	3.8 (3.2, 4.6)	4.7 (3.9, 5.7)	4.7 (3.9, 5.7)
	38-40mm	153	3658	3.1 (2.6, 3.7)	3.8 (3.2, 4.5)	4.0 (3.4, 4.7)	4.5 (3.8, 5.3)	5.0 (4.2, 5.9)	5.9 (4.7, 7.4)
	>40mm	105	1442	5.1 (4.1, 6.4)	6.6 (5.4, 8.1)	7.0 (5.7, 8.5)	8.0 (6.6, 9.6)	8.6 (7.0, 10.4)	8.6 (7.0, 10.4)
TOTAL		2097	58196						

Note: Excludes procedures with unknown glenosphere sizes
Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST64 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis OA)



HR - adjusted for age and gender

Osteoarthritis <38mm vs Osteoarthritis 38-40mm
Entire Period: HR=1.09 (95% CI 0.93, 1.27), p=0.304

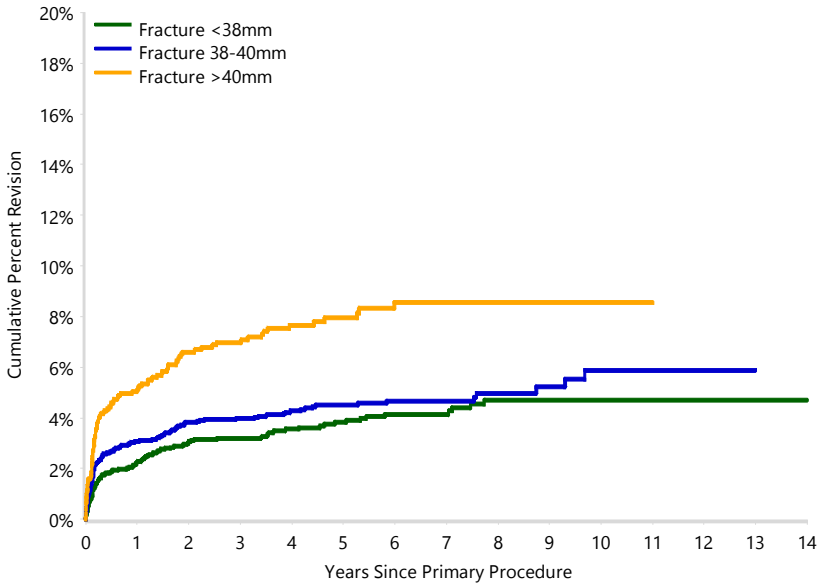
Osteoarthritis >40mm vs Osteoarthritis <38mm
Entire Period: HR=0.79 (95% CI 0.65, 0.94), p=0.009

Osteoarthritis >40mm vs Osteoarthritis 38-40mm
0 - 3Mth: HR=0.65 (95% CI 0.48, 0.89), p=0.007
3Mth+: HR=0.94 (95% CI 0.77, 1.15), p=0.568

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	<38mm	9868	8140	5648	3739	2261	951	198
	38-40mm	10127	8762	6411	4262	2437	807	128
	>40mm	6199	5372	3979	2651	1457	477	62

Note: Restricted to modern prostheses

Figure ST65 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis Fracture)



HR - adjusted for age and gender

Fracture 38-40mm vs Fracture <38mm

Entire Period: HR=1.18 (95% CI 0.94, 1.49), p=0.160

Fracture >40mm vs Fracture <38mm

Entire Period: HR=1.46 (95% CI 1.11, 1.92), p=0.007

Fracture >40mm vs Fracture 38-40mm

Entire Period: HR=1.24 (95% CI 0.95, 1.62), p=0.118

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture	**<38mm**	4078	3297	2126	1309	780	284	47
	38-40mm	3658	3117	2221	1411	758	223	23
	>40mm	1442	1221	892	547	277	81	5

Note: Restricted to modern prostheses

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Baseplate Augmentation

A glenoid baseplate is categorised as augmented if the backside has been modified for glenoid deformity (eg. wedged, stepped, angulated, or lateralised). When stratified by primary diagnosis, there is no difference in the rate of revision when augmented and non-augmented glenoid baseplates are compared amongst all common primary diagnoses except for osteoarthritis in the first 3 months, where a non-augmented glenoid is at higher revision risk (Table ST93 and Figure ST66).

When stratified by glenoid morphology, glenoid base plate augmentation varies with differing primary diagnoses. In osteoarthritis, while there is no difference when utilised for type A glenoids, glenoid morphology B augmented glenoid replacement has a higher rate of revision from 9 months onwards with no difference prior to this time (Table ST94 and Figure ST67). In contrast, glenoid morphology C non-augmented glenoid replacement has a higher rate of revision for the entire period (Table ST94 and Figure ST68). Glenoid morphology B non-augmented glenoid for rotator cuff arthropathy has a higher rate of revision for the first month only, with no difference after this time (Table ST94 and Figure ST69).

Humeral, Stem Type and Stem Length

There is an increased rate of revision for non-fracture humeral stems compared to fracture humeral stems (Table ST95 and Figure ST70). When compared by fixation, a cemented fracture stem has a lower rate of revision than a cemented non fracture stem (Table ST96 and Figure ST71). There is no difference in the rate of revision when cementless fixation stems are used.

A short humeral stem (<100 mm) has a lower rate of revision compared to a conventional stem (≥100mm) from 3 months onwards in osteoarthritis patients only (Table ST97 and Figure ST72). Conventional stem lengths have higher cumulative incidence of infection compared to short stems (Figure ST73).

Glenosphere Lateralisation

If the radius of curvature of the articular surface of the glenosphere is displaced laterally by design, it is categorised as a lateralised glenosphere. There is no difference in the rate of revision for total stemmed reverse shoulder replacements with lateralised glenospheres when compared to total stemmed reverse shoulder replacements with standard glenospheres for all primary diagnoses analysed (Table ST98).

Primary Total Shoulder Replacement

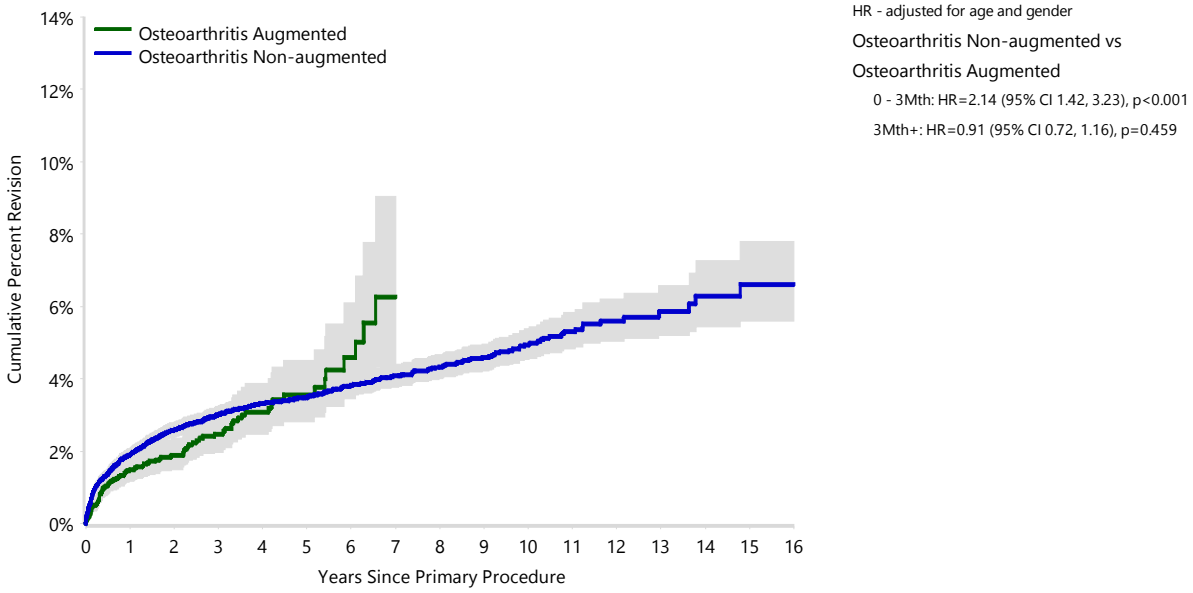
Table ST93 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenoid Augmentation

Primary Diagnosis	Glenoid Augmentation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	Augmented	105	4765	1.5 (1.2, 1.9)	1.9 (1.5, 2.4)	2.5 (2.0, 3.1)	3.1 (2.5, 3.9)	3.6 (2.8, 4.5)
	Non-augmented	792	23154	1.9 (1.7, 2.1)	2.6 (2.4, 2.8)	3.0 (2.8, 3.3)	3.3 (3.1, 3.6)	3.5 (3.2, 3.8)
Rotator Cuff Arthropathy								
	Augmented	93	3800	1.9 (1.5, 2.4)	2.7 (2.2, 3.4)	3.0 (2.4, 3.7)	3.2 (2.5, 4.0)	3.4 (2.7, 4.5)
	Non-augmented	792	20316	2.3 (2.1, 2.6)	3.1 (2.9, 3.4)	3.6 (3.3, 3.9)	4.0 (3.7, 4.3)	4.3 (4.0, 4.6)
Fracture								
	Augmented	18	771	1.9 (1.1, 3.3)	2.9 (1.7, 4.9)	2.9 (1.7, 4.9)	4.0 (2.1, 7.6)	
	Non-augmented	388	8816	3.1 (2.8, 3.5)	4.0 (3.6, 4.5)	4.2 (3.8, 4.7)	4.6 (4.1, 5.1)	4.8 (4.4, 5.3)
TOTAL		2188	61622					

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST66 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis	Augmented	4765	3268	2176	1465	949	538
	Non-augmented	23154	20082	17340	14971	12436	10212

Note: Restricted to modern prostheses

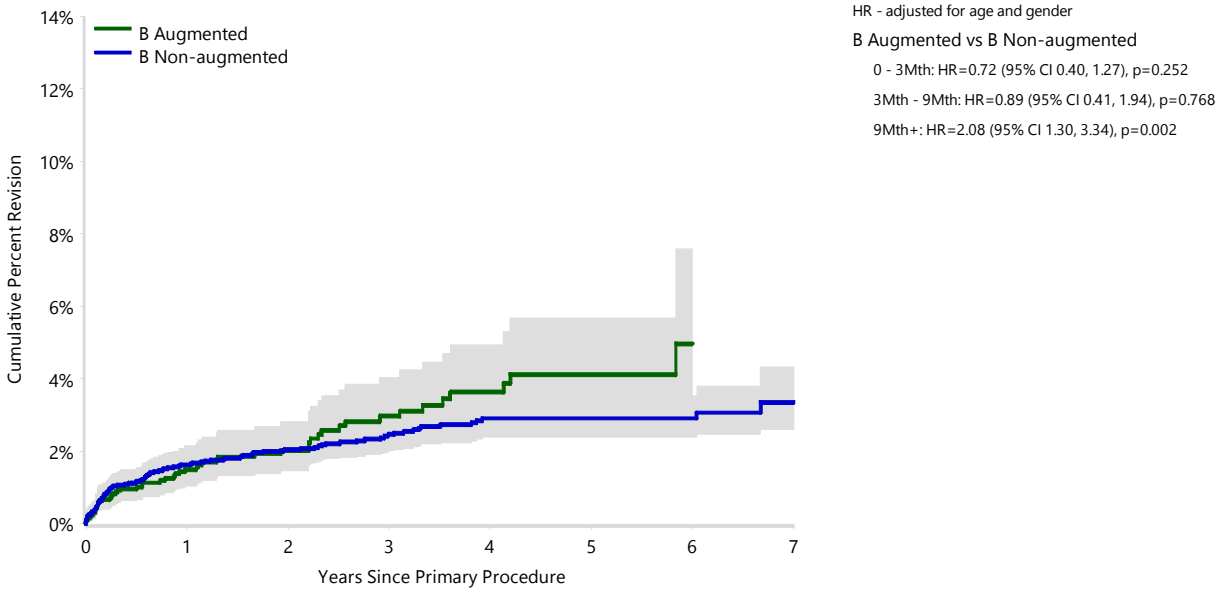
Table ST94 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Glenoid Morphology and Glenoid Augmentation

Primary Diagnosis	Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis									
	A	Augmented	27	1378	1.6 (1.0, 2.5)	2.1 (1.3, 3.2)	2.3 (1.5, 3.6)	3.1 (1.9, 5.0)	3.1 (1.9, 5.0)
		Non-augmented	216	7939	1.6 (1.4, 1.9)	2.6 (2.2, 3.0)	3.0 (2.6, 3.5)	3.2 (2.8, 3.7)	3.4 (3.0, 3.9)
	B	Augmented	55	2255	1.5 (1.0, 2.1)	2.0 (1.5, 2.8)	3.0 (2.2, 4.0)	3.6 (2.7, 4.9)	4.1 (3.0, 5.7)
		Non-augmented	107	4618	1.6 (1.3, 2.1)	2.0 (1.6, 2.5)	2.5 (2.0, 3.0)	2.9 (2.4, 3.5)	2.9 (2.4, 3.5)
	C	Augmented	6	496	0.7 (0.2, 2.1)	0.7 (0.2, 2.1)	0.7 (0.2, 2.1)	1.3 (0.4, 3.9)	3.6 (1.4, 9.4)
		Non-augmented	28	732	2.6 (1.6, 4.0)	3.4 (2.3, 5.1)	3.9 (2.6, 5.7)	4.4 (3.0, 6.4)	4.8 (3.3, 7.1)
Rotator Cuff Arthropathy									
	A	Augmented	41	1748	1.8 (1.3, 2.6)	2.7 (1.9, 3.8)	2.9 (2.1, 4.0)	3.5 (2.4, 5.1)	3.5 (2.4, 5.1)
		Non-augmented	350	10632	2.2 (1.9, 2.5)	3.0 (2.7, 3.4)	3.5 (3.1, 3.9)	3.8 (3.4, 4.3)	4.0 (3.6, 4.5)
	B	Augmented	29	1425	1.5 (0.9, 2.3)	2.3 (1.5, 3.4)	2.6 (1.8, 4.0)	2.6 (1.8, 4.0)	3.3 (2.0, 5.4)
		Non-augmented	87	2745	2.2 (1.7, 2.8)	2.9 (2.3, 3.6)	3.4 (2.7, 4.2)	3.6 (2.9, 4.5)	3.9 (3.1, 4.8)
	C	Augmented	8	310	2.4 (1.2, 5.0)	2.9 (1.5, 5.8)	2.9 (1.5, 5.8)	2.9 (1.5, 5.8)	
		Non-augmented	12	360	2.1 (1.0, 4.4)	2.8 (1.5, 5.4)	3.2 (1.7, 5.9)	3.2 (1.7, 5.9)	4.9 (2.6, 9.0)
Fracture									
	A	Augmented	14	532	2.0 (1.0, 3.9)	3.5 (1.9, 6.4)	3.5 (1.9, 6.4)		
		Non-augmented	186	4774	3.0 (2.5, 3.5)	3.9 (3.4, 4.6)	4.1 (3.5, 4.7)	4.4 (3.8, 5.0)	4.7 (4.0, 5.4)
	B	Augmented	3	110	3.0 (1.0, 8.9)				
		Non-augmented	14	286	3.3 (1.7, 6.2)	4.8 (2.8, 8.5)	4.8 (2.8, 8.5)	6.3 (3.7, 10.7)	6.3 (3.7, 10.7)
	C	Augmented	0	17	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
		Non-augmented	1	38	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)
TOTAL			1184	40395					

Note: Excludes 21,255 procedures with unknown glenoid augmentation or glenoid morphology
Restricted to modern prostheses.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Primary Total Shoulder Replacement

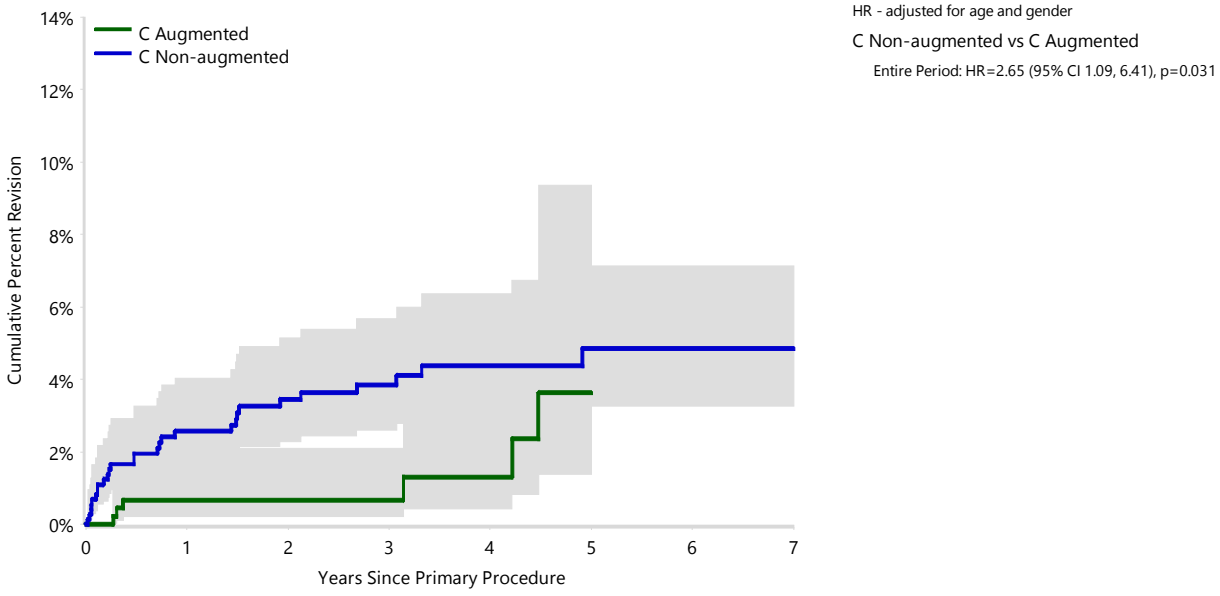
Figure ST67 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Morphology B and Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
B	Augmented	2255	1533	1017	688	427	221
	Non-augmented	4618	3710	2935	2292	1608	1091

Note: Restricted to modern prostheses.

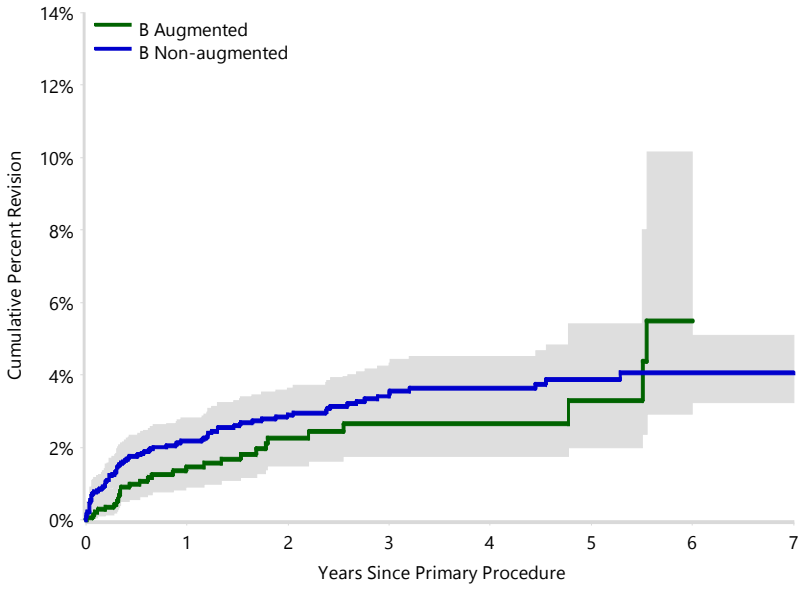
Figure ST68 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Morphology C and Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
C	Augmented	496	357	243	167	112	59
	Non-augmented	732	616	507	399	283	190

Note: Restricted to modern prostheses.

Figure ST69 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Morphology B and Glenoid Augmentation (Primary Diagnosis Rotator Cuff Arthropathy)



HR - adjusted for age and gender

B Non-augmented vs B Augmented

0 - 1Mth: HR=5.52 (95% CI 1.29, 23.55), p=0.020

1Mth+: HR=1.01 (95% CI 0.64, 1.58), p=0.973

Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
B	Augmented	1425	955	593	386	240	130
	Non-augmented	2745	2242	1756	1346	953	637

Note: Restricted to modern prostheses.

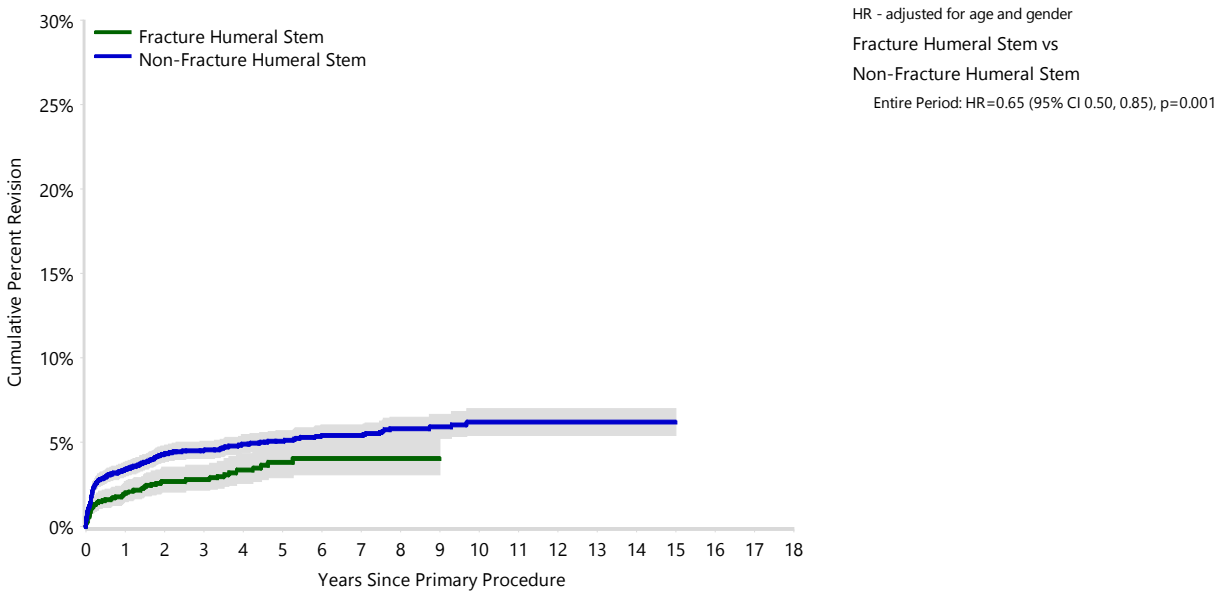
Primary Total Shoulder Replacement

Table ST95 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture Humeral Stem	65	2305	2.0 (1.5, 2.7)	2.8 (2.1, 3.6)	3.8 (2.9, 5.0)	4.0 (3.1, 5.3)		
Non-Fracture Humeral Stem	341	7284	3.4 (3.0, 3.8)	4.5 (4.0, 5.1)	5.1 (4.6, 5.7)	5.4 (4.8, 6.0)	6.2 (5.4, 7.0)	6.2 (5.4, 7.0)
TOTAL	406	9589						

Note: Restricted to modern prostheses

Figure ST70 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Fracture Humeral Stem	2305	1814	1042	502	175	14	0
Non-Fracture Humeral Stem	7284	6061	4246	2770	1641	575	75

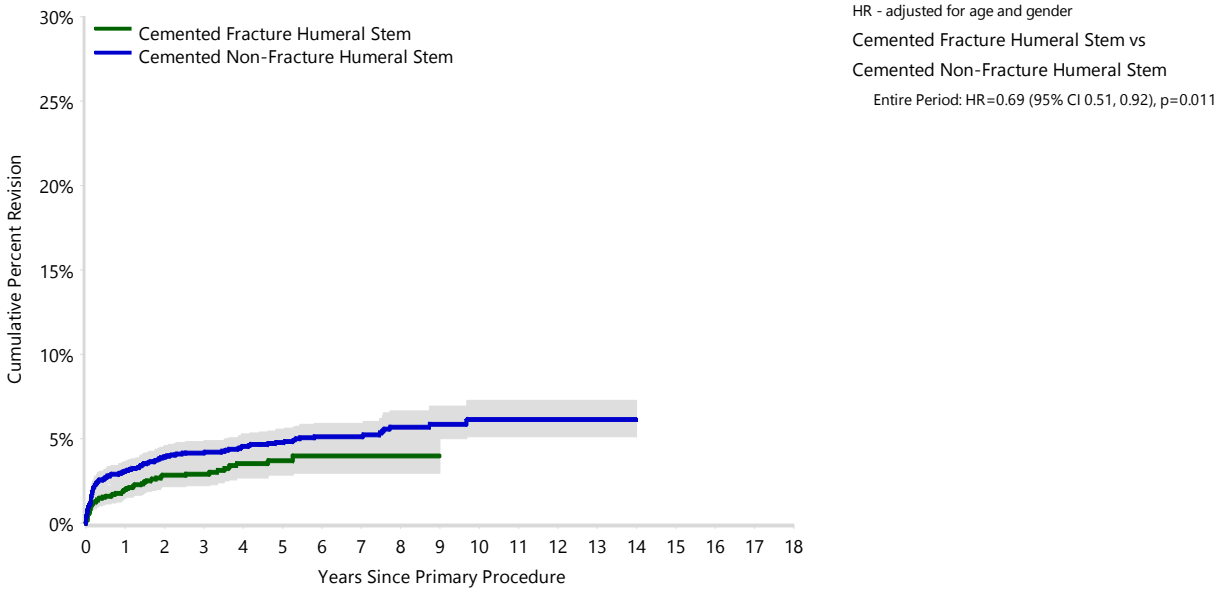
Note: Restricted to modern prostheses

Table ST96 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Humeral Fixation and Stem Type (Primary Diagnosis Fracture)

Humeral Fixation	Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cementless	Fracture Humeral Stem	6	238	1.7 (0.6, 4.5)	1.7 (0.6, 4.5)	4.4 (1.7, 10.7)			
	Non-Fracture Humeral Stem	146	2867	3.8 (3.2, 4.6)	5.1 (4.3, 6.0)	5.5 (4.7, 6.5)	5.8 (4.9, 6.9)	6.3 (5.2, 7.6)	
Cemented	Fracture Humeral Stem	59	2067	2.0 (1.5, 2.7)	2.9 (2.2, 3.8)	3.7 (2.8, 4.9)	4.0 (3.0, 5.3)		
	Non-Fracture Humeral Stem	195	4417	3.1 (2.6, 3.7)	4.2 (3.6, 4.8)	4.8 (4.2, 5.6)	5.1 (4.4, 5.9)	6.1 (5.1, 7.3)	6.1 (5.1, 7.3)
TOTAL		406	9589						

Note: Restricted to modern prostheses

Figure ST71 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Cemented Humeral Fixation by Stem Type (Primary Diagnosis Fracture)



	Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented	Fracture Humeral Stem	2067	1615	928	438	151	11	0
	Non-Fracture Humeral Stem	4417	3685	2582	1651	962	343	40

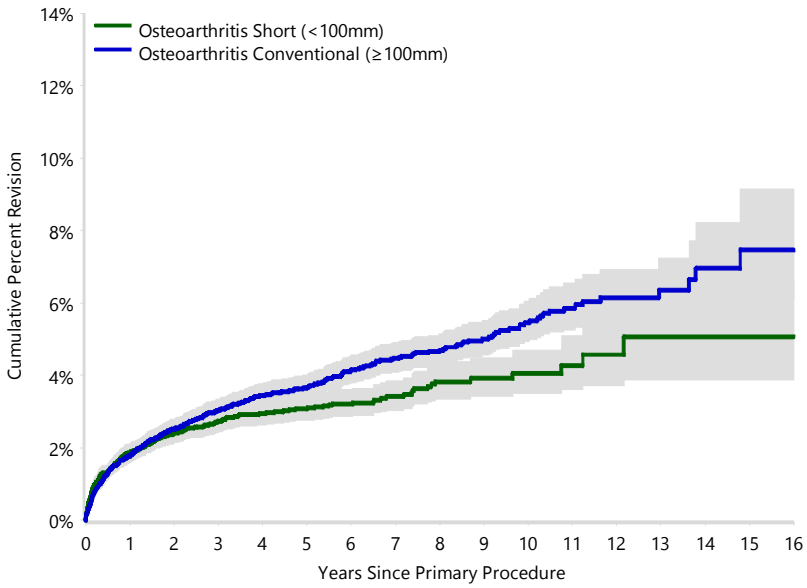
Note: Restricted to modern prostheses

Table ST97 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Humeral Stem Length

Primary Diagnosis	Humeral Stem Length	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis									
	Short (<100mm)	338	12636	1.9 (1.6, 2.1)	2.7 (2.4, 3.1)	3.1 (2.8, 3.4)	3.4 (3.0, 3.9)	4.1 (3.5, 4.7)	5.1 (3.9, 6.6)
	Conventional (≥100mm)	555	15152	1.8 (1.6, 2.0)	3.0 (2.8, 3.3)	3.7 (3.4, 4.0)	4.5 (4.1, 4.9)	5.5 (4.9, 6.1)	7.0 (5.9, 8.2)
Rotator Cuff Arthropathy									
	Short (<100mm)	359	10896	2.3 (2.0, 2.6)	3.4 (3.1, 3.8)	4.0 (3.6, 4.5)	4.4 (3.9, 4.9)	5.0 (4.3, 5.9)	5.8 (4.6, 7.2)
	Conventional (≥100mm)	521	13091	2.3 (2.0, 2.5)	3.5 (3.2, 3.9)	4.2 (3.9, 4.6)	4.8 (4.4, 5.3)	5.6 (5.1, 6.2)	6.1 (5.4, 6.9)
Fracture									
	Short (<100mm)	128	2631	3.8 (3.1, 4.6)	5.1 (4.3, 6.1)	5.5 (4.6, 6.5)	5.6 (4.7, 6.7)	5.6 (4.7, 6.7)	
	Conventional (≥100mm)	278	6948	2.8 (2.4, 3.2)	3.8 (3.3, 4.3)	4.5 (4.0, 5.1)	4.9 (4.3, 5.5)	5.9 (5.0, 6.9)	5.9 (5.0, 6.9)
TOTAL		2179	61354						

Note: Excludes procedures with unknown humeral stem length
Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST72 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)

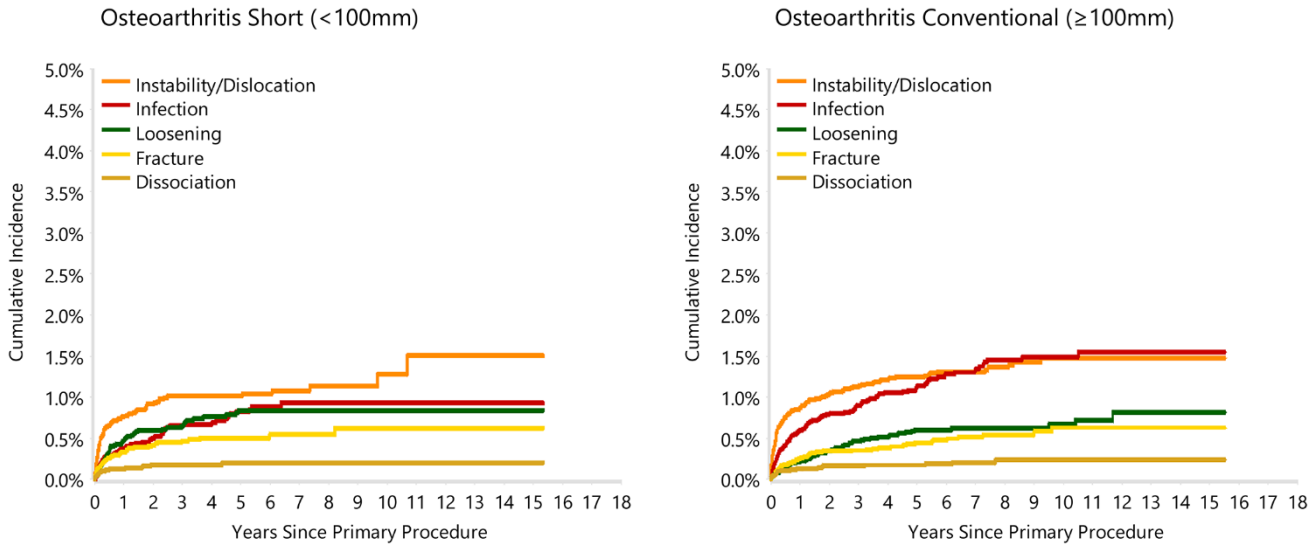


HR - adjusted for age and gender
Osteoarthritis Conventional (≥100mm) vs Osteoarthritis Short (<100mm)
0 - 3Mth: HR=0.88 (95% CI 0.69, 1.12), p=0.283
3Mth - 6Mth: HR=1.46 (95% CI 0.96, 2.23), p=0.077
6Mth - 3.5Yr: HR=1.25 (95% CI 1.02, 1.54), p=0.034
3.5Yr+: HR=2.14 (95% CI 1.43, 3.19), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Osteoarthritis	Short (<100mm)	12636	10022	6523	3911	1985	632	121
	Conventional (≥100mm)	15152	13281	9902	6834	4170	1603	267

Note: Excludes procedures with unknown humeral stem length
Restricted to modern prostheses

Figure ST73 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Humeral Stem Length



Note: Restricted to modern prostheses

Table ST98 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenosphere Lateralisation

Primary Diagnosis	Glenoid Lateralisation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	Lateralised	18	1047	1.5 (0.8, 2.5)	2.0 (1.2, 3.4)	2.4 (1.4, 4.1)	3.2 (1.7, 5.9)	3.2 (1.7, 5.9)
	Standard	878	26764	1.8 (1.7, 2.0)	2.5 (2.3, 2.7)	2.9 (2.7, 3.2)	3.3 (3.0, 3.5)	3.5 (3.2, 3.7)
Rotator Cuff Arthropathy								
	Lateralised	23	876	2.6 (1.6, 4.0)	3.3 (2.2, 5.1)	3.3 (2.2, 5.1)	4.4 (2.5, 7.6)	4.4 (2.5, 7.6)
	Standard	858	23108	2.2 (2.1, 2.5)	3.1 (2.8, 3.3)	3.5 (3.3, 3.8)	3.9 (3.6, 4.1)	4.1 (3.9, 4.5)
Fracture								
	Lateralised	17	361	4.6 (2.8, 7.6)	5.2 (3.2, 8.4)	5.2 (3.2, 8.4)		
	Standard	388	9195	3.0 (2.7, 3.4)	3.9 (3.5, 4.3)	4.1 (3.7, 4.5)	4.5 (4.0, 4.9)	4.7 (4.3, 5.2)
TOTAL		2182	61351					

Note: Excludes procedures with unknown lateralisation
Restricted to modern prostheses.
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Primary Total Shoulder Replacement

SURGEON ASSISTIVE TOOLS (SAT)

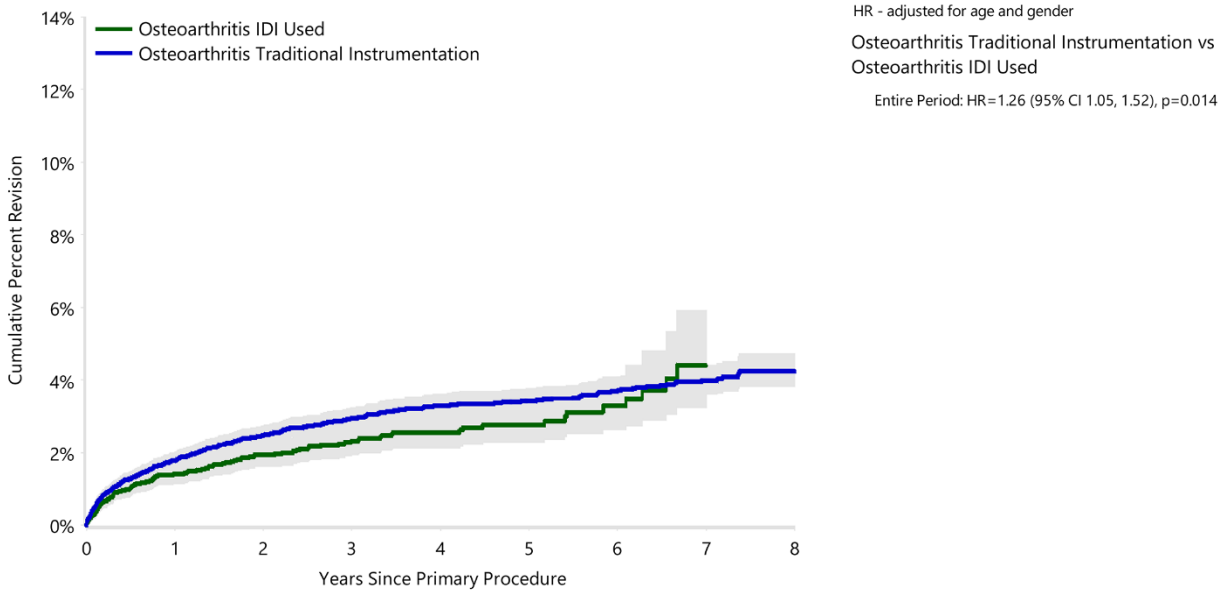
An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient.
There are 6,977 total stemmed reverse shoulder replacements for osteoarthritis, 6,213 for rotator cuff arthropathy, and 582 for fracture utilising an IDI since their first use in 2014. In 2024, IDI are used in 42% of osteoarthritis procedures, 40.8% of rotator cuff arthropathy and 13.7% of fracture (Table ST99 and Figure ST74).

Table ST99 Cumulative Percent Revision of Primary Total Stemmed Reverse Replacement Since 2016 by Primary Diagnosis and IDI Usage

Primary Diagnosis	IDI Use	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	IDI Used	144	6977	1.4 (1.1, 1.7)	1.9 (1.6, 2.3)	2.3 (1.9, 2.8)	2.6 (2.1, 3.1)	2.8 (2.3, 3.3)
	Traditional Instrumentation	477	16034	1.8 (1.6, 2.0)	2.5 (2.2, 2.7)	2.9 (2.7, 3.2)	3.3 (3.0, 3.6)	3.4 (3.1, 3.8)
Rotator Cuff Arthropathy								
	IDI Used	201	6213	2.2 (1.9, 2.7)	3.0 (2.6, 3.5)	3.6 (3.1, 4.2)	4.1 (3.5, 4.7)	4.4 (3.8, 5.2)
	Traditional Instrumentation	467	14206	2.1 (1.9, 2.4)	2.9 (2.7, 3.3)	3.3 (3.0, 3.7)	3.6 (3.3, 3.9)	3.8 (3.5, 4.2)
Fracture								
	IDI Used	23	582	2.8 (1.8, 4.6)	4.5 (2.9, 6.9)	4.5 (2.9, 6.9)	4.5 (2.9, 6.9)	6.8 (3.9, 11.7)
	Traditional Instrumentation	315	7415	3.2 (2.8, 3.6)	4.1 (3.7, 4.6)	4.3 (3.8, 4.8)	4.8 (4.3, 5.3)	5.0 (4.5, 5.6)
TOTAL		1627	51427					

Note: Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Figure ST74 Cumulative Percent Revision of Primary Total Stemmed Reverse Replacement Since 2016 by IDI Usage (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis	IDI Used	6977	5223	3781	2668	1730	1015
	Traditional Instrumentation	16034	13402	11147	9318	7362	5637

Note: Restricted to modern prostheses

OPERATIVE TECHNIQUE

Rotator Cuff Repair

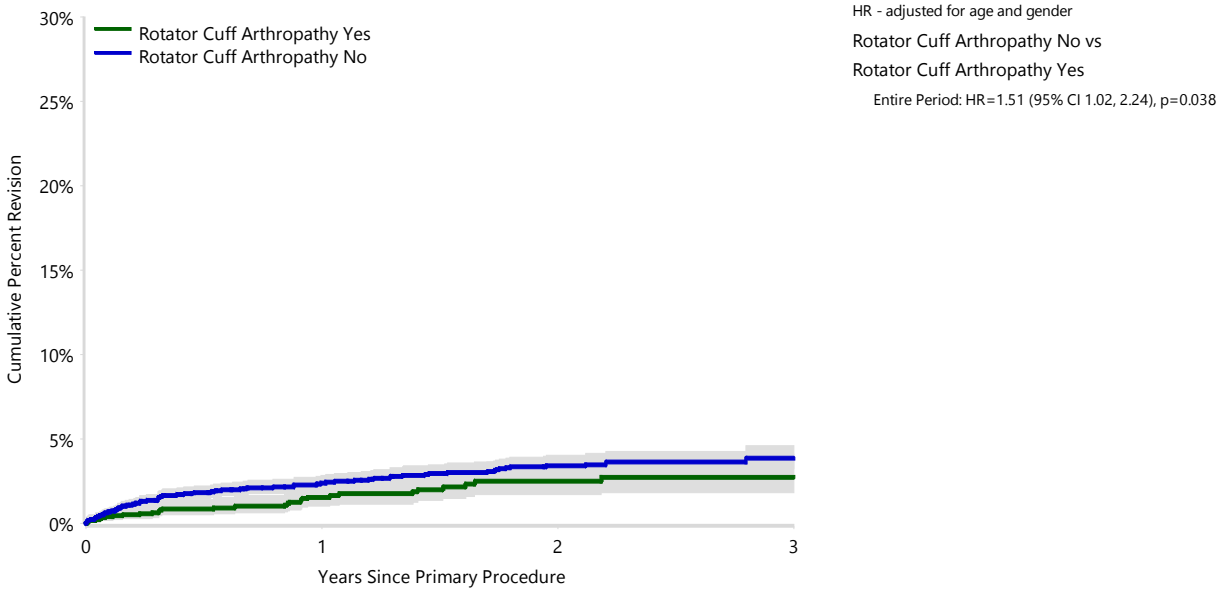
When a rotator cuff repair is not undertaken as part of the implantation of a total stemmed reverse shoulder replacement there is an increased rate of revision for rotator cuff arthropathy and fracture but no difference for osteoarthritis (Table ST100, Figure ST75 and Figure ST76).

Table ST100 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Rotator Cuff Repair

Primary Diagnosis	Rotator Cuff Repair	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis								
	Yes	24	1940	1.1 (0.7, 1.8)	1.9 (1.3, 3.0)	1.9 (1.3, 3.0)		
	No	99	5262	1.6 (1.3, 2.0)	2.3 (1.9, 2.9)	2.8 (2.2, 3.5)	3.8 (2.6, 5.5)	
Rotator Cuff Arthropathy								
	Yes	30	1747	1.6 (1.0, 2.4)	2.5 (1.7, 3.6)	2.8 (1.9, 4.1)		
	No	156	5667	2.4 (2.0, 2.8)	3.4 (2.9, 4.1)	3.9 (3.2, 4.6)		
Fracture								
	Yes	20	896	2.2 (1.4, 3.5)	2.7 (1.7, 4.3)	2.7 (1.7, 4.3)		
	No	49	1200	3.9 (2.9, 5.2)	5.1 (3.9, 6.9)	5.1 (3.9, 6.9)		
TOTAL		378	16712					

Note: Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report. .

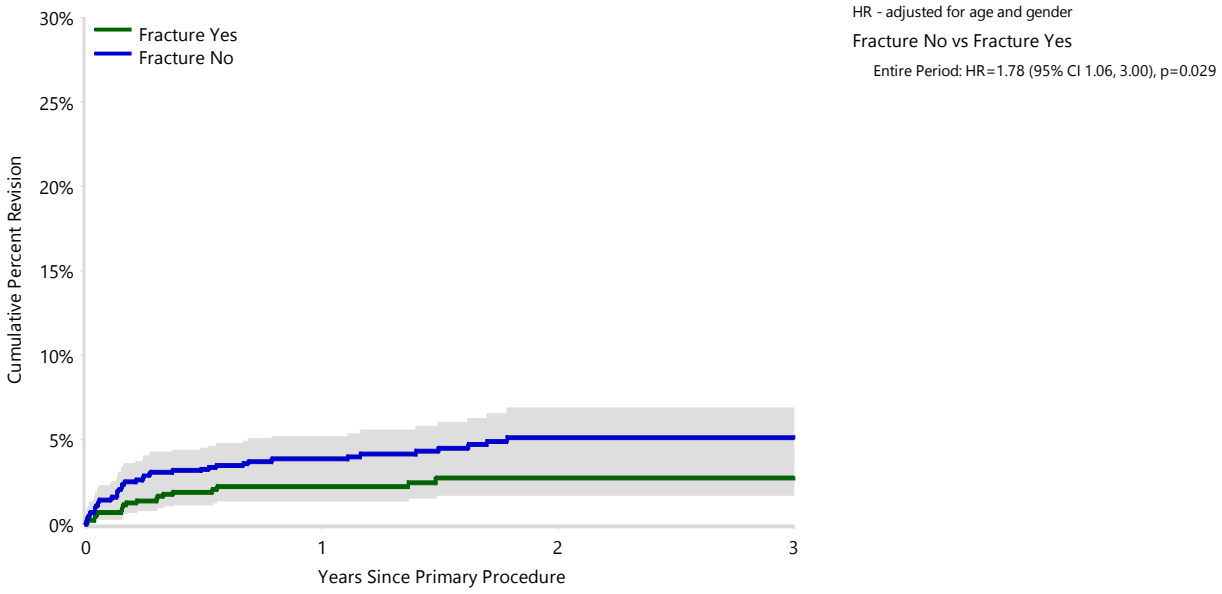
Figure ST75 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Rotator Cuff Arthropathy	Yes	1747	1014	437	118	8	0
	No	5667	3517	1795	655	38	0

Note: Restricted to modern prostheses

Figure ST76 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Fracture	**Yes**	896	511	242	73	3	0
	No	1200	705	361	131	14	0

Note: Restricted to modern prostheses

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcomes of the most commonly used prosthesis combinations are listed in Table ST101 to Table ST103. The most commonly used cementless prosthesis combinations are listed in Table ST104 to Table ST106. The most commonly used hybrid (humerus cemented) prosthesis combinations are listed in Table ST107 to Table ST109.

Table ST101 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	79	1606	2.0 (1.4, 2.8)	3.3 (2.6, 4.4)	3.9 (3.0, 5.0)	5.3 (4.2, 6.7)	6.1 (4.8, 7.7)	7.1 (5.5, 9.3)
	Perform Reversed	4	133	0.8 (0.1, 5.5)	3.4 (1.0, 10.7)				
Affinis	Affinis	28	826	1.4 (0.8, 2.4)	3.1 (2.1, 4.7)	3.3 (2.2, 4.9)	4.0 (2.7, 6.0)		
AltiVate Reverse	RSP	22	1166	1.4 (0.8, 2.4)	2.8 (1.8, 4.3)				
Ascend Flex	Aequalis	69	1983	2.2 (1.6, 2.9)	3.7 (2.9, 4.7)	4.3 (3.3, 5.5)	5.1 (3.8, 7.0)		
	Perform Reversed	21	1018	2.4 (1.6, 3.7)	2.6 (1.7, 4.0)				
Comprehensive	Comprehensive Reverse	48	3788	0.9 (0.6, 1.2)	1.3 (1.0, 1.8)	1.7 (1.3, 2.4)	1.7 (1.3, 2.4)	3.0 (1.3, 7.0)	
Delta Xtend	Delta Xtend	199	5465	1.8 (1.5, 2.2)	2.8 (2.4, 3.3)	3.2 (2.8, 3.8)	3.8 (3.2, 4.4)	4.7 (4.0, 5.5)	6.1 (4.9, 7.7)
Equinoxe	Equinoxe	123	3506	1.9 (1.5, 2.5)	3.1 (2.6, 3.9)	4.1 (3.4, 5.0)	6.4 (5.1, 8.1)		
Global Unite	Delta Xtend	16	621	1.1 (0.5, 2.4)	3.0 (1.8, 5.1)	3.6 (2.1, 6.0)	4.2 (2.4, 7.2)		
MSS	MSS	1	275	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
RSP	RSP	34	787	2.4 (1.6, 3.8)	3.8 (2.6, 5.4)	4.6 (3.3, 6.4)	4.6 (3.3, 6.4)		
SMR	SMR	1	173	0.6 (0.1, 4.3)					
	SMR Axioma	5	117	1.7 (0.4, 6.8)	4.8 (2.0, 11.1)				
	SMR L1	188	5177	2.4 (2.0, 2.8)	3.3 (2.8, 3.8)	3.5 (3.0, 4.1)	3.9 (3.4, 4.5)	4.6 (3.9, 5.4)	5.6 (4.3, 7.3)
Trabecular Metal	Comprehensive Reverse	3	212	1.0 (0.3, 4.0)	2.0 (0.6, 6.6)	2.0 (0.6, 6.6)			
	Trabecular Metal	38	823	1.6 (0.9, 2.8)	3.6 (2.5, 5.2)	4.7 (3.4, 6.6)	5.0 (3.6, 6.9)	5.9 (4.1, 8.3)	
Other (27)		19	258	6.5 (4.0, 10.4)	6.5 (4.0, 10.4)	9.5 (5.8, 15.2)			
TOTAL		898	27934						

Note: Restricted to modern prostheses
Only prostheses with >100 procedures have been listed

Table ST102 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	70	1327	2.2 (1.5, 3.2)	3.8 (2.9, 5.0)	4.9 (3.8, 6.3)	5.4 (4.2, 6.9)	7.2 (5.6, 9.3)	7.2 (5.6, 9.3)
	Perform Reversed	0	117	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
Affinis	Affinis	27	748	1.6 (0.9, 2.8)	3.0 (1.9, 4.5)	3.9 (2.6, 5.7)	4.9 (2.9, 8.0)		
AltiVate	RSP	2	77	3.0 (0.8, 11.7)	3.0 (0.8, 11.7)				
AltiVate Reverse	RSP	48	1329	2.7 (1.9, 3.8)	4.6 (3.4, 6.2)				
Ascend Flex	Aequalis	78	1845	2.7 (2.0, 3.6)	4.5 (3.6, 5.7)	5.7 (4.5, 7.2)	5.7 (4.5, 7.2)		
	Perform Reversed	21	1095	1.8 (1.1, 3.0)	3.0 (1.8, 4.8)				
Comprehensive	Comprehensive Reverse	66	3226	1.3 (1.0, 1.8)	2.3 (1.8, 3.0)	3.0 (2.2, 3.9)	3.1 (2.4, 4.2)		
	Trabecular Metal	1	40	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.0 (0.4, 19.6)			
Delta Xtend	Delta Xtend	182	4811	2.0 (1.6, 2.4)	3.1 (2.6, 3.6)	3.7 (3.1, 4.3)	4.3 (3.7, 5.0)	4.7 (4.0, 5.4)	5.4 (4.5, 6.6)
Equinoxe	Equinoxe	93	2703	2.2 (1.7, 2.8)	3.3 (2.6, 4.1)	4.1 (3.3, 5.2)	5.2 (4.0, 6.7)		
Global Unite	Delta Xtend	14	492	1.5 (0.7, 3.1)	2.8 (1.6, 4.9)	3.6 (2.1, 6.1)	3.6 (2.1, 6.1)		
MSS	MSS	6	218	3.3 (1.2, 8.8)					
RSP	RSP	31	762	2.9 (1.9, 4.4)	3.9 (2.7, 5.6)	4.3 (3.1, 6.1)	4.3 (3.1, 6.1)		
SMR	SMR	3	107	1.9 (0.5, 7.4)					
	SMR Axioma	5	56	5.4 (1.8, 15.7)	9.4 (4.0, 21.1)	9.4 (4.0, 21.1)			
	SMR L1	173	4197	2.8 (2.3, 3.3)	3.8 (3.2, 4.4)	4.2 (3.6, 4.9)	4.6 (3.9, 5.4)	5.3 (4.4, 6.4)	6.1 (4.8, 7.7)
Trabecular Metal	Comprehensive Reverse	15	173	7.5 (4.3, 12.8)	10.4 (6.3, 17.0)	10.4 (6.3, 17.0)			
	Trabecular Metal	47	736	3.7 (2.6, 5.4)	5.3 (3.9, 7.3)	5.9 (4.3, 7.9)	6.5 (4.8, 8.6)	7.8 (5.7, 10.5)	
Other (19)		3	63	3.6 (0.9, 13.5)	5.5 (1.8, 16.2)	5.5 (1.8, 16.2)			
TOTAL		885	24122						

Note Restricted to modern prostheses
Only prostheses with >25 procedures have been listed

Table ST103 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	52	1428	2.0 (1.4, 2.9)	2.8 (2.0, 3.8)	3.8 (2.8, 5.1)	4.3 (3.2, 5.8)	5.6 (4.1, 7.7)	
	Perform Reversed	4	163	2.6 (0.8, 8.3)					
Aequalis Flex Revive	Perform Reversed	3	72	3.2 (0.8, 12.2)	6.4 (2.0, 20.0)				
Affinis	Affinis	17	373	2.2 (1.1, 4.3)	3.7 (2.1, 6.2)	5.2 (3.2, 8.3)	5.2 (3.2, 8.3)		
AltiVate Reverse	RSP	9	338	2.6 (1.3, 5.2)	3.2 (1.6, 6.0)				
Ascend Flex	Aequalis	3	82	2.5 (0.6, 9.6)	4.1 (1.3, 12.2)	4.1 (1.3, 12.2)	4.1 (1.3, 12.2)		
	Perform Reversed	3	81	4.9 (1.6, 14.7)					
Comprehensive	Comprehensive Reverse	29	1293	1.9 (1.3, 2.9)	2.3 (1.6, 3.4)	3.1 (2.1, 4.6)	3.1 (2.1, 4.6)		
Delta Xtend	Delta Xtend	87	1532	4.2 (3.3, 5.3)	5.1 (4.1, 6.4)	5.6 (4.5, 6.9)	5.8 (4.7, 7.2)	6.9 (5.4, 8.7)	
Equinoxe	Equinoxe	39	830	3.2 (2.1, 4.6)	5.0 (3.6, 7.0)	6.6 (4.6, 9.4)	6.6 (4.6, 9.4)		
Global Unite	Delta Xtend	20	634	2.3 (1.4, 3.9)	3.0 (1.9, 4.8)	4.1 (2.5, 6.9)	5.0 (2.9, 8.6)		
RSP	RSP	14	220	3.2 (1.6, 6.7)	5.8 (3.3, 10.0)	7.4 (4.4, 12.3)			
SMR	SMR L1	111	1995	4.3 (3.5, 5.3)	5.7 (4.7, 6.9)	5.9 (4.9, 7.0)	6.1 (5.1, 7.4)	6.1 (5.1, 7.4)	
Trabecular Metal	Comprehensive Reverse	3	139	2.2 (0.7, 6.6)	2.2 (0.7, 6.6)				
	Trabecular Metal	9	304	2.0 (0.9, 4.4)	2.8 (1.4, 5.5)	2.8 (1.4, 5.5)	3.4 (1.8, 6.6)	3.4 (1.8, 6.6)	
Other (12)		3	105	3.0 (1.0, 9.0)					
TOTAL		406	9589						

Note Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Table ST104 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	65	1215	1.9 (1.3, 2.9)	3.7 (2.7, 4.9)	4.2 (3.1, 5.5)	5.7 (4.4, 7.4)	6.5 (5.0, 8.4)	7.9 (5.9, 10.7)
	Perform Reversed	2	114	0.9 (0.1, 6.4)	0.9 (0.1, 6.4)				
Affinis	Affinis	19	517	1.2 (0.5, 2.6)	3.4 (2.1, 5.5)	3.7 (2.3, 5.9)	4.3 (2.6, 7.1)		
AltiVate Reverse	RSP	19	1069	1.4 (0.8, 2.5)	2.6 (1.6, 4.2)				
Ascend Flex	Aequalis	64	1767	2.2 (1.6, 3.0)	3.8 (2.9, 5.0)	4.5 (3.5, 5.8)	5.4 (3.9, 7.5)		
	Perform Reversed	20	902	2.5 (1.6, 4.0)	2.8 (1.8, 4.3)				
Comprehensive	Comprehensive Reverse	46	3643	0.9 (0.6, 1.3)	1.4 (1.0, 1.9)	1.7 (1.3, 2.3)	1.7 (1.3, 2.3)	1.7 (1.3, 2.3)	
Delta Xtend	Delta Xtend	157	4213	1.9 (1.5, 2.3)	2.9 (2.4, 3.5)	3.4 (2.9, 4.1)	3.9 (3.3, 4.6)	5.1 (4.3, 6.1)	7.2 (5.3, 9.8)
Equinoxe	Equinoxe	115	3335	1.9 (1.5, 2.5)	3.1 (2.5, 3.8)	4.1 (3.3, 5.0)	6.1 (4.8, 7.8)		
Global Unite	Delta Xtend	12	549	0.8 (0.3, 2.2)	2.5 (1.3, 4.7)	3.1 (1.7, 5.8)	3.8 (2.0, 7.1)		
MSS	MSS	1	273	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
RSP	RSP	29	680	2.5 (1.6, 4.0)	3.6 (2.4, 5.4)	4.6 (3.2, 6.5)	4.6 (3.2, 6.5)		
SMR	SMR	1	171	0.6 (0.1, 4.3)					
	SMR Axioma	4	115	1.8 (0.4, 6.9)	3.9 (1.5, 10.1)				
	SMR L1	180	5055	2.3 (1.9, 2.8)	3.2 (2.8, 3.8)	3.4 (3.0, 4.0)	3.8 (3.3, 4.5)	4.5 (3.8, 5.4)	5.6 (4.3, 7.3)
Trabecular Metal	Comprehensive Reverse	2	196	0.5 (0.1, 3.7)	1.6 (0.4, 6.7)	1.6 (0.4, 6.7)			
	Trabecular Metal	33	751	1.6 (0.9, 2.8)	3.5 (2.3, 5.1)	4.6 (3.2, 6.5)	4.8 (3.4, 6.8)	5.8 (4.0, 8.4)	
Other (23)		16	238	5.7 (3.4, 9.7)	5.7 (3.4, 9.7)	8.9 (5.2, 14.9)			
TOTAL		785	24803						

Note Restricted to modern prostheses
Only prostheses with >25 procedures have been listed

Table ST105 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	59	1122	2.1 (1.4, 3.1)	3.7 (2.7, 5.0)	5.0 (3.8, 6.5)	5.5 (4.2, 7.2)	7.4 (5.6, 9.7)	
	Perform Reversed	0	95	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
Affinis	Affinis	18	446	1.6 (0.8, 3.3)	3.1 (1.8, 5.3)	4.4 (2.7, 7.0)	5.7 (3.2, 10.2)		
AltiVate	RSP	2	77	3.0 (0.8, 11.7)	3.0 (0.8, 11.7)				
AltiVate Reverse	RSP	44	1250	2.5 (1.8, 3.7)	4.6 (3.4, 6.2)				
Ascend Flex	Aequalis	71	1614	2.8 (2.1, 3.8)	4.7 (3.7, 6.0)	5.8 (4.6, 7.4)	5.8 (4.6, 7.4)		
	Perform Reversed	20	987	2.0 (1.3, 3.3)	3.1 (1.9, 5.1)				
Comprehensive	Comprehensive Reverse	62	3140	1.3 (0.9, 1.8)	2.2 (1.7, 2.9)	2.9 (2.1, 3.8)	3.1 (2.3, 4.1)		
	Trabecular Metal	1	40	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.0 (0.4, 19.6)			
Delta Xtend	Delta Xtend	162	4125	2.0 (1.6, 2.5)	3.2 (2.7, 3.8)	3.8 (3.2, 4.5)	4.5 (3.8, 5.3)	4.9 (4.1, 5.7)	5.8 (4.7, 7.2)
Equinoxe	Equinoxe	88	2607	2.2 (1.6, 2.8)	3.2 (2.5, 4.0)	4.0 (3.2, 5.1)	5.2 (4.0, 6.7)		
Global Unite	Delta Xtend	13	446	1.6 (0.8, 3.4)	2.8 (1.6, 5.1)	3.7 (2.1, 6.4)	3.7 (2.1, 6.4)		
MSS	MSS	6	212	3.4 (1.2, 9.0)					
RSP	RSP	28	700	2.7 (1.8, 4.3)	3.8 (2.6, 5.6)	4.3 (3.0, 6.2)	4.3 (3.0, 6.2)		
SMR	SMR	3	106	1.9 (0.5, 7.5)					
	SMR Axioma	4	55	3.6 (0.9, 13.8)	7.7 (3.0, 19.4)	7.7 (3.0, 19.4)			
	SMR L1	163	4087	2.6 (2.2, 3.2)	3.6 (3.1, 4.3)	4.0 (3.4, 4.7)	4.5 (3.8, 5.3)	5.2 (4.3, 6.4)	6.0 (4.7, 7.7)
Trabecular Metal	Comprehensive Reverse	12	154	6.3 (3.3, 11.8)	9.4 (5.4, 16.2)	9.4 (5.4, 16.2)			
	Trabecular Metal	45	688	3.8 (2.6, 5.6)	5.6 (4.1, 7.6)	6.1 (4.5, 8.3)	6.8 (5.1, 9.1)	7.7 (5.6, 10.4)	
Other (16)		2	56	2.0 (0.3, 13.4)	4.2 (1.1, 15.9)	4.2 (1.1, 15.9)			
TOTAL		803	22007						

Note Restricted to modern prostheses
Only prostheses with >25 procedures have been listed

Table ST106 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	6	66	3.0 (0.8, 11.6)	3.0 (0.8, 11.6)	9.0 (3.8, 20.5)	9.0 (3.8, 20.5)	12.5 (5.6, 26.9)	
Aequalis Flex Revive	Perform Reversed	1	59	2.0 (0.3, 13.1)	2.0 (0.3, 13.1)				
Comprehensive	Comprehensive Reverse	7	298	2.3 (1.0, 5.0)	3.0 (1.4, 6.3)	3.0 (1.4, 6.3)			
Delta Xtend	Delta Xtend	9	230	2.2 (0.9, 5.2)	3.7 (1.8, 7.2)	3.7 (1.8, 7.2)	4.4 (2.3, 8.4)		
Equinoxe	Equinoxe	9	141	4.4 (2.0, 9.4)	5.6 (2.6, 11.5)				
Global Unite	Delta Xtend	4	140	1.4 (0.4, 5.7)	1.4 (0.4, 5.7)	5.3 (1.8, 14.9)			
SMR	SMR L1	95	1696	4.3 (3.4, 5.4)	5.7 (4.7, 6.9)	5.9 (4.8, 7.2)	6.2 (5.0, 7.5)	6.2 (5.0, 7.5)	
Trabecular Metal	Trabecular Metal	2	59	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	
Other (15)		7	232	2.8 (1.3, 6.1)	3.5 (1.7, 7.2)	3.5 (1.7, 7.2)			
TOTAL		140	2921						

Note Restricted to modern prostheses
Only prostheses with >50 procedures have been listed

Table ST107 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	14	367	2.2 (1.1, 4.4)	2.5 (1.3, 4.8)	3.3 (1.8, 5.9)	4.3 (2.5, 7.5)	5.1 (2.9, 8.9)	
Affinis	Affinis	8	288	1.7 (0.7, 4.1)	2.5 (1.2, 5.3)	2.5 (1.2, 5.3)	3.3 (1.6, 6.8)		
Ascend Flex	Aequalis	5	193	2.1 (0.8, 5.6)	2.8 (1.2, 6.5)				
	Perform Reversed	1	110	1.5 (0.2, 10.1)					
Comprehensive	Comprehensive Reverse	1	135	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
Delta Xtend	Delta Xtend	41	1189	1.6 (1.0, 2.5)	2.5 (1.7, 3.6)	2.8 (2.0, 3.9)	3.4 (2.5, 4.7)	3.8 (2.7, 5.2)	4.5 (3.2, 6.3)
Equinoxe	Equinoxe	7	158	1.9 (0.6, 5.9)	3.8 (1.6, 9.2)				
RSP	RSP	5	101	2.0 (0.5, 7.7)	5.2 (2.2, 12.1)	5.2 (2.2, 12.1)			
Other (20)		22	362	3.2 (1.8, 5.7)	6.9 (4.6, 10.5)	7.7 (5.0, 11.7)	7.7 (5.0, 11.7)		
TOTAL		104	2903						

Note Restricted to modern prostheses
Only prostheses with >25 procedures have been listed

Table ST108 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	11	201	3.0 (1.4, 6.6)	4.6 (2.4, 8.6)	4.6 (2.4, 8.6)	5.3 (2.9, 9.7)	6.7 (3.6, 12.4)	
Affinis	Affinis	9	279	1.8 (0.8, 4.3)	3.0 (1.5, 5.9)	3.4 (1.8, 6.5)			
AltiVate Reverse	RSP	2	70	3.1 (0.8, 11.7)	3.1 (0.8, 11.7)				
Ascend Flex	Aequalis	4	223	0.9 (0.2, 3.6)	2.2 (0.8, 5.9)				
	Perform Reversed	1	103	0.0 (0.0, 0.0)					
Comprehensive	Comprehensive Reverse	4	81	3.7 (1.2, 11.1)	6.0 (2.2, 15.8)				
Delta Xtend	Delta Xtend	19	667	1.8 (1.0, 3.2)	2.6 (1.6, 4.2)	2.8 (1.8, 4.5)	3.1 (2.0, 4.9)	3.1 (2.0, 4.9)	
Equinoxe	Equinoxe	4	84	3.9 (1.3, 11.7)	5.6 (2.1, 14.4)	5.6 (2.1, 14.4)			
Global Unite	Delta Xtend	1	43	0.0 (0.0, 0.0)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)		
RSP	RSP	3	59	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)		
SMR	SMR L1	4	44	6.8 (2.3, 19.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	
Trabecular Metal	Trabecular Metal	2	43	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	11.2 (2.3, 45.1)	
Other (10)		5	54	9.9 (4.3, 22.3)	9.9 (4.3, 22.3)	9.9 (4.3, 22.3)			
TOTAL		69	1951						

Note Restricted to modern prostheses
Only prostheses with >25 procedures have been listed

Table ST109 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	45	1339	2.0 (1.4, 2.9)	2.8 (2.0, 3.9)	3.3 (2.4, 4.5)	3.9 (2.8, 5.3)	5.0 (3.5, 7.1)	
	Perform Reversed	4	159	2.7 (0.9, 8.5)					
Affinis	Affinis	16	349	2.0 (1.0, 4.2)	3.6 (2.1, 6.3)	5.3 (3.2, 8.5)	5.3 (3.2, 8.5)		
AltiVate Reverse	RSP	8	278	2.8 (1.4, 5.9)	3.5 (1.7, 6.9)				
Comprehensive	Comprehensive Reverse	19	934	1.7 (1.0, 2.9)	2.1 (1.3, 3.4)	2.8 (1.7, 4.5)	2.8 (1.7, 4.5)		
Delta Xtend	Delta Xtend	75	1279	4.4 (3.4, 5.6)	5.2 (4.1, 6.6)	5.8 (4.6, 7.3)	5.9 (4.7, 7.4)	7.2 (5.6, 9.3)	
Equinoxe	Equinoxe	26	661	2.6 (1.6, 4.2)	4.7 (3.2, 7.0)	5.4 (3.5, 8.1)			
Global Unite	Delta Xtend	15	454	2.6 (1.5, 4.7)	3.6 (2.1, 6.0)	3.6 (2.1, 6.0)			
RSP	RSP	14	176	4.1 (2.0, 8.3)	7.3 (4.2, 12.5)	9.2 (5.5, 15.2)			
SMR	SMR L1	10	265	3.1 (1.6, 6.1)	4.1 (2.2, 7.6)	4.1 (2.2, 7.6)	4.1 (2.2, 7.6)		
Trabecular Metal	Comprehensive Reverse	3	117	2.6 (0.8, 7.9)	2.6 (0.8, 7.9)				
	Trabecular Metal	7	228	1.8 (0.7, 4.7)	2.8 (1.3, 6.2)	2.8 (1.3, 6.2)	3.8 (1.8, 8.2)		
Other (12)		6	125	4.2 (1.8, 9.7)					
TOTAL		248	6364						

Note Restricted to modern prostheses

Only prostheses with >50 procedures have been listed

Primary Total Shoulder Replacement

Special Clinical Assessment – Shoulder Implant Choice

The purpose of the following analyses is to inform surgeons about the outcome of specific clinical options across several shoulder prosthesis categories. There are two new special clinical analyses that evaluate prosthesis class choices for the surgical management of primary diagnoses in shoulder replacement.

The first analysis examines patients aged <60 years with osteoarthritis, comparing outcomes for hemi stemmed anatomic with a pyrocarbon humeral head, total stemmed anatomic with a polyethylene glenoid, total stemless anatomic with a polyethylene glenoid and a primary stemmed reverse replacement. A polyethylene glenoid is all polyethylene glenoids excluding modular metal backed glenoids in total shoulder anatomic procedures (Table ST110 and Figure ST77).

The second assessment compares total stemmed reverse replacements for all primary diagnoses, stratified by glenoid component type – custom, augmented or standard (Table ST111 and Figure ST78).

It is important to recognise that there are patient and prosthesis factors that may further confound the results beyond that which are presented here.

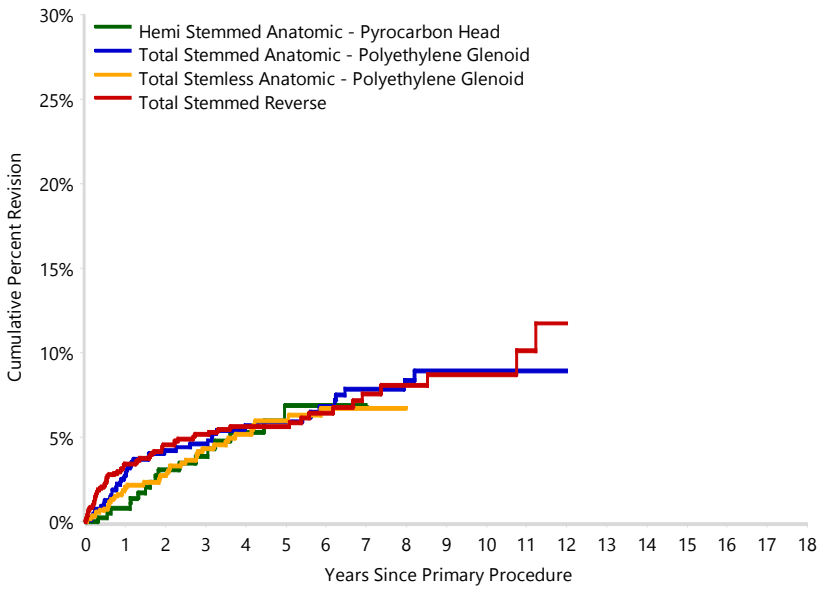
Peer reviewed journal articles that are based on AOANJRR shoulder replacement data, from the first publication to the present, are available on the AOANJRR website: https://aoanjrr.sahmri.com/publications-2025

Table ST110 Cumulative Percent Revision of Primary Shoulder Replacement in Patients Aged <60 Years by Class (Primary Diagnosis OA)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Hemi Stemmed Anatomic - Pyrocarbon Head	17	432	0.8 (0.3, 2.4)	3.9 (2.2, 6.8)	6.9 (4.2, 11.2)	6.9 (4.2, 11.2)		
Total Stemmed Anatomic - Polyethylene Glenoid	46	658	2.9 (1.8, 4.5)	4.6 (3.2, 6.6)	5.9 (4.2, 8.2)	7.9 (5.7, 10.7)	8.9 (6.5, 12.2)	
Total Stemless Anatomic - Polyethylene Glenoid	44	1072	2.1 (1.3, 3.2)	4.4 (3.1, 6.1)	6.0 (4.4, 8.1)	6.7 (4.9, 9.2)		
Total Stemmed Reverse	68	1241	3.4 (2.5, 4.7)	5.2 (4.0, 6.7)	5.6 (4.4, 7.3)	7.6 (5.7, 10.0)	8.7 (6.4, 11.8)	
TOTAL	175	3403						

Note: Restricted to modern prostheses

Figure ST77 Cumulative Percent Revision of Primary Shoulder Replacement in Patients Aged <60 Years by Class (Primary Diagnosis OA)



HR - adjusted for age and gender

Total Stemmed Anatomic - Polyethylene Glenoid vs Hemi Stemmed Anatomic - Pyrocarbon Head

Entire Period: HR=1.28 (95% CI 0.71, 2.29), p=0.407

Total Stemless Anatomic - Polyethylene Glenoid vs Hemi Stemmed Anatomic - Pyrocarbon Head

Entire Period: HR=1.08 (95% CI 0.61, 1.92), p=0.791

Total Stemmed Reverse vs Hemi Stemmed Anatomic - Pyrocarbon Head

0 - 6Mth: HR=3.32 (95% CI 1.56, 7.07), p=0.001

6Mth+: HR=0.93 (95% CI 0.51, 1.70), p=0.811

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Hemi Stemmed Anatomic - Pyrocarbon Head	432	335	221	107	49	10	0
Total Stemmed Anatomic - Polyethylene Glenoid	658	587	471	348	227	80	26
Total Stemless Anatomic - Polyethylene Glenoid	1072	859	523	284	123	17	0
Total Stemmed Reverse	1241	990	668	399	212	88	23

Note: Restricted to modern prostheses

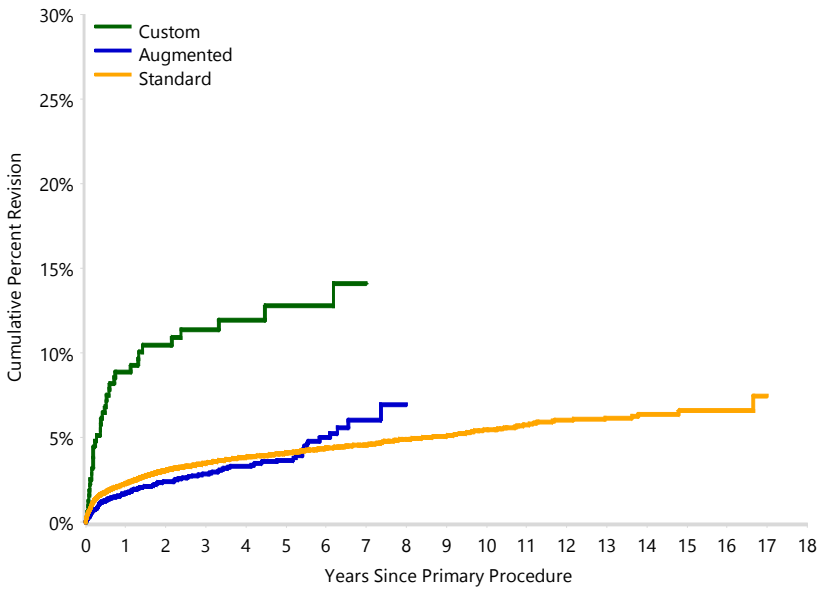
Primary Total Shoulder Replacement

Table ST111 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (All Diagnoses)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Custom	39	317	8.9 (6.2, 12.7)	11.4 (8.2, 15.7)	12.8 (9.2, 17.6)	14.1 (10.0, 19.8)		
Augmented	232	9803	1.7 (1.5, 2.0)	2.8 (2.5, 3.3)	3.7 (3.1, 4.3)	6.0 (4.6, 7.8)		
Standard	2092	54516	2.3 (2.2, 2.4)	3.5 (3.3, 3.7)	4.1 (3.9, 4.3)	4.6 (4.4, 4.8)	5.4 (5.2, 5.7)	6.4 (5.9, 7.0)
TOTAL	2363	64636						

Note: Restricted to modern prostheses

Figure ST78 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (All Diagnoses)



HR - adjusted for age and gender

Custom vs Augmented

0 - 6Mth: HR=4.18 (95% CI 2.63, 6.64), p<0.001

6Mth+: HR=2.10 (95% CI 1.28, 3.44), p=0.003

Custom vs Standard

Entire Period: HR=2.38 (95% CI 1.72, 3.29), p<0.001

Standard vs Augmented

0 - 3Mth: HR=1.94 (95% CI 1.54, 2.45), p<0.001

3Mth+: HR=0.97 (95% CI 0.82, 1.14), p=0.705

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Custom	317	247	166	97	43	8	1
Augmented	9803	6562	2693	914	144	10	0
Standard	54516	46851	34097	22661	13118	4623	723

Note: Restricted to modern prostheses

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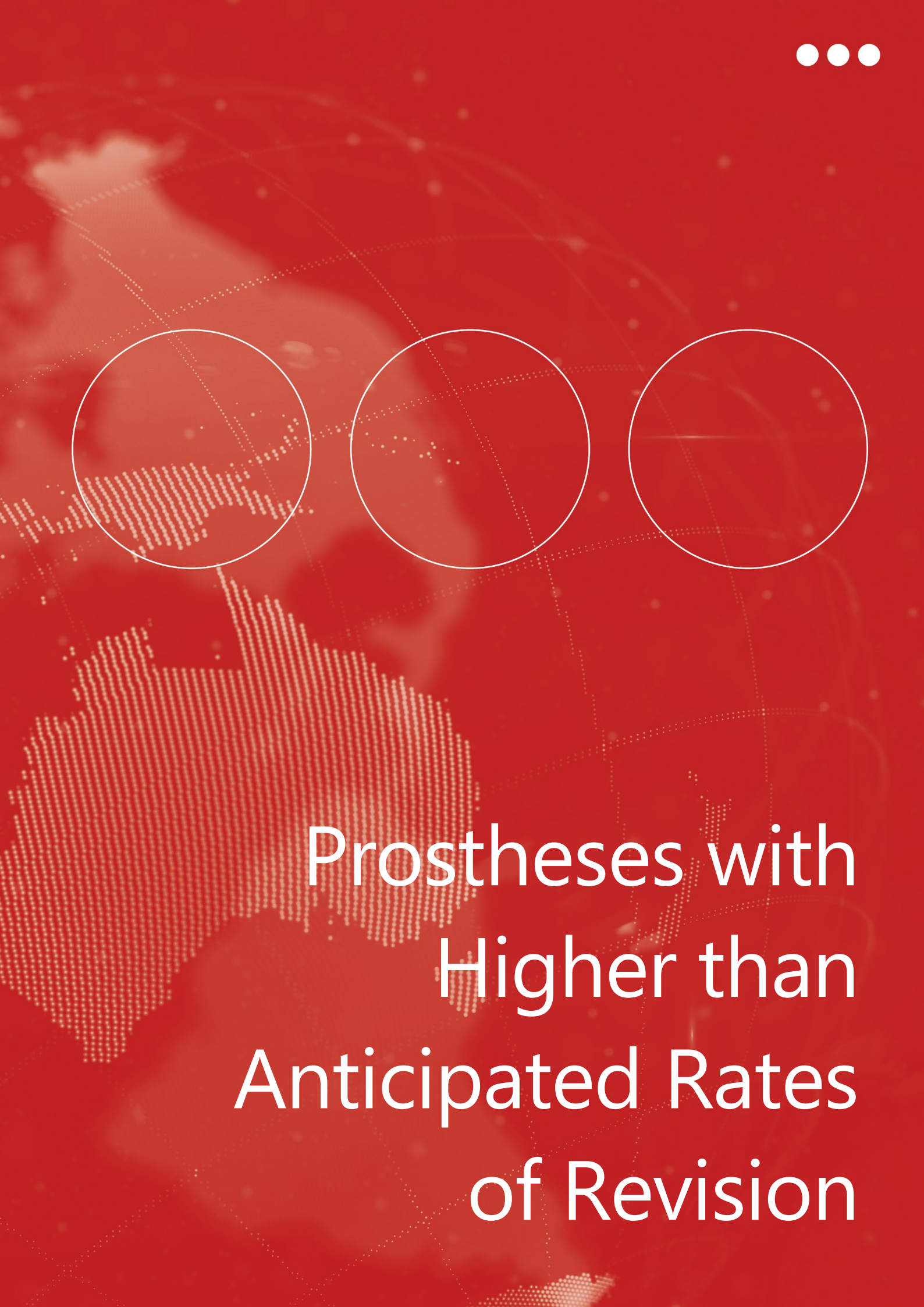
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Prostheses with Higher than Anticipated Rates of Revision

Prostheses with Higher than Anticipated Rates of Revision

Introduction

A unique and important function of registries is that they can provide population-based data on the comparative outcome of individual prostheses in a community. Outcome data are necessary to enable an evidence-based approach to prosthesis selection. For many prostheses, the only source of outcome data are Registry reports.

It is evident from Registry data that most prostheses have similar outcomes. However, a number have a rate of revision that is statistically higher than other prostheses in the same class. The Registry identifies these as 'prostheses with a higher than anticipated rate of revision'.

The Registry has developed a standardised three-stage approach to identify prostheses that are outliers with respect to rate of revision. In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included as the comparator within the class. This is a more pragmatic approach than comparing to a select group of prostheses with the lowest rate of revision.

Stage 1

The first stage is a screening test to identify prostheses that differ significantly from the combined revisions per 100 observed component years of all other modern prostheses in the same class. The analysis is automated and identifies prostheses based on set criteria. These include:

The revision rate (per 100 component years) exceeds twice that for the group,
and

The Poisson probability of observing that number of revisions, given the rate of the group is significant ($p<0.05$),
and either:

There are at least 10 primary procedures for that component, or

The proportion revised is at least 75% and there have been at least two revisions.

The Registry has the capacity to assess the outcome of individual prostheses or combinations of prostheses used in a procedure. It is apparent from previous reports that individual prostheses that perform well in one combination, may not perform well in another.

Therefore, the outcome of an individual prosthesis is partly dependent on the combination of the different prostheses used.

Consequently, the Registry undertakes two different analyses in Stage 1. The first assesses the outcome of all combinations. The second assesses all individual prostheses regardless of the combination. Both analyses are reviewed to determine if a higher revision rate is identified with a single combination, multiple combinations, or uniformly with all combinations. If prostheses are identified in a single combination, that combination progresses to Stage 2. An individual prosthesis progresses to Stage 2 if it is identified in multiple combinations or uniformly across all combinations.

If a prosthesis is identified in more than two combinations with 10 or more procedures in Stage 1, an additional analysis of the individual prosthesis is undertaken for review at Stage 2, regardless of whether the individual prosthesis was identified in Stage 1. The purpose of this is to simplify the reporting of an individual prosthesis and to avoid identifying the same prosthesis in multiple combinations when it may be more appropriate to identify it individually.

A prosthesis or combination may also be brought to the attention of the Registry by the Therapeutic Goods Administration (TGA) or a member of the AOA. A further investigation may then be undertaken as outlined in Stage 2.

It has been apparent that the revision rates for total stemmed anatomic shoulder replacements have been confounded by the higher than anticipated rate of revision of modular metal backed glenoid prostheses in this class. The Clinical Directors have decided to re-analyse Stage 1 for total stemmed anatomic combinations in comparison to the total stemmed anatomic class excluding modular metal backed glenoids. The new comparator only applied to Newly Identified prostheses. Re-identified and Still Used and Identified and no longer used are compared to all other procedures in this class. The new comparator will apply to all sections in subsequent reports.

Stage 2

In Stage 2, the AOANJRR Clinical Director, Deputy Clinical Directors, and Assistant Deputy Clinical Directors in conjunction with SAHMRI staff, review the identified prostheses and undertake further investigation. This includes examining the impact of confounders and calculating age and gender adjusted hazard ratios. In addition, all prostheses identified in previous reports are re-analysed as part of the Stage 2 analysis. This is not dependent on re-identification in Stage 1. If there is a significant difference compared to the combined hazard rate of all other modern prostheses in the same class, then the prosthesis or prosthesis combination progresses to Stage 3. The possible exception to this is the presence of confounding factors, such as use in complex primary procedures.

Stage 3

The final stage involves review by a panel of independent orthopaedic surgeons from the AOA and the Arthroplasty Society of Australia or the Shoulder and Elbow Society. The panel meets with Registry staff at joint specific workshops to review the Stage 2 analysis and determine which prostheses will be identified in the Annual Report.

Identified Prostheses

Identified prostheses are listed in one of three groups. The first group 'Newly Identified', lists prostheses that are identified for the first time and are still used.

The second group is 'Re-Identified and Still Used'. This listing identifies prostheses that continue to have a higher than anticipated rate of revision and provides information on their continued use. Most identified or re-identified prostheses decline in use. This is usually evident only after the first year because almost a full year of use has occurred prior to identification in the Annual Report.

Prostheses that have a higher rate of revision but are no longer used in Australia make up the third group: 'Identified and No Longer Used'. These are listed to provide ongoing information on the rate of revision. This also enables comparison of other prostheses to the discontinued group. This group may include prostheses that are no longer used in Australia that are identified for the first time.

The Registry does not make a recommendation or otherwise on the continued use of identified prostheses. Identification is made to ensure that prostheses with a higher rate of revision, compared to others in the same class, are highlighted.

On occasion, a prosthesis previously identified no longer meets the criteria for inclusion. In this situation, the prosthesis is not subsequently re-identified. The Registry monitors the continual real-time performance of prostheses within a community and the Annual Report provides the outcome at a particular time. It is necessary to appreciate that outcomes are continually changing and that many factors may influence that change, including identification in the Annual Report.

The current approach used by the Registry is most effective at identifying the relative performance of recently introduced prostheses. As the Registry's follow-up period increases, it is becoming evident that prostheses with a delayed onset of higher rates of revision are not as readily identified by this approach. The Registry will develop further strategies in the future to identify these prostheses.

Prior to publication, three workshops were held to review, comment, and provide advice on all sections of the report. Members of the AOA, Arthroplasty Society of Australia, and Shoulder and Elbow Society are invited to attend these surgeon workshops.

The hip, knee and shoulder surgeon workshops were held in Adelaide on the weekend of the 2 and 3 August 2025. In addition to AOANJRR and SAHMRI staff, 17 hip, 16 knee and 4 shoulder arthroplasty specialists from the AOA membership attended the workshops.

Investigations of prostheses identified as having a higher than anticipated rate of revision are available on the Registry website:

Prostheses with Higher than Anticipated Rates of Revision

Primary Partial Hip Replacement

UNIPOLAR MODULAR

There are no newly identified unipolar modular hip prostheses.

Table IP1 Revision Rate of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Head/Femoral Stem	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
**Avenir	8	69	246	3.25	Entire Period: HR=2.90 (95% CI 1.45, 5.82), p=0.002
Identified and No Longer Used	.	.	.	.	
Unipolar Head (JRI)/Furlong LOL	11	132	556	1.98	Entire Period: HR=2.13 (95% CI 1.18, 3.85), p=0.012

Note: Components have been compared to all other modern unipolar modular hip components. Note: **Femoral Stem Component

Table IP2 Cumulative Percent Revision of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Re-Identified and Still Used					
**Avenir	7.6 (3.2, 17.3)	9.8 (4.5, 20.7)	13.0 (6.1, 26.4)		
Identified and No Longer Used					
Unipolar Head (JRI)/Furlong LOL	6.4 (3.1, 13.0)	9.8 (5.3, 17.5)	11.2 (6.3, 19.6)		

Note: **Femoral Stem Component

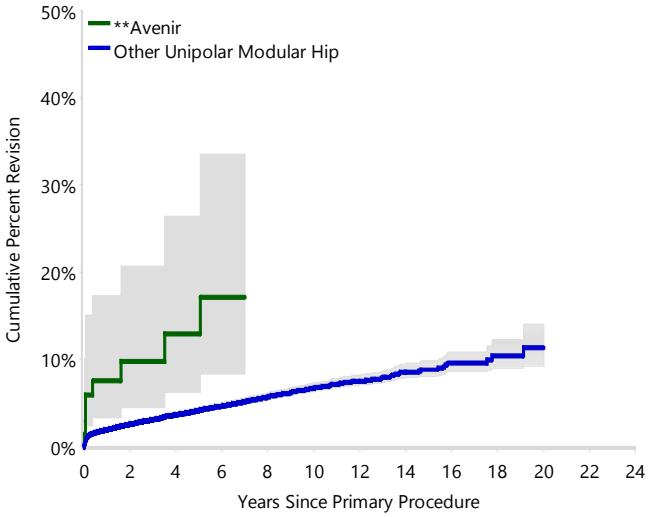
Table IP3 Yearly Usage of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Avenir	.	.	.	.	8	8	5	7	3	6	8	10	.	1	3	3	5	2
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Unipolar Head (JRI)/Furlong LOL	12	18	10	13	10	8	7	34	16	4	.	.	.	.	.	.	.	.

Note: **Femoral Stem Component

Figure IP1 Cumulative Percent Revision of Re-Identified and Still Used Unipolar Modular Hip Prostheses

Re-Identified and Still Used



Prostheses with Higher than Anticipated Rates of Revision

BIPOLAR

There are no newly identified bipolar hip prostheses.

Table IP4 Revision Rate of Bipolar Hip Prostheses identified as having a Higher than Anticipated Rate of Revision

Bipolar/Femoral Stem	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
**Quadra-H	7	87	247	2.84	Entire Period: HR=3.04 (95% CI 1.45, 6.40), p=0.003
Identified and No Longer Used	.	.	.	.	
UHR/ABGII	23	177	1020	2.25	0 - 2Wk: HR=4.44 (95% CI 1.09, 18.03), p=0.037
	.	.	.	.	2Wk - 9Mth: HR=0.87 (95% CI 0.28, 2.71), p=0.810
	.	.	.	.	9Mth - 3.5Yr: HR=2.11 (95% CI 0.79, 5.67), p=0.137
	.	.	.	.	3.5Yr+: HR=8.69 (95% CI 4.97, 15.18), p<0.001
UHR/Omnifit (class)	8	40	286	2.79	Entire Period: HR=3.85 (95% CI 1.92, 7.73), p<0.001
**Basis	18	156	876	2.06	0 - 1Yr: HR=0.48 (95% CI 0.12, 1.93), p=0.302
	.	.	.	.	1Yr - 1.5Yr: HR=6.06 (95% CI 1.91, 19.19), p=0.002
	.	.	.	.	1.5Yr+: HR=4.92 (95% CI 2.80, 8.62), p<0.001
**Synergy	9	55	460	1.96	Entire Period: HR=2.66 (95% CI 1.38, 5.15), p=0.003

Note: Components have been compared to all other modern bipolar hip components
**Femoral Stem Component

Table IP5 Cumulative Percent Revision of Bipolar Hip Prostheses identified as having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Re-Identified and Still Used					
**Quadra-H	6.2 (2.3, 15.7)	10.5 (4.8, 22.3)	13.6 (6.5, 27.3)		
Identified and No Longer Used					
UHR/ABGII	4.3 (2.1, 8.9)	5.1 (2.6, 10.0)	10.8 (6.5, 17.9)		
UHR/Omnifit (class)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	
**Basis	1.5 (0.4, 5.8)	10.1 (5.9, 17.2)	12.6 (7.6, 20.6)		
**Synergy	7.3 (2.8, 18.4)	9.5 (4.1, 21.4)	12.2 (5.6, 25.4)	18.0 (9.2, 33.4)	

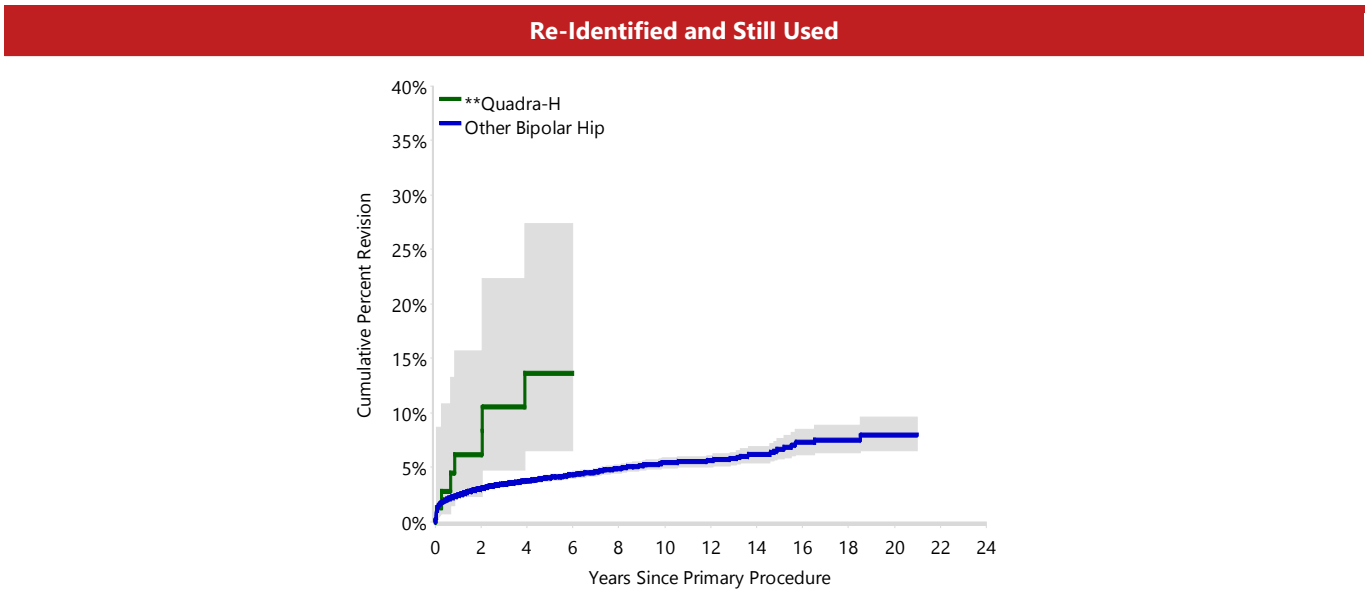
Note: **Femoral Stem Component

Table IP6 Yearly Usage of Bipolar Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Quadra-H	.	.	11	7	5	6	4	11	9	7	4	7	5	7	1	.	.	3
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UHR/ABGII	145	20	7	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UHR/Omnifit (cless)	38	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Basis	74	11	4	7	8	21	24	6	1	.	.	.	.	.	.	.	.	.
**Synergy	49	1	1	.	1	.	2	.	.	.	1	.	.	.	.	.	.	.

Note: **Femoral Stem Component

Figure IP2 Cumulative Percent Revision of Re-Identified and Still Used Bipolar Hip Prostheses



Prostheses with Higher than Anticipated Rates of Revision

Primary Total Hip Replacement

TOTAL CONVENTIONAL

There is one newly identified total conventional hip replacement that is still used.

The Echelon femoral stem is identified as having a higher than anticipated rate of revision. It has been used since 2001 in 479 procedures of which 37 have been revised. The cumulative percent revision is 9.9% at 13 years. Major revisions account for 29 of the 37 revisions. There are 12 revisions for dislocation/instability, 10 for loosening, 6 for infection and 3 for stem breakage.

When the cemented Echelon stems are separately analysed there are 281 procedures with 20 revised. This subgroup has a higher rate of revision than other total conventional hips. With the cementless Echelon stem there are 198 procedures with 17 revised. This subgroup also has a higher rate of revision.

As this stem is often used for diagnoses other than osteoarthritis, a comparison was also made with other stems often used for revision procedures. In this analysis the Echelon stem also has a higher rate of revision.

Due to concerns raised from surgeons regarding pelvic osteolysis, investigation was carried out for the Lima dual mobility acetabular component. This prosthesis was used between 2011 and 2016. This prosthesis has a higher rate of revision than other total hip replacements after 6 years. There are 129 procedures with 15 revisions. The cumulative percent revision is 11.4% at 12 years. Of the 15 revisions 10 are major revisions. There are 7 revisions for loosening and 5 for osteolysis. This component used non-XLPE. When compared to other dual mobility prostheses the Lima acetabular component also has a higher rate of revision after 6 years.

This year there are 4 femoral components that are identified for the first time but are no longer used. These are the CBC stem (not used since 2011), the Silent stem (not used since 2014) and the Trifit stem (not used since 2008). In addition, the MBA (exchangeable neck) femoral component is individually identified for the first time, whereas it had previously been identified in combination with the PINNACLE acetabular component.

The Corail/Trident and the Friendly/Delta TT combinations are no longer identified.

Table IP7 Revision Rate of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Newly Identified	.	.	.	.	
*Echelon	37	479	2462	1.50	Entire Period: HR=2.57 (95% CI 1.86, 3.55), p<0.001
Re-Identified and Still Used	.	.	.	.	
Accolade II/Trident Tritanium (Shell)	163	4366	19326	0.84	Entire Period: HR=1.27 (95% CI 1.09, 1.48), p=0.002
CORAIL/Trabecular Metal (Shell)	11	99	868	1.27	Entire Period: HR=2.61 (95% CI 1.45, 4.70), p=0.001
*CPT	1334	25572	190107	0.70	Entire Period: HR=1.41 (95% CI 1.33, 1.49), p<0.001
*Excia (cless)	30	463	3843	0.78	0 - 3Mth: HR=2.72 (95% CI 1.64, 4.51), p<0.001
	.	.	.	.	3Mth+: HR=1.12 (95% CI 0.68, 1.86), p=0.657
*HACTIV	126	3052	14993	0.84	Entire Period: HR=1.37 (95% CI 1.15, 1.64), p<0.001
*MiniMax	23	417	2284	1.01	0 - 2Wk: HR=6.08 (95% CI 2.89, 12.76), p<0.001
	.	.	.	.	2Wk - 3Mth: HR=2.04 (95% CI 1.02, 4.09), p=0.043
	.	.	.	.	3Mth - 1.5Yr: HR=1.91 (95% CI 0.86, 4.26), p=0.112
	.	.	.	.	1.5Yr+: HR=0.37 (95% CI 0.09, 1.49), p=0.163
*Revision Hip	11	118	654	1.68	Entire Period: HR=2.87 (95% CI 1.59, 5.18), p<0.001
*Taper Fit	223	7192	28111	0.79	0 - 6Mth: HR=0.95 (95% CI 0.77, 1.16), p=0.611
	.	.	.	.	6Mth - 9Mth: HR=1.56 (95% CI 0.95, 2.56), p=0.078
	.	.	.	.	9Mth - 1.5Yr: HR=0.82 (95% CI 0.51, 1.32), p=0.406
	.	.	.	.	1.5Yr - 5.5Yr: HR=1.47 (95% CI 1.15, 1.89), p=0.002
	.	.	.	.	5.5Yr+: HR=2.27 (95% CI 1.62, 3.17), p<0.001
**Atlas (Shell)	61	595	5053	1.21	Entire Period: HR=2.41 (95% CI 1.88, 3.10), p<0.001
**Continuum	675	14064	117123	0.58	0 - 1Mth: HR=1.82 (95% CI 1.57, 2.12), p<0.001
	.	.	.	.	1Mth - 1.5Yr: HR=1.28 (95% CI 1.12, 1.46), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=1.46 (95% CI 1.05, 2.02), p=0.023
	.	.	.	.	2Yr+: HR=0.84 (95% CI 0.73, 0.95), p=0.006

Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
**Delta-One-TT	17	208	1240	1.37	Entire Period: HR=2.43 (95% CI 1.51, 3.90), p<0.001
**Fin II	189	2580	24428	0.77	Entire Period: HR=1.60 (95% CI 1.38, 1.84), p<0.001
**Fixa	79	1554	9684	0.82	0 - 3Mth: HR=1.73 (95% CI 1.22, 2.45), p=0.002
	.	.	.	.	3Mth - 2Yr: HR=1.83 (95% CI 1.24, 2.71), p=0.002
	.	.	.	.	2Yr+: HR=1.05 (95% CI 0.69, 1.60), p=0.812
**G7 Multihole	81	1588	3846	2.11	Entire Period: HR=2.38 (95% CI 1.91, 2.96), p<0.001
**Mueller	12	63	551	2.18	Entire Period: HR=4.43 (95% CI 2.51, 7.79), p<0.001
**Versafitcup DM	83	2447	9701	0.86	Entire Period: HR=1.26 (95% CI 1.02, 1.56), p=0.035
Identified and no longer used	.	.	.	.	
+**Total Hip Replacement (Lima)	15	129	1392	1.08	0 - 6Yr: HR=1.56 (95% CI 0.74, 3.26), p=0.242
	.	.	.	.	6Yr+: HR=3.72 (95% CI 1.86, 7.44), p<0.001
+*CBC Stem	49	290	4309	1.14	Entire Period: HR=2.48 (95% CI 1.87, 3.28), p<0.001
+*MBA (exch neck)	79	567	6814	1.16	0 - 2.5Yr: HR=1.22 (95% CI 0.75, 2.00), p=0.417
	.	.	.	.	2.5Yr+: HR=3.45 (95% CI 2.70, 4.42), p<0.001
+*Silent	12	74	911	1.32	Entire Period: HR=2.67 (95% CI 1.51, 4.70), p<0.001
+*Tri-Fit	17	58	672	2.53	Entire Period: HR=5.44 (95% CI 3.38, 8.75), p<0.001
Anatomic II/Duraloc Option	13	60	789	1.65	Entire Period: HR=3.60 (95% CI 2.09, 6.18), p<0.001
Anca-Fit/PINNACLE	16	101	1120	1.43	Entire Period: HR=3.09 (95% CI 1.89, 5.05), p<0.001
Avenir/Fitmore	21	373	1766	1.19	0 - 1Mth: HR=5.06 (95% CI 2.94, 8.71), p<0.001
	.	.	.	.	1Mth+: HR=0.95 (95% CI 0.47, 1.89), p=0.876
CPCS/Reflection (Non XLPE Cup)	77	407	4767	1.62	0 - 2Yr: HR=0.71 (95% CI 0.32, 1.58), p=0.397
	.	.	.	.	2Yr - 3Yr: HR=4.10 (95% CI 1.70, 9.85), p=0.001
	.	.	.	.	3Yr - 7Yr: HR=1.92 (95% CI 0.91, 4.03), p=0.084
	.	.	.	.	7Yr+: HR=7.14 (95% CI 5.52, 9.23), p<0.001
Esop/Delta-PF	12	59	795	1.51	0 - 4Yr: HR=1.20 (95% CI 0.30, 4.78), p=0.800
	.	.	.	.	4Yr+: HR=5.01 (95% CI 2.70, 9.29), p<0.001
Evolve/Acetabular Shell (Global)	9	139	835	1.08	Entire Period: HR=2.04 (95% CI 1.06, 3.93), p=0.032
F2L/Delta-PF	20	107	1385	1.44	Entire Period: HR=3.15 (95% CI 2.03, 4.88), p<0.001
Friendly Hip/Cup (Exactech)	17	97	1155	1.47	Entire Period: HR=3.26 (95% CI 2.03, 5.25), p<0.001
M-Cor/Equator+ Cup	11	77	974	1.13	Entire Period: HR=2.49 (95% CI 1.38, 4.48), p=0.002
Meridian/ABGII	22	143	1839	1.20	Entire Period: HR=2.55 (95% CI 1.68, 3.88), p<0.001
Omnifit/Vitalock	15	66	906	1.66	Entire Period: HR=3.57 (95% CI 2.16, 5.92), p<0.001
Secur-Fit Plus HA/Secur-Fit	33	197	2788	1.18	Entire Period: HR=2.57 (95% CI 1.83, 3.62), p<0.001
Taperloc/M2a^{MoM}	77	515	7300	1.05	Entire Period: HR=2.32 (95% CI 1.86, 2.90), p<0.001
*ABGII (exch neck)	109	246	2262	4.82	0 - 1Mth: HR=4.13 (95% CI 1.97, 8.66), p<0.001
	.	.	.	.	1Mth - 1.5Yr: HR=2.68 (95% CI 1.34, 5.36), p=0.005
	.	.	.	.	1.5Yr - 2.5Yr: HR=8.26 (95% CI 3.94, 17.35), p<0.001
	.	.	.	.	2.5Yr - 4Yr: HR=14.03 (95% CI 8.13, 24.22), p<0.001
	.	.	.	.	4Yr - 4.5Yr: HR=43.63 (95% CI 23.98, 79.38), p<0.001
	.	.	.	.	4.5Yr - 5Yr: HR=11.29 (95% CI 3.63, 35.14), p<0.001
	.	.	.	.	5Yr - 6Yr: HR=36.87 (95% CI 23.11, 58.82), p<0.001
	.	.	.	.	6Yr+: HR=12.30 (95% CI 9.07, 16.67), p<0.001
*Adapter (cless)	160	744	7841	2.04	0 - 2Wk: HR=3.96 (95% CI 1.98, 7.93), p<0.001
	.	.	.	.	2Wk - 1Mth: HR=1.58 (95% CI 0.66, 3.79), p=0.308
	.	.	.	.	1Mth - 6Mth: HR=0.73 (95% CI 0.28, 1.96), p=0.536
	.	.	.	.	6Mth+: HR=5.43 (95% CI 4.60, 6.41), p<0.001
*Adapter (ctd)	34	148	1354	2.51	0 - 6Mth: HR=1.94 (95% CI 0.73, 5.17), p=0.184
	.	.	.	.	6Mth+: HR=6.89 (95% CI 4.82, 9.86), p<0.001
*Apex	204	2591	28167	0.72	Entire Period: HR=1.55 (95% CI 1.35, 1.77), p<0.001

Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
*BMHR VST	42	260	3231	1.30	Entire Period: HR=2.62 (95% CI 1.93, 3.55), p<0.001
*CBH Stem	44	274	2894	1.52	Entire Period: HR=3.25 (95% CI 2.42, 4.37), p<0.001
*Custom Made (MSA)	44	224	2403	1.83	Entire Period: HR=3.73 (95% CI 2.77, 5.02), p<0.001
*Edinburgh	19	138	1137	1.67	Entire Period: HR=3.52 (95% CI 2.25, 5.51), p<0.001
*Elite Plus	281	2841	33708	0.83	0 - 3Mth: HR=0.45 (95% CI 0.27, 0.75), p=0.002
	.	.	.	.	3Mth+: HR=2.23 (95% CI 1.97, 2.52), p<0.001
*Emperion	59	507	5596	1.05	Entire Period: HR=2.20 (95% CI 1.70, 2.84), p<0.001
*Furlong Evolution	42	521	2954	1.42	Entire Period: HR=2.43 (95% CI 1.80, 3.29), p<0.001
*GHE	13	114	1051	1.24	Entire Period: HR=2.66 (95% CI 1.55, 4.57), p<0.001
*K2	92	601	6851	1.34	Entire Period: HR=2.90 (95% CI 2.37, 3.57), p<0.001
*LYDERIC II	16	164	1530	1.05	Entire Period: HR=2.23 (95% CI 1.37, 3.65), p=0.001
*Linear	21	290	2396	0.88	Entire Period: HR=1.79 (95% CI 1.17, 2.74), p=0.007
*ML Taper Kinectiv	220	3532	36715	0.60	Entire Period: HR=1.29 (95% CI 1.13, 1.47), p<0.001
*Margron	126	688	9712	1.30	Entire Period: HR=2.81 (95% CI 2.35, 3.35), p<0.001
*Mayo	20	168	2164	0.92	Entire Period: HR=2.04 (95% CI 1.31, 3.16), p=0.001
*Metha (exch neck)	16	88	1051	1.52	Entire Period: HR=3.23 (95% CI 1.98, 5.26), p<0.001
*Novation	94	1423	11615	0.81	0 - 3Mth: HR=2.29 (95% CI 1.67, 3.14), p<0.001
	.	.	.	.	3Mth+: HR=1.37 (95% CI 1.05, 1.78), p=0.021
*Profemur Z	33	186	2256	1.46	Entire Period: HR=3.16 (95% CI 2.24, 4.44), p<0.001
*Proxima	15	51	921	1.63	Entire Period: HR=3.41 (95% CI 2.06, 5.66), p<0.001
*Trabecular Metal	131	1904	20582	0.64	0 - 1Mth: HR=2.58 (95% CI 1.85, 3.59), p<0.001
	.	.	.	.	1Mth - 1.5Yr: HR=1.74 (95% CI 1.29, 2.36), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=0.83 (95% CI 0.27, 2.58), p=0.748
	.	.	.	.	2Yr - 3.5Yr: HR=1.36 (95% CI 0.77, 2.40), p=0.290
	.	.	.	.	3.5Yr - 4Yr: HR=2.06 (95% CI 0.86, 4.98), p=0.106
	.	.	.	.	4Yr - 7Yr: HR=1.34 (95% CI 0.85, 2.10), p=0.206
	.	.	.	.	7Yr+: HR=0.51 (95% CI 0.30, 0.84), p=0.008
*UniSyn	73	466	5409	1.35	Entire Period: HR=2.87 (95% CI 2.28, 3.61), p<0.001
**2000 Plus	20	135	1406	1.42	Entire Period: HR=3.02 (95% CI 1.95, 4.68), p<0.001
**ASR	2099	4421	43133	4.87	0 - 2Wk: HR=1.29 (95% CI 0.79, 2.12), p=0.305
	.	.	.	.	2Wk - 1Mth: HR=0.21 (95% CI 0.08, 0.55), p=0.001
	.	.	.	.	1Mth - 3Mth: HR=0.74 (95% CI 0.46, 1.20), p=0.220
	.	.	.	.	3Mth - 6Mth: HR=1.02 (95% CI 0.57, 1.85), p=0.939
	.	.	.	.	6Mth - 9Mth: HR=1.89 (95% CI 1.11, 3.20), p=0.018
	.	.	.	.	9Mth - 1.5Yr: HR=4.29 (95% CI 3.37, 5.46), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=7.54 (95% CI 5.85, 9.71), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=13.25 (95% CI 10.78, 16.29), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=18.59 (95% CI 15.28, 22.62), p<0.001
	.	.	.	.	3Yr - 5Yr: HR=31.31 (95% CI 28.61, 34.28), p<0.001
	.	.	.	.	5Yr - 6Yr: HR=36.45 (95% CI 31.99, 41.53), p<0.001
	.	.	.	.	6Yr - 7Yr: HR=25.53 (95% CI 21.67, 30.07), p<0.001
	.	.	.	.	7Yr - 8Yr: HR=19.72 (95% CI 16.37, 23.77), p<0.001
	.	.	.	.	8Yr - 8.5Yr: HR=15.65 (95% CI 11.74, 20.86), p<0.001
	.	.	.	.	8.5Yr - 10Yr: HR=12.00 (95% CI 9.86, 14.61), p<0.001
	.	.	.	.	10Yr - 10.5Yr: HR=9.29 (95% CI 6.15, 14.05), p<0.001
	.	.	.	.	10.5Yr - 12Yr: HR=6.84 (95% CI 5.40, 8.67), p<0.001
	.	.	.	.	12Yr - 12.5Yr: HR=4.41 (95% CI 2.54, 7.63), p<0.001
	.	.	.	.	12.5Yr - 13.5Yr: HR=7.13 (95% CI 5.19, 9.80), p<0.001
	.	.	.	.	13.5Yr+: HR=3.58 (95% CI 2.85, 4.50), p<0.001

Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
**Adept	27	121	1465	1.84	Entire Period: HR=3.80 (95% CI 2.60, 5.54), p<0.001
**Artek	76	179	2520	3.02	0 - 1Yr: HR=1.54 (95% CI 0.64, 3.71), p=0.331
	.	.	.	.	1Yr - 1.5Yr: HR=4.80 (95% CI 1.20, 19.21), p=0.026
	.	.	.	.	1.5Yr - 2.5Yr: HR=6.08 (95% CI 2.28, 16.21), p<0.001
	.	.	.	.	2.5Yr - 4Yr: HR=15.01 (95% CI 8.29, 27.16), p<0.001
	.	.	.	.	4Yr - 4.5Yr: HR=4.87 (95% CI 0.68, 34.64), p=0.113
	.	.	.	.	4.5Yr - 6Yr: HR=18.98 (95% CI 10.75, 33.52), p<0.001
	.	.	.	.	6Yr+: HR=6.52 (95% CI 4.76, 8.94), p<0.001
**BHR	593	2988	37920	1.56	0 - 2Wk: HR=0.83 (95% CI 0.40, 1.75), p=0.626
	.	.	.	.	2Wk - 1Mth: HR=0.15 (95% CI 0.04, 0.60), p=0.007
	.	.	.	.	1Mth - 3Mth: HR=1.03 (95% CI 0.63, 1.68), p=0.916
	.	.	.	.	3Mth - 1Yr: HR=0.55 (95% CI 0.29, 1.06), p=0.074
	.	.	.	.	1Yr - 1.5Yr: HR=1.71 (95% CI 0.97, 3.01), p=0.065
	.	.	.	.	1.5Yr+: HR=4.68 (95% CI 4.29, 5.11), p<0.001
**Bionik	158	608	6357	2.49	0 - 2Wk: HR=3.04 (95% CI 1.26, 7.31), p=0.013
	.	.	.	.	2Wk - 3Mth: HR=1.07 (95% CI 0.48, 2.37), p=0.875
	.	.	.	.	3Mth+: HR=6.46 (95% CI 5.49, 7.60), p<0.001
**Conserve Plus	25	135	1832	1.36	0 - 1Yr: HR=0.83 (95% CI 0.21, 3.31), p=0.789
	.	.	.	.	1Yr+: HR=3.79 (95% CI 2.51, 5.70), p<0.001
**Cormet	162	803	10237	1.58	0 - 3Mth: HR=0.60 (95% CI 0.27, 1.34), p=0.214
	.	.	.	.	3Mth - 1.5Yr: HR=1.91 (95% CI 1.09, 3.37), p=0.024
	.	.	.	.	1.5Yr+: HR=4.55 (95% CI 3.86, 5.37), p<0.001
**DeltaLox	31	222	2082	1.49	Entire Period: HR=3.17 (95% CI 2.23, 4.51), p<0.001
**Duraloc	680	5354	67963	1.00	0 - 3Mth: HR=0.77 (95% CI 0.58, 1.02), p=0.071
	.	.	.	.	3Mth - 9Mth: HR=1.43 (95% CI 1.00, 2.05), p=0.051
	.	.	.	.	9Mth - 2Yr: HR=1.94 (95% CI 1.48, 2.53), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=0.88 (95% CI 0.44, 1.78), p=0.730
	.	.	.	.	2.5Yr - 5.5Yr: HR=1.96 (95% CI 1.57, 2.45), p<0.001
	.	.	.	.	5.5Yr+: HR=3.17 (95% CI 2.88, 3.50), p<0.001
**Durom	223	1245	16901	1.32	0 - 1.5Yr: HR=0.74 (95% CI 0.47, 1.17), p=0.199
	.	.	.	.	1.5Yr - 2Yr: HR=4.47 (95% CI 2.47, 8.11), p<0.001
	.	.	.	.	2Yr - 6Yr: HR=3.57 (95% CI 2.70, 4.72), p<0.001
	.	.	.	.	6Yr - 7.5Yr: HR=8.64 (95% CI 6.27, 11.90), p<0.001
	.	.	.	.	7.5Yr - 8.5Yr: HR=4.03 (95% CI 2.28, 7.15), p<0.001
	.	.	.	.	8.5Yr - 11Yr: HR=5.42 (95% CI 3.97, 7.41), p<0.001
	.	.	.	.	11Yr+: HR=2.28 (95% CI 1.72, 3.02), p<0.001
**Dynasty	118	2127	14370	0.82	0 - 3Mth: HR=1.90 (95% CI 1.43, 2.51), p<0.001
	.	.	.	.	3Mth - 6Mth: HR=1.39 (95% CI 0.66, 2.93), p=0.383
	.	.	.	.	6Mth - 1.5Yr: HR=1.81 (95% CI 1.17, 2.81), p=0.008
	.	.	.	.	1.5Yr - 2.5Yr: HR=1.29 (95% CI 0.69, 2.41), p=0.416
	.	.	.	.	2.5Yr - 3Yr: HR=2.60 (95% CI 1.30, 5.20), p=0.006
	.	.	.	.	3Yr+: HR=0.99 (95% CI 0.66, 1.48), p=0.966
**ExpanSys	15	71	891	1.68	Entire Period: HR=3.72 (95% CI 2.25, 6.16), p<0.001
**Furlong	73	970	7994	0.91	0 - 3Mth: HR=1.96 (95% CI 1.30, 2.95), p=0.001
	.	.	.	.	3Mth - 1.5Yr: HR=3.61 (95% CI 2.46, 5.30), p<0.001
	.	.	.	.	1.5Yr+: HR=1.13 (95% CI 0.76, 1.69), p=0.553
**Hedrocel	13	46	631	2.06	Entire Period: HR=4.36 (95% CI 2.53, 7.51), p<0.001
**Icon	118	401	4584	2.57	0 - 2.5Yr: HR=2.55 (95% CI 1.71, 3.80), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=10.35 (95% CI 4.63, 23.13), p<0.001

Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
	.	.	.	.	3Yr - 3.5Yr: HR=3.72 (95% CI 0.93, 14.92), p=0.063
	.	.	.	.	3.5Yr - 8.5Yr: HR=9.21 (95% CI 6.77, 12.53), p<0.001
	.	.	.	.	8.5Yr - 9Yr: HR=20.91 (95% CI 10.75, 40.65), p<0.001
	.	.	.	.	9Yr+: HR=5.40 (95% CI 3.89, 7.51), p<0.001
**Inter-Op	9	33	384	2.34	Entire Period: HR=5.10 (95% CI 2.66, 9.79), p<0.001
**MBA	18	124	1148	1.57	Entire Period: HR=3.35 (95% CI 2.11, 5.31), p<0.001
**Mitch TRH	181	731	8949	2.02	0 - 3Mth: HR=0.55 (95% CI 0.23, 1.33), p=0.185
	.	.	.	.	3Mth - 2Yr: HR=2.55 (95% CI 1.61, 4.05), p<0.001
	.	.	.	.	2Yr+: HR=6.17 (95% CI 5.27, 7.23), p<0.001
**Plasmacup	42	482	5331	0.79	Entire Period: HR=1.71 (95% CI 1.26, 2.32), p<0.001
**SPH-Blind	134	952	13809	0.97	Entire Period: HR=2.12 (95% CI 1.79, 2.52), p<0.001
**Universal	22	167	1978	1.11	Entire Period: HR=2.45 (95% CI 1.61, 3.72), p<0.001
**seleXys (excluding seleXys PC)	52	391	4104	1.27	Entire Period: HR=2.69 (95% CI 2.05, 3.53), p<0.001

Note: Components have been compared to all other modern total conventional hip components

*Femoral Stem Component

**Acetabular Component

+ Newly identified and no longer used

Table IP8 Cumulative Percent Revision of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Newly Identified					
*Echelon	5.2 (3.5, 7.7)	8.0 (5.8, 11.2)	8.4 (6.1, 11.6)	9.9 (7.2, 13.6)	
Re-Identified and Still Used					
Accolade II/Trident Tritanium (Shell)	2.3 (1.9, 2.8)	3.4 (2.9, 4.0)	3.9 (3.3, 4.6)		
CORAIL/Trabecular Metal (Shell)	6.1 (2.8, 13.1)	9.5 (5.0, 17.4)	11.9 (6.7, 20.4)	11.9 (6.7, 20.4)	
*CPT	2.3 (2.1, 2.5)	3.3 (3.1, 3.6)	4.3 (4.0, 4.5)	6.3 (5.9, 6.6)	9.5 (8.7, 10.4)
*Excia (cless)	4.1 (2.7, 6.4)	5.0 (3.4, 7.5)	5.5 (3.8, 8.1)	7.1 (4.9, 10.2)	
*HACTIV	2.6 (2.1, 3.2)	3.6 (2.9, 4.3)	4.0 (3.3, 4.8)	6.0 (4.7, 7.7)	
*MiniMax	4.6 (2.9, 7.1)	5.5 (3.7, 8.2)	5.5 (3.7, 8.2)		
*Revision Hip	3.6 (1.4, 9.4)	8.6 (4.3, 16.6)	12.1 (6.5, 21.8)		
*Taper Fit	1.6 (1.4, 2.0)	2.5 (2.1, 2.9)	3.3 (2.8, 3.8)	6.3 (5.0, 8.0)	
**Atlas (Shell)	3.3 (2.1, 5.1)	4.1 (2.7, 6.0)	4.7 (3.2, 6.9)	9.4 (6.9, 12.9)	
**Continuum	2.6 (2.4, 2.9)	3.5 (3.2, 3.8)	4.0 (3.6, 4.3)	5.2 (4.8, 5.6)	
**Delta-One-TT	3.4 (1.6, 7.0)	6.1 (3.5, 10.5)	7.5 (4.5, 12.5)	9.8 (5.9, 16.0)	
**Fin II	2.5 (2.0, 3.2)	3.4 (2.7, 4.2)	4.4 (3.7, 5.4)	7.6 (6.5, 8.8)	
**Fixa	3.2 (2.4, 4.2)	4.2 (3.3, 5.4)	4.6 (3.7, 5.9)	6.1 (4.8, 7.7)	
**G7 Multihole	4.7 (3.7, 5.9)	5.7 (4.6, 7.2)	6.2 (4.9, 7.7)		
**Mueller	1.6 (0.2, 10.9)	11.9 (5.5, 24.7)	14.0 (6.9, 27.3)	22.9 (12.8, 39.1)	
**Versafitcup DM	2.4 (1.8, 3.1)	3.4 (2.7, 4.2)	3.9 (3.1, 4.9)		
Identified and no longer used					
+**Total Hip Replacement (Lima)	0.0 (0.0, 0.0)	2.4 (0.8, 7.1)	2.4 (0.8, 7.1)	8.0 (4.4, 14.4)	
+*CBC Stem	2.4 (1.2, 5.0)	4.6 (2.7, 7.7)	6.4 (4.1, 10.0)	10.0 (6.9, 14.2)	19.6 (14.9, 25.5)
+*MBA (exch neck)	2.1 (1.2, 3.7)	3.9 (2.6, 5.9)	6.2 (4.5, 8.6)	11.0 (8.6, 14.1)	21.1 (16.3, 27.1)
+*Silent	2.7 (0.7, 10.4)	4.1 (1.3, 12.0)	9.5 (4.6, 18.8)	16.2 (9.6, 26.8)	
+*Tri-Fit	3.4 (0.9, 13.1)	3.4 (0.9, 13.1)	5.3 (1.7, 15.5)	23.6 (14.1, 38.0)	
Anatomic II/Duraloc Option	1.7 (0.2, 11.2)	6.7 (2.6, 16.8)	10.1 (4.7, 21.1)	14.2 (7.3, 26.5)	
Anca-Fit/PINNACLE	6.0 (2.7, 12.8)	8.0 (4.1, 15.4)	11.1 (6.3, 19.2)	16.4 (10.1, 25.8)	
Avenir/Fitmore	5.1 (3.3, 7.9)	5.4 (3.5, 8.2)	5.7 (3.8, 8.7)		
CPCS/Reflection (Non XLPE Cup)	1.0 (0.4, 2.7)	2.9 (1.6, 5.1)	3.4 (2.0, 5.8)	10.0 (7.2, 13.8)	33.6 (27.0, 41.2)
Esop/Delta-PF	0.0 (0.0, 0.0)	1.8 (0.3, 12.0)	5.6 (1.8, 16.3)	7.8 (3.0, 19.4)	
Evolve/Acetabular Shell (Global)	2.9 (1.1, 7.5)	3.7 (1.5, 8.6)	5.4 (2.6, 11.1)		
F2L/Delta-PF	5.6 (2.6, 12.1)	10.3 (5.9, 17.9)	12.3 (7.3, 20.2)	16.5 (10.6, 25.3)	
Friendly Hip/Cup (Exactech)	2.1 (0.5, 8.0)	3.2 (1.0, 9.5)	6.5 (3.0, 14.0)	14.1 (8.2, 23.6)	
M-Cor/Equator+ Cup	0.0 (0.0, 0.0)	2.7 (0.7, 10.4)	4.1 (1.3, 12.1)	11.6 (6.0, 21.9)	
Meridian/ABGII	2.1 (0.7, 6.4)	5.0 (2.4, 10.1)	6.4 (3.4, 12.0)	8.3 (4.6, 14.5)	
Omnifit/Vitalock	1.5 (0.2, 10.3)	6.2 (2.4, 15.8)	6.2 (2.4, 15.8)	14.8 (8.0, 26.7)	28.6 (18.0, 43.6)
Secur-Fit Plus HA/Secur-Fit	3.1 (1.4, 6.7)	7.3 (4.4, 11.9)	7.8 (4.8, 12.6)	10.1 (6.5, 15.3)	19.4 (13.9, 26.8)
Taperloc/M2a^{MoM}	1.8 (0.9, 3.3)	4.3 (2.9, 6.5)	7.4 (5.4, 10.0)	12.4 (9.7, 15.6)	17.3 (13.9, 21.6)
*ABGII (exch neck)	4.5 (2.5, 8.0)	11.1 (7.8, 15.8)	20.5 (15.9, 26.2)	37.2 (31.2, 43.9)	
*Adapter (cless)	3.2 (2.2, 4.8)	6.9 (5.2, 8.9)	11.7 (9.5, 14.3)	20.1 (17.2, 23.3)	
*Adapter (ctd)	4.1 (1.9, 8.9)	9.1 (5.4, 15.2)	16.2 (11.0, 23.6)	23.6 (17.0, 32.2)	
*Apex	2.2 (1.7, 2.9)	3.3 (2.7, 4.0)	4.5 (3.8, 5.4)	7.2 (6.3, 8.4)	
*BMHR VST	1.9 (0.8, 4.6)	4.6 (2.7, 8.0)	7.0 (4.5, 10.8)	12.1 (8.7, 16.8)	
*CBH Stem	4.0 (2.3, 7.2)	7.4 (4.9, 11.3)	9.8 (6.8, 14.1)	15.0 (11.1, 20.1)	
*Custom Made (MSA)	5.8 (3.4, 9.8)	9.5 (6.3, 14.1)	11.3 (7.8, 16.3)	17.8 (13.3, 23.6)	
*Edinburgh	6.0 (3.1, 11.7)	9.6 (5.6, 16.4)	12.5 (7.7, 20.0)	16.8 (10.7, 25.8)	
*Elite Plus	1.5 (1.1, 2.0)	2.8 (2.3, 3.5)	4.2 (3.5, 5.1)	7.8 (6.8, 9.0)	15.4 (13.6, 17.4)
*Emperion	4.8 (3.2, 7.0)	6.0 (4.2, 8.4)	7.2 (5.2, 9.8)	10.8 (8.3, 14.0)	

Prostheses with Higher than Anticipated Rates of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
*Furlong Evolution	5.2 (3.6, 7.5)	7.3 (5.4, 9.9)	8.2 (6.1, 11.0)	8.2 (6.1, 11.0)	
*GHE	2.6 (0.9, 8.0)	5.3 (2.4, 11.5)	8.2 (4.3, 15.2)	12.6 (7.5, 20.8)	
*K2	5.2 (3.7, 7.3)	7.5 (5.7, 10.0)	9.8 (7.7, 12.6)	13.8 (11.2, 17.0)	
*LYDERIC II	3.1 (1.3, 7.2)	5.7 (3.0, 10.6)	7.1 (4.0, 12.5)	12.2 (7.2, 20.1)	
*Linear	2.8 (1.4, 5.4)	5.9 (3.7, 9.3)	7.0 (4.6, 10.6)	7.6 (5.0, 11.4)	
*ML Taper Kinectiv	2.4 (2.0, 3.0)	3.5 (3.0, 4.2)	4.3 (3.7, 5.0)	6.0 (5.3, 6.9)	
*Margron	5.8 (4.3, 7.9)	8.6 (6.7, 10.9)	10.6 (8.5, 13.1)	15.7 (13.1, 18.8)	20.5 (17.4, 24.0)
*Mayo	3.0 (1.3, 7.0)	6.6 (3.7, 11.6)	6.6 (3.7, 11.6)	8.6 (5.2, 14.2)	
*Metha (exch neck)	12.5 (7.1, 21.4)	13.6 (8.0, 22.8)	13.6 (8.0, 22.8)	16.0 (9.8, 25.5)	
*Novation	3.7 (2.9, 4.9)	4.4 (3.5, 5.7)	5.2 (4.2, 6.5)	7.3 (6.0, 9.0)	
*Profemur Z	6.0 (3.4, 10.5)	10.4 (6.8, 15.8)	11.0 (7.2, 16.5)	12.2 (8.2, 18.0)	
*Proxima	3.9 (1.0, 14.8)	3.9 (1.0, 14.8)	3.9 (1.0, 14.8)	12.0 (5.6, 24.7)	25.4 (15.2, 40.6)
*Trabecular Metal	3.5 (2.8, 4.5)	4.8 (3.9, 5.8)	5.4 (4.5, 6.6)	6.8 (5.7, 8.1)	
*UniSyn	3.2 (2.0, 5.3)	5.9 (4.1, 8.5)	6.6 (4.7, 9.3)	12.5 (9.7, 16.1)	
**2000 Plus	3.0 (1.1, 7.8)	6.8 (3.6, 12.7)	9.2 (5.3, 15.7)	14.1 (9.0, 21.8)	
**ASR	1.9 (1.5, 2.3)	9.6 (8.8, 10.5)	24.5 (23.3, 25.9)	45.1 (43.6, 46.7)	
**Adept	4.1 (1.7, 9.6)	8.4 (4.6, 15.0)	9.3 (5.3, 16.2)	15.9 (10.3, 24.0)	
**Artek	2.8 (1.2, 6.7)	8.0 (4.8, 13.1)	16.1 (11.4, 22.5)	27.1 (21.0, 34.4)	44.2 (36.8, 52.4)
**BHR	1.1 (0.8, 1.6)	3.2 (2.6, 3.9)	6.1 (5.3, 7.0)	14.3 (13.0, 15.7)	26.9 (24.4, 29.7)
**Bionik	3.6 (2.4, 5.5)	7.7 (5.8, 10.2)	14.3 (11.7, 17.4)	24.3 (20.9, 28.1)	
**Conserve Plus	1.5 (0.4, 5.8)	3.0 (1.1, 7.8)	3.8 (1.6, 8.8)	11.6 (7.0, 18.8)	
**Cormet	1.5 (0.9, 2.6)	3.5 (2.4, 5.1)	5.2 (3.9, 7.0)	13.7 (11.4, 16.5)	28.4 (24.3, 33.1)
**DeltaLox	5.9 (3.5, 9.9)	8.7 (5.6, 13.3)	10.1 (6.8, 15.0)	14.2 (10.1, 19.9)	
**Duraloc	1.8 (1.5, 2.2)	3.0 (2.6, 3.5)	4.1 (3.6, 4.7)	8.4 (7.6, 9.2)	19.4 (18.0, 21.0)
**Durom	1.1 (0.7, 1.9)	3.6 (2.7, 4.8)	5.5 (4.3, 6.9)	13.6 (11.7, 15.7)	21.4 (18.9, 24.2)
**Dynasty	3.3 (2.7, 4.2)	4.5 (3.7, 5.4)	5.0 (4.2, 6.1)	5.9 (4.9, 7.1)	
**ExpanSys	2.8 (0.7, 10.8)	5.7 (2.2, 14.5)	10.3 (5.0, 20.3)	16.8 (9.7, 28.4)	
**Furlong	4.2 (3.1, 5.7)	6.1 (4.8, 7.8)	6.7 (5.3, 8.5)	7.5 (5.9, 9.5)	
**Hedrocel	4.3 (1.1, 16.3)	6.6 (2.2, 19.2)	6.6 (2.2, 19.2)	23.4 (12.8, 40.4)	36.3 (22.6, 54.7)
**Icon	3.0 (1.7, 5.3)	7.8 (5.5, 10.9)	12.7 (9.7, 16.5)	24.5 (20.4, 29.4)	
**Inter-Op	12.1 (4.7, 29.1)	15.2 (6.6, 32.6)	21.4 (10.8, 39.8)	28.3 (15.8, 47.4)	28.3 (15.8, 47.4)
**MBA	4.0 (1.7, 9.4)	8.2 (4.5, 14.8)	10.2 (5.9, 17.2)	16.0 (9.9, 25.5)	
**Mitch TRH	1.5 (0.8, 2.7)	4.6 (3.3, 6.4)	7.7 (6.0, 10.0)	15.6 (13.1, 18.6)	
**Plasmacup	4.4 (2.9, 6.6)	5.6 (3.9, 8.1)	5.8 (4.1, 8.3)	8.1 (6.0, 11.0)	
**SPH-Blind	3.8 (2.8, 5.2)	5.8 (4.5, 7.5)	7.3 (5.8, 9.2)	10.4 (8.6, 12.6)	16.7 (14.2, 19.6)
**Universal	4.8 (2.4, 9.4)	4.8 (2.4, 9.4)	5.4 (2.9, 10.2)	11.6 (7.3, 18.2)	
**seleXys (excluding seleXys PC)	4.6 (2.9, 7.2)	7.8 (5.5, 11.0)	10.6 (7.9, 14.1)	13.3 (10.2, 17.2)	

Note: Components have been compared to all other total conventional hip components

Note: *Femoral Stem Component

Note: **Acetabular Component

Note: + Newly identified and no longer used

Table IP9 Yearly Usage of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Newly Identified	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Echelon	97	27	19	30	21	40	31	30	32	47	43	41	10	3	3	2	1	2
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Accolade II/Trident Tritanium (Shell)	.	.	.	.	.	1	1	30	119	258	484	402	510	584	810	670	348	149
CORAIL/Trabecular Metal (Shell)	5	10	17	20	9	8	8	6	1	6	2	4	1	1	.	.	.	1
*CPT	3812	1070	1049	1196	1241	1295	1462	1566	1303	1233	1240	1159	1275	1339	1409	1333	1566	1024
*Excia (cless)	.	6	34	8	47	58	38	17	42	35	65	66	10	.	.	18	6	13
*HACTIV	.	.	.	2	19	63	61	117	146	96	240	452	388	418	406	194	225	225
*MiniMax	.	.	.	.	.	.	.	.	.	4	43	170	133	41	19	5	.	2
*Revision Hip	23	1	3	3	3	7	6	13	6	5	10	4	5	2	2	11	12	2
*Taper Fit	271	18	6	8	17	55	45	110	161	227	315	592	790	789	798	853	1204	933
**Atlas (Shell)	234	16	13	6	7	4	8	28	23	13	27	26	26	35	23	27	29	50
**Continuum	.	.	175	1117	1245	1331	1505	1492	1359	1327	1293	1197	850	513	294	182	156	28
**Delta-One-TT	.	.	.	4	7	7	15	37	13	12	14	14	23	15	14	13	11	9
**Fin II	342	251	269	318	286	205	247	101	6	.	.	9	76	94	96	88	95	97
**Fixa	.	.	.	.	44	161	153	99	134	100	91	78	84	95	134	162	133	86
**G7 Multihole	.	.	.	.	.	.	.	.	.	.	15	49	169	222	244	236	334	319
**Mueller	48	2	.	.	.	1	.	1	1	.	1	1	3	.	.	1	3	1
**Versafitcup DM	.	.	.	.	10	12	4	19	146	193	199	194	188	229	249	271	381	352
Identified and no longer used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
+**Total Hip Replacement (Lima)	.	.	.	.	18	37	41	28	3	2	.	.	.	.	.	.	.	.
+*CBC Stem	283	3	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
+*MBA (exch neck)	321	46	31	43	46	36	44	.	.	.	.	.	.	.	.	.	.	.
+*Silent	19	.	.	21	21	3	6	4	.	.	.	.	.	.	.	.	.	.
+*Tri-Fit	54	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anatomic II/Duraloc Option	60	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anca-Fit/PINNACLE	85	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Avenir/Fitmore	.	.	.	.	.	.	2	7	5	46	44	42	56	41	55	41	34	.
CPCS/Reflection (Non XLPE Cup)	373	19	13	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Esop/Delta-PF	59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Evolve/Acetabular Shell (Global)	.	.	.	.	.	.	.	1	13	43	32	15	11	10	12	2	.	.
F2L/Delta-PF	107	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Friendly Hip/Cup (Exactech)	89	2	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
M-Cor/Equator+ Cup	6	70	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Meridian/ABGII	143	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Omnifit/Vitalock	66	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Secur-Fit Plus HA/Secur-Fit	197	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Taperloc/M2a^{MoM}	365	76	49	23	2	.	.	.	.	.	.	.	.	.	.	.	.	.
*ABGII (exch neck)	10	39	69	58	63	7	.	.	.	.	.	.	.	.	.	.	.	.
*Adapter (cless)	290	122	158	115	58	.	1	.	.	.	.	.	.	.	.	.	.	.
*Adapter (ctd)	100	33	8	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Apex	545	265	197	169	190	219	246	188	193	168	88	61	44	18	.	.	.	.
*BMHR VST	.	2	65	81	71	22	13	5	1	.	.	.	.	.	.	.	.	.
*CBH Stem	70	28	27	45	53	43	7	.	1	.	.	.	.	.	.	.	.	.
*Custom Made (MSA)	2	3	11	57	77	46	21	7	.	.	.	.	.	.	.	.	.	.
*Edinburgh	86	18	23	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.
*Elite Plus	2814	26	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.

Prostheses with Higher than Anticipated Rates of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
*Emperion	35	26	65	87	72	44	53	38	41	34	12	.	.	.	.	.	.	.
*Furlong Evolution	.	.	.	.	.	.	29	25	32	11	54	102	106	83	75	4	.	.
*GHE	.	.	.	9	4	47	28	14	12	.	.	.	.	.	.	.	.	.
*K2	23	80	172	204	122	.	.	.	.	.	.	.	.	.	.	.	.	.
*LYDERIC II	156	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Linear	.	.	.	.	.	23	31	31	88	70	27	12	5	3	.	.	.	.
*ML Taper Kinectiv	.	36	341	647	576	515	384	345	256	199	159	74	.	.	.	.	.	.
*Margron	686	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Mayo	107	29	30	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Metha (exch neck)	.	.	20	53	15	.	.	.	.	.	.	.	.	.	.	.	.	.
*Novation	.	.	4	32	53	130	137	226	266	148	90	101	145	51	19	21	.	.
*Profemur Z	182	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Proxima	50	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Trabecular Metal	107	148	198	242	272	276	186	220	112	106	32	5	.	.	.	.	.	.
*UniSyn	200	46	48	36	22	19	23	27	23	17	5	.	.	.	.	.	.	.
**2000 Plus	76	14	18	25	2	.	.	.	.	.	.	.	.	.	.	.	.	.
**ASR	2811	1180	430	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Adept	39	29	30	11	12	.	.	.	.	.	.	.	.	.	.	.	.	.
**Artek	179	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**BHR	1651	477	404	276	134	27	13	5	1	.	.	.	.	.	.	.	.	.
**Bionik	294	138	134	38	4	.	.	.	.	.	.	.	.	.	.	.	.	.
**Conserve Plus	105	15	14	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Cormet	426	129	124	93	26	4	1	.	.	.	.	.	.	.	.	.	.	.
**DeltaLox	.	.	.	34	84	72	24	8	.	.	.	.	.	.	.	.	.	.
**Duraloc	4687	293	187	82	84	18	3	.	.	.	.	.	.	.	.	.	.	.
**Durom	928	218	85	13	1	.	.	.	.	.	.	.	.	.	.	.	.	.
**Dynasty	.	.	.	.	40	31	49	178	298	317	306	307	272	241	39	32	17	.
**ExpanSys	70	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Furlong	35	7	61	90	85	73	76	64	66	12	55	100	82	65	71	21	7	.
**Hedrocel	46	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Icon	207	68	78	37	11	.	.	.	.	.	.	.	.	.	.	.	.	.
**Inter-Op	33	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**MBA	122	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Mitch TRH	318	164	130	82	37	.	.	.	.	.	.	.	.	.	.	.	.	.
**Plasmacup	39	7	54	60	59	77	70	44	51	21	.	.	.	.	.	.	.	.
**SPH-Blind	952	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Universal	139	11	6	7	4	.	.	.	.	.	.	.	.	.	.	.	.	.
**seleXys (excluding seleXys PC)	68	20	21	53	70	89	57	13	.	.	.	.	.	.	.	.	.	.

Note: *Femoral Stem Component
**Acetabular Component
+ Newly identified and no longer used

Figure IP3 Cumulative Percent Revision of Newly Identified Total Conventional Hip Prostheses

Newly Identified

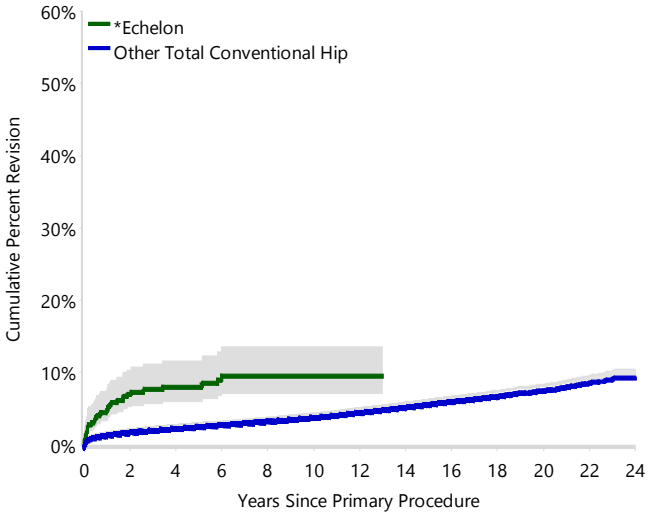
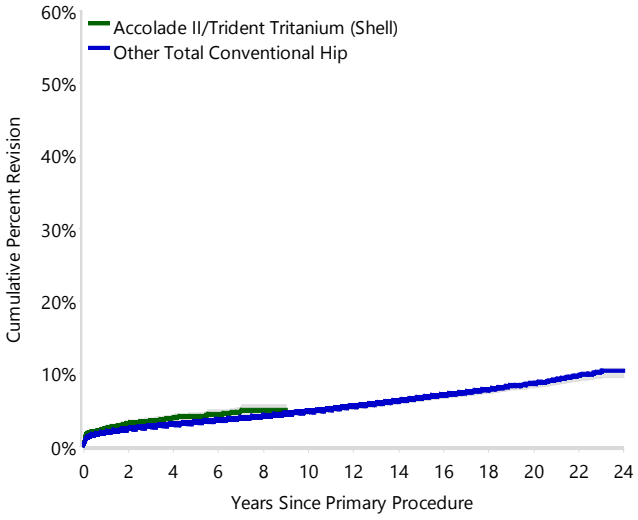
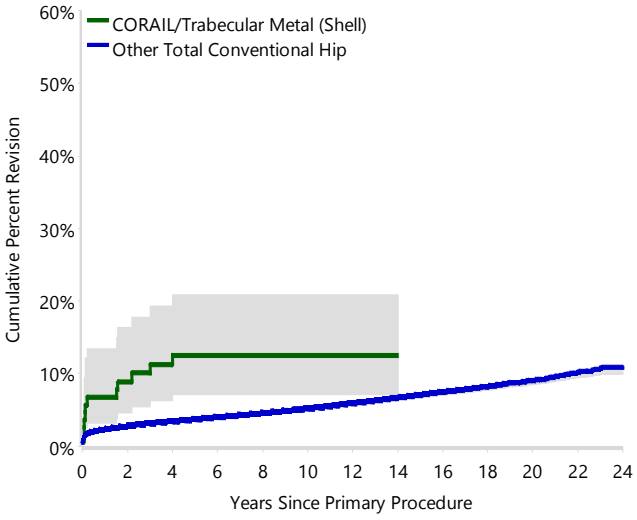


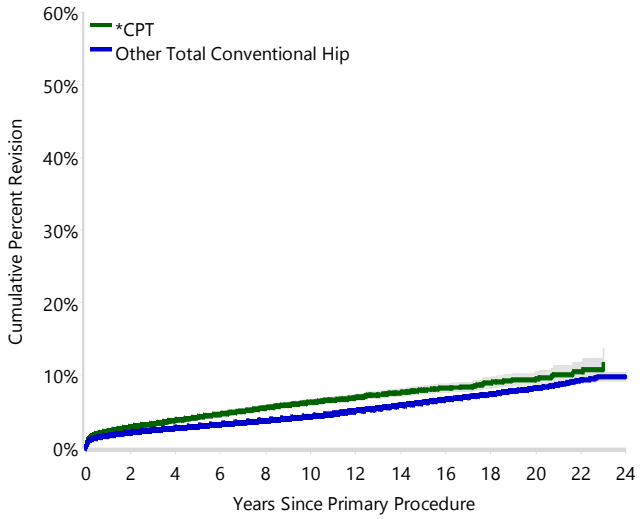
Figure IP4 Cumulative Percent Revision of Re-Identified and Still Used Total Conventional Hip Prostheses

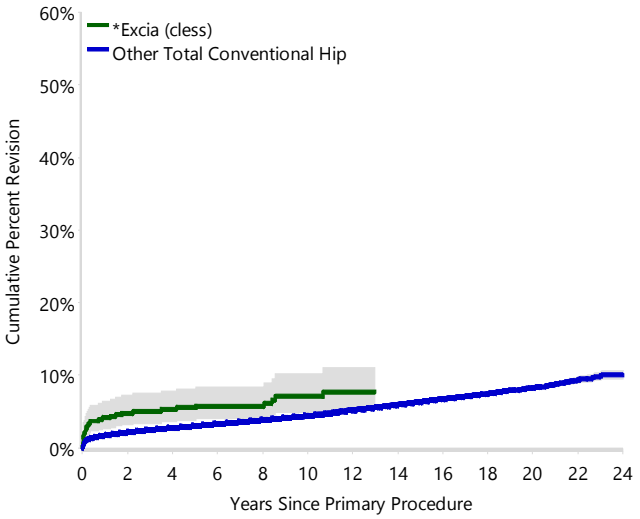
Re-Identified and Still Used

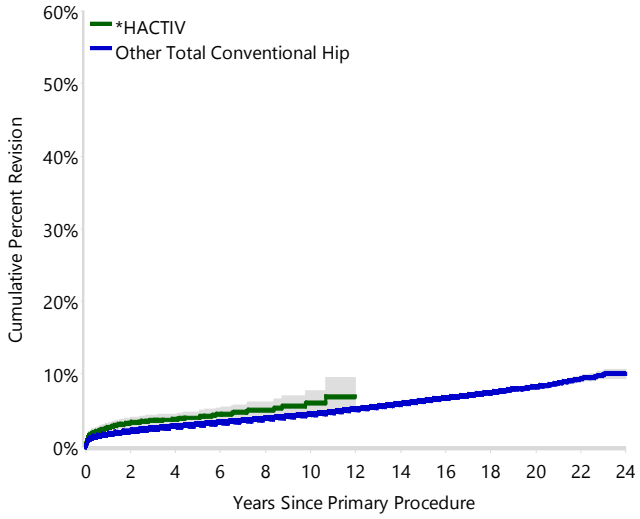


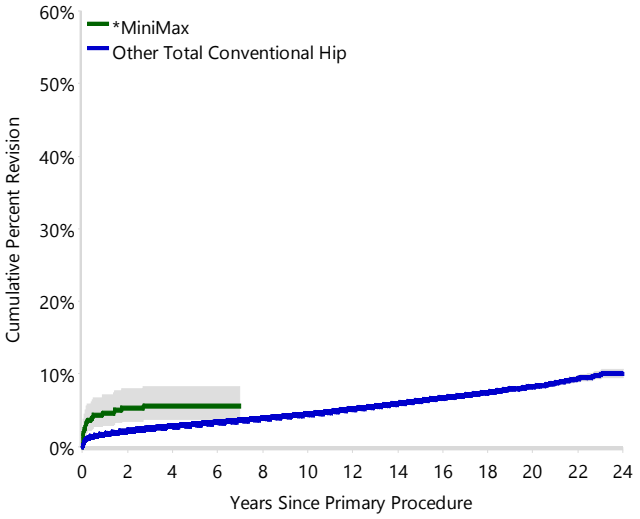


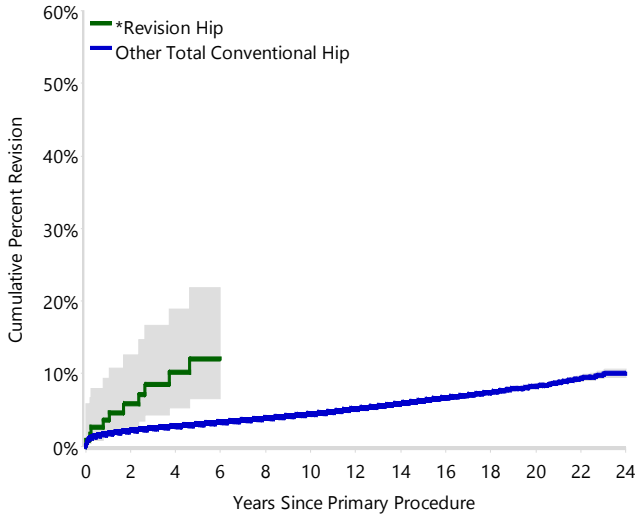
Prostheses with Higher than Anticipated Rates of Revision

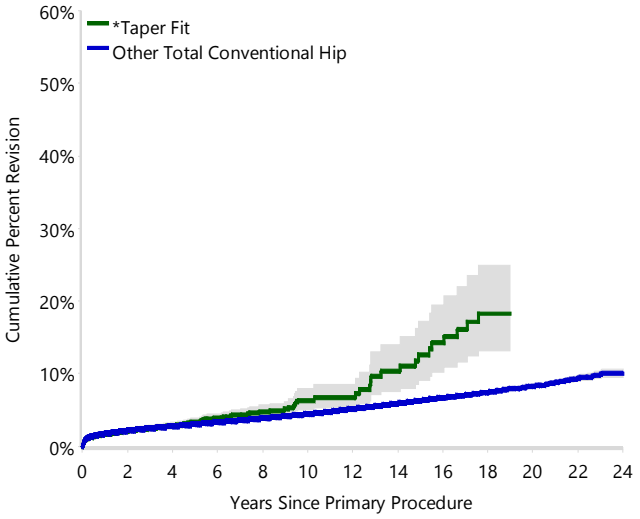




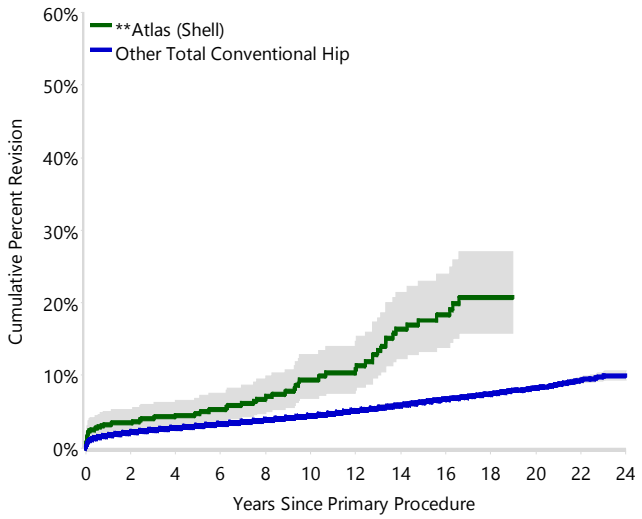


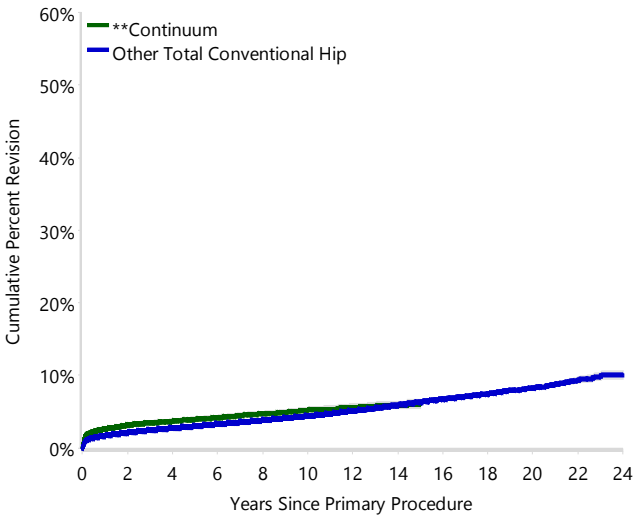


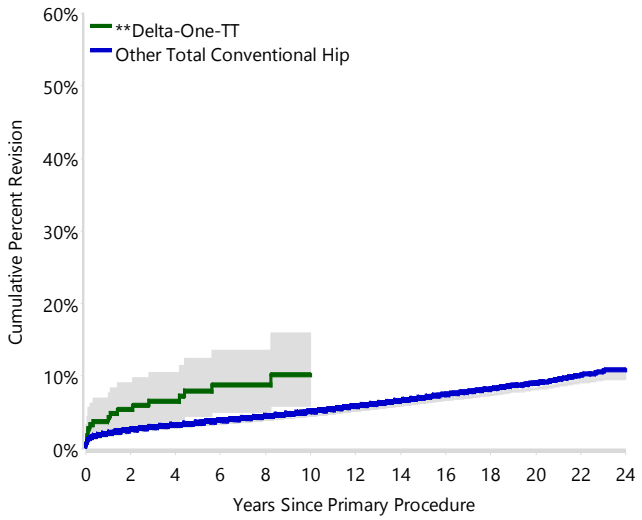


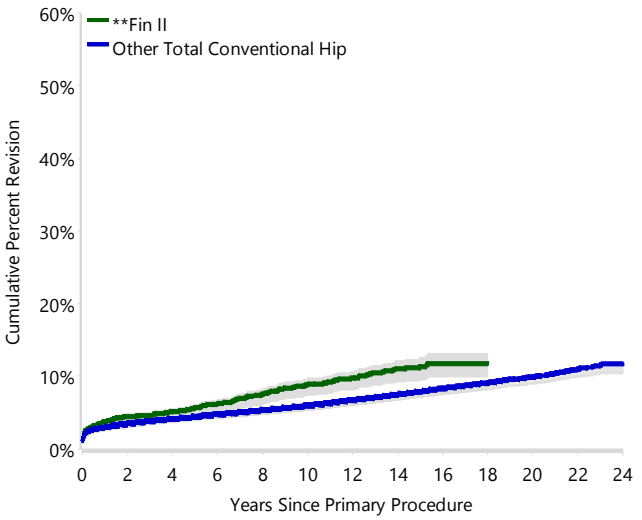


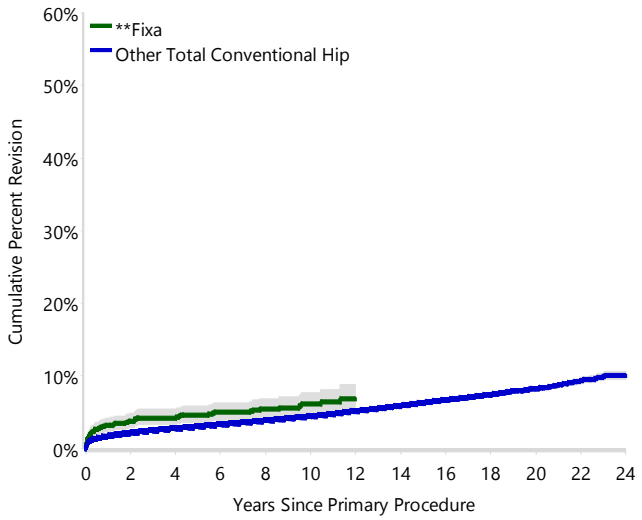
Prostheses with Higher than Anticipated Rates of Revision

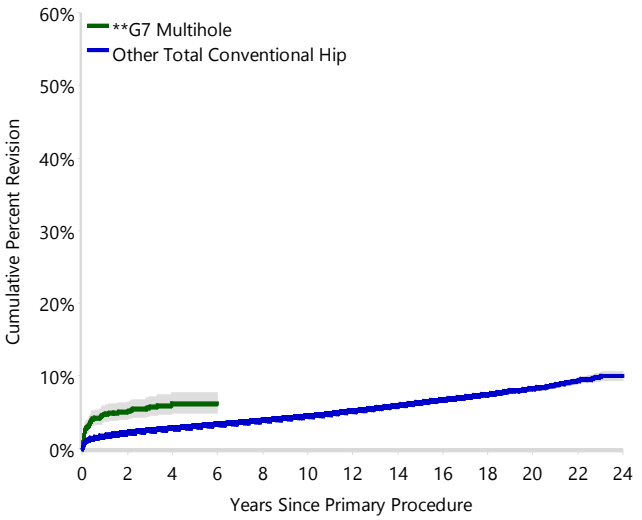




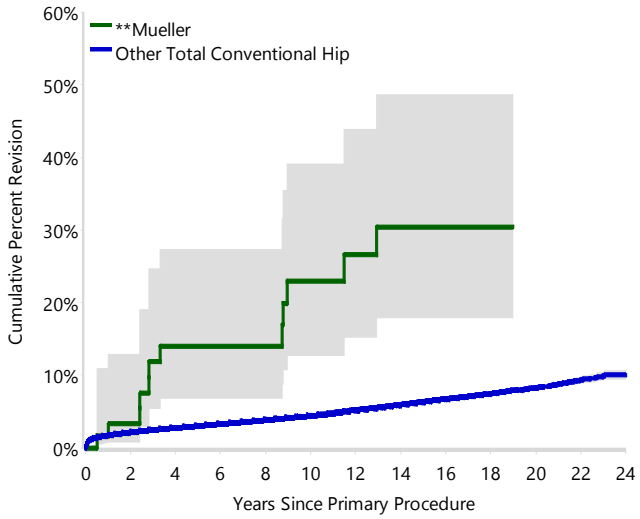


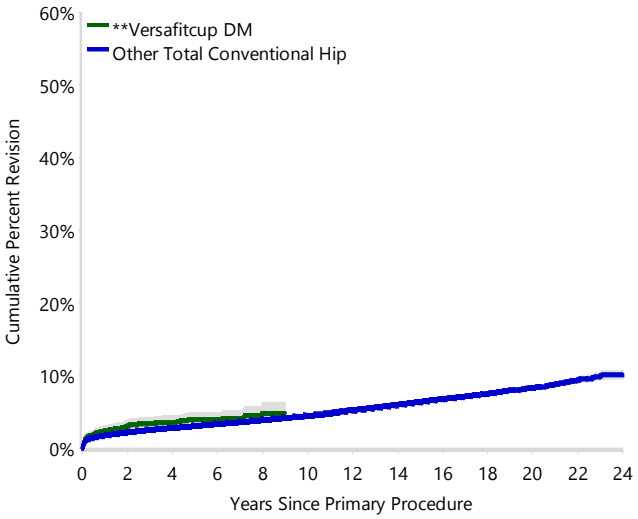






Prostheses with Higher than Anticipated Rates of Revision





TOTAL RESURFACING

There are no newly identified total resurfacing hip prostheses.

Table IP10 Revision Rate of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

Head/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Identified and no longer used	.	.	.	.	
ASR/ASR	426	1168	15824	2.69	Entire Period: HR=4.14 (95% CI 3.71, 4.61), p<0.001
Bionik/Bionik	64	200	2526	2.53	Entire Period: HR=4.24 (95% CI 3.30, 5.45), p<0.001
Conserve Plus/Conserve Plus	17	63	1011	1.68	Entire Period: HR=2.29 (95% CI 1.42, 3.70), p<0.001
Cormet/Cormet	157	626	9096	1.73	Entire Period: HR=2.63 (95% CI 2.23, 3.10), p<0.001
Durom/Durom	126	847	13542	0.93	0 - 4.5Yr: HR=2.50 (95% CI 1.92, 3.26), p<0.001
	.	.	.	.	4.5Yr+: HR=1.14 (95% CI 0.88, 1.47), p=0.314
Recap/Recap	31	196	2811	1.10	0 - 6Mth: HR=2.85 (95% CI 1.26, 6.43), p=0.011
	.	.	.	.	6Mth - 1.5Yr: HR=6.66 (95% CI 3.24, 13.69), p<0.001
	.	.	.	.	1.5Yr+: HR=1.22 (95% CI 0.76, 1.97), p=0.415
*Cormet 2000 HAP	31	95	1537	2.02	Entire Period: HR=3.55 (95% CI 2.49, 5.07), p<0.001

Note: Components have been compared to all other total resurfacing hip components
*Head Component

Table IP11 Cumulative Percent Revision of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Identified and No Longer Used					
ASR/ASR	3.4 (2.5, 4.6)	7.2 (5.9, 8.8)	15.5 (13.5, 17.7)	29.9 (27.4, 32.7)	37.9 (35.1, 40.9)
Bionik/Bionik	3.5 (1.7, 7.2)	12.5 (8.7, 18.0)	18.6 (13.8, 24.7)	27.8 (22.1, 34.6)	
Conserve Plus/Conserve Plus	4.8 (1.6, 14.0)	6.4 (2.4, 16.1)	9.6 (4.4, 20.1)	14.4 (7.8, 25.9)	27.9 (18.3, 41.0)
Cormet/Cormet	2.1 (1.2, 3.6)	5.9 (4.3, 8.1)	10.0 (7.9, 12.6)	17.4 (14.6, 20.7)	29.3 (25.1, 34.1)
Durom/Durom	3.3 (2.3, 4.8)	5.6 (4.2, 7.3)	7.7 (6.1, 9.7)	11.0 (9.0, 13.3)	15.4 (13.1, 18.1)
Recap/Recap	5.1 (2.8, 9.3)	8.7 (5.5, 13.6)	10.2 (6.7, 15.4)	14.5 (10.2, 20.3)	
*Cormet 2000 HAP	6.3 (2.9, 13.5)	8.4 (4.3, 16.1)	9.5 (5.0, 17.4)	21.1 (14.2, 30.7)	32.6 (24.0, 43.2)

Note: Components have been compared to all other total resurfacing hip components
*Head Component

Table IP12 Yearly Usage of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ASR/ASR	944	133	91	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bionik/Bionik	78	46	54	20	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Conserve Plus/Conserve Plus	62	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cormet/Cormet	389	94	75	50	10	4	4	.	.	.	.	.	.	.	.	.	.	.
Durom/Durom	679	88	46	24	10	.	.	.	.	.	.	.	.	.	.	.	.	.
Recap/Recap	93	46	38	16	3	.	.	.	.	.	.	.	.	.	.	.	.	.
*Cormet 2000 HAP	95	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: Components have been compared to all other total resurfacing hip components
*Head Component

Prostheses with Higher than Anticipated Rates of Revision

Primary Partial Knee Replacement

PATELLA/TROCHLEA

There are no newly identified patella/trochlea prostheses.

Table IP13 Revision Rate of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Patella/Trochlear	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Identified and No Longer Used					
Lubinus/Lubinus	23	39	413	5.56	Entire Period: HR=2.30 (95% CI 1.48, 3.59), p<0.001
PFC Sigma/Sigma HP	50	117	1009	4.95	Entire Period: HR=1.98 (95% CI 1.48, 2.66), p<0.001
**LCS	231	413	4426	5.22	Entire Period: HR=2.04 (95% CI 1.73, 2.41), p<0.001

Note: Components have been compared to all other modern patella-trochlear knee components
**Trochlear Component

Table IP14 Cumulative Percent Revision of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Identified and No Longer Used					
Lubinus/Lubinus	5.1 (1.3, 19.0)	18.1 (9.1, 34.3)	20.9 (11.0, 37.6)	35.0 (22.0, 52.7)	
PFC Sigma/Sigma HP	4.3 (1.8, 10.0)	14.7 (9.4, 22.6)	20.9 (14.5, 29.6)	38.3 (29.9, 48.2)	
**LCS	3.9 (2.4, 6.2)	11.9 (9.1, 15.4)	20.7 (17.1, 25.0)	40.9 (36.2, 46.0)	

Note: **Trochlear Component

Table IP15 Yearly Usage of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lubinus/Lubinus	37	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PFC Sigma/Sigma HP	14	6	5	16	15	12	20	7	7	7	8	.	.	.	.	.	.	.
**LCS	326	60	27	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: **Trochlear Component

UNICOMPARTMENTAL

There are no newly identified unicompartmental prostheses.

Table IP16 Revision Rate of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Identified and no longer used	.	.	.	.	
Advance/Advance	16	37	357	4.48	0 - 2Yr: HR=6.07 (95% CI 2.89, 12.72), p<0.001
	.	.	.	.	2Yr - 4.5Yr: HR=6.46 (95% CI 2.43, 17.20), p<0.001
	.	.	.	.	4.5Yr+: HR=1.64 (95% CI 0.68, 3.94), p=0.270
BalanSys Uni/BalanSys Uni Convex	21	54	625	3.36	Entire Period: HR=2.20 (95% CI 1.43, 3.37), p<0.001
BalanSys Uni/BalanSys Uni Mobile	70	199	2609	2.68	0 - 2Yr: HR=3.16 (95% CI 2.08, 4.82), p<0.001
	.	.	.	.	2Yr+: HR=1.49 (95% CI 1.12, 1.99), p=0.005
Eius/Eius	55	142	1897	2.90	0 - 2Yr: HR=1.97 (95% CI 1.12, 3.48), p=0.019
	.	.	.	.	2Yr - 2.5Yr: HR=5.63 (95% CI 2.32, 13.67), p<0.001
	.	.	.	.	2.5Yr+: HR=1.39 (95% CI 1.01, 1.91), p=0.045
Freedom PKR Active/Freedom PKR Active	531	1505	17214	3.08	0 - 6Mth: HR=0.49 (95% CI 0.23, 1.03), p=0.059
	.	.	.	.	6Mth - 9Mth: HR=1.11 (95% CI 0.57, 2.16), p=0.755
	.	.	.	.	9Mth - 1.5Yr: HR=2.17 (95% CI 1.60, 2.94), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=1.68 (95% CI 1.03, 2.74), p=0.037
	.	.	.	.	2Yr - 3.5Yr: HR=2.50 (95% CI 1.89, 3.31), p<0.001
	.	.	.	.	3.5Yr - 7Yr: HR=3.38 (95% CI 2.84, 4.02), p<0.001
	.	.	.	.	7Yr - 8.5Yr: HR=2.18 (95% CI 1.58, 2.99), p<0.001
	.	.	.	.	8.5Yr - 9Yr: HR=4.33 (95% CI 2.89, 6.50), p<0.001
	.	.	.	.	9Yr - 10Yr: HR=3.43 (95% CI 2.45, 4.79), p<0.001
	.	.	.	.	10Yr - 13.5Yr: HR=2.09 (95% CI 1.67, 2.61), p<0.001
	.	.	.	.	13.5Yr+: HR=1.45 (95% CI 1.10, 1.90), p=0.007
GMK-UNI/GMK-UNI	48	168	1233	3.89	Entire Period: HR=2.70 (95% CI 2.03, 3.59), p<0.001
Uniglide/Uniglide	208	756	9449	2.20	0 - 2Yr: HR=2.21 (95% CI 1.71, 2.86), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=3.21 (95% CI 1.84, 5.62), p<0.001
	.	.	.	.	2.5Yr+: HR=1.21 (95% CI 1.02, 1.44), p=0.028
**Preservation Mobile	169	400	5436	3.11	0 - 1.5Yr: HR=2.72 (95% CI 1.95, 3.81), p<0.001
	.	.	.	.	1.5Yr - 3Yr: HR=3.73 (95% CI 2.54, 5.48), p<0.001
	.	.	.	.	3Yr+: HR=1.48 (95% CI 1.22, 1.80), p<0.001

Note: Components have been compared to all other modern unicompartmental knee components
**Tibial Component

Prostheses with Higher than Anticipated Rates of Revision

Table IP17 Cumulative Percent Revision of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Identified and No Longer Used					
Advance/Advance	10.8 (4.2, 26.3)	27.0 (15.6, 44.4)	35.8 (22.5, 53.6)	41.6 (27.5, 59.4)	
BalanSys Uni/BalanSys Uni Convex	1.9 (0.3, 12.4)	7.4 (2.8, 18.5)	7.4 (2.8, 18.5)	24.9 (15.3, 39.0)	
BalanSys Uni/BalanSys Uni Mobile	7.0 (4.2, 11.6)	13.1 (9.1, 18.6)	14.6 (10.4, 20.4)	21.7 (16.5, 28.2)	
Eius/Eius	4.9 (2.4, 10.1)	12.8 (8.3, 19.5)	17.8 (12.4, 25.2)	22.3 (16.3, 30.2)	
Freedom PKR Active/Freedom PKR Active	1.9 (1.3, 2.7)	8.0 (6.7, 9.5)	13.8 (12.1, 15.6)	27.2 (24.9, 29.6)	
GMK-UNI/GMK-UNI	6.5 (3.7, 11.5)	17.3 (12.4, 23.9)	24.7 (18.9, 32.1)	28.9 (22.6, 36.6)	
Uniglide/Uniglide	4.8 (3.5, 6.6)	10.8 (8.8, 13.3)	13.0 (10.8, 15.6)	19.8 (17.1, 22.9)	34.6 (30.5, 39.2)
**Preservation Mobile	5.3 (3.5, 7.9)	15.5 (12.3, 19.5)	19.1 (15.6, 23.3)	27.2 (23.1, 31.9)	45.1 (40.0, 50.5)

Note: **Tibial Component

Table IP18 Yearly Usage of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Advance/Advance	36	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BalanSys Uni/BalanSys Uni Convex	12	10	4	7	9	1	3	3	5	.	.	.	.	.	.	.	.	.
BalanSys Uni/BalanSys Uni Mobile	184	9	2	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eius/Eius	125	8	7	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Freedom PKR Active/Freedom PKR Active	787	162	149	102	75	68	63	51	31	12	5	.	.	.	.	.	.	.
GMK-UNI/GMK-UNI	.	5	10	2	.	21	22	16	19	17	12	29	3	8	3	1	.	.
Uniglide/Uniglide	460	93	61	30	38	25	22	9	5	8	3	.	1	1	.	.	.	.
**Preservation Mobile	400	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: **Tibial Component

Primary Total Knee Replacement

There is one newly identified total knee replacement.

The E.motion/E.motion total knee combination has been identified since 2012 and is still used. This year the E.motion (cementless)/E.motion Pro (cemented) combination is identified as having a higher than anticipated rate of revision. There are 205 procedures with 10 revisions. The cumulative percent revision at 5 years is 6.4%. There are 6 major revisions with 5 revisions for loosening. The tibial polyethylene is non-XLPE.

The Mutars/Mutars combination has been identified since 2023. This prosthesis is often used for difficult or uncommon primary diagnoses. When first identified, the hinged subgroup was found to have a higher rates of revision compared to other hinged devices, and when restricted to procedures for osteoarthritis. The Mutars/Mutars hinged devices continue to be identified.

This year the distal femoral replacement subgroup also has a higher rate of revision compared to other total knee replacements, and also when compared to other distal femoral replacements. There have been 230 Mutars/Mutars distal femoral replacement procedures of which 58 have been revised. The cumulative percent revision at 5 years is 33.7%. There are 38 (65.5%) revisions where the primary diagnosis is tumour, but this proportion is lower than that for other revised distal femoral replacement procedures. There are 46 major revisions. There are 18 revisions for loosening, 13 for infection, 7 for femoral component breakage, 5 for fracture and 4 for metal related pathology.

Table IP19 Revision Rate of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Newly Identified	.	.	.	.	
E.Motion (class)/E.Motion Pro (ctd)	10	205	753	1.33	Entire Period: HR=1.92 (95% CI 1.03, 3.56), p=0.039
Re-Identified and Still Used	.	.	.	.	
ACS (class)/ACS Fixed	142	3021	19709	0.72	Entire Period: HR=1.26 (95% CI 1.07, 1.49), p=0.005
Active Knee (class)/Active Knee	796	7315	90865	0.88	0 - 1Yr: HR=1.05 (95% CI 0.84, 1.31), p=0.663
	.	.	.	.	1Yr - 2.5Yr: HR=1.74 (95% CI 1.48, 2.04), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.16 (95% CI 0.76, 1.77), p=0.480
	.	.	.	.	3Yr+: HR=2.17 (95% CI 1.98, 2.36), p<0.001
Apex Knee CR (class)/Apex Knee (class)	32	529	4138	0.77	Entire Period: HR=1.45 (95% CI 1.02, 2.05), p=0.036
Attune PS (ctd)/Attune (class)	38	1210	2950	1.29	Entire Period: HR=1.61 (95% CI 1.17, 2.21), p=0.003
Columbus/Columbus	283	8502	37432	0.76	Entire Period: HR=1.20 (95% CI 1.06, 1.35), p=0.002
E.Motion/E.Motion	77	1041	8956	0.86	0 - 1.5Yr: HR=2.53 (95% CI 1.84, 3.46), p<0.001
	.	.	.	.	1.5Yr+: HR=1.21 (95% CI 0.88, 1.66), p=0.240
Mutars/Mutars	82	482	1400	5.86	Entire Period: HR=4.49 (95% CI 3.60, 5.59), p<0.001
Trekking/Trekking	78	1304	10358	0.75	0 - 1.5Yr: HR=1.90 (95% CI 1.37, 2.63), p<0.001
	.	.	.	.	1.5Yr+: HR=1.16 (95% CI 0.86, 1.57), p=0.332
*Legion Oxinium FS	48	545	3268	1.47	0 - 3Mth: HR=7.24 (95% CI 4.36, 12.01), p<0.001
	.	.	.	.	3Mth - 6Mth: HR=5.99 (95% CI 2.68, 13.35), p<0.001
	.	.	.	.	6Mth - 1.5Yr: HR=1.92 (95% CI 1.00, 3.69), p=0.050
	.	.	.	.	1.5Yr+: HR=1.55 (95% CI 0.97, 2.46), p=0.064
**Legion Revision Tibial Baseplate	84	1444	7598	1.11	0 - 6Mth: HR=3.74 (95% CI 2.64, 5.29), p<0.001
	.	.	.	.	6Mth+: HR=1.25 (95% CI 0.95, 1.64), p=0.106
Identified and no longer used	.	.	.	.	
ACS/ACS Mobile PC (class)	31	131	1152	2.69	Entire Period: HR=5.14 (95% CI 3.62, 7.32), p<0.001
AMK/AMK	26	203	2594	1.00	Entire Period: HR=2.36 (95% CI 1.61, 3.46), p<0.001
Advance/Advance	82	1009	9376	0.87	Entire Period: HR=1.68 (95% CI 1.36, 2.09), p<0.001
Buechel-Pappas/Buechel-Pappas	59	479	5894	1.00	Entire Period: HR=2.07 (95% CI 1.60, 2.67), p<0.001
Eska RP/Eska RP	9	40	414	2.17	Entire Period: HR=4.86 (95% CI 2.53, 9.33), p<0.001
Evolis (class)/Evolis (class)	10	87	966	1.04	Entire Period: HR=2.03 (95% CI 1.09, 3.77), p=0.025
Gemini MK II/Gemini MK II	8	21	226	3.54	Entire Period: HR=7.32 (95% CI 3.66, 14.63), p<0.001
Genesis (ctd)/Genesis (ctd)	11	62	732	1.50	Entire Period: HR=3.63 (95% CI 2.01, 6.54), p<0.001
Genesis II CR (class)/Profix Mobile (ctd)	39	241	3152	1.24	Entire Period: HR=2.90 (95% CI 2.12, 3.97), p<0.001

Prostheses with Higher than Anticipated Rates of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Genesis II Oxinium CR (class)/Genesis II	48	110	1065	4.51	0 - 9Mth: HR=9.41 (95% CI 4.89, 18.09), p<0.001
	.	.	.	.	9Mth - 1Yr: HR=15.86 (95% CI 5.95, 42.32), p<0.001
	.	.	.	.	1Yr - 1.5Yr: HR=23.61 (95% CI 13.06, 42.68), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=25.34 (95% CI 15.26, 42.08), p<0.001
	.	.	.	.	2.5Yr+: HR=2.81 (95% CI 1.46, 5.41), p=0.001
Genesis II Oxinium CR (class)/Profix Mobile	57	88	663	8.60	0 - 6Mth: HR=7.09 (95% CI 2.66, 18.90), p<0.001
	.	.	.	.	6Mth - 1.5Yr: HR=45.39 (95% CI 32.07, 64.25), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=33.74 (95% CI 16.07, 70.81), p<0.001
	.	.	.	.	2Yr+: HR=6.35 (95% CI 3.76, 10.74), p<0.001
Genesis II Oxinium PS (ctd)/Genesis II (class)	17	56	569	2.99	0 - 1Yr: HR=17.35 (95% CI 9.60, 31.34), p<0.001
	.	.	.	.	1Yr - 1.5Yr: HR=8.21 (95% CI 2.05, 32.82), p=0.002
	.	.	.	.	1.5Yr - 3Yr: HR=4.17 (95% CI 1.04, 16.66), p=0.043
	.	.	.	.	3Yr+: HR=1.16 (95% CI 0.29, 4.65), p=0.831
Genesis II Oxinium PS (ctd)/Genesis II (keel)	71	269	3265	2.17	Entire Period: HR=4.61 (95% CI 3.65, 5.82), p<0.001
HLS Noetos/HLS Noetos	45	294	3368	1.34	Entire Period: HR=2.77 (95% CI 2.07, 3.71), p<0.001
IB II/IB II	41	199	2667	1.54	0 - 2Yr: HR=0.91 (95% CI 0.29, 2.83), p=0.876
	.	.	.	.	2Yr - 2.5Yr: HR=5.27 (95% CI 1.70, 16.29), p=0.003
	.	.	.	.	2.5Yr+: HR=5.36 (95% CI 3.85, 7.47), p<0.001
Interax/Interax	12	52	532	2.26	0 - 3Yr: HR=0.88 (95% CI 0.12, 6.26), p=0.899
	.	.	.	.	3Yr+: HR=9.56 (95% CI 5.29, 17.26), p<0.001
Journey Oxinium/Journey	434	3033	35699	1.22	0 - 3Mth: HR=0.26 (95% CI 0.08, 0.81), p=0.020
	.	.	.	.	3Mth - 1.5Yr: HR=2.32 (95% CI 1.85, 2.90), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=2.10 (95% CI 1.56, 2.83), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.59 (95% CI 0.90, 2.80), p=0.111
	.	.	.	.	3Yr+: HR=3.07 (95% CI 2.73, 3.44), p<0.001
Maxim (class)/Vanguard (ctd)	75	413	5765	1.30	0 - 2Yr: HR=1.58 (95% CI 0.90, 2.78), p=0.114
	.	.	.	.	2Yr - 3Yr: HR=1.27 (95% CI 0.41, 3.95), p=0.676
	.	.	.	.	3Yr - 4.5Yr: HR=3.48 (95% CI 1.74, 6.97), p<0.001
	.	.	.	.	4.5Yr - 6Yr: HR=1.07 (95% CI 0.27, 4.30), p=0.919
	.	.	.	.	6Yr - 9.5Yr: HR=2.12 (95% CI 1.06, 4.24), p=0.033
	.	.	.	.	9.5Yr+: HR=5.02 (95% CI 3.70, 6.82), p<0.001
Nexgen LPS Flex (class)/Nexgen	119	2114	17167	0.69	0 - 1.5Yr: HR=2.00 (95% CI 1.56, 2.58), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=1.70 (95% CI 0.98, 2.93), p=0.056
	.	.	.	.	2Yr+: HR=0.88 (95% CI 0.66, 1.18), p=0.401
Optetrak Logic CR/Optetrak Logic	210	1887	11007	1.91	0 - 1.5Yr: HR=1.09 (95% CI 0.75, 1.58), p=0.657
	.	.	.	.	1.5Yr - 2Yr: HR=2.32 (95% CI 1.39, 3.85), p=0.001
	.	.	.	.	2Yr - 3.5Yr: HR=3.71 (95% CI 2.80, 4.91), p<0.001
	.	.	.	.	3.5Yr+: HR=7.87 (95% CI 6.56, 9.45), p<0.001
Optetrak-CR (ctd)/Optetrak (ctd)	12	92	982	1.22	Entire Period: HR=2.78 (95% CI 1.58, 4.87), p<0.001
Optetrak-PS/Optetrak	390	2410	29114	1.34	0 - 1Mth: HR=0.22 (95% CI 0.03, 1.57), p=0.131
	.	.	.	.	1Mth - 1.5Yr: HR=1.88 (95% CI 1.45, 2.44), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=2.78 (95% CI 2.07, 3.72), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.89 (95% CI 1.04, 3.42), p=0.035
	.	.	.	.	3Yr - 5.5Yr: HR=2.22 (95% CI 1.65, 2.97), p<0.001
	.	.	.	.	5.5Yr+: HR=4.05 (95% CI 3.55, 4.63), p<0.001
Optetrak-PS/Optetrak RBK	110	1127	11949	0.92	Entire Period: HR=1.95 (95% CI 1.62, 2.35), p<0.001
Optetrak-PS/Optetrak-PS	14	55	580	2.41	Entire Period: HR=5.53 (95% CI 3.28, 9.34), p<0.001

Prostheses with Higher than Anticipated Rates of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
PFC Sigma PS (ctd)/MBT (cless)	26	316	3396	0.77	Entire Period: HR=1.52 (95% CI 1.03, 2.22), p=0.032
Profix Oxinium (cless)/Profix	33	75	779	4.24	0 - 9Mth: HR=5.96 (95% CI 2.24, 15.88), p<0.001
	.	.	.	.	9Mth - 2Yr: HR=28.92 (95% CI 18.84, 44.38), p<0.001
	.	.	.	.	2Yr+: HR=3.15 (95% CI 1.58, 6.31), p=0.001
Profix Oxinium (cless)/Profix Mobile	71	158	1451	4.89	0 - 9Mth: HR=3.10 (95% CI 1.16, 8.26), p=0.023
	.	.	.	.	9Mth - 1.5Yr: HR=28.71 (95% CI 19.93, 41.36), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=19.24 (95% CI 10.00, 37.02), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=37.76 (95% CI 22.32, 63.88), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=23.76 (95% CI 10.65, 52.98), p<0.001
	.	.	.	.	3Yr+: HR=2.39 (95% CI 1.24, 4.60), p=0.008
Profix Oxinium (ctd)/Profix (cless)	15	100	1397	1.07	Entire Period: HR=2.08 (95% CI 1.26, 3.45), p=0.004
Profix Oxinium (ctd)/Profix Mobile	30	228	3377	0.89	Entire Period: HR=1.78 (95% CI 1.25, 2.55), p=0.001
Profix/Profix Mobile	117	1005	13662	0.86	0 - 1.5Yr: HR=2.81 (95% CI 2.06, 3.83), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=3.23 (95% CI 2.10, 4.96), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.29 (95% CI 0.41, 3.99), p=0.664
	.	.	.	.	3Yr - 6.5Yr: HR=2.05 (95% CI 1.35, 3.11), p<0.001
	.	.	.	.	6.5Yr+: HR=1.14 (95% CI 0.80, 1.62), p=0.475
Rotaglide Plus/Rotaglide Plus	89	631	8333	1.07	0 - 1.5Yr: HR=1.34 (95% CI 0.76, 2.37), p=0.305
	.	.	.	.	1.5Yr - 2Yr: HR=3.64 (95% CI 1.82, 7.27), p<0.001
	.	.	.	.	2Yr+: HR=2.63 (95% CI 2.08, 3.34), p<0.001
SAL/SAL	15	56	771	1.94	0 - 8.5Yr: HR=1.65 (95% CI 0.62, 4.40), p=0.315
	.	.	.	.	8.5Yr+: HR=9.86 (95% CI 5.45, 17.84), p<0.001
Score (cless)/Score (cless)	267	3026	25072	1.06	Entire Period: HR=1.90 (95% CI 1.68, 2.14), p<0.001
Score (cless)/Score (ctd)	128	1679	12245	1.05	Entire Period: HR=1.89 (95% CI 1.59, 2.24), p<0.001
Scorpio NRG PS (cless)/Series 7000 (cless)	96	1172	13166	0.73	Entire Period: HR=1.33 (95% CI 1.09, 1.63), p=0.005
TC-Plus (cless)/TC-Plus (ctd)	8	63	764	1.05	Entire Period: HR=2.48 (95% CI 1.24, 4.95), p=0.010
Trac/Trac	27	138	1730	1.56	Entire Period: HR=3.38 (95% CI 2.32, 4.92), p<0.001
Vanguard PS/Regenerex	45	465	4257	1.06	0 - 1.5Yr: HR=2.52 (95% CI 1.59, 4.00), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=2.78 (95% CI 1.16, 6.68), p=0.022
	.	.	.	.	2Yr+: HR=1.60 (95% CI 1.06, 2.44), p=0.026
Vanguard PS/Vanguard	392	5405	52140	0.75	0 - 1.5Yr: HR=1.94 (95% CI 1.65, 2.27), p<0.001
	.	.	.	.	1.5Yr+: HR=1.32 (95% CI 1.16, 1.50), p<0.001
*LCS Duofix	709	4866	60743	1.17	Entire Period: HR=2.49 (95% CI 2.31, 2.69), p<0.001
*LCS PS	78	638	6891	1.13	Entire Period: HR=2.45 (95% CI 1.96, 3.06), p<0.001
*Renasys	20	121	1602	1.25	Entire Period: HR=2.80 (95% CI 1.80, 4.33), p<0.001

Note: Components have been compared to all other modern total knee components

*Femoral Component

**Tibial Component

Prostheses with Higher than Anticipated Rates of Revision

Table IP20 Cumulative Percent Revision of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Newly Identified					
E.Motion (class)/E.Motion Pro (ctd)	2.0 (0.8, 5.2)	4.6 (2.3, 9.0)	6.4 (3.4, 11.8)		
Re-Identified and Still Used					
ACS (class)/ACS Fixed	1.3 (1.0, 1.8)	3.7 (3.0, 4.4)	4.4 (3.7, 5.2)	5.7 (4.8, 6.8)	
Active Knee (class)/Active Knee	1.1 (0.9, 1.4)	3.5 (3.1, 4.0)	5.0 (4.5, 5.6)	8.7 (8.0, 9.4)	15.0 (13.9, 16.2)
Apex Knee CR (class)/Apex Knee (class)	2.5 (1.4, 4.2)	5.0 (3.4, 7.2)	5.6 (4.0, 8.0)	6.5 (4.6, 9.1)	
Attune PS (ctd)/Attune (class)	1.7 (1.1, 2.6)	3.9 (2.8, 5.3)			
Columbus/Columbus	1.2 (1.0, 1.4)	2.8 (2.4, 3.2)	3.8 (3.4, 4.4)	6.2 (5.2, 7.2)	
E.Motion/E.Motion	2.5 (1.7, 3.7)	5.6 (4.4, 7.2)	6.5 (5.1, 8.2)	8.4 (6.7, 10.5)	
Mutars/Mutars	7.7 (5.6, 10.6)	17.0 (13.5, 21.4)	22.9 (18.3, 28.5)		
Trekking/Trekking	2.2 (1.6, 3.2)	4.1 (3.1, 5.3)	5.0 (3.9, 6.3)	6.3 (5.0, 7.9)	
*Legion Oxinium FS	5.1 (3.5, 7.3)	7.0 (5.1, 9.6)	8.5 (6.3, 11.4)	10.7 (7.9, 14.3)	
**Legion Revision Tibial Baseplate	2.8 (2.1, 3.9)	4.4 (3.4, 5.7)	5.7 (4.4, 7.2)	8.3 (6.5, 10.6)	
Identified and no longer used					
ACS/ACS Mobile PC (class)	7.7 (4.2, 13.8)	19.3 (13.5, 27.2)	20.1 (14.2, 28.2)	24.5 (17.9, 33.0)	
AMK/AMK	1.0 (0.2, 3.9)	5.0 (2.7, 9.1)	6.6 (3.9, 11.1)	11.4 (7.5, 16.9)	18.3 (12.1, 27.1)
Advance/Advance	2.0 (1.3, 3.1)	5.3 (4.1, 6.9)	6.4 (5.0, 8.1)	8.5 (6.9, 10.6)	
Buechel-Pappas/Buechel-Pappas	1.9 (1.0, 3.6)	5.7 (3.9, 8.2)	7.9 (5.8, 10.7)	10.5 (8.0, 13.7)	
Eska RP/Eska RP	7.5 (2.5, 21.5)	12.7 (5.5, 27.9)	18.2 (9.1, 34.5)	21.1 (11.1, 37.9)	
Evolis (class)/Evolis (class)	2.3 (0.6, 8.9)	8.0 (3.9, 16.1)	10.3 (5.5, 18.9)	11.5 (6.4, 20.4)	
Gemini MK II/Gemini MK II	9.5 (2.5, 33.0)	14.3 (4.8, 38.0)	23.8 (10.7, 48.1)	23.8 (10.7, 48.1)	
Genesis (ctd)/Genesis (ctd)	0.0 (0.0, 0.0)	6.7 (2.6, 16.8)	10.0 (4.6, 20.9)	16.1 (8.6, 28.9)	24.1 (13.3, 41.4)
Genesis II CR (class)/Profix Mobile (ctd)	2.9 (1.4, 6.1)	7.7 (4.9, 11.9)	9.4 (6.3, 14.0)	14.7 (10.7, 20.1)	17.4 (12.8, 23.3)
Genesis II Oxinium CR (class)/Genesis II	11.8 (7.0, 19.5)	38.9 (30.4, 48.7)	39.8 (31.3, 49.7)	42.8 (34.0, 52.7)	
Genesis II Oxinium CR (class)/Profix Mobile	24.0 (16.3, 34.4)	52.8 (42.8, 63.5)	57.4 (47.4, 67.9)	61.1 (51.0, 71.3)	67.1 (56.7, 77.1)
Genesis II Oxinium PS (ctd)/Genesis II (class)	19.6 (11.4, 32.7)	26.8 (17.1, 40.4)	30.4 (20.1, 44.2)	30.4 (20.1, 44.2)	
Genesis II Oxinium PS (ctd)/Genesis II (keel)	4.5 (2.6, 7.7)	14.9 (11.1, 19.7)	19.0 (14.8, 24.3)	22.6 (18.0, 28.2)	
HLS Noetos/HLS Noetos	3.4 (1.8, 6.2)	8.6 (5.9, 12.4)	10.7 (7.7, 14.9)	13.5 (10.0, 18.1)	
IB II/IB II	0.0 (0.0, 0.0)	3.6 (1.7, 7.3)	7.8 (4.8, 12.7)	15.9 (11.3, 22.1)	27.2 (20.1, 36.1)
Interax/Interax	0.0 (0.0, 0.0)	2.0 (0.3, 13.4)	8.3 (3.2, 20.7)	13.0 (6.0, 26.8)	
Journey Oxinium/Journey	1.4 (1.0, 1.9)	4.6 (3.9, 5.4)	6.5 (5.6, 7.4)	11.2 (10.1, 12.4)	
Maxim (class)/Vanguard (ctd)	1.2 (0.5, 2.9)	3.7 (2.2, 6.0)	6.0 (4.0, 8.8)	9.4 (6.9, 12.8)	24.6 (19.8, 30.2)
Nexgen LPS Flex (class)/Nexgen	2.4 (1.8, 3.2)	4.3 (3.6, 5.3)	5.0 (4.1, 6.0)	6.2 (5.1, 7.4)	
Optetrak Logic CR/Optetrak Logic	1.1 (0.7, 1.6)	4.4 (3.5, 5.4)	8.2 (6.9, 9.6)		
Optetrak-CR (ctd)/Optetrak (ctd)	0.0 (0.0, 0.0)	6.6 (3.0, 14.0)	10.1 (5.4, 18.5)	12.8 (7.3, 22.0)	
Optetrak-PS/Optetrak	1.5 (1.1, 2.0)	4.8 (4.0, 5.7)	6.4 (5.5, 7.5)	12.2 (10.9, 13.6)	21.7 (19.5, 24.0)
Optetrak-PS/Optetrak RBK	1.8 (1.2, 2.7)	4.6 (3.5, 6.0)	6.0 (4.7, 7.5)	8.7 (7.1, 10.6)	
Optetrak-PS/Optetrak-PS	1.8 (0.3, 12.2)	16.4 (8.9, 29.1)	20.0 (11.6, 33.3)	24.4 (14.9, 38.5)	
PFC Sigma PS (ctd)/MBT (class)	2.2 (1.1, 4.6)	5.4 (3.4, 8.6)	7.1 (4.7, 10.5)	7.4 (5.0, 10.9)	
Profix Oxinium (class)/Profix	13.3 (7.4, 23.4)	36.1 (26.4, 48.1)	37.5 (27.6, 49.5)	42.0 (31.7, 54.2)	46.0 (35.1, 58.5)
Profix Oxinium (class)/Profix Mobile	9.0 (5.4, 14.6)	40.2 (32.9, 48.3)	41.5 (34.2, 49.7)	46.0 (38.4, 54.3)	
Profix Oxinium (ctd)/Profix (class)	4.0 (1.5, 10.3)	8.0 (4.1, 15.4)	9.0 (4.8, 16.6)	11.2 (6.4, 19.4)	16.6 (10.3, 26.2)
Profix Oxinium (ctd)/Profix Mobile	2.2 (0.9, 5.2)	7.2 (4.4, 11.4)	9.4 (6.3, 14.1)	11.8 (8.2, 16.8)	14.4 (10.2, 20.0)
Profix/Profix Mobile	2.3 (1.5, 3.4)	6.5 (5.1, 8.2)	8.2 (6.6, 10.1)	10.0 (8.3, 12.1)	13.6 (11.3, 16.3)
Rotaglide Plus/Rotaglide Plus	0.8 (0.3, 1.9)	4.1 (2.8, 6.0)	5.8 (4.2, 8.0)	11.1 (8.8, 14.0)	18.3 (14.9, 22.3)
SAL/SAL	0.0 (0.0, 0.0)	1.9 (0.3, 12.6)	1.9 (0.3, 12.6)	14.8 (7.3, 28.6)	37.5 (24.0, 55.2)
Score (class)/Score (class)	1.5 (1.1, 2.0)	4.6 (3.9, 5.4)	6.3 (5.5, 7.3)	10.1 (8.9, 11.4)	
Score (class)/Score (ctd)	1.5 (1.0, 2.2)	3.8 (3.0, 4.9)	5.6 (4.6, 6.9)	9.3 (7.7, 11.1)	

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Scorpio NRG PS (class)/Series 7000 (class)	1.2 (0.7, 2.0)	4.9 (3.8, 6.3)	6.2 (4.9, 7.7)	7.4 (6.0, 9.1)	
TC-Plus (class)/TC-Plus (ctd)	1.6 (0.2, 10.7)	8.4 (3.6, 19.1)	8.4 (3.6, 19.1)	14.4 (7.4, 26.9)	
Trac/Trac	2.2 (0.7, 6.6)	5.9 (3.0, 11.4)	9.0 (5.2, 15.2)	15.1 (9.9, 22.8)	
Vanguard PS/Regenerex	3.2 (2.0, 5.3)	7.1 (5.1, 9.9)	7.8 (5.7, 10.6)	9.6 (7.2, 12.9)	
Vanguard PS/Vanguard	1.8 (1.5, 2.2)	4.2 (3.7, 4.8)	5.3 (4.7, 5.9)	7.3 (6.6, 8.1)	
*LCS Duofix	1.5 (1.2, 1.9)	5.9 (5.3, 6.6)	9.7 (8.9, 10.6)	13.0 (12.1, 14.1)	
*LCS PS	2.1 (1.2, 3.5)	6.7 (5.0, 9.0)	8.5 (6.6, 11.0)	12.0 (9.6, 14.8)	
*Renasys	2.5 (0.8, 7.5)	4.2 (1.8, 9.8)	8.5 (4.6, 15.1)	11.2 (6.7, 18.5)	

Note: *Femoral Component
**Tibial Component

Table IP21 Yearly Usage of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Newly Identified	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
E.Motion (class)/E.Motion Pro (ctd)	.	.	.	.	.	.	.	1	6	.	6	24	24	36	29	23	36	20
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACS (class)/ACS Fixed	.	.	.	.	41	118	284	337	331	238	266	259	319	209	169	127	181	142
Active Knee (class)/Active Knee	3293	483	412	479	601	500	427	319	336	176	91	35	21	24	17	1	37	63
Apex Knee CR (class)/Apex Knee (class)	.	.	.	.	.	69	83	118	78	11	3	29	53	6	23	48	7	1
Attune PS (ctd)/Attune (class)	.	.	.	.	.	.	.	.	.	.	.	.	1	38	530	287	136	218
Columbus/Columbus	230	148	156	135	135	108	69	36	60	118	358	670	828	1115	1105	1080	1084	1067
E.Motion/E.Motion	.	.	12	87	114	129	171	71	93	87	101	64	45	12	15	14	13	13
Mutars/Mutars	.	.	.	.	.	2	12	8	15	14	26	32	63	56	62	71	75	46
Trekking/Trekking	.	.	.	35	102	133	107	108	106	129	216	143	100	65	20	18	10	12
*Legion Oxinium FS	29	19	28	28	24	31	30	18	23	25	24	37	30	37	53	38	41	30
**Legion Revision Tibial Baseplate	49	48	40	56	47	63	54	47	38	50	50	87	93	129	173	144	151	125
Identified and no longer used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACS/ACS Mobile PC (class)	.	.	.	.	20	37	57	17	.	.	.	.	.	.	.	.	.	.
AMK/AMK	203	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Advance/Advance	91	5	43	115	138	74	7	92	92	100	90	69	58	17	13	5	.	.
Buechel-Pappas/Buechel-Pappas	91	84	100	148	44	4	.	7	1	.	.	.	.	.	.	.	.	.
Eska RP/Eska RP	38	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Evolis (class)/Evolis (class)	.	17	5	11	9	20	7	11	7	.	.	.	.	.	.	.	.	.
Gemini MK II/Gemini MK II	21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis (ctd)/Genesis (ctd)	62	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II CR (class)/Profix Mobile (ctd)	173	12	6	9	17	2	22	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium CR (class)/Genesis II	110	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium CR (class)/Profix Mobile	88	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium PS (ctd)/Genesis II (class)	4	4	11	35	1	1	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium PS (ctd)/Genesis II (keel)	269	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HLS Noetos/HLS Noetos	96	45	56	48	28	20	1	.	.	.	.	.	.	.	.	.	.	.
IB II/IB II	199	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Interax/Interax	52	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

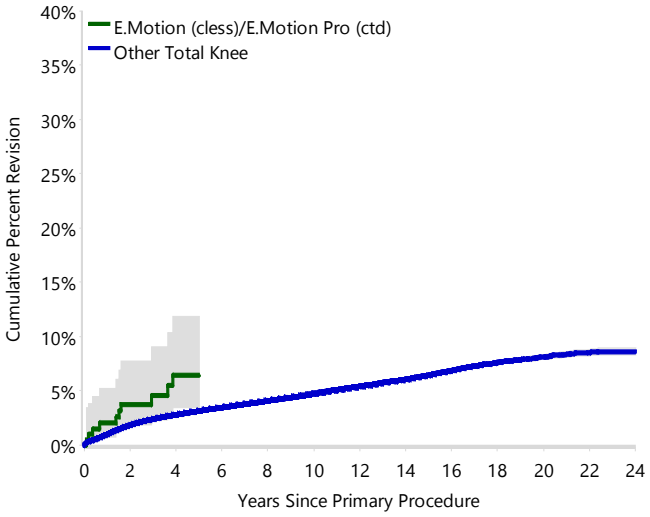
Prostheses with Higher than Anticipated Rates of Revision

Year of Implant	≤2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Journey Oxinium/Journey	471	541	555	464	334	343	325	.	.	.	.	.	.	.	.	.	.	.
Maxim (cless)/Vanguard (ctd)	403	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Nexgen LPS Flex (cless)/Nexgen	.	.	.	73	78	149	312	238	280	225	252	221	188	82	12	4	.	.
Optetrak Logic CR/Optetrak Logic	.	.	.	.	.	.	.	21	171	234	321	339	286	195	226	83	11	.
Optetrak-CR (ctd)/Optetrak (ctd)	38	7	4	.	5	6	8	24	.	.	.	.	.	.	.	.	.	.
Optetrak-PS/Optetrak	1132	168	202	198	202	200	151	115	30	3	5	3	1	.	.	.	.	.
Optetrak-PS/Optetrak RBK	255	166	119	82	40	37	50	100	56	46	88	75	13	.	.	.	.	.
Optetrak-PS/Optetrak-PS	55	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PFC Sigma PS (ctd)/MBT (class)	49	.	.	.	25	89	110	42	.	1	.	.	.	.	.	.	.	.
Profix Oxinium (class)/Profix	75	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (class)/Profix Mobile	158	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (ctd)/Profix (class)	79	10	8	2	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (ctd)/Profix Mobile	225	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix/Profix Mobile	980	11	12	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rotaglide Plus/Rotaglide Plus	616	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SAL/SAL	56	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Score (class)/Score (class)	12	135	212	187	204	195	239	273	263	170	160	214	151	252	354	5	.	.
Score (class)/Score (ctd)	6	3	3	.	5	15	90	181	324	300	267	122	205	114	44	.	.	.
Scorpio NRG PS (class)/Series 7000 (class)	76	185	171	166	114	67	71	76	72	77	69	28	.	.	.	.	.	.
TC-Plus (class)/TC-Plus (ctd)	63	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trac/Trac	138	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vanguard PS/Regenerex	.	.	4	121	54	27	15	21	18	76	59	56	14	.	.	.	.	.
Vanguard PS/Vanguard	248	321	430	478	607	561	451	523	445	331	310	205	186	136	117	56	.	.
*LCS Duofix	2480	1532	854	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*LCS PS	.	8	157	203	109	51	69	39	2	.	.	.	.	.	.	.	.	.
*Renasys	107	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: *Femoral Component
**Tibial Component

Figure IP5 Cumulative Percent Revision of Newly Identified Total Knee Prostheses

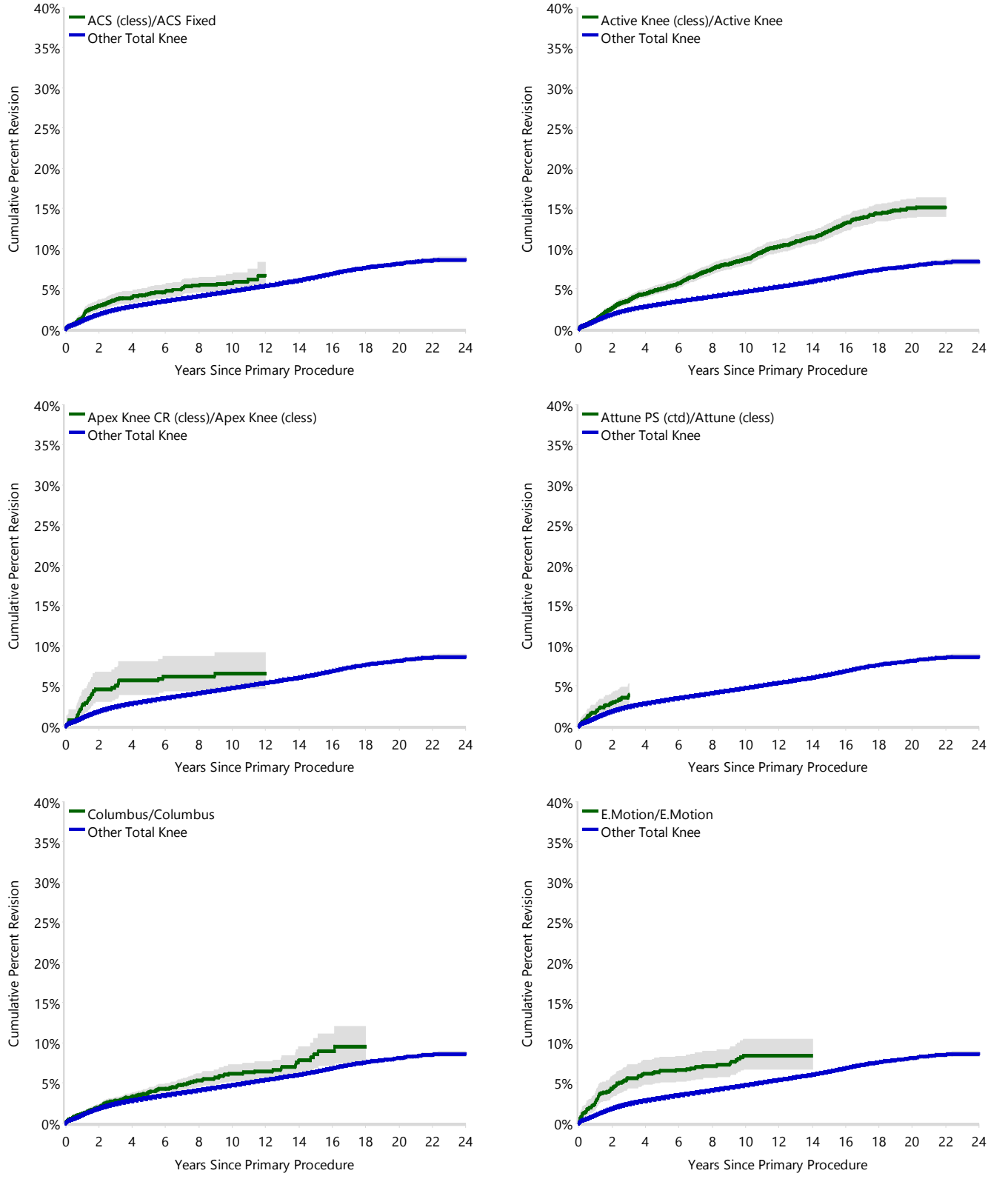
Newly Identified



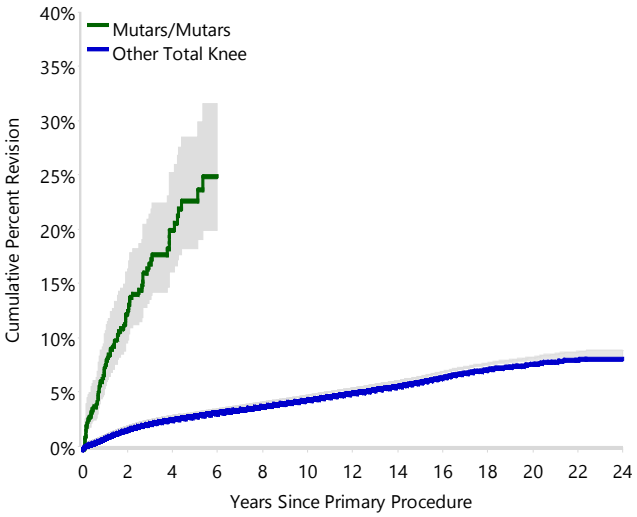
Prostheses with Higher than Anticipated Rates of Revision

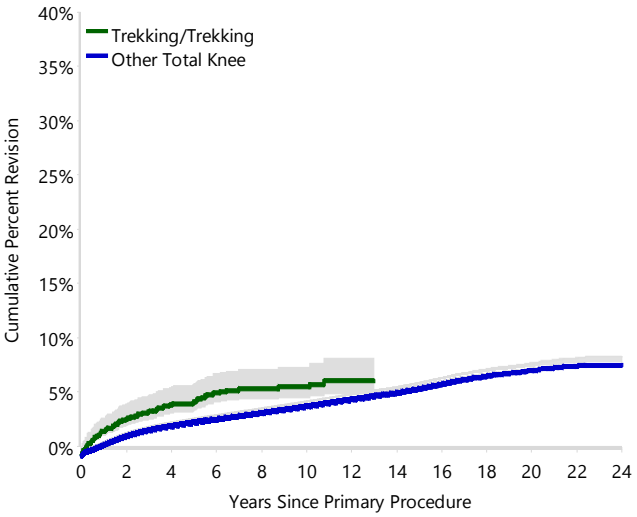
Figure IP6 Cumulative Percent Revision of Re-Identified and Still Used Total Knee Prostheses

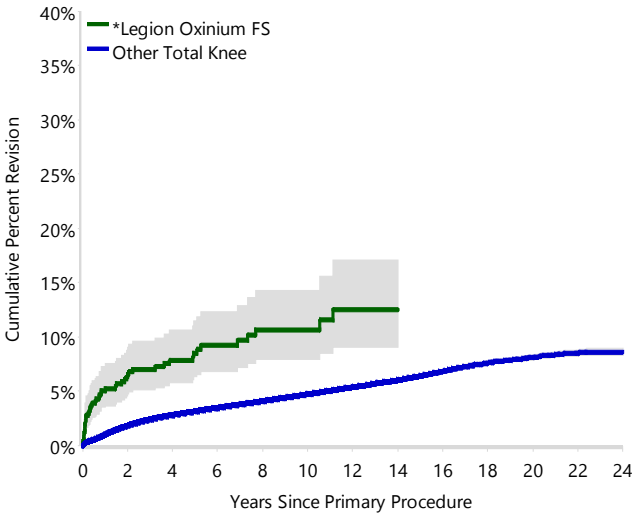
Re-Identified and Still Used

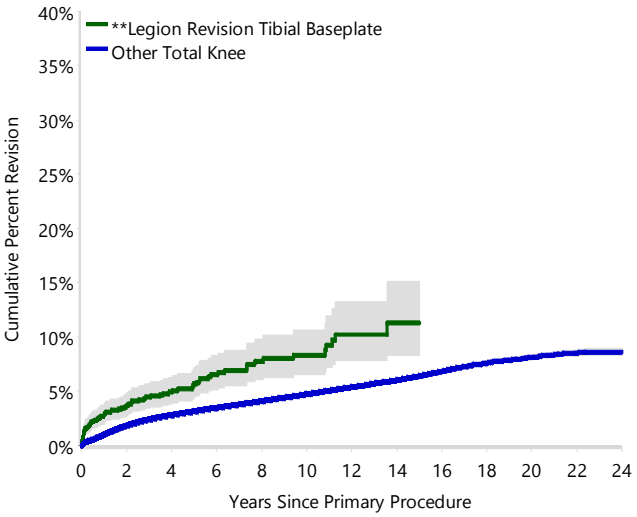


Prostheses with Higher than Anticipated Rates of Revision









Prostheses with Higher than Anticipated Rates of Revision

Primary Partial Shoulder Replacement

HEMI STEMMED ANATOMIC

There are no newly identified hemi stemmed anatomic shoulder prostheses.

Table IP22 Revision Rate of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Head	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used					
Delta Xtend/Delta Xtend	14	79	524	2.67	Entire Period: HR=1.83 (95% CI 1.07, 3.13), p=0.026
Global Unite/Global Unite	43	227	1374	3.13	Entire Period: HR=1.77 (95% CI 1.29, 2.43), p<0.001

Note: Components have been compared to all other modern hemi stemmed anatomic shoulder components

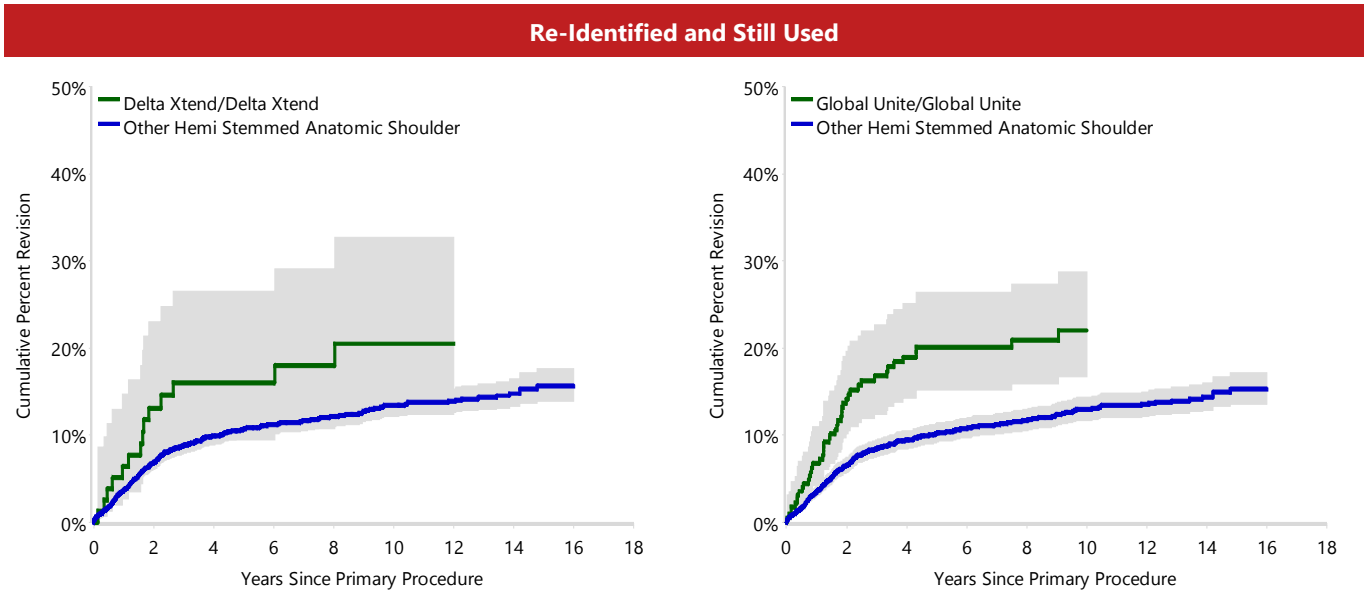
Table IP23 Cumulative Percent Revision of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Delta Xtend/Delta Xtend	6.4 (2.7, 14.7)	16.0 (9.4, 26.5)	16.0 (9.4, 26.5)	17.9 (10.8, 29.0)	
Global Unite/Global Unite	6.8 (4.1, 11.0)	16.8 (12.3, 22.6)	20.1 (15.2, 26.3)	20.1 (15.2, 26.3)	

Table IP24 Yearly Usage of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Delta Xtend/Delta Xtend	7	9	9	5	10	7	6	5	4	3	6	3	1	.	1	2	1
Global Unite/Global Unite	.	.	.	.	15	37	25	38	37	14	12	11	12	6	2	7	11

Figure IP7 Cumulative Percent Revision of Re-Identified and Still Used Hemi Stemmed Anatomic Shoulder Prostheses



Primary Total Shoulder Replacement

TOTAL STEMMED ANATOMIC

There are no newly identified total stemmed anatomic shoulder prostheses

Table IP25 Revision Rate of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Glenoid	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
Equinoxe/Equinoxe (All Poly)	35	305	1739	2.01	0 - 1.5Yr: HR=1.40 (95% CI 0.73, 2.66), p=0.309
	.	.	.	.	1.5Yr+: HR=3.55 (95% CI 2.31, 5.46), p<0.001
Equinoxe/Equinoxe (Hybrid Glenoid)	49	453	2093	2.34	0 - 2.5Yr: HR=1.59 (95% CI 1.03, 2.46), p=0.036
	.	.	.	.	2.5Yr+: HR=4.81 (95% CI 3.05, 7.59), p<0.001
Identified and no longer used	.	.	.	.	
Comprehensive/Custom Made (Comprehensive)	7	18	75	9.35	Entire Period: HR=8.52 (95% CI 4.00, 18.16), p<0.001
SMR/SMR L1	481	2440	19517	2.46	Entire Period: HR=2.94 (95% CI 2.54, 3.41), p<0.001
SMR/SMR L2	328	856	7108	4.61	Entire Period: HR=6.55 (95% CI 5.57, 7.70), p<0.001
Univers 3D/Univers 3D	17	34	305	5.57	Entire Period: HR=7.46 (95% CI 4.53, 12.27), p<0.001
Vaios/Vaios	19	36	227	8.36	Entire Period: HR=9.61 (95% CI 6.02, 15.33), p<0.001

Note: Components have been compared to all other modern total stemmed anatomic shoulder components

Table IP26 Cumulative Percent Revision of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

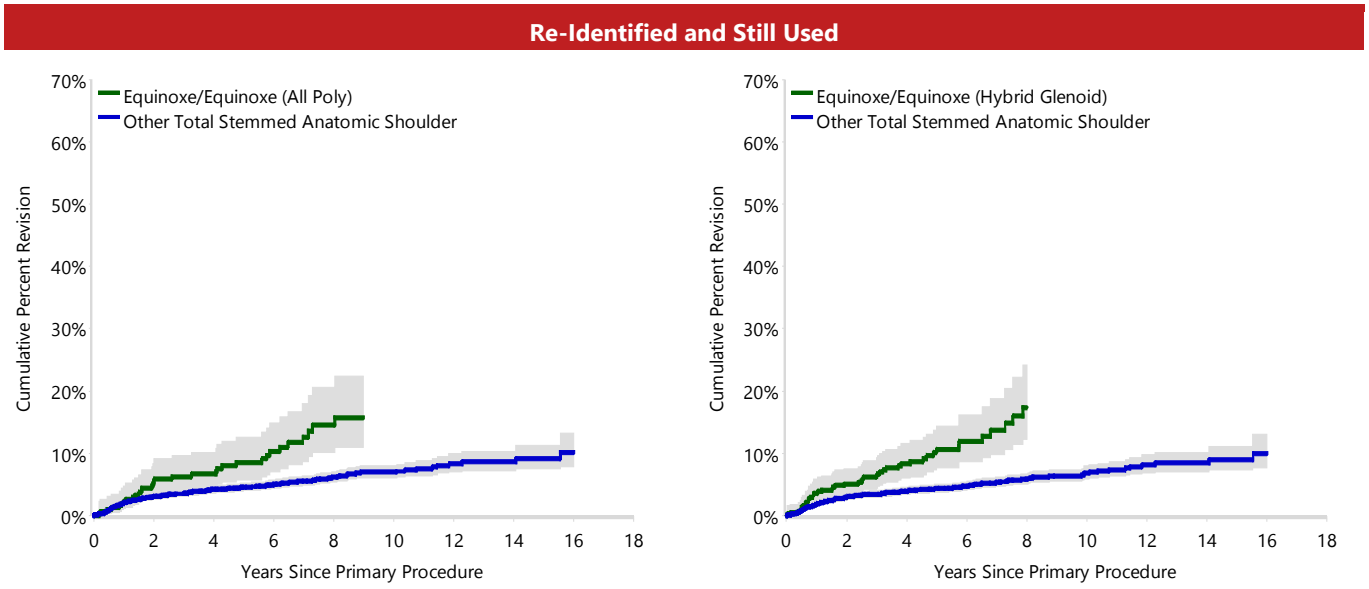
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Equinoxe/Equinoxe (All Poly)	2.0 (0.9, 4.4)	6.2 (3.9, 9.7)	8.5 (5.7, 12.6)	12.6 (8.7, 18.0)	
Equinoxe/Equinoxe (Hybrid Glenoid)	3.6 (2.2, 5.8)	6.4 (4.4, 9.2)	10.5 (7.7, 14.4)	13.7 (9.9, 18.8)	
Identified and no longer used					
Comprehensive/Custom Made (Comprehensive)	16.7 (5.7, 43.2)	27.8 (12.6, 54.4)	33.8 (16.8, 60.4)		
SMR/SMR L1	5.9 (5.1, 6.9)	11.4 (10.2, 12.7)	13.7 (12.4, 15.2)	16.2 (14.7, 17.7)	26.2 (23.8, 28.9)
SMR/SMR L2	9.5 (7.7, 11.7)	22.2 (19.6, 25.2)	29.8 (26.9, 33.1)	34.1 (31.0, 37.4)	40.1 (36.8, 43.7)
Univers 3D/Univers 3D	5.9 (1.5, 21.5)	14.7 (6.4, 31.8)	21.2 (10.7, 39.4)	31.0 (18.0, 50.1)	48.9 (32.7, 68.0)
Vaios/Vaios	13.9 (6.0, 30.2)	27.8 (16.0, 45.5)	39.1 (25.3, 57.0)	48.7 (33.6, 66.4)	57.0 (40.5, 74.6)

Prostheses with Higher than Anticipated Rates of Revision

Table IP27 Yearly Usage of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equinoxe/Equinoxe (All Poly)	.	.	.	6	10	26	18	8	23	36	45	37	18	28	24	24	2
Equinoxe/Equinoxe (Hybrid Glenoid)	.	.	.	.	.	.	14	38	19	35	34	68	74	64	62	24	21
Identified and no longer used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Comprehensive/Custom Made (Comprehensive)	.	.	.	.	.	.	.	.	1	4	7	5	1	.	.	.	.
SMR/SMR L1	372	247	.	.	156	302	256	242	195	172	128	98	72	70	65	65	.
SMR/SMR L2	.	43	343	336	134	.	.	.	.	.	.	.	.	.	.	.	.
Univers 3D/Univers 3D	34	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vaios/Vaios	.	.	.	16	17	2	1	.	.	.	.	.	.	.	.	.	.

Figure IP8 Cumulative Percent Revision of Re-Identified and Still Used Total Stemmed Anatomic Shoulder Prostheses



TOTAL STEMMED REVERSE

There is one newly identified total stemmed reverse shoulder prostheses.

The Equinoxe/Equinoxe total stemmed reverse combination was first used in 2011 and is categorised as total stemmed reverse with a polyethylene humeral insert and a modular metal glenosphere and glenoid base plate. There have been 7,299 procedures, of which 45.4% were for osteoarthritis, 34.3% rotator cuff arthropathy and 14.4% for fracture. The cumulative percent revision at 9 years is 7.3%. Of the 271 revisions, 90 have been for infection, 78 for instability/dislocation and 39 for loosening. The majority (181/271) have been major revisions. The bearing surface of this implant combination is (humeral/glenoid) non-XLPE/metal.

The previously identified Trabecular Metal/Comprehensive combination no longer fulfils the criteria for identification in 2024.

Table IP28 Revision Rate of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Glenoid	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Newly Identified	.	.	.	.	
Equinoxe/Equinoxe	271	7299	22812	1.19	0 - 2Wk: HR=1.17 (95% CI 0.79, 1.73), p=0.439
	.	.	.	.	2Wk - 3Mth: HR=0.75 (95% CI 0.57, 0.99), p=0.038
	.	.	.	.	3Mth - 1.5Yr: HR=1.12 (95% CI 0.90, 1.38), p=0.310
	.	.	.	.	1.5Yr - 2Yr: HR=1.49 (95% CI 0.96, 2.32), p=0.078
	.	.	.	.	2Yr - 3.5Yr: HR=0.92 (95% CI 0.60, 1.41), p=0.705
	.	.	.	.	3.5Yr+: HR=2.57 (95% CI 1.84, 3.59), p<0.001
Re-Identified and Still Used	.	.	.	.	
SMR/SMR L1	505	11877	61575	0.82	0 - 3Mth: HR=1.61 (95% CI 1.38, 1.88), p<0.001
	.	.	.	.	3Mth - 1.5Yr: HR=1.10 (95% CI 0.92, 1.31), p=0.281
	.	.	.	.	1.5Yr+: HR=0.64 (95% CI 0.52, 0.78), p<0.001
Verso/Verso	7	40	107	6.52	Entire Period: HR=4.76 (95% CI 2.27, 9.99), p<0.001

Note: Components have been compared to all other modern total stemmed reverse shoulder components.
This combination is one of two that have reached the 'non-inferior' 10 year performance benchmark (for further information refer to the 10, 15, 20 Year Prosthesis Outcomes chapter in this report).

Table IP29 Cumulative Percent Revision of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Newly Identified					
Equinoxe/Equinoxe	2.3 (2.0, 2.7)	3.6 (3.1, 4.1)	4.5 (3.9, 5.1)	6.2 (5.2, 7.2)	
Re-Identified and Still Used					
SMR/SMR L1	2.9 (2.6, 3.2)	3.9 (3.6, 4.3)	4.3 (3.9, 4.7)	4.7 (4.3, 5.1)	6.0 (5.2, 6.9)
Verso/Verso	15.3 (7.2, 31.0)	18.6 (9.3, 35.3)	18.6 (9.3, 35.3)		

Prostheses with Higher than Anticipated Rates of Revision

Table IP30 Yearly Usage of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Newly Identified	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equinoxe/Equinoxe	.	.	.	1	9	14	32	103	168	332	495	675	855	955	1057	1346	1257
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SMR/SMR L1	407	271	.	.	248	563	633	732	914	930	1046	1055	1009	1191	1034	943	901
Verso/Verso	.	.	.	.	.	.	.	.	.	.	5	8	1	6	5	13	2

Figure IP9 Cumulative Percent Revision of Newly Identified Total Stemmed Reverse Shoulder Prostheses

Newly Identified

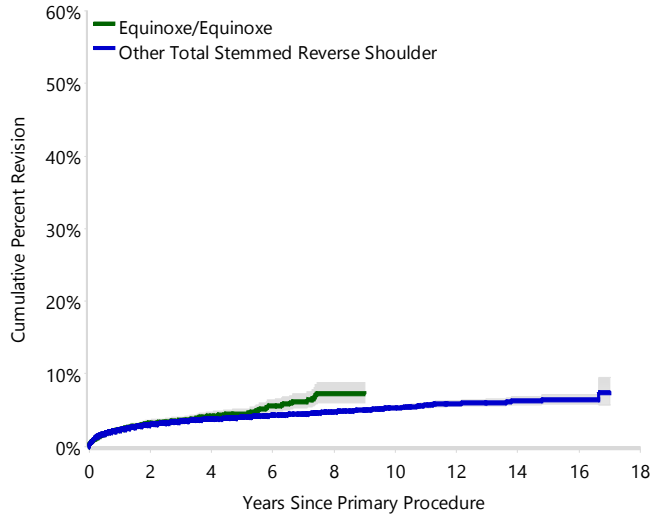
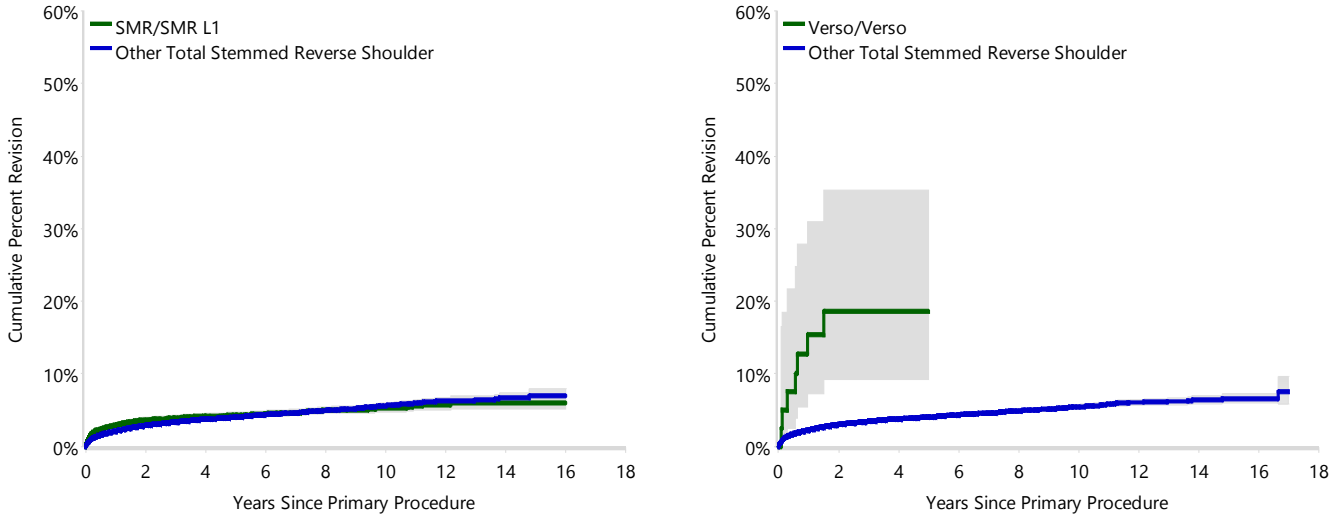


Figure IP10 Cumulative Percent Revision of Re-Identified and Still Used Total Stemmed Reverse Shoulder Prostheses

Re-Identified and Still Used



Primary Total Ankle Replacement

There are no newly identified total ankle replacement prostheses.

Table IP31 Revision Rate of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Talar/Tibial Tray	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
Hintermann Series H3/Hintermann Series H3	108	573	4725	2.29	Entire Period: HR=1.93 (95% CI 1.55, 2.40), p<0.001
Identified and no longer used	.	.	.	.	
S.T.A.R/S.T.A.R	14	49	411	3.40	Entire Period: HR=2.45 (95% CI 1.44, 4.18), p<0.001

Note: Components have been compared to all other total ankle components

Table IP32 Cumulative Percent Revision of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Hintermann Series H3/Hintermann Series H3	4.1 (2.7, 6.0)	8.4 (6.4, 11.1)	11.4 (8.9, 14.4)	15.7 (12.7, 19.2)	24.9 (20.8, 29.7)
Identified and no longer used					
S.T.A.R/S.T.A.R	4.1 (1.0, 15.5)	12.6 (5.8, 25.8)	14.7 (7.3, 28.4)	21.3 (12.0, 35.9)	

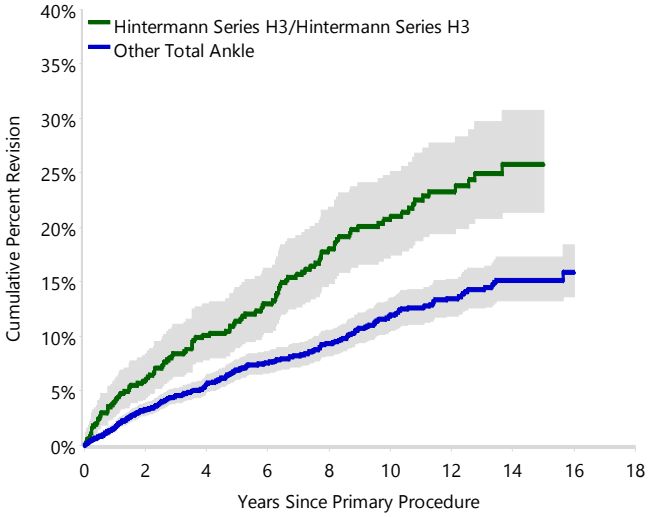
Table IP33 Yearly Usage of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hintermann Series H3/Hintermann Series H3	40	45	63	56	67	48	40	34	12	25	30	13	20	24	21	20	15
Identified and no longer used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S.T.A.R/S.T.A.R	1	3	3	4	2	15	12	4	4	.	1	.	.	.	.	.	.

Prostheses with Higher than Anticipated Rates of Revision

Figure IP11 Cumulative Percent Revision of Re-Identified and Still Used Total Ankle Prostheses

Re-Identified and Still Used



Appendices

Appendices

APPENDIX 1 – Participating Hospitals and Coordinators

VICTORIA			
Public Hospitals		**Private Hospitals**	
Austin Health	R Kentish / B Murray	Ballarat Day Procedure Centre	A Ingram
Bacchus Marsh Hospital	C Clifford / J Dehnert	Beleura Private Hospital	J Leyland
Bairnsdale Regional Health Service	S Guns	Bellbird Private Hospital	B Van Denberg
Bass Coast Health	L Mckenzie / P Dewar	Cabrini Brighton	D Heng
Bendigo Health	E Smith / S Sharp / C Jensen	Cabrini Malvern	D Heng
Broadmeadows Hospital	R Paul / B Wilson	Epping Private Hospital	J Jose
Central Gippsland Health	M Pusmucans / J Hunt	Epworth Eastern	K Longley
Cohuna District Hospital	K Storm	Epworth Freemasons	C Nozzolillo
Colac Area Health	A Tout	Epworth Geelong	N Cuttiford
Dandenong Hospital	K Ferguson / M Murray	Epworth Richmond	A Condon
East Grampians Health Service	K Carr / J Debney / J Sargent	Essendon Private Hospital	E Jordan
Eastern Health Box Hill	L Bingham / D Wickramasinghe	Glenferrie Private Hospital	L Banbury / S Srisawat / S Jones / M
Eastern Health Maroondah	B Connelly / G Whitemore	Holmesglen Private Hospital	N Malovic
Echuca Regional Health	H Lias / K Giorgianni	John Fawkner Private Hospital	B Emmett
Footscray Hospital	L Carbone / A Dijak	Knox Private Hospital	J Assauw / E George / H McCarty
Frankston Hospital	J Harry	La Trobe Private Hospital	J Flestado / J Telfer
Frankston Public Surgical Centre	N Larner / S Reeves	Linacre Private Hospital	M Krotwaar / R Carliesh / B Prentice / D
Goulburn Valley Health	A Stevens	Maryvale Private Hospital	F Van Dyke / K Collier
Grampians Health Ballarat	M Nicholson / B Anderson	Masada Private Hospital	D MacKenzie / S Howell
Grampians Health Horsham	M Markby / A Ampt	Melbourne Private Hospital	T Perkins
Grampians Health Stawell	S Hamilton / C Ellen	Mildura Health Private Hospital	S Malcolm
Hamilton Base Hospital	C Raymond / R Broadfoot	Mitcham Private Hospital	J Lonthyil / J Nankivell
Kyabram District Health Service	B Harrison / L Walker	Mulgrave Private Hospital	B Gurung / A Chandrakumar
Latrobe Regional Hospital	S Lovison	Northern Private Hospital	L Macpherson
Mildura Base Public Hospital	K Mailes	Northpark Private Hospital	J Flestado / M Muganiwa / K Morris
Monash Medical Centre	J Cranston	Peninsula Private Hospital	K Jones
Moorabbin Hospital	C Jackson / L Mason	Ringwood Private Hospital	C Burns
Northeast Health Wangaratta	D Reidy	Shepparton Private Hospital	V Cabatu / A Lam
Northern Hospital Epping	S Perry	St John of God Ballarat Hospital	G Mathachan
Portland District Health	M Ashby	St John of God Bendigo Hospital	A Sheehan
Sandringham Hospital	G Jack / L Scopel / S Kurup	St John of God Berwick Hospital	R Jamieson
St Vincent's Hospital Melbourne	A Lynskey / D Thangavel	St John of God Geelong Hospital	C Hay
Sunshine Hospital	A Dijak	St John of God Warrnambool Hospital	G Wheaton / L McPherson
Swan Hill District Health	D Hartland	St Vincent's Private Hospital East	E Valenton / S Francis
The Alfred	T Krohman	St Vincent's Private Hospital Fitzroy	D Dellevirgini / N Carter
The Royal Children's Hospital	S Lauletta	St Vincent's Private Hospital Kew	S Vohra / H Xing
The Royal Melbourne Hospital	H Eggleston	St Vincent's Private Hospital Werribee	D Adanza / D Sanchez / M Ipio / L Fifis
University Hospital Geelong	M Quinn / D Barber	Sunshine Private Hospital	C Alagao
Warrnambool Base Hospital	W Marsh / T Kelly	The Avenue Hospital	K Seng / R Crompton / T Kilpi
West Gippsland Healthcare Group	B Norman / S Backman	The Bays Hospital	L Charenko / L Kerr / S Burton
West Wimmera Health Service	T Heinrich	The Melbourne Eastern Private Hospital	J Phillpotts
Williamstown Hospital	J Bonganay / A Chircop	Vermont Private Hospital	V Howell / D Cooper
		Wangaratta Private Hospital	J McKie
		Warringal Private Hospital	M Dey / M Bhagat

VICTORIA			
Public Hospitals		**Private Hospitals**	
		Waverley Private Hospital	E Fernandez / N Smith / N Dator
		Werribee Mercy Hospital	J Anwar
		Western Private Hospital	M Samson / D Cringasu

NEW SOUTH WALES			
Public Hospitals		**Private Hospitals**	
Albury Base Hospital	L Rhodes	Albury Wodonga Private Hospital	R Daggett
Armidale Hospital	J Waters / A Sutherland / A Prater	Armidale Private Hospital	K Latter
Auburn Health Service	A Balangue / M Malonzo	Baringa Private Hospital	E Ford / K Henderson / F Howson
Bankstown-Lidcombe Hospital	W Liaw / N Bassett* / K Och	Bathurst Private Hospital	K Quinton / D Carter
Bathurst Hospital	B Hodges	Brisbane Waters Private Hospital	A Ryan
Belmont Hospital	J Jones / J Osland	Calvary Riverina Hospital	F Oxley / L Pennier
Blacktown Hospital	J Tsang	Campbelltown Private Hospital	J Blanch / C Macdonald
Bowral and District Hospital	R Roberts / B Allan	Delmar Private Hospital	C Byrne
Broken Hill Base Hospital	T Kerle / S Beahl	Dubbo Private Hospital	A Wright / K Troth / S Cross
Campbelltown Hospital	K Hanger / S Paudel / S Birch	Dudley Private Hospital	P Fullgrabe
Canterbury Hospital	J Cubitt	East Sydney Private Hospital	T Woodgate
Chris O'Brien Lifehouse	S Harnedy	Forster Private Hospital	S Jose / D Conway / S Daczko
Coffs Harbour Health Campus	J Bellenger	Gosford Private Hospital	A Maguire
Concord Repatriation General Hospital	D Debello	Hawkesbury District Health Service	E Jones / S Garden
Dubbo Hospital	K Chapman / R Willis	Holroyd Private Hospital	M Brosas
Fairfield Hospital	C Youkhana	Hunter Valley Private Hospital	R Pridue
Gosford Hospital	K Mizzi / T Hoad / K Brown / M Farthing	Hurstville Private Hospital	J Mati / T Ross
Goulburn Base Hospital	K Goode / L Phelan	Insight Private Hospital	J Furness
Grafton Base Hospital	K Shaw / G Snook	Kareena Private Hospital	A Burazer / B Mitchell
Hornsby Ku-Ring-Gai Hospital	J Colville / B Chu	Kogarah Private Hospital	R Duag
Institute of Rheumatology and	M Hatziandreou	Lake Macquarie Private Hospital	V Jones / C Wright
John Hunter Hospital	J Gilbert / F Bristow	Lakeview Private Hospital	S Mitchell / H MacAllister
Lismore Base Hospital	G Nettle	Lingard Private Hospital	A Flaherty / K Bailey / A Dagg
Liverpool Hospital	S Seap	Macquarie University Hospital	J Guthrie
Maitland Hospital	B Game	Maitland Private Hospital	J Hayward / M Mead
Manning Hospital	G Cooke	Mater Hospital North Sydney	N Guerrero
Mount Druitt Hospital	C Boyd	Mayo Private Hospital	K Boucher
Murwillumbah District Hospital	S Smith / G Jacklin	Nepean Private Hospital	J Vimalraj
Nepean Hospital	D Dobbs / R Steward	Newcastle Private Hospital	D Fogarty / J Kelly
Orange Health Service	J Allenby	North Shore Private Hospital	A Bloxham
Port Macquarie Base Hospital	J Atkins / A Bartlett	Northern Beaches Hospital	S Maristela
Prince of Wales Hospital	E Katz	Norwest Private Hospital	J Woodward / R Shepherd
Royal Newcastle Centre	D Sommer / G Cutler	Nowra Private Hospital	D Maslen / G Hutton
Royal North Shore Hospital	H Celep	Orange Private Hospital	A McClelland
Royal Prince Alfred Hospital	J Wilkie	Port Macquarie Private Hospital	T Bell
Ryde Hospital	K Jones / H Nowlan	Prince of Wales Private Hospital	F Sarmiento
Shoalhaven Memorial Hospital	L Royston	Shellharbour Private Hospital	M Stevens / J Wilkinson

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NEW SOUTH WALES			
Public Hospitals		**Private Hospitals**	
South East Regional Hospital	K Wild-Edwards / L Williams	Somerset Private Hospital	F Strachan
St George Hospital	D Gray / D Elliott	Southern Highlands Private Hospital	L Byrne
St Vincent's Hospital Sydney	A Baker / L Hatton	St George Private Hospital	L Mayo
Sutherland Hospital	P Beattie / C Kirgan	St Luke's Care	D Papadopoulos
Tamworth Hospital	M Lebrocq	St Vincent's Private Community Hospital	M Blackman
The Children's Hospital at Westmead	A Galstaun	St Vincent's Private Hospital Sydney	H George / M McGlynn / M Bancroft
Tweed Valley Hospital	A Budd / N Prestage	St Vincent's Private Hospital Lismore	J Hospers
Wagga Wagga Base Hospital	M O'Reilly / J Bowden / A Meek	Strathfield Private Hospital	F Abood / J Mati
Westmead Hospital	D Martic	Sydney Adventist Hospital	A Hickey
Wollongong Hospital	C Jackson	Sydney South West Private Hospital	H Tran
Wyong Hospital	T Clancy / M Randall	Tamara Private Hospital	R Moody
		The George Centre	S Calubaquib
		The Sydney Private Hospital	P Gyawali / R Cabading / S David / M
		Toronto Private Hospital	S Keys
		Tuggerah Lakes Private Hospital	J Hanneghan
		Waratah Private Hospital	K Graham
		Warners Bay Private Hospital	A Harrison
		Westmead Private Hospital	K Teren / L Yogathasar
		Wollongong Private Hospital	R Chapple / J Burns

QUEENSLAND			
Public Hospitals		**Private Hospitals**	
Bundaberg Hospital	J Anderson / D Norman / J Larsen	Brisbane Private Hospital	L Drabble
Cairns Hospital	H Campbell / E Walker / C McCall / L Borzi	Buderim Private Hospital	S Newbury
Gold Coast University Hospital	M Armstrong	Caboolture Private Hospital	B Altona / L King
Hervey Bay Hospital	M Elsworth	Cairns Private Hospital	L Rush
Ipswich Hospital	S Wilkinson	Friendly Society Private Hospital	K Smith / M Alcorn
Logan Hospital	M Harrison / S Childs	Gold Coast Private Hospital	V French
Mackay Base Hospital	B Daley / C Ruthenberg	Greenslopes Private Hospital	K Williams / R Griffin
Maryborough Hospital	Y Howlett / S Hose	Hervey Bay Surgical Hospital	M Pracy
Mater Hospital Brisbane	M Colbeck / C Steains / A Roeun	Hillcrest Rockhampton Private Hospital	J Smith
Nambour General Hospital	B Rajan / T Graham / R Hutchison	John Flynn Private Hospital	L Sarquis
Princess Alexandra Hospital	S Reed	Mater Private Hospital Brisbane	N Herden / A Williams / M Baltais / S Pfeffer / J Windsor
Queen Elizabeth II Jubilee Hospital	D Cal	Mater Private Hospital Bundaberg	J Zillmann / L Zunker / M Mooney
Queensland Children's Hospital	F Wright / M Cullen	Mater Private Hospital Mackay	H Douglas
Redcliffe Hospital	S Ovchinnikoff / G van Fleet	Mater Private Hospital Redland	D Chambers / T Hinder / T Diab / J Golding / J Garnsey
Redland Hospital	M McGahey	Mater Private Hospital Rockhampton	T Harkin / M Havik
Robina Hospital	R Kapera / L Thompson	Mater Private Hospital Springfield	C Cullen / C James
Rockhampton Hospital	M Todd / S Platzke	Mater Private Hospital Townsville	M Allan / J Humphreys
Royal Brisbane and Women's Hospital	G McPhee / B Ballantyne / A Dowe	Nambour Selangor Private Hospital	L Shanahan / S Pfeiffer / T Dempsey
Sunshine Coast University Hospital	F Tognolini / C Jones	Noosa Hospital	M Hale / J Andersson

QUEENSLAND			
Public Hospitals		**Private Hospitals**	
Surgical, Treatment & Rehabilitation Service	E Daniels	North West Private Hospital	D Campbell / T Auckland
The Prince Charles Hospital	L Tuppin / R Seddon / S Butler	Pacific Private Hospital	A Keen
Toowoomba Hospital	F Chadwick / A Lostroh	Peninsula Private Hospital	A Moutrey
Townsville Hospital & Health Service	T Cudmore	Pindara Private Hospital	M Pederson / E Moire
		St Andrew's Ipswich Private Hospital	M Grant
		St Andrew's Toowoomba Hospital	A Shannon
		St Andrew's War Memorial Hospital	S Flood
		St Stephen's Hospital	S Costello / K McLaughlan
		St Vincent's Private Hospital Northside	D Ravn / L Shannon
		St Vincent's Private Hospital Toowoomba	R Butler / A Fitzgerald
		Sunnybank Private Hospital	F Robinston
		Sunshine Coast University Private Hospital	T Prothero
		The Wesley Hospital	C Gregory / K Patel
		Westside Private Hospital	M Esdale / B Owen

WESTERN AUSTRALIA			
Public Hospitals		**Private Hospitals**	
Albany Health Campus	P Karra	Bethesda Health Care	H Hanekom / J Fitzroy
Armadale Health Service	L Bennett / E Griffiths	Hollywood Private Hospital	L Godfrey / M Connor
Bunbury Regional Hospital	C Wicksteed / L Watterson-Stutley	Joondalup Health Campus	D Crowley / D Jenkins / T Rankin / J Holmes
Busselton Health Campus	G Moyes	Mount Private Hospital	M Gontran / M Huyser
Fiona Stanley Hospital	J Duncan	Peel Health Campus	G Keogh
Fremantle Hospital	E Jiji	South Perth Hospital	D Waters
Geraldton Hospital	J Joseph	St John of God Bunbury Hospital	C Habig / I Du Plessis
Kalgoorlie Health Campus	N Hintz	St John of God Geraldton Hospital	L Culallad / K Hutton / R Caporn
Osborne Park Hospital	T Hughes / K Zhang	St John of God Midland Hospital	S Blinman
Perth Children's Hospital	K Theedom	St John of God Mt Lawley Hospital	F Campos
Rockingham General Hospital	C Beaney	St John of God Murdoch Hospital	C Sheen / A Kapiteyn
Royal Perth Hospital	L Daly	St John of God Subiaco Hospital	P Emrose
Sir Charles Gairdner Hospital	T Lemmey / M Requilme	Waikiki Private Hospital	B Muir

SOUTH AUSTRALIA			
Public Hospitals		**Private Hospitals**	
Clare Hospital	M Green	Ashford Hospital	E Moore / L Kowalik
Flinders Medical Centre	A Olson / S McAndrew	Burnside Hospital, Stepney	S Williams / K Stapleton / S Chong / F Penning
Gawler Health Service	T Sayce	Burnside Hospital, Toorak Gardens	L Johnson / T Behrendt
Lyell McEwin Hospital	L Wills	Calvary Adelaide Hospital	D Jocey-Prior / T Heinrich
Modbury Hospital	J Harris / B Foster	Calvary Central Districts Hospital	L Keech / M Ireland
Mount Barker District Soldiers Memorial	K Schultz / E Crowder	Calvary North Adelaide Hospital	A Labang
Mount Gambier and Districts Health	K Duncan	Flinders Private Hospital	M Ender
Murray Bridge Soldiers Memorial	J Colwell	Glenelg Community Hospital	N Russell-Higgins / V Lawrence / R English
Naracoorte Health Service	T Berry	North Eastern Community Hospital	L Shaw
Noarlunga Hospital	C Roper / K Thomson	St Andrew's Hospital	C McAllister / L White

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SOUTH AUSTRALIA			
Public Hospitals		**Private Hospitals**	
Port Augusta Hospital	J Haynes / L Turner	Stirling Hospital	S Kemp
Port Lincoln Hospital	C Weber	The Memorial Hospital	J Ohlson / J Emery
Port Pirie Regional Health Service	N Dolphin / A Murray / L Cutler	Western Hospital	A Scheepers / R Dalziell
Riverland General Hospital	M Gardner / N Romeo		
Royal Adelaide Hospital	L Davies / A Wilson / R Woodfine		
South Coast District Hospital	J Hunt / A Price		
The Queen Elizabeth Hospital	A Hunter		
Whyalla Hospital and Health Service	K Sibanda / E Windhouwer / M Prunty		
Women's and Children's Hospital	M Betterman		

TASMANIA			
Public Hospitals		**Private Hospitals**	
Launceston General Hospital	M Postmus / E Davidson	Calvary Lenah Valley Hospital	B Stephensen / K Harrex / E Hey / A Copping
North West Regional Hospital	T Gorrie	Calvary St John's Hospital	C Farrell
Royal Hobart Hospital	M Chandler / S Kirkham	Calvary St Luke's Hospital	T Morice / G Stratton
		Hobart Private Hospital	J Dohnt
		North-West Private Hospital	P Purva

NORTHERN TERRITORY			
Public Hospitals		**Private Hospitals**	
Alice Springs Hospital	C Wooding / L Mathieson / M Bibal	Darwin Private Hospital	Y Wing / A Thomas / S Delaney
Royal Darwin Hospital	D Shih / W Rogers		

AUSTRALIAN CAPITAL TERRITORY			
Public Hospitals		**Private Hospitals**	
Canberra Hospital	T Schild / H Boyd	Calvary Bruce Private Hospital	C Morris
North Canberra Hospital	R Kathage / T Pula / J Cain	Calvary John James Hospital	S Sreesan / J Lynch
		Canberra Private Hospital	A John / S Phillips / L Tuohy / M Rogina
		The National Capital Private Hospital	G Palada / R Barancewicz / I Coronado

Appendix 2 - Glossary

STATISTICAL TERMS

Adjustment: The process of re-estimating a crude measure, such as a rate or rate ratio, to minimise the effects of a difference in the distribution of a characteristic, such as age, between groups being compared on that measure. Adjustment may be carried out in the context of a modelling procedure, for example, linear or proportional hazards regression models, or by standardising the data set against a reference population with a known age distribution, for example, the World Standard Population or the Australian population defined by the Australian Bureau of Statistics Census in a specified year.

Censoring: When the outcome of interest is the time to a defined event, for example, revision of a prosthesis, the event may not occur during the available period of observation. For example, the Registry analyses its data on prosthesis revision for the period ending 31 December each year, and many prostheses will not have been revised by that time. Unless the prosthesis was revised prior to 31 December the outcome is unknown. For the majority, we only know that up until 31 December they had not yet been revised. The times to revision for these prostheses are said to have been censored at 31 December. Statistical methods exist to ensure that censored data are not ignored in analysis, rather information on survival up until the time of censoring is used to give the best possible estimates of survival or revision probabilities.

Chi-Square (X^2) Test: Any test whose statistic has a chi-square distribution under the null hypothesis is called a chi-square test. A common example is a test for association between two categorical variables whose data are arrayed in a cross-classification table of counts (Pearson's chi-square test). This can be generalised to many situations where the distribution of observed data is being compared to an expected theoretical distribution.

Closure of the Database: Closure of the database occurs in April of the report year for procedures up to 31 December of the preceding year. Due to delays in receipt of the procedure form, some procedures are not included until the following annual report.

Competing Risk: Any event that changes the probability of occurrence of another event is known as a competing risk for the other event. For example, death is a competing risk for revision because the probability of revision after death cannot be assumed to be the same as the probability of revision before death. Another example is that if interest centres on specific causes of revision, then each cause (infection, loosening etc) is a competing risk for each other cause. Treating a competing risk event as a right censoring will bias the estimation of the risk of the event of interest.

Confidence Interval: A range of values, produced to capture the true value of a measure (like a rate or ratio) a certain percentage of the time — usually 95%. This means that if we repeated the study many times, about 95% of the confidence intervals we calculate would include the true value. The range has two ends, called the lower and upper confidence limits.

Cox Model or Proportional Hazards Model: A statistical model that relates the hazard for an individual at any time *t* to an (unspecified) baseline hazard and a set of predictor variables, such as treatment type, age, gender etc. The Cox model produces hazard ratios that allow comparisons between groups of the rate of the event of interest. The main assumption of a Cox model is that the ratio of hazards between groups that we wish to compare does not vary over time. If the hazard for prosthesis Model A is twice that of prosthesis Model B at three years, it will also be twice at four years, and so on. This is referred to as the 'proportional hazards assumption'. If the hazard ratio is not proportional over the entire time of observation, then a time varying model is used, which estimates a separate hazard ratio within each pre-defined time period. Within each time period, the hazards are proportional. The Registry uses a set algorithm which iteratively chooses time points until the assumption of proportional hazards is met for each time period. The time points are selected based on where the greatest change in hazard occurs between the two comparison groups, weighted by the number of events in that time period.

Cumulative Incidence Function: An estimator of the actual probability of revision in the presence of a competing risk. In these circumstances, the Kaplan-Meier estimate, which treats competing risks as censored, overestimates the true probability. In the competing risks paradigm, patients who have already had a revision or who have died are excluded from the set at risk of being revised. Under Kaplan-Meier, only patients who have already been revised are excluded from the risk set; dead patients are analysed as though they are still at risk of revision.

Cumulative Percent Revision: Otherwise known as the 'cumulative failure rate'. This is defined as 100 x [1- S(t)] where S(t) is the survivorship probability estimated by the Kaplan-Meier method (see survival curve, below). The cumulative percent revision gives the percent of procedures revised up until time t, and allows for right censoring due to death (but see Cumulative Incidence Function above) or closure of the database for analysis.

Hazard Ratio: A hazard is an estimate of the instantaneous risk of occurrence of an event, for example revision, at a point in time, t. A hazard ratio results from dividing one group's hazard by another's to give a comparative measure of the instantaneous risk of experiencing the event of interest. In this report, hazard ratios are adjusted for age and gender as appropriate. Hazard ratios are either for the entire survivorship period (if proportional; see 'Cox Model or Proportional Hazards Model' section above) or for specific time periods (if the hazard for the entire survivorship period is not proportional).

For example, a comparison of Primary Total Conventional Hip Replacement for a Primary Diagnosis of Avascular Necrosis

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(AVN), Developmental Dysplasia of the Hip (DDH) and Osteoarthritis (OA):

Avascular Necrosis vs Osteoarthritis.

Entire Period: HR=1.34 (1.16, 1.54), p<0.001

The hazard ratio for this comparison is proportional over the entire time of observation. AVN has a significantly higher rate of event (in this case, revision) compared to OA over the entire time of observation (p<0.001). The hazard is 1.34 times higher for AVN compared to OA and, with 95% confidence, the true hazard for AVN will lie between 1.16 times higher and 1.54 times higher than the hazard for OA.

Developmental Dysplasia vs Osteoarthritis

0-3Mth: HR=1.75 (1.21, 2.52), p=0.002

3Mth+: HR=1.07 (0.78, 1.45), p=0.683

The hazard ratio is not proportional over the entire time of observation, so the hazard ratio has been divided into two periods; the time from primary arthroplasty to three months following the primary and three months following the primary to the end of observation. DDH has a significantly higher revision rate compared to OA in the first three months following the primary (p=0.002). The hazard for revision in the first three months is 1.75 times higher for DDH than for OA and with 95% confidence, the true hazard for DDH will lie between 1.21 and 2.52 times higher. From three months following the primary to the end of observation, there is no significant difference in the revision rate between DDH and OA (p=0.683).

Incidence Rate: The number of new occurrences of an event divided by a measure of the population at risk of that event over a specified time period. The population at risk is often given in terms of person-time: for example, if 6 persons are each at risk over 4 months, they contribute 6 x 1/3 = 2 person-years to the denominator of the incidence rate. The incidence rate ratio (IRR) is commonly used to compare the incidence rates of two groups. If the two groups' incidence rates are the same, the result is an IRR of 1.

Log Rank Test: A family of statistical tests that compares the survival experience of two or more groups over the entire time of observation (contrast with comparison of survival at a defined time, e.g. five-year survival).

Observed Component Years: For each procedure, component time is the time during which it is at risk of being revised. This is calculated as the number of days from the date of the primary procedure until either the date of revision, date of death or end of study (31/12/2019) whichever happens first. This is then divided by 365.25 to obtain the number of component years. Each primary procedure then contributes this calculated number of component years to the overall total component years for a particular category of prosthesis.

For example: A primary total hip procedure performed on 1/1/2019 was revised on 1/7/2019. Therefore, the number of days that this procedure is at risk of being revised is 183 days. This prosthesis then contributes 0.5 (183/365.25) component years to the overall number of observed component years for the total hip procedure category.

A patient with a primary procedure on 1/1/2019 died without being revised on 1/4/2019. This procedure contributes 0.25 component years.

A primary procedure occurs on 1/1/2019 and has not been revised. This procedure contributes 1 component year (as observation time is censored at 31/12/2019).

Survival Curve: A plot of the proportion of subjects who have not yet experienced a defined event (for example, death or revision of prosthesis) versus time. The Kaplan-Meier method is the one most commonly used. The curve takes account of subjects whose ultimate survival time is not known, a phenomenon called 'censoring'. The survival estimate at each time is accompanied by a confidence interval based on the method of Greenwood. An interval is interpretable only at the time for which it was estimated and the sequence of intervals (depicted as shading on the Kaplan-Meier curve) cannot be used to judge the significance of any perceived difference over the entire time of observation. Often, for convenience, the curve is presented to show the proportion revised by a certain time, rather than the proportion not being revised ('surviving'). In the Registry, we call this cumulative percent revision (CPR). The Kaplan-Meier method is biassed in the presence of a competing risk and will overestimate the risk of revision. In such circumstances, use of the cumulative incidence function for all competing risks, rather than the Kaplan-Meier estimate, is advised. The cumulative incidence of all competing risks must be assessed simultaneously to avoid bias in interpretation.

Appendix 3 – Diagnosis Hierarchy

DIAGNOSIS HIERARCHY FOR PRIMARY PARTIAL HIP REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Failed Internal Fixation
3	Fractured Neck of Femur
4	Osteonecrosis/AVN
5	Rheumatoid Arthritis
6	Osteoarthritis (including Post Traumatic OA)
7	Developmental Dysplasia
8	Osteochondritis Dissecans
9	Other

DIAGNOSIS HIERARCHY FOR PRIMARY TOTAL RESURFACING HIP REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Arthrodesis Takedown
3	Osteonecrosis/AVN
4	Rheumatoid Arthritis
5	Developmental Dysplasia
6	Other Inflammatory Arthritis
7	Osteoarthritis (including Post Traumatic OA)
8	Fracture/Dislocation (acetabulum)
9	Other

DIAGNOSIS HIERARCHY FOR PRIMARY TOTAL HIP REPLACEMENT (EXCLUDING TOTAL RESURFACING)

Rank	Diagnosis
1	Tumour
2	Arthrodesis Takedown
3	Failed Internal Fixation
4	Fractured Neck of Femur
5	Osteonecrosis/AVN
6	Rheumatoid Arthritis
7	Developmental Dysplasia
8	Other Inflammatory Arthritis
9	Osteoarthritis (including Post Traumatic OA)
10	Fracture/Dislocation (acetabulum)
11	Other

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DIAGNOSIS HIERARCHY FOR REVISION HIP REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Leg Length Discrepancy	Surgical procedure
4	Incorrect Sizing	
5	Malposition	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Hip Insert	Wear and implant breakage
10	Wear Acetabular Cup/Shell	
11	Wear Head	
12	Implant Breakage Head	
13	Implant Breakage Stem	
14	Implant Breakage Hip Insert	
15	Implant Breakage Acetabular Cup/Shell	
16	Prosthesis Dislocation	Stability of prosthesis
17	Instability	
18	Fracture (Femur/Acetabular/Neck/Periprosthetic)	Fracture of bone
19	Chondrolysis/Acetabular Erosion	Progression of disease on non-operated part of joint
20	Progression of Disease	
21	Synovitis	New diseases occurring in association with joint replacement
22	Osteonecrosis/AVN	
23	Heterotopic Bone	
24	Pain	Pain
25	Other	Remaining diagnoses

DIAGNOSIS HIERARCHY FOR PRIMARY KNEE REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Osteonecrosis/AVN
3	Rheumatoid Arthritis
4	Other Inflammatory Arthritis
5	Osteoarthritis (including Post Traumatic OA)
6	Chondrocalcinosis
7	Osteochondritis Dissecans

DIAGNOSIS HIERARCHY FOR REVISION KNEE REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Incorrect Side	Surgical procedure
4	Incorrect Sizing	
5	Malalignment	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Knee Insert	Wear and implant breakage
10	Wear Tibial Tray	
11	Wear Femoral	
12	Wear Patella	
13	Implant Breakage Femoral	
14	Implant Breakage Knee Insert	
15	Implant Breakage Tibial Tray	
16	Implant Breakage Patella	
17	Bearing Dislocation	Stability of prosthesis/knee
18	Patellar Dislocation	
19	Prosthesis Dislocation	
20	Instability	
21	Patellar Maltracking	
22	Fracture (Femur/Tibia/Patella/Periprosthetic)	Fracture of bone
23	Progression of Disease	Progression of disease on non-operated part of join

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24	Patellar Erosion	
25	Synovitis	New diseases occurring in association with joint replacement
26	Arthrofibrosis	
27	Osteonecrosis/AVN	
28	Heterotopic Bone	
29	Patellofemoral Pain	Pain
30	Pain	
31	Other	Remaining diagnoses

DIAGNOSIS HIERARCHY FOR PRIMARY SHOULDER REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Fracture (including Failed Internal Fixation)
3	Instability
4	Dislocation
5	Osteonecrosis/AVN
6	Rheumatoid Arthritis
7	Other Inflammatory Arthritis
8	Rotator Cuff Arthropathy
9	Hill-Sachs Defect
10	Osteoarthritis (including Post Traumatic OA)
11	Osteochondritis Dissecans
12	Other

DIAGNOSIS HIERARCHY FOR REVISION SHOULDER REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Incorrect Side	Surgical procedure
4	Incorrect Sizing	
5	Malalignment	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Glenoid Insert	Wear and implant breakage

10	Wear Glenoid	
11	Wear Humeral	
12	Wear Humeral Cup	
13	Implant Breakage Glenoid Insert	
14	Implant Breakage Glenoid	
15	Implant Breakage Humeral	
16	Implant Breakage Head	
17	Instability/ Dislocation	
18	Rotator Cuff Insufficiency	Stability of prosthesis
19	Dissociation	
20	Fracture (Glenoid/Humeral/Periprosthetic)	Fracture of bone
21	Progression of Disease	Progression of disease on non-operated part of join
22	Glenoid Erosion	
23	Synovitis	New diseases occurring in association with joint replacement
24	Arthrofibrosis	
25	Osteonecrosis/AVN	
26	Heterotopic Bone	
27	Pain	Pain
28	Other	Remaining diagnoses

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APPENDIX 4 – Patient Consent and Confidentiality Guidelines

PATIENT CONSENT

The Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) obtains consent to include information from individuals undergoing joint replacement by using the 'opt off' approach. The implementation of the new Commonwealth Legislation at the end of 2001 resulted in the Registry meeting with the Privacy Commission to ensure that the system used for patient consent is within the privacy guidelines.

Using this approach, patients are provided with a Patient Information Sheet. This explains what information is required, how it is collected and the avenues to take should an individual not want their information included in the Registry. The information is provided to patients by surgeons and hospitals prior to surgery. To accommodate patients that may have questions, wish to opt out or discuss any issues, a freecall number is available to contact the Registry.

PATIENT CONFIDENTIALITY

Joint replacement patients will not be contacted directly by the Registry. No individual patient will be identified during analysis or in reports and publications produced by the Registry. Patient operative and prostheses data is managed in accordance with the Guidelines for the Protection of Privacy in the Conduct of Medical Research. Personal data collected are for use by the AOA National Joint Replacement Registry only. The Registry has been listed as a Federal Quality Assurance Activity and all information is protected (refer to section below).

DATA MANAGEMENT AND CONFIDENTIALITY

The South Australian Health and Medical Research Institute (SAHMRI) undertakes data entry, validation and analysis and provides secure data storage. Only a small number of identified positions have access to patient information.

Declaration of the project as a Quality Assurance Activity ensures that Registry and SAHMRI staff are bound to maintain confidentiality. Confidentiality not only applies to individual patients but also includes surgeons and hospitals.

SAHMRI has security systems to restrict access to SAHMRI and Registry staff only. There are policies and procedures in place as well as software barriers to protect personal information. These include the use of codes, passwords, and encryption.

The proforma used for data collection are stored in a secure locked room at SAHMRI. Forms are scanned and electronically stored. After data entry and data cleaning, all data are securely stored and retained in accordance with good scientific practice.

SURGEON CONFIDENTIALITY

Surgeon confidentiality is assured. The purpose of the Registry is to provide demographic and outcome information relevant to joint replacement surgery. Surgeon name is not recorded in the Registry database.

It is an important Registry function to provide a service to surgeons that allows them to monitor and audit their own performance. For this reason, surgeons have a choice to identify themselves by code, which can be linked to their procedures. This is optional and there is no requirement to provide the surgeon code. These codes are provided to surgeons by AOA.

Surgeons are provided with access to their own information through a secure online facility. It is important to emphasise that surgeons have the choice of using their code and that surgeon name is not recorded in the database.

FEDERAL QUALITY ASSURANCE ACTIVITY

The AOANJRR was initially declared a Federal Quality Assurance Activity in March 1999, by the then Federal Minister for Health and Aged Care, Dr Wooldridge. This was renewed in 2001, 2006, 2011, 2016 and for a further five years in July 2022. An amendment was approved in 2018 to add collection of Knee Osteotomy procedures. This declaration ensures freedom from subpoena and absolute confidentiality of information held by the Registry.

The Quality Assurance legislation is part of the Health Insurance Act of 1973. This act was amended in 1992 to include quality assurance confidentiality. The Act operates on the underlying assumption that quality assurance activities are in the public interest.

A declaration as a Quality Assurance Activity by the Commonwealth Minister of Health prohibits the disclosure of information, which identifies individual patients or health care providers that is known solely as a result of the declared quality assurance activity. It is not possible to provide identifying information to any individual or organisation including the government.

The protection provided by the declaration assures surgeons, hospitals and government that information supplied to the Registry remains confidential and secure. The act also protects persons engaging in those activities in good faith from civil liability in respect of those activities.

APPENDIX 5 - Patient Information Sheet

INTRODUCTION – ABOUT THE REGISTRY

You are about to have an operation on one of your joints. More than 100,000 people have a joint replacement or knee osteotomy operation each year in Australia. Most of these operations are very successful. However, a number of people who have a joint operation may at some time require another operation on that joint. This may occur due to a variety of reasons. For instance, if you have had a joint replacement the most common cause is that the joint replacement has worn out. How quickly this occurs depends on which of the many different types of artificial joints have been used. For those patients having a knee osteotomy the aim is to delay or prevent the need for having a joint replacement.

In order to improve the success of these operations, the Australian Orthopaedic Association set up the National Joint Replacement Registry in 1999. The purpose is to monitor and report on the results of these operations. This information helps everyone working in the health system to ensure patients get the best treatment possible both now and in the future. Another important Registry role is that it assists hospitals and doctors to locate people in the uncommon event a problem with any medical device used is identified.

To do this it is important for the Registry to record a small amount of information on as many people having these operations as possible. It is also important to record if any subsequent operations have occurred. By analysing this information, it is possible to identify which of the medical devices are working best and the best type of operation for each patient. We are asking you to participate in the Registry, by allowing us to document information relevant to your operation.

YOUR INVOLVEMENT – THE INFORMATION WE NEED

The information we require includes your name, date of birth, address, Medicare number, hospital identity number, the name of the hospital and the reason you are having a joint replacement or knee osteotomy. This information is necessary to accurately link you to the medical device inserted as well as linking any following joint surgery you may have, to your previous records. We will also record the day of the operation, which joint was operated on and the type of medical device used. No other personal information is recorded. Government Departments also provide information so that the Registry can check the accuracy of the data and update records to reflect if someone has died.

INFORMATION – HOW WE WILL KEEP YOUR INFORMATION CONFIDENTIAL

Your personal information is confidential and safety measures are in place to protect this information. Your personal information is protected by an Act of Parliament. This means you cannot be identified in any reports produced by the Registry. On occasion, your data may be linked to other government health datasets to further enhance the Registry's ability to improve patient outcomes. Your de-identified data may be used for other research projects and may be shared with national and international collaborators.

HOW WE WILL COLLECT THE INFORMATION

Although we are asking to record your operation details in the Registry you are not required to do anything. Your surgeon and/or theatre staff will complete the form that contains your personal details at the time of your operation and send it to us. The information will be entered into the secure Registry database which is stored in the South Australian Health & Medical Research Institute, Adelaide, South Australia.

RISKS AND BENEFITS – TO YOU

There are no risks to you by having your details in the Registry. The Registry produces general reports on a variety of factors that influence the success of joint operations. The results of joint operations have greatly improved because of this information.

WHAT TO DO IF YOU DON'T WANT TO BE IN THE REGISTRY

We understand that not everyone is comfortable about having his or her personal details documented in a registry. If you feel this way and do not want your details recorded, please contact the Manager on 1800 068 419 (freecall) as well as making your decision known to hospital staff. A decision on whether or not you wish to be involved in the Registry does not affect your treatment in any way. If you have any questions, concerns, or require further information on the National Joint Replacement Registry please do not hesitate to contact the Registry.

Concerns or complaints related to the data collection process may be directed to the AOANJRR on 1800 068 419 (freecall) or alternatively the Australian Government, Office of the Privacy Commissioner on 1300 363 992

Appendices

APPENDIX 6 - Implementation Timeline

IMPLEMENTATION OF NATIONAL JOINT REPLACEMENT REGISTRY FOR HIP, KNEE AND SHOULDER REPLACEMENT

The Registry was implemented in a staged manner on a state-by-state basis. The table below shows the commencement date for each state or territory. Implementation was completed nationally by mid 2002, therefore 2003 was the first year of complete national data.

National data collection on shoulder replacement commenced in November 2007. Knee osteotomy data collection commenced in early 2018.

State/Territory	Commencement Date
South Australia	September 1999
Queensland	April 2000
Western Australia	April 2000
Victoria	July 2000
Tasmania	September 2000
Northern Territory	October 2000
Australian Capital Territory	May 2001
New South Wales	June 2001

APPENDIX 7 - ICD - 10-AM Codes

ICD-10-AM CODES – v12 (2022 Edition) State Health Department Separation Data	
HIP	
Partial Hip Replacement	
49315-00	Partial arthroplasty (excludes Austin Moore)
47522-00	Hemiarthroplasty of femur (Austin Moore)
Primary Total Hip Replacement	
49318-00	Total arthroplasty of hip unilateral
49319-00	Total arthroplasty of hip bilateral
90607-00 [1489]	Resurfacing of hip, unilateral
90607-01 [1489]	Resurfacing of hip, bilateral
Revision Hip Replacement	
49312-00	Excision arthroplasty of hip (removal of prosthesis without replacement)
49324-00	Revision of total arthroplasty of hip
49327-00	Revision of total arthroplasty with bone graft to acetabulum
49330-00	Revision of total arthroplasty with bone graft to femur
49333-00	Revision of total arthroplasty with bone graft to acetabulum and femur
49339-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum
49342-00	Revision of total arthroplasty of hip with anatomic specific allograft to femur
49345-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum and femur
49346-00	Revision of partial arthroplasty hip replacement

ICD-10-AM CODES – v12 (2022 Edition) State Health Department Separation Data	
KNEE	
Partial Knee Replacement	
Patellofemoral Knee Replacement	
49534-01	Total replacement arthroplasty of patellofemoral joint of knee
Unicompartmental Knee Replacement	
49517-00	Hemi arthroplasty of knee
Primary Total Knee Replacement	
49518-00	Total arthroplasty of knee unilateral
49519-00	Total arthroplasty of knee bilateral
49521-00	Total arthroplasty of knee with bone graft to femur unilateral
49521-01	Total arthroplasty of knee with bone graft to femur bilateral
49521-02	Total arthroplasty of knee with bone graft to tibia unilateral
49521-03	Total arthroplasty of knee with bone graft to tibia bilateral
49524-00	Total arthroplasty of knee with bone graft to femur and tibia unilateral
49524-01	Total arthroplasty of knee with bone graft to femur and tibia bilateral
Revision Knee Replacement	
49512-00	Arthrodesis with removal of prosthesis
49515-00	Removal-prostheses from knee
49527-00	Revision of total arthroplasty of knee excluding patella resurfacing
49530-00	Revision of total arthroplasty of knee with bone graft to femur
49530-01	Revision of total arthroplasty of knee with bone graft to tibia
49533-00	Revision of total arthroplasty of knee with bone graft to femur and tibia
49554-00	Revision of total arthroplasty of knee with anatomic specific allograft
90562-00	Patella resurfacing

SHOULDER	
Partial Shoulder Replacement	
48915-00	Hemiarthroplasty of shoulder
Total Shoulder Replacement	
48918-00	Total arthroplasty of shoulder
Revision Shoulder Replacement	
48921-00	Revision of total joint replacement of shoulder
48924-00	Revision of total joint replacement of shoulder with bone graft
48927-00	Removal of shoulder prosthesis
48942-00	Arthrodesis and removal of shoulder prosthesis



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