# *Hip and Knee Arthroplasty*



## ANNUAL REPORT
## 2011

AUSTRALIAN ORTHOPAEDIC ASSOCIATION

National Joint Replacement Registry

# AUSTRALIAN ORTHOPAEDIC ASSOCIATION
# NATIONAL JOINT REPLACEMENT REGISTRY

## ANNUAL REPORT


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Hip and Knee Arthroplasty
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# EXECUTIVE SUMMARY

This summary gives an overview of the 2011 Annual Report outlining additions to the Registry analysis as well as highlighting major findings.

A chapter included for the first time is a report on the ten year outcome of specific prostheses. Ten year data is an important milestone in assessing prostheses performance. The Registry has been able to present this analysis for a number of different primary total hip and primary total knee prostheses. The outcomes have shown that almost all have considerably better than 90% survivorship.

The number of hip and knee replacement procedures undertaken each year continues to increase. In 2010, the number of procedures reported increased by 7.9% compared to 2009 (6.0% for hips and 9.4% for knees). Most procedures were undertaken in the private sector (58.3% for hips and 68.5% for knees in 2010).

The change in use of different classes of partial hip replacement previously reported has continued in 2010. The use of unipolar monoblock prostheses continues to decline, particularly the Austin Moore type prosthesis. Since 2003, use of this prosthesis has decreased by 60.0%, and when used the patients selected are generally older. The proportion of patients aged 85 years or older receiving an unipolar monoblock has increased from 49.0% in 2004 to 59.7 % in 2010. The use of bipolar prostheses has also decreased, reducing by 39.2% since 2003. The use of unipolar modular prostheses has increased by 334.5% during the same period.

Fractured neck of femur is the most common reason for performing primary partial hip replacement. The Registry has previously identified that revision rates of primary partial hip replacement for fractured neck of femur are affected by a number of factors. These include the age at time of surgery, class of prosthesis, method of fixation and the type of prosthesis used.

Unipolar modular and bipolar replacement continue to have a lower cumulative percent revision compared to unipolar monoblock prostheses. Bipolar prostheses are revised less frequently than unipolar modular prostheses when individuals are less than 75 years of age. The Registry has previously reported that the use of cement fixation reduces the rate of revision regardless of the class of partial hip replacement.

The two main classes of primary total hip replacement are total conventional hip replacement and total resurfacing.

Primary total conventional hip is undertaken much more often than primary total resurfacing hip replacement (96.4% and 3.6% respectively of all primary total hip replacement in 2010). The use of primary total conventional hip replacement continues to increase, not only in absolute numbers but also as a proportion of all primary total hip replacement (91.7% in 2003).

There are many factors known to influence the outcome of total hip replacement. Previously the Registry has reported the effect of different patient and prosthesis characteristics on the rate of revision. As well as updating these analyses, the Registry has also undertaken more detailed analysis on the use of prostheses with exchangeable femoral necks and the outcome related to the use of different bearing surfaces.

Femoral stems with exchangeable femoral necks have twice the rate of revision compared to all other femoral stems. This is due to increased rates of dislocation and loosening. This is not affected by the bearing surface. Even with metal on metal bearings, which have a higher rate of revision compared to other bearing surfaces, the use of exchangeable necks further increases the rate of revision. All femoral stems with exchangeable necks that have been used for more than three years have an increased rate of revision.

Metal on metal bearing surface when used in primary conventional total hip replacement has the highest rate of revision compared to any bearing surface. The higher rate of revision however is only apparent when the head size is greater than 32mm.

The increased rate of revision of metal on metal bearing surface is due to higher rates of loosening and metal sensitivity. It is not age related. There is however an interaction between age and head size. The rate of revision for head sizes larger than 32mm is higher regardless of age and this rate is greater the younger the patient.

There is gender variation in outcome, with females having a higher rate of revision when metal on metal bearing surfaces are used. This gender difference is only evident when head size is greater than 32mm.

The higher rate of revision with metal on metal bearing surfaces is not isolated to a small number of prostheses. Of those with head sizes greater than 32mm and over 200 procedures recorded, almost all have a cumulative percent revision that is higher than

the entire group of primary total conventional hip replacement.

Initial outcomes for modified polyethylene show a lower rate of revision compared to non-modified polyethylene in the first ten years. This lower rate is becoming more evident with time. There is no difference in outcome related to head size when using modified polyethylene with head sizes greater than 32mm having the same outcome as those 32mm or less.

New prostheses continued to come onto the market in 2010. The number of new femoral and acetabular prostheses combinations used in primary total conventional hip replacement increased, with a further 330 combinations recorded.

The use of primary total resurfacing hip replacement has declined for the fourth consecutive year. There was a 22.1% reduction in primary total resurfacing procedures compared to 2009. Analyses on a variety of factors affecting outcome have been presented. These include primary diagnosis, gender, age, head size and type of prosthesis. Patients having a total resurfacing for osteoarthritis are revised less frequently than patients with developmental dysplasia. Females have a significantly higher rate of revision compared to males. Males have an age related rate of revision, which is significantly higher for patients 65 years or older.

As reported last year, the difference in outcome related to gender is largely due to the size of the femoral component. There is an inverse relationship between rate of revision and size of the femoral head component. This year the Registry has identified that there is also a small gender specific increase in the rate of revision in females independent of head size.

The five classes of primary partial knee replacement are partial resurfacing, unispacer, bicompartmental, patella/trochlear and unicompartmental knee replacement. Two of these (partial resurfacing and bicompartmental) are relatively recent technologies introduced to the Australian market and reported for the first time three years ago. Both of these single product procedures continue to have high rates of revision compared to other currently used knee prostheses.

Patella/trochlear procedures continue to be undertaken in small numbers (256 new procedures undertaken in 2010). The cumulative percent revision at nine years for patella/trochlear replacement is 26.5%. Age and gender are significant risk factors.

The use of unicompartmental knee replacement continues to decline. There were 37.3% less unicompartmental knee replacements undertaken in 2010 compared to 2003. Age at the time of surgery is a major factor affecting the outcome, the younger the patient the greater the rate of revision.

Primary total knee replacements account for 80.7% of all knee replacements and has increased in use by 72.3% since 2003.

Patient and prostheses characteristics are important factors affecting the outcome of primary total knee replacement. Primary diagnosis, age and gender as well as prosthesis stability, bearing mobility, patella resurfacing and the type of prosthesis used all impact on the rate of revision.

Rheumatoid arthritis has the lowest rate of revision of any primary diagnosis. The rate of revision increases with decreasing age. After three and a half years, those aged less than 55 years have over five times the rate of revision compared to those aged 75 or older. Males have a higher incidence of revision. This is in part due to a higher rate of reported infection.

Tibial prostheses with fixed bearings have a lower rate of revision compared to mobile bearing tibial prostheses. The Registry identifies three types of fixed bearings with all-polyethylene tibial prostheses having the highest rate of revision of the fixed bearing tibial prostheses.

Posterior stabilised primary total knees are revised more than minimally stabilised knees. The rate of revision in the first ten years increases if the patella is not resurfaced, this rate is highest if a posterior stabilised prosthesis is used.

The Registry has had sufficient data to present preliminary information on the outcome of revision hip and knee replacement for a number of years. Although this analysis is complex, it has become increasingly evident that regardless of the class of primary procedure revised and the type of revision, there is a high rate of subsequent re-revision.

The rate of re-revision of a revised primary total resurfacing hip is similar to the rate of re-revision of a revised primary total conventional hip replacement. The re-revision of a revised primary total knee has a cumulative percent revision of 20.0% at seven years. This is slightly higher than the rate of re-revision of a primary unicompartmental knee revised to a total knee (15.8% at seven years).

For primary total knee replacement, insert only revision has the highest rate of re-revision compared

to all other types of revision. Patella resurfacing undertaken after a primary total knee has over three times the cumulative percent revision at seven years compared to a primary total knee replacement.

A unique and important function of registries is the ability to provide population based data on the comparative outcome of individual prostheses in a community. In this report, the Registry has presented the outcome of individual prostheses within each class of prosthesis. There is significant variation depending on the type of prosthesis used.

The Registry specifically highlights prostheses or prostheses combinations identified as having a higher than anticipated rate of revision. These have been reported in the section 'Prostheses with Higher than Anticipated Rates of Revision'.

This year the Registry has identified 84 prostheses or prostheses combinations (51 hip and 33 knee). Of these, 16 hips and 4 knees are reported for the first time. Two of the hips that have been reported for the first time are no longer used. Detailed analyses of all identified prostheses and prostheses combinations are available as a supplementary report on the Registry website.

As in previous years, the Registry also publishes a number of supplementary reports covering a range of topics. This year eleven supplementary reports will be available on the Registry website.
*www.dmac.adelaide.edu.au/aoanjrr/publications.jsp*.

# INTRODUCTION

The 2011 Hip and Knee Arthroplasty Report is based on the analysis of 628,093 primary and revision hip and knee procedures recorded by the Registry with a procedure date up to and including 31 December 2010. This is an increase of 80,486 procedures compared to the 2010 Annual Report.

In addition, there are 11 supplementary reports that complete the AOANJRR Annual Report for 2011.

1. Lay Summary
2. Demographics of Hip Arthroplasty
3. Demographics of Knee Arthroplasty
4. Cement in Hip and Knee Arthroplasty
5. Mortality of Hip and Knee Arthroplasty
6. Demographics of Shoulder, Elbow and Wrist Arthroplasty
7. Outcome of Shoulder Arthroplasty
8. Demographics and Outcome of Ankle Arthroplasty
9. Demographics of Spinal Disc Arthroplasty
10. Investigations of Prostheses with Higher than Anticipated Rates of Revision
11. Analysis of State and Territory Health Data – All Arthroplasty 1993/1994 – 2009/2010

These reports are available on the Registry website *www.dmac.adelaide.edu.au/aoanjrr/publications.jsp*.

Data are submitted to the Registry by all hospitals (public and private) undertaking joint replacement. Currently there are 300 participating hospitals however, this may vary from time to time due to hospital closures, new hospitals, or changes to services within hospitals.

## Background

Joint replacement is a commonly performed major surgical procedure that has considerable success in alleviating pain and disability.

The rate of joint replacement surgery is continuing to increase. In 2010, the number of hip replacement procedures increased by 3.6% compared to the year prior and the number of knees by 7.6%. Since 2003, the first year of complete national data collection by the Registry, the number of hip procedures has increased by 32.4% and the number of knee procedures by 54.9%.

It is anticipated that this rate of increase will continue in the foreseeable future. The Registry has previously detailed the rate of increase from 1993/1994 by comparing the number and type of joint replacements undertaken each year using data supplied by the State and Territory Health Departments. These data are presented in the supplementary report 'Analysis of State and Territory Health Data – All Arthroplasty 1993/1994 – 2009/2010'.

There are many factors known to influence the outcome of joint replacement surgery. Some of these include age, gender and diagnosis of patients, the type of prosthesis and surgical techniques used. Superimposed on this 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 the outcome remains uncertain.

The Australian Orthopaedic Association (AOA) recognised the need to establish a National Joint Replacement Registry (NJRR) in 1993. At that time, the outcome of joint replacement in Australia was unknown. It was not apparent who was receiving joint replacement or the types of prostheses and techniques used to implant them.

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 Commonwealth Department of Health and Ageing (DOHA) agreed to fund the AOA to establish the Registry.

The Registry began 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 (Appendix 6). The Department of Health 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.

The purpose of the Registry is to define, improve and maintain the quality of care of 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.

## Aims

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

## Benefits

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 ad hoc reports (141 in 2010). These ad hoc reports are specific analyses requested by surgeons, hospitals, academic institutions, Government and government agencies as well as orthopaedic companies.

In addition, the Registry provides surgeons with access to their individual data through an online facility. A separate online facility is available for orthopaedic companies to monitor their own prostheses as well as regulatory bodies to monitor all prostheses used in Australia. The data obtained through the online facilities are updated daily and over 90% complete within six weeks of the procedure date.

Although it is a relatively short time since full national implementation of the Registry, it has already influenced joint replacement in a beneficial manner.

The proportion of revision hip replacement has declined from 13.0% in 2003 to 11.2% in 2010. This equates to 630 less hip revisions in 2010 and 2,883 less since 2003.

Similarly, the proportion of revision knee procedures has declined from a peak of 8.8% in 2004 to 8.1% in 2010, equating to 299 less knee revisions in 2010 and 1,548 less since 2004.

The reduction in revision surgery has been brought about as a result of increased use of the type and class of prostheses shown to have better outcomes and a decline in use when less satisfactory outcomes are identified.

## Governance

The NJRR is an initiative of the AOA. At the time it was established, the Federal Board of the AOA nominated a committee to develop and manage NJRR policies. The NJRR Committee reports to the Board. Members include the Chairman, NJRR Director, two NJRR Deputy Directors, an orthopaedic surgeon from each state and the ACT and a representative from each of the AOA specialty arthroplasty groups and the Neurosurgical Society of Australasia. A complete list of the current NJRR Committee is provided on the inside front cover of this report.

The Director and Deputy Directors are appointed by the Board and responsible for the day-to-day management. In addition, the AOA employs a Coordinator who is involved in maintaining the cooperation of hospitals, surgeons and Government as well as implementing new strategies and coordinating the preparation of the annual report.

The Data Management & Analysis Centre (DMAC), University of Adelaide, is contracted by the AOA to provide data management and independent data analysis services for the Registry.

In 2009, the Commonwealth established the NJRR Consultative Committee. This was a restructure of the previous Registry Advisory Committee. The NJRR Consultative Committee is administered and chaired by the Commonwealth. The aim is to provide advice on the overall strategic direction of the Registry.

Committee members include: -

- Chair, Department of Health and Ageing
- NJRR Director

a representative of

- Department of Health and Ageing
- Australian Orthopaedic Association
- Consumer's Health Forum
- Therapeutic Goods Administration
- Prostheses and Devices Committee
- Australian Health Industries Association
- Australian Private Hospitals Association
- Orthopaedic Industry (2)
  - Medical Technology Association of Australia
  - Non Medical Technology Association of Australia

## Data Collection

Hospitals provide data on specific Registry forms, which are completed in theatre at the time of surgery and submitted to the Registry monthly. Examples of Registry data forms are available on the website www.dmac.adelaide.edu.au/aoanjrr/documentation.jsp.

The Registry uses a paper-based system, however it has established mechanisms to collect data electronically when it becomes feasible for contributing hospitals. To date no hospital is 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.

The validation process identifies:

- Registry procedure records for procedures notified to state/territory health departments by hospitals.
- State/territory records for procedures not submitted to the Registry by hospitals.
- 'Exact match' procedures, that is, records held by the Registry and state/territory health departments.
- 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 number 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 mis-matches 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 of primary or revision codes or admission period.

In the 2009/10 financial year, the Registry received almost 1,000 more procedures than were provided in the various health department data files. The Registry accepts that these additional notifications are valid.

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 obtain procedure details from individual hospitals for these data.

Initial validation resulted in over 93% of Registry records verified against health department data. Following the retrieval of unreported records and checking of unmatched data, the Registry is able to obtain an almost complete dataset relating to hip and knee replacement in Australia.

## Outcome Assessment

The Registry describes the time to first revision using the Kaplan-Meier estimates of survivorship. The cumulative percent revision at a certain time, for example five 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.

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 sex where appropriate, are used to compare revision rates. 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 graphically 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 graph is extended 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. However, analytical comparisons of revision rates using the proportional hazards model are based on all available data (*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*).

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 (for example, 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.

The Registry is currently investigating the introduction of different analytic methods to cope with competing risks. Cumulative incidence is one method of estimating the probability of revision in the presence of competing risks. In the 2010 Annual Report, the Registry introduced revision diagnosis cumulative incidence graphs to deal with the competing risks of reasons for revision. Revision diagnosis cumulative incidence graphs are useful when making comparisons between groups as the differences in the pattern of revision over time is highlighted and provides important insight into different mechanisms of failure.

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 its 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 section.

## Report Review Prior to Publication

Members of the AOA Arthroplasty Society were invited to attend a two-day workshop to review, comment and provide advice on all sections of the report. The workshop for this report was held in Adelaide on the weekend of 6 and 7 August 2011. Following the workshop the report is provided to the AOA Board for consideration and final approval prior to publication.

## Presentation of 2011 Annual Report

This year, for the first time the Registry is able to report on ten year outcomes of hip and knee prostheses. The data are presented in a separate chapter at the beginning of the report.

There are four main sections to the report; Primary Hip, Primary Knee, Revision and Prostheses with Higher than Anticipated Rates of Revision. The Primary Hip and Knee sections are divided into Introduction, Partial and Total. The Revision and Prostheses with Higher than Anticipated Rates of Revision sections includes both hip and knee procedures.

In previous years, the printed report has included chapters on cement use and mortality following hip and knee replacement. Data for these chapters are now presented as separate supplementary reports.

Demographics and outcome of joint replacement other than hip and knee are also available as separate supplementary reports on the Registry website.

Detailed analyses of prostheses or combinations of prostheses that have been identified as having a higher than anticipated rate of revision are provided as a separate supplementary report on the website. These analyses provide information on reasons for revision, type of revision, regional variation, annual use and catalogue range specific analysis.

## Acknowledgements

The Registry continues to receive support and invaluable assistance from the Commonwealth Government, State and Territory Health Departments and Orthopaedic Companies. The Registry could not function without the cooperation of a large number of organisations and individuals.

The Registry acknowledges the cooperation and support provided by those undertaking the surgery and completing the data forms, in particular all orthopaedic surgeons, registrars and nursing staff.

The Registry would also like to acknowledge 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 in Appendix 1.

# TEN YEAR PROSTHESES OUTCOMES

Ten year outcomes for individual joint replacement prostheses are widely regarded as an important milestone in assessing the performance of prostheses. Journal publications on the results of joint replacement surgery commonly use this milestone. In the UK, the National Institute for Clinical Excellence (NICE) implemented prosthetic hip replacement guidelines focusing on ten year outcomes as the benchmark for assessing prostheses performance. It recommended that surgeons use prostheses with a cumulative percent revision of less than 10% at ten years.

This is the first year that the Registry is able to report ten year survivorship data on individual hip and knee prostheses. For primary total conventional hip replacement, individual femoral stem and acetabular prostheses have been reported when more than 500 procedures using that prosthesis have been recorded by the Registry. In addition, the Registry is reporting the ten year cumulative percent revision for femoral stem and acetabular prostheses combinations when that combination has been used in more than 350 procedures. For primary total knee replacement, only femoral and tibial prostheses combinations that have been used in more than 350 procedures have been reported.

## Hip Replacement

For primary total conventional hip replacement, there are 27 femoral stems, 22 acetabular components and 39 combinations that have ten year data (Tables TY1 – TY3). The cumulative percent revision at ten years for femoral stems ranges from 2.1% to 13.9%, acetabular components from 3.0% to 10.0% and combinations from 1.7% to 9.8%. The survivorship analysis reported for individual femoral stem and acetabular components is the cumulative percent revision for patients who have received those components regardless of the type of revision. Revision is a re-operation of a primary procedure where one or more of the components are replaced, removed, or another component is added.

Femoral stems with a ten year cumulative percent revision have been used in 69.3% of all primary total conventional hip replacement procedures. All but 2.7% of the procedures using these stems are consistent with the NICE guidelines.

The two femoral stems that exceed 10% cumulative percent revision at ten years are the Margron and the S-ROM. The Margron has not been used in the Australian market since 2008. The S-ROM has a higher cumulative percent revision at ten years when used in association with both the ASR and Duroloc acetabular components. The Registry previously identified the ASR as having a higher than anticipated rate of revision. It was withdrawn from the Australian market in 2009. In 2010, the Registry identified the S-ROM/Duroloc combination as having a higher than anticipated rate of revision. Further analysis of the S-Rom stem this year has shown an increase in revision procedures in the tenth year of analysis, which is due entirely to acetabular revisions for loosening and lysis associated with the Duraloc cup. There have been no S-Rom stems revised in these later revisions.

Acetabular prostheses with a ten year cumulative percent revision have been used in 60.2% of all primary total conventional hip replacements. All but 0.7% of the procedures using these acetabular prostheses are consistent with the NICE guidelines. The acetabular prosthesis not consistent with the NICE guidelines is the SPH-Blind acetabular component. This prosthesis has not been used in Australia since 2007.

The finding that the S-ROM stem has a high cumulative percent revision at ten years when used in association with the ASR and Duroloc acetabular components emphasises the need to consider the combination of prostheses used in a procedure. Over 1,800 different combinations of femoral stem and acetabular components have been reported to the Registry. Of the 39 that have ten year cumulative percent revision data, at this point in time all are consistent with the NICE guidelines. They account for 30.8% of all primary total conventional hip procedures. Of these combinations, 16 are no longer used, these account for 5.4% of all primary total conventional hip procedures.

The ten year results of almost all individual femoral stems and acetabular prostheses and combinations reported in this analysis are consistent with the NICE guidelines. All prostheses that are not consistent have previously been identified by the Registry as having a higher than anticipated rate of revision either individually or in combination with other prostheses.

Data from this Registry suggests that the guidelines for determining satisfactory outcome could perhaps be a little more stringent than the NICE guidelines. Most femoral stems, acetabular prostheses and combinations with a 10 year cumulative percent revision greater than 7.5% have already been identified by the Registry as having a higher than anticipated rate of revision either individually or in combination with other prostheses.

**Table TY1: Revision Rates of Primary Total Conventional Hip Replacement Femoral Components with 10 Year Data (Primary Diagnosis OA)**

| Femoral Component | N Revised | N Total | 1 Yr CPR | 5 Yrs CPR | 10 Yrs CPR |
|---|---|---|---|---|---|
| Exeter V40 | 802 | 36268 | 1.1 (1.0, 1.2) | 2.5 (2.3, 2.7) | 4.5 (3.9, 5.2) |
| Corail | 466 | 14866 | 1.7 (1.5, 1.9) | 5.5 (4.9, 6.1) | 7.3 (6.0, 8.8) |
| Synergy | 246 | 9496 | 1.4 (1.1, 1.6) | 2.6 (2.3, 3.0) | 7.1 (4.9, 10.4) |
| Alloclassic | 271 | 7991 | 1.5 (1.3, 1.8) | 3.8 (3.3, 4.3) | 7.5 (5.0, 11.0) |
| Spectron EF | 239 | 6723 | 1.1 (0.9, 1.4) | 3.3 (2.9, 3.9) | 8.2 (6.7, 10.0) |
| CPT | 148 | 6194 | 1.2 (0.9, 1.5) | 2.8 (2.3, 3.3) | 6.0 (4.1, 8.8) |
| ABGII | 261 | 5810 | 1.9 (1.5, 2.2) | 4.1 (3.6, 4.6) | 6.5 (5.5, 7.7) |
| Secur-Fit | 123 | 5341 | 1.2 (1.0, 1.6) | 2.7 (2.2, 3.3) | 3.9 (2.9, 5.3) |
| VerSys | 161 | 4720 | 2.1 (1.8, 2.6) | 3.3 (2.8, 3.9) | 4.8 (3.8, 6.0) |
| Secur-Fit Plus | 114 | 4498 | 1.2 (0.9, 1.6) | 2.5 (2.1, 3.1) | 3.6 (2.8, 4.5) |
| Omnifit | 161 | 3990 | 1.7 (1.3, 2.1) | 3.8 (3.2, 4.5) | 6.4 (5.1, 8.1) |
| C-Stem | 106 | 3416 | 1.3 (1.0, 1.8) | 3.0 (2.4, 3.7) | 6.2 (4.6, 8.3) |
| S-Rom | 126 | 3157 | 1.6 (1.2, 2.1) | 4.1 (3.4, 4.9) | 13.3 (8.6, 20.3) |
| Mallory-Head | 110 | 3151 | 1.7 (1.3, 2.2) | 3.0 (2.4, 3.7) | 6.4 (4.9, 8.4) |
| Exeter* | 105 | 2740 | 1.3 (1.0, 1.8) | 2.5 (2.0, 3.2) | 4.4 (3.6, 5.3) |
| Taperloc | 82 | 2516 | 1.7 (1.3, 2.3) | 3.8 (3.0, 4.8) | 6.6 (4.7, 9.2) |
| MS 30 | 51 | 2513 | 0.9 (0.6, 1.4) | 2.0 (1.5, 2.7) | 2.9 (2.1, 4.0) |
| Elite Plus* | 128 | 2506 | 1.2 (0.9, 1.8) | 4.0 (3.3, 4.9) | 7.4 (5.9, 9.2) |
| Charnley | 108 | 2137 | 1.2 (0.9, 1.8) | 4.6 (3.7, 5.7) | 7.2 (5.9, 8.7) |
| Natural Hip | 48 | 1824 | 0.8 (0.5, 1.4) | 2.5 (1.8, 3.4) | 5.3 (3.0, 9.1) |
| Citation | 41 | 1609 | 1.2 (0.8, 1.9) | 2.6 (1.9, 3.6) | 4.2 (2.7, 6.6) |
| CLS | 64 | 1588 | 1.5 (1.0, 2.3) | 3.8 (2.9, 4.9) | 6.4 (4.2, 9.8) |
| Meridian* | 45 | 755 | 1.7 (1.0, 3.0) | 4.8 (3.5, 6.6) | 7.5 (5.5, 10.2) |
| F2L* | 53 | 698 | 3.2 (2.1, 4.8) | 6.9 (5.2, 9.0) | 8.3 (6.4, 10.9) |
| Definition | 11 | 651 | 0.3 (0.1, 1.2) | 1.6 (0.8, 3.0) | 2.1 (1.1, 3.7) |
| Stability* | 30 | 577 | 0.7 (0.3, 1.8) | 2.5 (1.5, 4.1) | 8.4 (5.4, 12.9) |
| Margron* | 65 | 556 | 5.2 (3.7, 7.5) | 9.5 (7.3, 12.3) | 13.9 (10.9, 17.6) |
| **TOTAL** | **4165** | **136291** | | | |

Note: Only prostheses with over 500 procedures have been listed
* denotes prostheses that have not had any reported use in 2010

**Table TY2: Revision Rates of Primary Total Conventional Hip Replacement Acetabular Components with 10 Year Data (Primary Diagnosis OA)**

| Acetabular Component | N Revised | N Total | 1 Yr CPR | 5 Yrs CPR | 10 Yrs CPR |
|---|---|---|---|---|---|
| Trident | 1070 | 43827 | 1.3 (1.2, 1.4) | 2.9 (2.7, 3.1) | 4.2 (3.8, 4.7) |
| Reflection (cementless) | 412 | 14328 | 1.2 (1.1, 1.4) | 2.6 (2.3, 2.9) | 6.9 (5.6, 8.5) |
| Trilogy | 319 | 11992 | 1.6 (1.4, 1.8) | 2.7 (2.4, 3.1) | 4.5 (3.5, 5.8) |
| Allofit | 179 | 7254 | 1.3 (1.0, 1.6) | 2.8 (2.4, 3.3) | 4.6 (3.5, 6.1) |
| Mallory-Head | 163 | 5136 | 1.4 (1.1, 1.8) | 2.7 (2.3, 3.2) | 5.6 (4.5, 7.0) |
| Vitalock* | 152 | 4630 | 1.0 (0.8, 1.4) | 2.5 (2.1, 3.0) | 4.1 (3.5, 4.9) |
| Duraloc | 221 | 4612 | 1.5 (1.2, 1.9) | 3.7 (3.2, 4.3) | 9.6 (7.5, 12.2) |
| ABGII | 189 | 4351 | 1.5 (1.2, 1.9) | 3.5 (3.0, 4.1) | 5.8 (4.9, 6.8) |
| Contemporary | 140 | 4222 | 1.3 (1.0, 1.7) | 3.1 (2.6, 3.8) | 6.1 (4.4, 8.5) |
| Fitmore | 130 | 3774 | 1.5 (1.2, 2.0) | 3.4 (2.9, 4.1) | 4.6 (3.8, 5.6) |
| Exeter Contemporary | 63 | 2328 | 1.3 (0.9, 1.9) | 3.1 (2.4, 4.1) | 7.3 (4.5, 12.0) |
| Reflection (cemented) | 71 | 1909 | 0.9 (0.5, 1.4) | 2.9 (2.2, 3.9) | 8.5 (6.0, 12.0) |
| Exeter | 57 | 1892 | 0.9 (0.5, 1.4) | 2.6 (1.9, 3.6) | 5.0 (3.7, 6.6) |
| Option* | 70 | 1537 | 1.7 (1.2, 2.5) | 3.4 (2.6, 4.5) | 6.9 (4.6, 10.2) |
| Secur-Fit* | 97 | 1401 | 2.4 (1.7, 3.3) | 5.5 (4.4, 6.8) | 8.5 (6.8, 10.6) |
| Charnley Ogee* | 51 | 1031 | 1.1 (0.6, 1.9) | 4.2 (3.1, 5.7) | 6.4 (4.7, 8.7) |
| SPH-Blind* | 75 | 842 | 3.6 (2.5, 5.1) | 7.1 (5.6, 9.1) | 10.0 (8.0, 12.6) |
| Charnley* | 29 | 825 | 1.0 (0.5, 1.9) | 2.5 (1.6, 4.0) | 5.4 (3.7, 7.9) |
| ZCA | 18 | 698 | 0.3 (0.1, 1.2) | 1.9 (1.0, 3.6) | 7.8 (4.1, 14.5) |
| Elite Plus Ogee | 15 | 662 | 0.5 (0.1, 1.4) | 1.9 (1.1, 3.4) | 3.9 (2.1, 7.4) |
| Low Profile Cup | 16 | 645 | 1.3 (0.6, 2.5) | 2.5 (1.5, 4.2) | 3.0 (1.7, 5.2) |
| Elite Plus LPW* | 13 | 506 | 1.0 (0.4, 2.4) | 2.2 (1.2, 4.0) | 3.6 (2.0, 6.4) |
| **TOTAL** | **3550** | **118402** | | | |

Note: Only prostheses with over 500 procedures have been listed
* denotes prostheses that have not had any reported use in 2010

**Table TY3: Revision Rates of Primary Total Conventional Hip Replacement Combinations with 10 Year Data (Primary Diagnosis OA)**

| Femoral/Acetabular | N Revised | N Total | 1 Yr CPR | 5 Yrs CPR | 10 Yrs CPR |
|---|---|---|---|---|---|
| Synergy/Reflection (cementless) | 190 | 6645 | 1.4 (1.2, 1.7) | 2.5 (2.1, 2.9) | 7.1 (4.8, 10.3) |
| Secur-Fit/Trident | 113 | 4519 | 1.3 (1.0, 1.7) | 2.9 (2.4, 3.5) | 4.5 (3.1, 6.5) |
| VerSys/Trilogy | 142 | 4276 | 2.1 (1.7, 2.6) | 3.2 (2.7, 3.8) | 4.3 (3.5, 5.2) |
| Secur-Fit Plus/Trident | 90 | 4079 | 1.1 (0.8, 1.5) | 2.2 (1.8, 2.8) | 3.1 (2.4, 4.2) |
| Spectron EF/Reflection (cementless) | 144 | 4073 | 1.0 (0.8, 1.4) | 3.1 (2.5, 3.7) | 7.9 (6.1, 10.3) |
| Alloclassic/Allofit | 106 | 4046 | 1.3 (1.0, 1.7) | 3.0 (2.5, 3.7) | 4.9 (3.4, 7.0) |
| CPT/Trilogy | 97 | 3993 | 1.2 (0.9, 1.6) | 2.7 (2.2, 3.4) | 5.2 (3.2, 8.4) |
| Omnifit/Trident | 81 | 2673 | 1.6 (1.2, 2.2) | 3.2 (2.5, 4.0) | 4.0 (3.1, 5.1) |
| ABGII/ABGII | 130 | 2650 | 1.7 (1.3, 2.3) | 4.1 (3.3, 4.9) | 6.4 (5.2, 7.9) |
| Mallory-Head/Mallory-Head | 78 | 2300 | 1.8 (1.3, 2.5) | 2.9 (2.2, 3.7) | 5.9 (4.4, 7.9) |
| Exeter V40/Vitalock* | 47 | 1795 | 0.8 (0.5, 1.4) | 2.2 (1.6, 3.0) | 3.1 (2.3, 4.1) |
| Exeter V40/Exeter | 40 | 1526 | 0.8 (0.5, 1.5) | 2.7 (1.9, 3.8) | 4.3 (3.0, 6.1) |
| Alloclassic/Fitmore | 61 | 1323 | 2.5 (1.8, 3.5) | 4.5 (3.4, 5.8) | 5.9 (4.4, 7.9) |
| Spectron EF/Reflection (cemented) | 51 | 1291 | 1.0 (0.5, 1.7) | 2.9 (2.1, 4.2) | 8.6 (5.9, 12.5) |
| Exeter/Vitalock* | 40 | 1076 | 1.4 (0.8, 2.3) | 2.3 (1.5, 3.4) | 4.2 (3.1, 5.7) |
| MS 30/Allofit | 22 | 1052 | 1.3 (0.7, 2.2) | 2.2 (1.4, 3.4) | 2.7 (1.7, 4.2) |
| Elite Plus/Duraloc* | 63 | 953 | 1.6 (1.0, 2.6) | 5.1 (3.9, 6.8) | 8.2 (6.4, 10.5) |
| C-Stem/Duraloc* | 40 | 952 | 1.9 (1.2, 3.0) | 3.5 (2.5, 4.9) | 7.8 (4.9, 12.3) |
| Exeter V40/ABGII | 23 | 907 | 0.9 (0.4, 1.8) | 1.8 (1.1, 2.9) | 3.0 (2.0, 4.5) |
| Natural Hip/Fitmore | 17 | 863 | 0.5 (0.2, 1.2) | 1.8 (1.0, 3.1) | 2.8 (1.7, 4.6) |
| Taperloc/Mallory-Head | 29 | 830 | 1.6 (0.9, 2.7) | 3.2 (2.1, 4.8) | 5.4 (3.5, 8.2) |
| Omnifit/Secur-Fit* | 57 | 716 | 2.4 (1.5, 3.8) | 6.2 (4.6, 8.3) | 9.8 (7.4, 13.0) |
| Charnley/Charnley Ogee* | 35 | 630 | 1.1 (0.5, 2.3) | 5.1 (3.6, 7.4) | 7.1 (5.1, 9.8) |
| CLS/Allofit | 22 | 619 | 1.3 (0.7, 2.6) | 3.6 (2.3, 5.6) | 8.5 (3.3, 20.9) |
| F2L/SPH-Blind* | 40 | 570 | 2.8 (1.7, 4.6) | 6.1 (4.4, 8.4) | 7.6 (5.6, 10.4) |
| Charnley/Charnley* | 18 | 562 | 0.5 (0.2, 1.7) | 2.6 (1.4, 4.7) | 6.4 (3.8, 10.5) |
| CPT/ZCA | 14 | 540 | 0.4 (0.1, 1.5) | 1.9 (1.0, 3.8) | 7.2 (3.4, 15.1) |
| MS 30/Low Profile Cup | 7 | 537 | 0.4 (0.1, 1.5) | 1.1 (0.5, 2.6) | 1.7 (0.7, 4.0) |
| S-Rom/Option* | 21 | 524 | 1.7 (0.9, 3.3) | 3.3 (2.1, 5.2) | 6.4 (3.2, 12.6) |
| CLS/Fitmore | 22 | 510 | 1.6 (0.8, 3.2) | 4.1 (2.7, 6.4) | 5.1 (3.4, 7.7) |
| Citation/Vitalock* | 13 | 508 | 0.4 (0.1, 1.6) | 2.0 (1.1, 3.7) | 4.0 (2.0, 7.9) |
| Natural Hip/Allofit | 8 | 464 | 0.9 (0.3, 2.3) | 1.4 (0.6, 3.1) | 2.6 (1.2, 5.7) |
| Exeter/Contemporary* | 23 | 426 | 1.9 (1.0, 3.8) | 4.2 (2.6, 6.6) | 6.0 (4.0, 9.0) |
| C-Stem/Elite Plus LPW* | 9 | 373 | 0.5 (0.1, 2.2) | 2.2 (1.0, 4.5) | 3.5 (1.7, 6.9) |
| Stability/Duraloc* | 20 | 373 | 0.5 (0.1, 2.1) | 2.2 (1.1, 4.3) | 8.0 (4.9, 12.9) |
| MS 30/Fitmore | 6 | 372 | 0.0 (0.0, 0.0) | 1.0 (0.3, 3.2) | 2.5 (1.1, 5.5) |
| Alloclassic/Metasul* | 13 | 371 | 0.8 (0.3, 2.5) | 3.6 (2.1, 6.1) | 3.6 (2.1, 6.1) |
| Charnley/Vitalock* | 21 | 370 | 1.9 (0.9, 3.9) | 4.4 (2.7, 7.1) | 6.4 (4.2, 9.9) |
| Meridian/Vitalock* | 18 | 354 | 0.9 (0.3, 2.6) | 3.5 (2.0, 6.1) | 6.5 (4.0, 10.4) |
| **TOTAL** | **1971** | **60641** | | | |

Note: Only prostheses with over 350 procedures have been listed
* denotes prostheses that have not had any reported use in 2010

## Knee Replacement

There are 20 total knee replacement combinations with over 350 procedures that have ten year survivorship data. The listed prostheses most often represent a family of devices that has a range of different femoral, tibial baseplate and tibial inserts being listed under one prosthesis name.

The cumulative percent revision at ten years ranges from 2.3% to 9.4%. This group of knee prostheses accounts for 51.3% of all primary total knee replacements reported to the Registry. Two of the three prostheses with a cumulative percent revision rate at ten years of over 7.5% have previously been identified by the Registry as having a higher than anticipated rate of revision.

As was the situation with primary total hip replacement, this data would suggest that primary total knee prostheses with a ten year cumulative percent revision of greater than 7.5% should be considered as an outlier with respect to satisfactory outcome.

**Table TY4: Revision Rates of Primary Total Knee Replacement Combinations with 10 Year Data (Primary Diagnosis OA)**

| Femoral/Tibial | N Revised | N Total | 1 Yr CPR | 5 Yrs CPR | 10 Yrs CPR |
|---|---|---|---|---|---|
| Genesis II/Genesis II | 624 | 21847 | 1.1 (1.0, 1.3) | 3.7 (3.4, 4.0) | 4.7 (4.3, 5.2) |
| Duracon/Duracon | 680 | 19780 | 1.1 (0.9, 1.2) | 3.3 (3.1, 3.6) | 4.9 (4.4, 5.4) |
| PFC Sigma/PFC Sigma | 359 | 16630 | 0.9 (0.7, 1.0) | 2.7 (2.4, 3.0) | 5.2 (3.9, 6.9) |
| Scorpio/Series 7000 | 452 | 12554 | 1.0 (0.9, 1.2) | 3.8 (3.5, 4.2) | 6.5 (5.4, 7.9) |
| Genesis II Oxinium Cted/Genesis II | 394 | 12451 | 1.4 (1.2, 1.6) | 4.6 (4.1, 5.1) | 5.9 (5.1, 6.9) |
| Nexgen CR/Nexgen | 230 | 10114 | 0.5 (0.4, 0.7) | 2.1 (1.8, 2.4) | 3.0 (2.6, 3.5) |
| LCS/LCS | 441 | 8247 | 1.1 (0.9, 1.4) | 4.4 (3.9, 4.8) | 6.5 (5.8, 7.2) |
| Profix/Profix | 238 | 6025 | 1.2 (1.0, 1.5) | 4.2 (3.6, 4.7) | 5.4 (4.4, 6.7) |
| Nexgen LPS/Nexgen | 188 | 5816 | 1.0 (0.8, 1.3) | 3.2 (2.7, 3.7) | 5.0 (4.1, 6.0) |
| Natural Knee II/Natural Knee II | 198 | 5557 | 0.9 (0.7, 1.2) | 3.1 (2.6, 3.6) | 7.0 (5.5, 9.0) |
| AGC/AGC | 141 | 4439 | 0.6 (0.4, 0.9) | 3.1 (2.5, 3.7) | 5.0 (4.0, 6.2) |
| Scorpio/Scorpio Plus | 177 | 4314 | 1.1 (0.8, 1.5) | 4.2 (3.6, 4.9) | 5.7 (4.8, 6.7) |
| Maxim/Maxim* | 99 | 2447 | 1.1 (0.7, 1.6) | 3.8 (3.1, 4.7) | 5.1 (4.0, 6.4) |
| Kinemax Plus/Kinemax Plus* | 68 | 1815 | 0.9 (0.6, 1.5) | 3.1 (2.4, 4.0) | 4.8 (3.6, 6.5) |
| Optetrak-PS/Optetrak | 96 | 1653 | 1.6 (1.1, 2.3) | 7.1 (5.7, 8.7) | 9.4 (7.4, 11.8) |
| Advance/Advance | 78 | 1406 | 1.7 (1.1, 2.6) | 5.9 (4.6, 7.4) | 8.9 (6.6, 11.9) |
| Genesis II/Mobile Bearing Knee | 52 | 1045 | 2.1 (1.4, 3.2) | 4.8 (3.6, 6.5) | 7.2 (5.2, 10.1) |
| Advantim/Advantim | 15 | 1004 | 0.4 (0.2, 1.1) | 1.6 (0.9, 2.7) | 2.3 (1.3, 4.2) |
| MBK (Zimmer)/MBK (Zimmer)* | 23 | 454 | 0.9 (0.3, 2.3) | 4.1 (2.6, 6.4) | 5.4 (3.6, 8.0) |
| AMK/AMK* | 32 | 402 | 1.5 (0.7, 3.4) | 5.9 (4.0, 8.8) | 9.1 (6.5, 12.8) |
| **TOTAL** | **4585** | **138000** | | | |

Note: Only prostheses with over 350 procedures have been listed.
* denotes prostheses that have not had any reported use in 2010

# HIP REPLACEMENT

## Categories of Hip Replacement

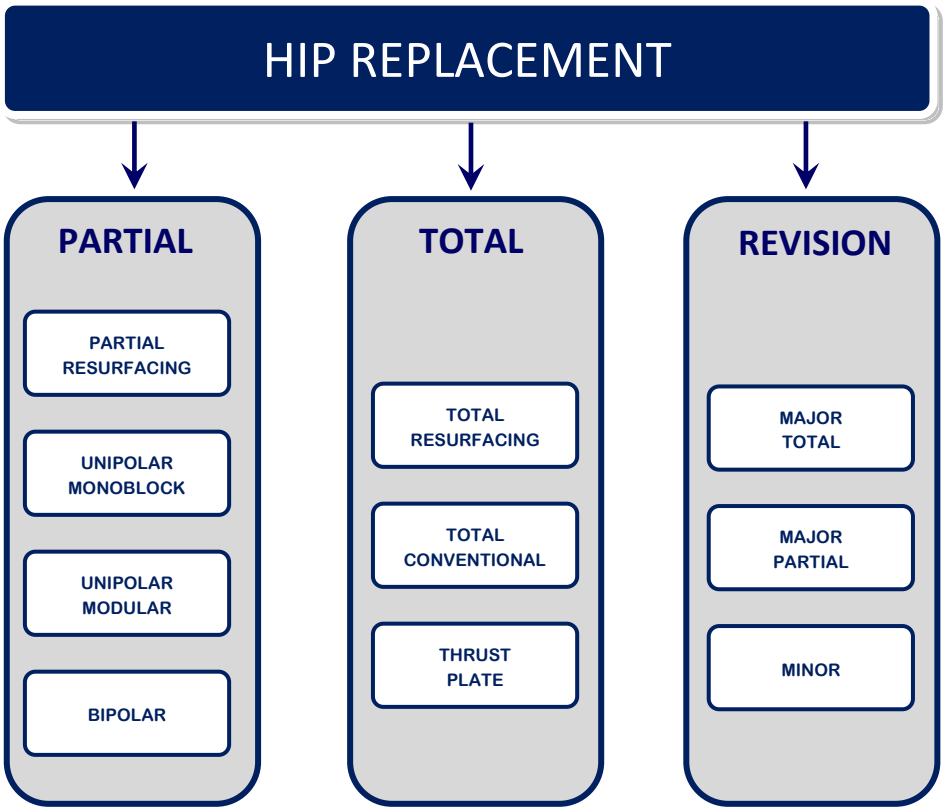
The Registry groups hip replacement into three broad categories, primary partial, primary total and revision hip replacement.

A primary replacement is the 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 sub-categorised into classes depending on the type of prostheses used. Partial hip classes are partial resurfacing, unipolar monoblock, unipolar modular and bipolar. Total hip classes are resurfacing, conventional and thrust plate. Definitions for each of these are detailed in the relevant chapters.

Revision hips are re-operations of previous hip replacements where one or more of the prosthetic components are replaced, removed, or another component is added. Revisions include re-operations of primary partial, primary total or previous revision procedures.

Hip revisions are sub-categorised into three classes, major total, major partial or minor revisions. These are defined in the chapter on revision outcomes.




## Use of Hip Replacement

This report analyses 294,329 hip replacements reported to the Registry with a procedure date up to and including 31 December 2010. This is an additional 35,996 hip procedures compared to the number reported last year. When considering all procedures currently recorded by the Registry primary partial hips account for 16.3% of all hip replacements, primary total hips 71.7% and revision hip replacement 12.0% (Table H1).

**Table H1: Number of Hip Replacements**

| Hip Category | Number | Percent |
|---|---|---|
| Primary Partial Hip | 47835 | 16.3 |
| Primary Total Hip | 211114 | 71.7 |
| Revision Hip | 35380 | 12.0 |
| **TOTAL** | **294329** | **100.0** |

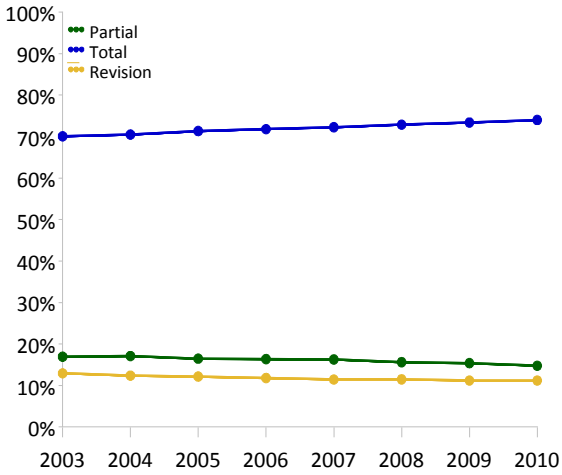
In 2010, the number of hip replacements reported to the Registry increased by 1,225 (3.6%) compared to 2009. During the last 12 months the use of primary partial decreased by 0.6%, primary total increased by 4.5% and revision hip replacement by 3.6%.

The number of hip replacement procedures undertaken in 2010 was 32.4% higher than undertaken in 2003. The corresponding increase in primary total hip replacement was 39.8%, primary partial 15.3% and revision hip replacement 14.6%.

In 2010, primary total hip replacement accounted for 74.0% of all hip replacement procedures. This has increased from 70.1% in 2003. Primary partial hip replacement has decreased from 17.0% in 2003 to 14.8% in 2010 (Figure H1).

Revision hip replacement as a proportion of all hip replacement procedures has declined from 13.0% in 2003 to 11.2% in 2010. This is the same proportion as in 2009. In previous years, there has been a reduction in the proportion of hip procedures that are revisions. The proportion of procedures that are revisions however remains significantly less than 2003 and equates to 630 less revision procedures in 2010 compared to what would have been the case if the proportion of revision procedures had not declined from 13.0 %.

**Figure H1: Proportion of Hip Replacements**



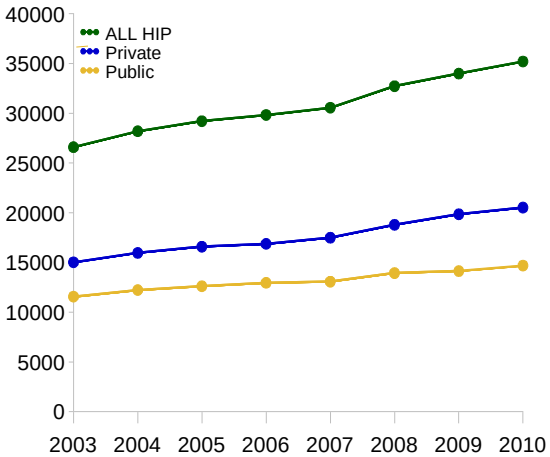

*Detailed information on the demographics of each category of hip replacement is provided in the supplementary report 'Demographics of Hip Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

## Public and Private Sector

More than half of all hip replacement procedures reported to the Registry have been undertaken in private hospitals (58.3% in 2010).

There were 20,516 private sector hip replacements reported for 2010, an increase of 3.3% compared to 2009. In the public sector, there were 14,694 hip replacements, an increase of 4.0% compared to 2009.

**Figure H2: Hip Replacement by Hospital Sector**




Since 2003, hip replacement in the private sector has increased by 36.5% compared to 27.0% in the public sector (Figure H2).

There were 4,286 public sector primary partial hip replacements reported for 2010, an increase of 2.5% compared to 2009. In the private sector, there were 917 partial hip replacements, a decrease of 12.7% compared to 2009. Since 2003, primary partial hip replacement in the public sector has increased by 19.4% compared to a decrease of 0.5% in the private sector.

In 2010, 17,244 private sector primary total hip replacements were reported, an increase of 4.5% compared to 2009. In the public sector, there were 8,816 primary total hip replacements, an increase of 4.4% compared to 2009. Since 2003, primary total hip replacement in the private sector has increased by 43.3% compared to 33.5% in the public sector.

There were 2,355 private sector revision hip replacements reported for 2010, an increase of 2.1% compared to 2009. In the public sector, there were 1,592 revision hip replacements, an increase of 5.8% compared to 2009. Since 2003, revision hip replacement in the private sector has increased by 13.8% compared to 15.9% in the public sector.

# PRIMARY PARTIAL HIP REPLACEMENT

## Classes of Partial Hip Replacement

The Registry identifies four classes of primary partial hip replacement. These are defined by the type of prostheses used.

1. **Partial resurfacing** involves the use of one or more button prosthesis to replace part of the natural articulating surface on one or both sides of the hip joint.
2. **Unipolar monoblock** involves the use of a femoral stem with a fixed large head that replaces the natural femoral head.
3. **Unipolar modular** involves the use of a femoral stem and exchangeable large head prosthesis that replaces the natural femoral head.
4. **Bipolar** involves the use of a femoral stem and standard head prosthesis that articulates with a non-fixed component that replaces the natural femoral head.

There is a fifth class of partial hip replacement that has been reported to the Registry. It involves the use of a prosthesis referred to by the manufacturer as an acetabular buffer. This is a polycarbonate urethane insert. There were three cases reported in 2009 where the insert was used with a femoral stem and head but no acetabular shell. Two have since been revised.

## Use of Partial Hip Replacement

The most common class of primary partial hip replacement is unipolar monoblock. This accounts for 44.8% of all partial hip procedures, followed by unipolar modular (32.9%) and bipolar (22.3%). Partial resurfacing prostheses are rarely used (Table HP1).

Fractured neck of femur is the principal diagnosis for all primary partial hip replacement with the exception of partial resurfacing. This diagnosis accounts for 97.4% of unipolar monoblock, 93.1% of unipolar modular and 89.2% of bipolar.

The outcome of primary partial hip replacement varies depending on the class. At seven years, bipolar has the lowest cumulative percent revision followed by unipolar monoblock and unipolar modular (Tables HP2 and HP3). This is most apparent again in the less than 75 year age group (Tables HP5 and HP6 and Figure HP1).

Partial hip replacement is associated with a high mortality. The mortality data are detailed in Table HP4. The prosthesis class variation is almost certainly due to patient selection.

*Detailed information on the demographics of each class of primary partial hip replacement is provided in the supplementary report 'Demographics of Hip Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

**Table HP1: Partial Hip Replacement by Class**

| Partial Hip Class | Number | Percent |
|---|---|---|
| Partial Resurfacing | 13 | 0.0 |
| Unipolar Monoblock | 21428 | 44.8 |
| Unipolar Modular | 15741 | 32.9 |
| Bipolar | 10653 | 22.3 |
| **TOTAL** | **47835** | **100.0** |

**Table HP2: Revision Rates of Primary Partial Hip Replacement by Class**

| Hip Class | N Revised | N Deceased | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Unipolar Monoblock | 791 | 15056 | 21428 | 50195 | 1.58 (1.47, 1.69) |
| Unipolar Modular | 468 | 6180 | 15741 | 34128 | 1.37 (1.25, 1.50) |
| Bipolar | 338 | 5267 | 10653 | 35660 | 0.95 (0.85, 1.05) |
| **TOTAL** | **1597** | **26503** | **47822** | **119984** | **1.33 (1.27, 1.40)** |

**Table HP3: Yearly Cumulative Percent Revision of Primary Partial Hip Replacement by Class**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unipolar Monoblock | 3.0 (2.7, 3.3) | 4.9 (4.6, 5.3) | 6.1 (5.6, 6.5) | 6.8 (6.3, 7.4) | 8.2 (7.1, 9.5) |
| Unipolar Modular | 2.0 (1.8, 2.3) | 3.8 (3.4, 4.2) | 5.3 (4.8, 5.9) | 7.2 (6.2, 8.2) | |
| Bipolar | 2.2 (1.9, 2.5) | 3.4 (3.0, 3.8) | 4.2 (3.7, 4.7) | 4.7 (4.2, 5.3) | 6.1 (4.5, 8.1) |

**Table HP4: Yearly Cumulative Percent Mortality of Primary Partial Hip Replacement by Class**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unipolar Monoblock | 34.4 (33.8, 35.1) | 57.8 (57.1, 58.5) | 73.7 (73.0, 74.4) | 83.6 (82.9, 84.2) | 91.9 (91.1, 92.7) |
| Unipolar Modular | 21.8 (21.1, 22.5) | 39.7 (38.8, 40.6) | 54.4 (53.3, 55.6) | 66.4 (64.9, 68.0) | |
| Bipolar | 19.8 (19.0, 20.6) | 36.4 (35.5, 37.4) | 50.1 (49.0, 51.1) | 61.4 (60.2, 62.6) | 73.5 (71.4, 75.5) |

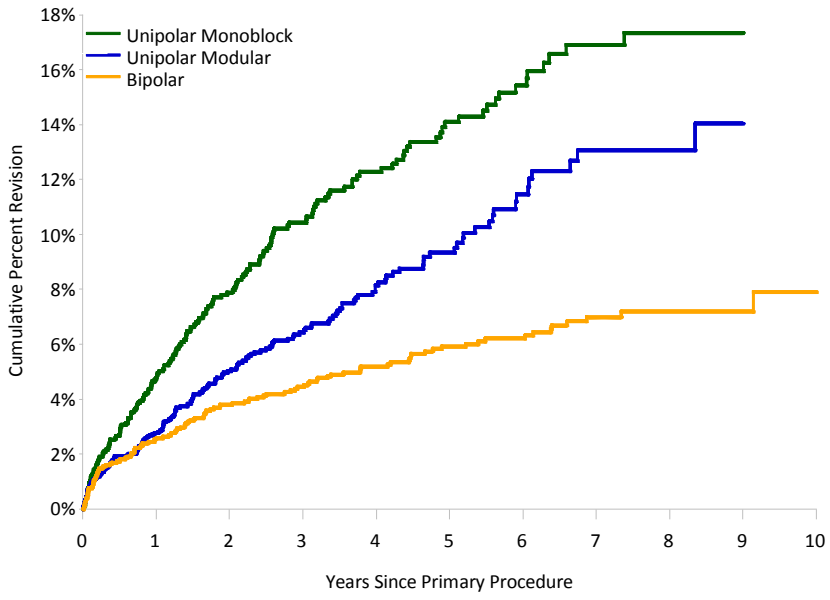
**Table HP5: Revision Rates of Primary Partial Hip Replacement in Patients <75 Years by Class**

| Hip Class | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Unipolar Monoblock | 180 | 1946 | 5786 | 3.11 (2.67, 3.60) |
| Unipolar Modular | 186 | 3167 | 8414 | 2.21 (1.90, 2.55) |
| Bipolar | 130 | 2706 | 10795 | 1.20 (1.01, 1.43) |
| **TOTAL** | **496** | **7819** | **24995** | **1.98 (1.81, 2.17)** |

**Table HP6: Yearly Cumulative Percent Revision of Primary Partial Hip Replacement in Patients <75 Years by Class**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unipolar Monoblock | 4.8 (3.8, 6.0) | 10.4 (8.9, 12.2) | 14.1 (12.1, 16.4) | 16.9 (14.4, 19.7) | |
| Unipolar Modular | 2.8 (2.2, 3.4) | 6.4 (5.4, 7.6) | 9.3 (7.9, 11.0) | 13.1 (10.9, 15.7) | |
| Bipolar | 2.6 (2.0, 3.3) | 4.4 (3.6, 5.4) | 5.9 (4.9, 7.1) | 7.0 (5.8, 8.4) | 7.9 (6.2, 10.0) |

**Figure HP1: Cumulative Percent Revision of Primary Partial Hip Replacement in Patients <75 Years by Class**




HR - adjusted for age and gender

Unipolar Monoblock vs Bipolar

0 - 3Mth: HR=1.35 (0.85, 2.15),p=0.206

3Mth+: HR=2.96 (2.27, 3.86),p<0.001

Unipolar Modular vs Bipolar

0 - 3Mth: HR=0.90 (0.58, 1.41),p=0.643

3Mth - 6Mth: HR=2.09 (1.08, 4.05),p=0.029

6Mth - 1.5Yr: HR=1.54 (1.04, 2.29),p=0.030

1.5Yr+: HR=2.22 (1.61, 3.05),p<0.001

Unipolar Monoblock vs Unipolar Modular

Entire Period: HR=1.52 (1.24, 1.87),p<0.001

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Unipolar Monoblock | 1946 | 1305 | 792 | 453 | 215 | 20 |
| Unipolar Modular | 3167 | 2191 | 1179 | 537 | 193 | 17 |
| Bipolar | 2706 | 2080 | 1495 | 1057 | 550 | 41 |

## Partial Resurfacing

The Registry has recorded 13 partial resurfacing procedures. There were no new procedures reported in 2010. Osteonecrosis was the principal diagnosis (46.2%) and ten patients were male. All procedures involved replacing part of the femoral articular surface.

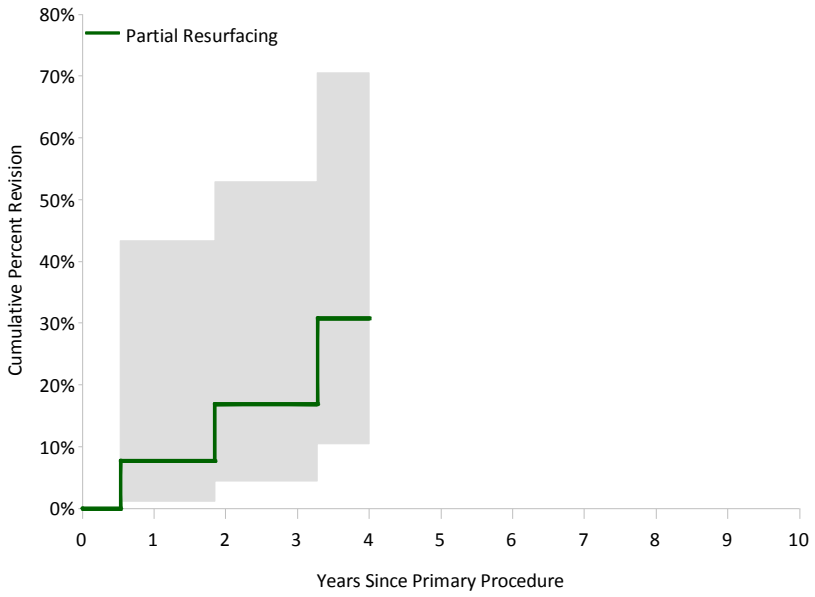
The cumulative percent revision is 7.7% at one year and 16.9% at three years (Table HP7 and Figure HP2).

Of the three revisions, two were for loosening/lysis and on one occasion the prosthesis dislocated. All were revised to a total hip replacement.

**Table HP7: Yearly Cumulative Percent Revision of Primary Partial Resurfacing Hip Replacement**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Partial Resurfacing | 7.7 (1.1, 43.4) | 16.9 (4.5, 52.8) | | | |

**Figure HP2: Cumulative Percent Revision of Primary Partial Resurfacing Hip Replacement**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Partial Resurfacing | 13 | 12 | 7 | 2 | 0 | 0 |

## Unipolar Monoblock

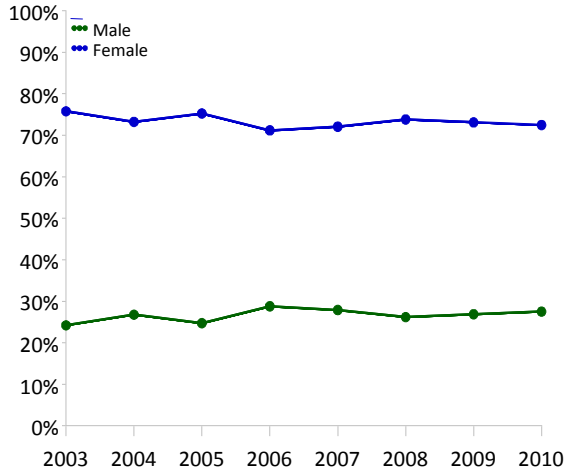
### Demographics

There have been 21,428 unipolar monoblock procedures reported to the Registry, an additional 1,636 procedures compared to the last report.

The use of all monoblock hip replacement in Australia continues to decline. The number of procedures reported in 2010 was 7.1% less than 2009 and 40.3% less than 2003.

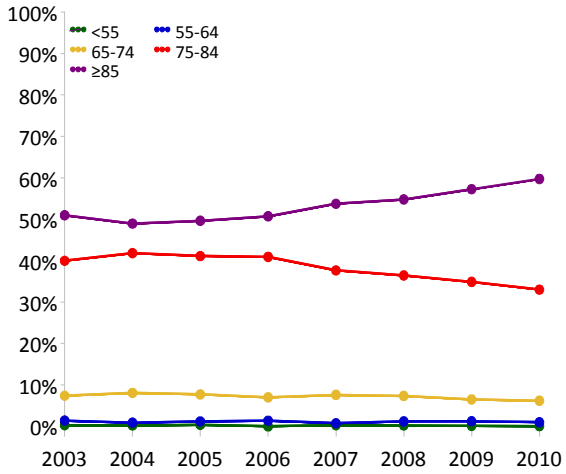
Fractured neck of femur is the principal diagnosis for unipolar monoblock hip replacement (97.4%).

**Figure HP3: Primary Unipolar Monoblock Hip Replacement by Gender**




Most patients are female (74.0%) and aged 75 years or older (91.0%). The proportion of patients aged 85 years or older has increased from 49% in 2004 to 59.7% in 2010 (Figures HP3 and HP4).

**Figure HP4: Primary Unipolar Monoblock Hip Replacement by Age**




The three types of unipolar monoblock prostheses are the Austin Moore type, Thompson type and Exeter Trauma Stem (ETS). The use of the Austin-Moore type decreased by 18.0% in 2010 compared to 2009 and 60.0% since 2003. In 2010 the use of the Thompson type increased for the first time since 2006 with 16.2% more procedures undertaken compared to 2009. The number of procedures in 2010 however is 12.5% less than the number undertaken in 2003. Over the last four years, the use of the ETS has remained constant and in 2010 it accounted for 16.3% of all monoblock prostheses. (Table HP8).

**Table HP8: Most Used Monoblock Prostheses in Primary Unipolar Monoblock Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 1988 | Austin-Moore | 1147 | Austin-Moore | 1085 | Austin-Moore | 970 | Austin-Moore | 795 | Austin-Moore |
| 526 | Thompson | 457 | Thompson | 401 | Thompson | 396 | Thompson | 460 | Thompson |
| | | 237 | ETS | 254 | ETS | 248 | ETS | 245 | ETS |
| **Most Used** | | | | | | | | | |
| 2514 | (2) 100.0% | 1841 | (3) 100.0% | 1740 | (3) 100.0% | 1614 | (3) 100.0% | 1500 | (3) 100.0% |

## Outcome

The cumulative percent revision at ten years for this procedure when undertaken for fractured neck of femur is 8.3% (Table HP9 and Figure HP5).

The main reasons for revision of unipolar monoblock hip replacement are loosening/lysis (49.1%) and fracture (17.7%). The majority of unipolar monoblock hip replacements are revised to a total hip replacement (62.6%) (Tables HP10 and HP11).

Age and fixation of the femoral stem are risk factors for revision.

The rate of revision decreases with increasing age. (Tables HP12 and HP13 and Figure HP6). This is evident in both males and females.

There is no difference in the outcome of primary unipolar monoblock hip replacement between males and females (Tables HP14 and HP15 and Figure HP7).

In the first one and a half years, cementless fixation has a higher rate of revision. There is no difference after this time (Tables HP16 and HP17 and Figure HP8).

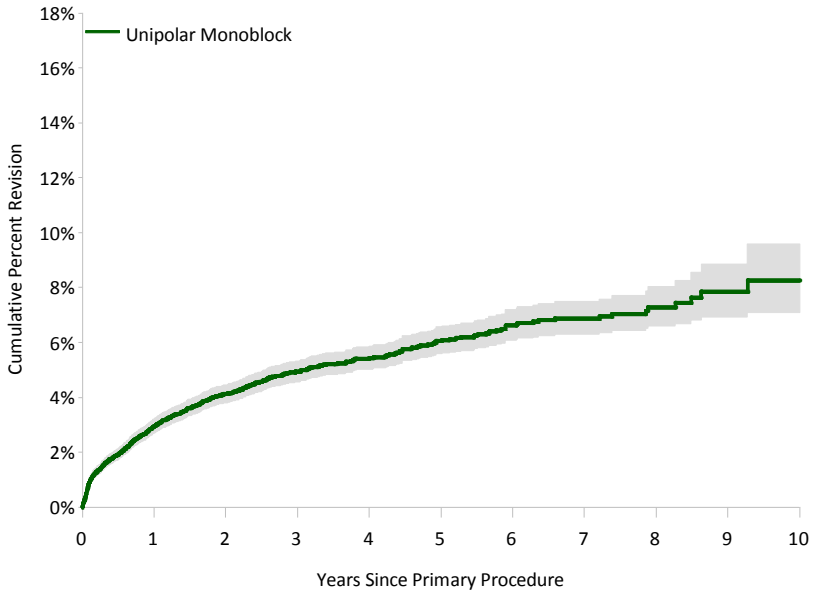
Although the Thompson type prosthesis is intended to be used with cement, the Registry does have outcome data when it is used without cement. The seven year cumulative percent revision with cement is 5.3% and without is 12.1% (Table HP18 and HP19).

The Austin Moore cementless has a higher rate of revision in the first 1.5 years compared to the Thompson cemented and over the entire period compared to the ETS. There is no difference in the revision rates between the ETS and Thompson cemented (Figure HP9).

**Table HP9: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unipolar Monoblock | 2.9 (2.7, 3.2) | 4.9 (4.6, 5.3) | 6.1 (5.6, 6.6) | 6.9 (6.3, 7.5) | 8.3 (7.1, 9.6) |

**Figure HP5: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Unipolar Monoblock | 20873 | 12423 | 6572 | 3227 | 1286 | 75 |

**Table HP10: Primary Unipolar Monoblock Hip Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Loosening/Lysis | 388 | 49.1 |
| Fracture | 140 | 17.7 |
| Prosthesis Dislocation | 82 | 10.4 |
| Infection | 77 | 9.7 |
| Pain | 55 | 7.0 |
| Chondrolysis/Acetab. Erosion | 29 | 3.7 |
| Malposition | 9 | 1.1 |
| Other | 11 | 1.4 |
| **TOTAL** | **791** | **100.0** |

**Table HP11: Primary Unipolar Monoblock Hip Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| THR (Femoral/Acetabular) | 495 | 62.6 |
| Femoral Component | 136 | 17.2 |
| Bipolar Head and Femoral | 85 | 10.7 |
| Cement Spacer | 31 | 3.9 |
| Removal of Prostheses | 31 | 3.9 |
| Minor Components | 8 | 1.0 |
| Reinsertion of Components | 4 | 0.5 |
| Incomplete | 1 | 0.1 |
| **TOTAL** | **791** | **100.0** |

Note: Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised.

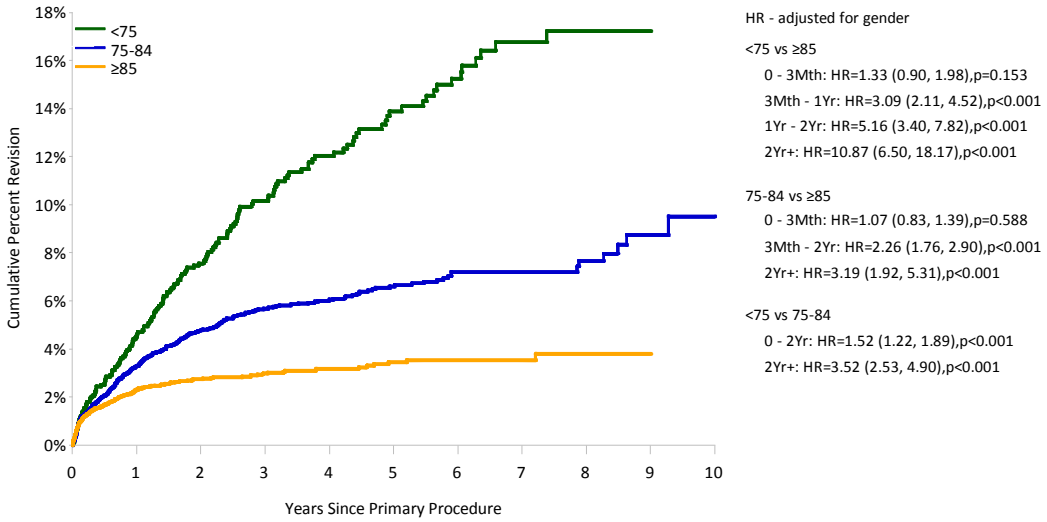
**Table HP12: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <75 | 172 | 1882 | 5666 | 3.04 (2.60, 3.52) |
| 75-84 | 363 | 8302 | 21775 | 1.67 (1.50, 1.85) |
| ≥85 | 234 | 10689 | 21561 | 1.09 (0.95, 1.23) |
| **TOTAL** | **769** | **20873** | **49001** | **1.57 (1.46, 1.68)** |

**Table HP13: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <75 | 4.6 (3.6, 5.7) | 10.1 (8.6, 11.9) | 13.9 (11.9, 16.2) | 16.8 (14.3, 19.6) | |
| 75-84 | 3.3 (2.9, 3.7) | 5.7 (5.1, 6.3) | 6.6 (5.9, 7.4) | 7.2 (6.4, 8.1) | 9.5 (7.5, 12.0) |
| ≥85 | 2.3 (2.0, 2.7) | 3.0 (2.6, 3.4) | 3.4 (3.0, 4.0) | 3.5 (3.0, 4.1) | |

**Figure HP6: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <75 | 1882 | 1276 | 777 | 446 | 210 | 20 |
| 75-84 | 8302 | 5289 | 2967 | 1576 | 645 | 41 |
| ≥85 | 10689 | 5858 | 2828 | 1205 | 431 | 14 |

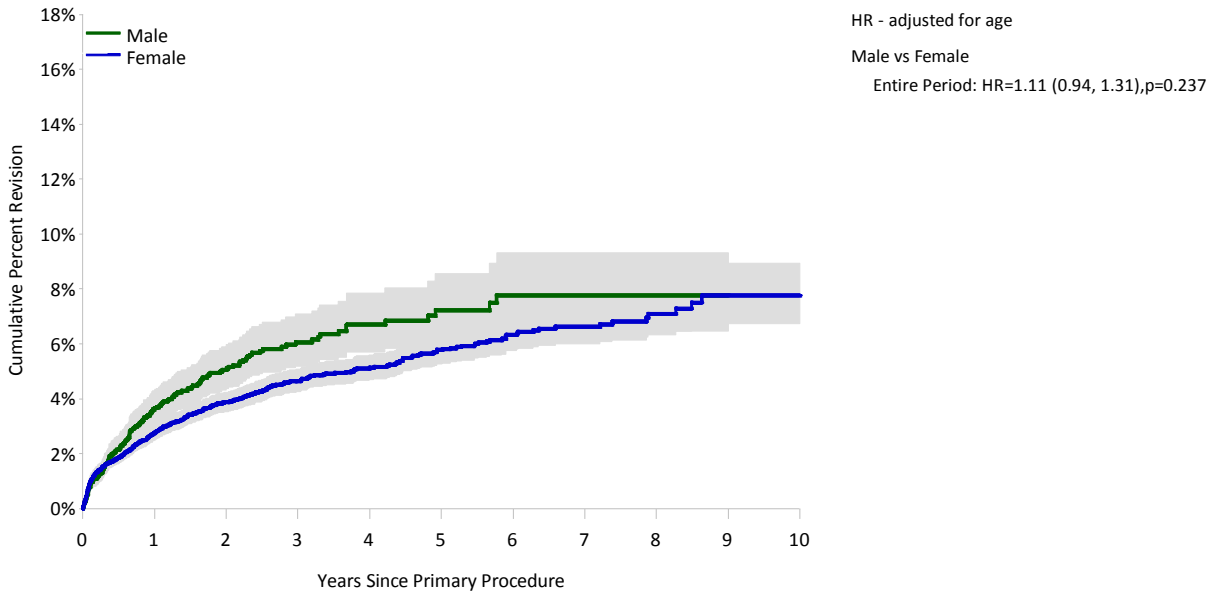
**Table HP14: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 189 | 5415 | 8950 | 2.11 (1.82, 2.44) |
| Female | 580 | 15458 | 40051 | 1.45 (1.33, 1.57) |
| **TOTAL** | **769** | **20873** | **49001** | **1.57 (1.46, 1.68)** |

**Table HP15: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 3.7 (3.1, 4.3) | 6.1 (5.2, 7.1) | 7.2 (6.1, 8.5) | 7.8 (6.5, 9.3) | |
| Female | 2.8 (2.5, 3.1) | 4.6 (4.3, 5.1) | 5.8 (5.3, 6.3) | 6.6 (6.0, 7.3) | 7.8 (6.7, 8.9) |

**Figure HP7: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 5415 | 2485 | 1058 | 451 | 173 | 11 |
| Female | 15458 | 9938 | 5514 | 2776 | 1113 | 64 |

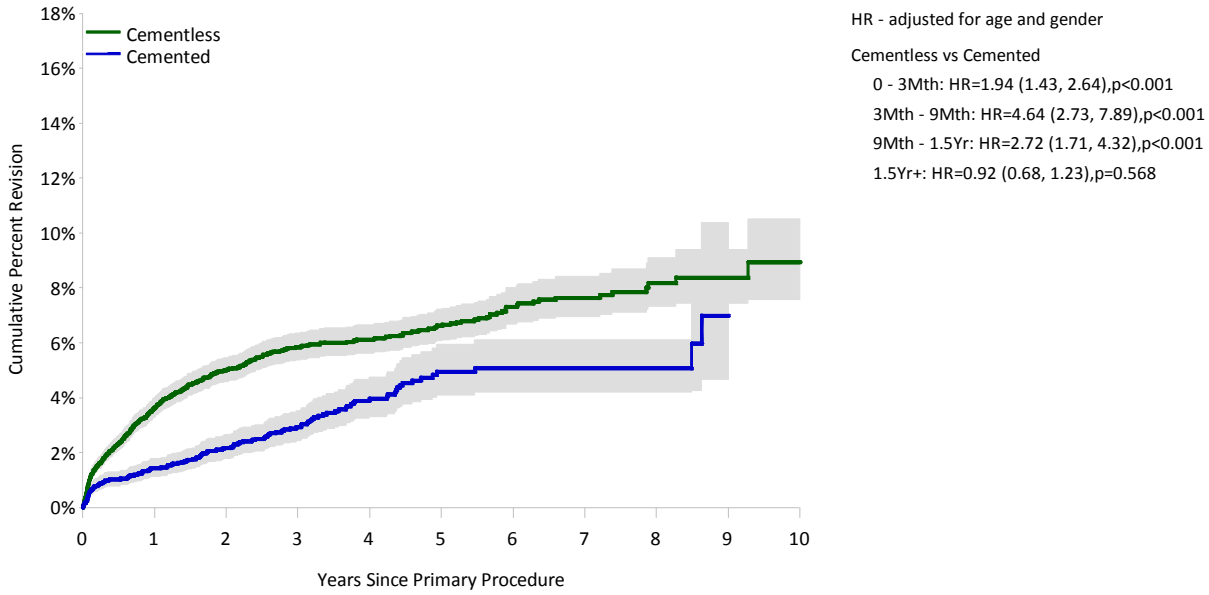
**Table HP16: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| Femoral Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Cementless | 617 | 14381 | 34252 | 1.80 (1.66, 1.95) |
| Cemented | 152 | 6492 | 14749 | 1.03 (0.87, 1.21) |
| **TOTAL** | **769** | **20873** | **49001** | **1.57 (1.46, 1.68)** |

**Table HP17: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Cementless | 3.6 (3.3, 4.0) | 5.8 (5.4, 6.3) | 6.6 (6.1, 7.2) | 7.6 (6.9, 8.4) | 8.9 (7.6, 10.5) |
| Cemented | 1.4 (1.1, 1.8) | 2.9 (2.4, 3.5) | 4.9 (4.1, 5.9) | 5.1 (4.2, 6.1) | |

**Figure HP8: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cementless | 14381 | 8480 | 4577 | 2357 | 1000 | 57 |
| Cemented | 6492 | 3943 | 1995 | 870 | 286 | 18 |

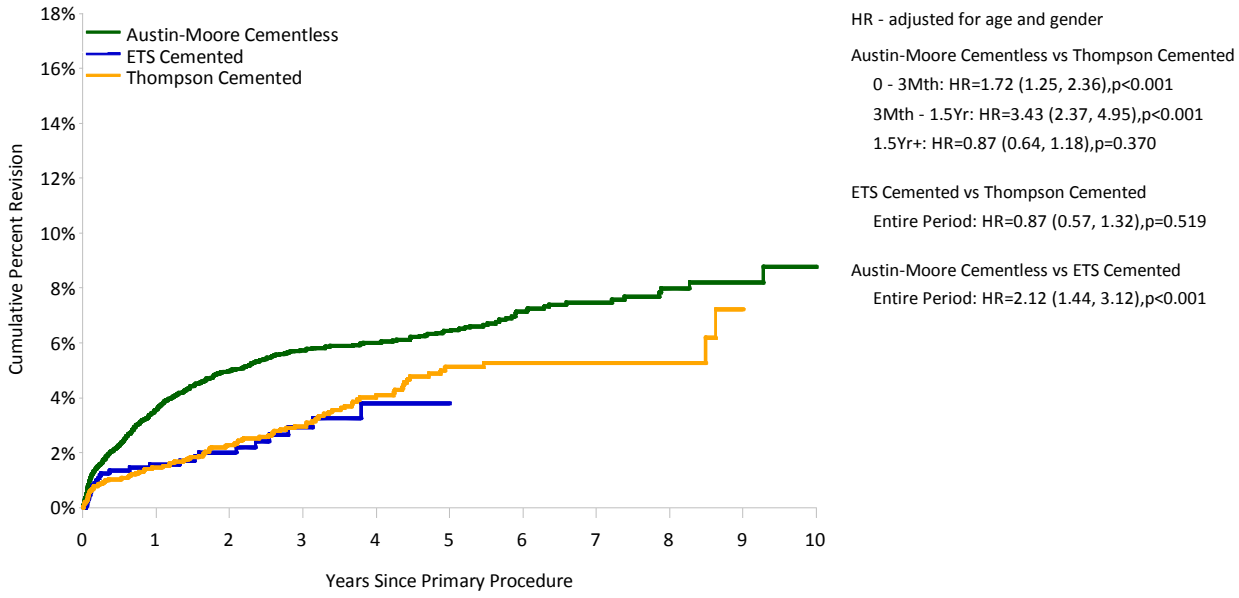
**Table HP18: Revision Rates of Primary Unipolar Monoblock Hip Replacement**

| Unipolar Monoblock | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Austin-Moore Type Cemented | 10 | 603 | 1156 | 0.86 (0.41, 1.59) |
| Austin-Moore Type Cementless | 601 | 14277 | 33924 | 1.77 (1.63, 1.92) |
| ETS Cemented | 27 | 1341 | 2460 | 1.10 (0.72, 1.60) |
| Thompson Type Cemented | 120 | 4736 | 11505 | 1.04 (0.86, 1.25) |
| Thompson Type Cementless | 33 | 471 | 1151 | 2.87 (1.97, 4.03) |
| **TOTAL** | **791** | **21428** | **50195** | **1.58 (1.47, 1.69)** |

**Table HP19: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Austin-Moore Type Cemented | 1.2 (0.5, 2.8) | 3.1 (1.5, 6.1) | 4.3 (2.0, 9.0) | | |
| Austin-Moore Type Cementless | 3.6 (3.2, 3.9) | 5.7 (5.3, 6.2) | 6.4 (5.9, 7.0) | 7.5 (6.8, 8.2) | 8.8 (7.4, 10.4) |
| ETS Cemented | 1.6 (1.0, 2.5) | 2.9 (1.9, 4.5) | 3.8 (2.4, 6.0) | | |
| Thompson Type Cemented | 1.5 (1.1, 1.9) | 3.0 (2.4, 3.7) | 5.1 (4.2, 6.3) | 5.3 (4.3, 6.5) | |
| Thompson Type Cementless | 6.3 (4.3, 9.4) | 9.4 (6.5, 13.4) | 12.1 (8.3, 17.5) | 12.1 (8.3, 17.5) | |

**Figure HP9: Cumulative Percent Revision of Cementless Austin Moore Type and Cemented Thompson Type and ETS Hip Prostheses**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Austin-Moore Cementless | 14277 | 8396 | 4543 | 2335 | 985 | 55 |
| ETS Cemented | 1341 | 798 | 319 | 71 | 0 | 0 |
| Thompson Cemented | 4736 | 2930 | 1577 | 757 | 275 | 18 |

# Unipolar Modular

## Demographics

There have been 15,741 unipolar modular procedures reported to the Registry, an additional 2,988 procedures compared to the previous report.

The number of unipolar modular procedures reported in 2010 was 1.9% more than 2009 and 334.5% more than 2003.

Fractured neck of femur is the principal diagnosis for unipolar modular hip replacement (93.1%).

Most patients are female (72.4%) and aged 75 years or older (79.9%). The proportion of patients aged 85 years or older has increased from 29.8% in 2005 to 43.4% in 2010 (Figures HP10 and HP11).

**Figure HP10: Primary Unipolar Modular Hip Replacement by Gender**

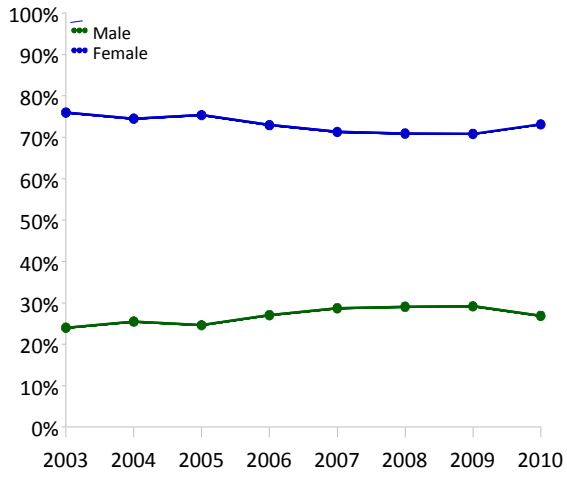
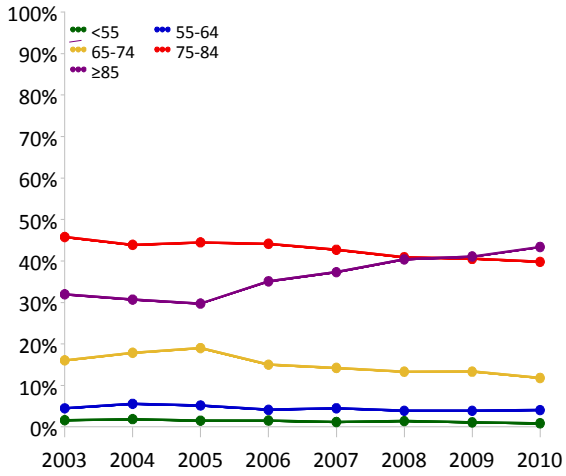



**Figure HP11: Primary Unipolar Modular Hip Replacement by Age**




There were 23 different unipolar modular head prostheses and 44 different stem prostheses used in 2010, a small increase compared to 2009. Overall there have been 153 unipolar modular head and stem combinations recorded by the Registry. The ten most frequently used unipolar modular head prostheses and femoral stems are listed in Tables HP20 and HP21.

In 2010, the Unitrax head was the most frequently used unipolar modular head (39.5%). The Exeter V40 was the most frequently used stem (37.8%).

The ten most used unipolar modular head prostheses account for 97.8% of all unipolar modular hip procedures. The ten most used femoral stems account for 93.6% of all unipolar modular hip procedures (Tables HP20 and HP21).

**Table HP20: Ten Most Used Unipolar Head Prostheses in Primary Unipolar Modular Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 193 | Unitrax | 649 | Unitrax | 796 | Unipolar (S&N) | 934 | Unitrax | 1142 | Unitrax |
| 142 | Unipolar (Zimmer) | 612 | Unipolar (S&N) | 758 | Unitrax | 907 | Unipolar (S&N) | 712 | Unipolar (S&N) |
| 89 | Unipolar (S&N) | 329 | VerSys Endo | 342 | VerSys Endo | 378 | VerSys Endo | 487 | VerSys Endo |
| 75 | VerSys Endo | 140 | Modular Cathcart | 185 | Modular Cathcart | 212 | Modular Cathcart | 174 | Modular Cathcart |
| 64 | Hemi (Mathys) | 139 | Unipolar (Corin) | 145 | Unipolar (Corin) | 118 | Unipolar (Zimmer) | 101 | Unipolar (Zimmer) |
| 46 | Elite | 138 | Unipolar (Zimmer) | 114 | Unipolar (Zimmer) | 104 | Unipolar (Corin) | 70 | Unipolar (Corin) |
| 38 | Unipolar (Plus) | 83 | Unipolar (Plus) | 87 | Unipolar (Plus) | 84 | Metasul | 61 | Metasul |
| 16 | Ultima | 40 | Hemi (Mathys) | 29 | Metasul | 54 | Unipolar (Plus) | 51 | Unipolar (Plus) |
| 1 | Cormet 2000 | 29 | Metasul | 18 | Hemi (Mathys) | 16 | Endo II | 19 | Conserve |
| 1 | Metasul | 13 | Pharo | 14 | Endo II | 6 | Furlong LOL | 13 | Femoral (Lima) |
| **Ten Most Used** | | | | | | | | | |
| 665 | (10) 99.8% | 2172 | (10) 97.9% | 2488 | (10) 98.5% | 2813 | (10) 99.0% | 2830 | (10) 97.8% |
| **Remainder** | | | | | | | | | |
| 1 | (1) 0.2% | 47 | (13) 2.1% | 39 | (9) 1.5% | 27 | (12) 1.0% | 64 | (13) 2.2% |
| **TOTAL** | | | | | | | | | |
| 666 | (11) 100.0% | 2219 | (23) 100.0% | 2527 | (19) 100.0% | 2840 | (22) 100.0% | 2894 | (23) 100.0% |

**Table HP21: Ten Most Used Femoral Stem Prostheses in Primary Unipolar Modular Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 179 | Exeter V40 | 618 | Exeter V40 | 728 | Exeter V40 | 914 | Exeter V40 | 1093 | Exeter V40 |
| 111 | Alloclassic | 306 | CPT | 359 | Spectron EF | 453 | CPCS | 487 | CPT |
| 91 | CPT | 278 | Spectron EF | 357 | CPCS | 390 | Spectron EF | 328 | Spectron EF |
| 88 | Spectron EF | 274 | CPCS | 313 | CPT | 360 | CPT | 317 | CPCS |
| 49 | Fullfix Stem | 159 | Alloclassic | 180 | Corail | 201 | Corail | 155 | Corail |
| 38 | SL-Plus | 140 | Corail | 148 | Alloclassic | 200 | Alloclassic | 143 | Alloclassic |
| 33 | Elite Plus | 91 | SL-Plus | 92 | SL-Plus | 86 | SL-Plus | 80 | SL-Plus |
| 15 | CCA | 76 | Trifit | 71 | Taper Fit | 53 | Metafix | 45 | Metafix |
| 15 | Thompson Modular | 59 | Taper Fit | 68 | Trifit | 44 | Taper Fit | 38 | Omnifit |
| 13 | C-Stem | 30 | Platform | 41 | Platform | 18 | Taperloc | 23 | Taper Fit |
| **Ten Most Used** | | | | | | | | | |
| 632 | (10) 94.9% | 2031 | (10) 91.5% | 2357 | (10) 93.3% | 2719 | (10) 95.7% | 2709 | (10) 93.6% |
| **Remainder** | | | | | | | | | |
| 34 | (12) 5.1% | 188 | (28) 8.5% | 170 | (26) 6.7% | 121 | (31) 4.3% | 185 | (34) 6.4% |
| **TOTAL** | | | | | | | | | |
| 666 | (22) 100.0% | 2219 | (38) 100.0% | 2527 | (36) 100.0% | 2840 | (41) 100.0% | 2894 | (44) 100.0% |

## Outcome

The cumulative percent revision at nine years for this procedure when undertaken for fractured neck of femur is 7.6% (Figure HP12).

The main reasons for revision are infection (18.8%) prosthesis dislocation (18.6%), loosening/lysis (18.2%), and fracture (16.7%). The majority of revisions of primary unipolar modular are acetabular only (44.2%), followed by THR (femoral/acetabular) revisions (21.4%) (Tables HP23 and HP24).

Age, gender and fixation of the femoral stem are risk factors for revision.

The rate of revision decreases with increasing age. (Tables HP25 and HP26 and Figure HP13). This is evident in both males and females.

Males have a significantly higher rate of revision in the first one and a half years (Tables HP27 and HP28 and Figure HP14).

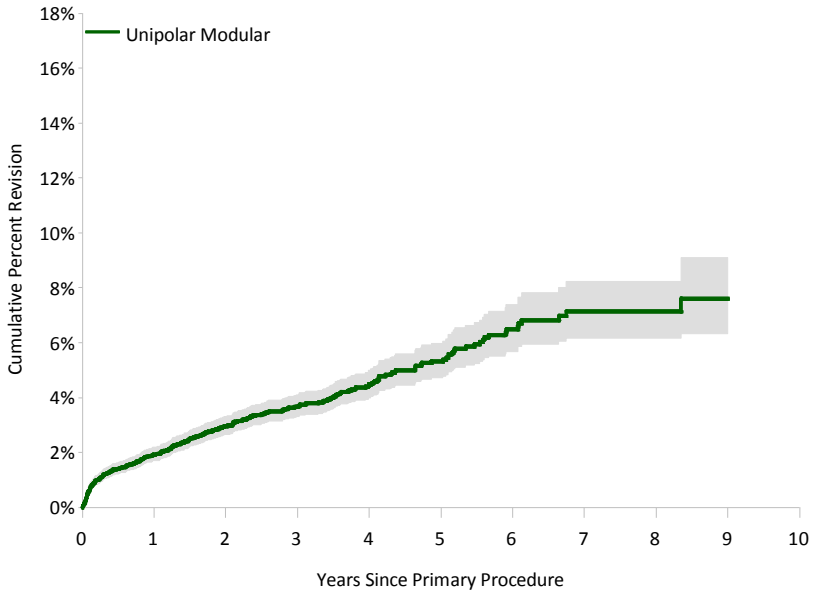
Cementless fixation has a higher rate of revision in the first 9 months, after this time there is no difference in the rate of revision compared to cemented stems (Tables HP29, HP30 and Figure HP15).

The revision rates and yearly cumulative percent revision of individual combinations of unipolar modular stem/head prostheses with 100 or more procedures are detailed in Tables HP31 and HP32.

**Table HP22: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unipolar Modular | 1.9 (1.7, 2.2) | 3.7 (3.3, 4.1) | 5.3 (4.7, 6.0) | 7.1 (6.2, 8.2) | |

**Figure HP12: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Unipolar Modular | 14654 | 9222 | 4159 | 1520 | 487 | 31 |

**Table HP23: Primary Unipolar Modular Hip Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Infection | 88 | 18.8 |
| Prosthesis Dislocation | 87 | 18.6 |
| Loosening/Lysis | 85 | 18.2 |
| Fracture | 78 | 16.7 |
| Pain | 64 | 13.7 |
| Chondrolysis/Acetab. Erosion | 49 | 10.5 |
| Malposition | 1 | 0.2 |
| Other | 16 | 3.4 |
| **TOTAL** | **468** | **100.0** |

**Table HP24: Primary Unipolar Modular Hip Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| Acetabular Component | 207 | 44.2 |
| THR (Femoral/Acetabular) | 100 | 21.4 |
| Femoral Component | 58 | 12.4 |
| Head Only | 40 | 8.5 |
| Cement Spacer | 20 | 4.3 |
| Minor Components | 17 | 3.6 |
| Bipolar Head and Femoral | 13 | 2.8 |
| Removal of Prostheses | 10 | 2.1 |
| Bipolar Only | 2 | 0.4 |
| Cement Only | 1 | 0.2 |
| **TOTAL** | **468** | **100.0** |

Note: Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised.

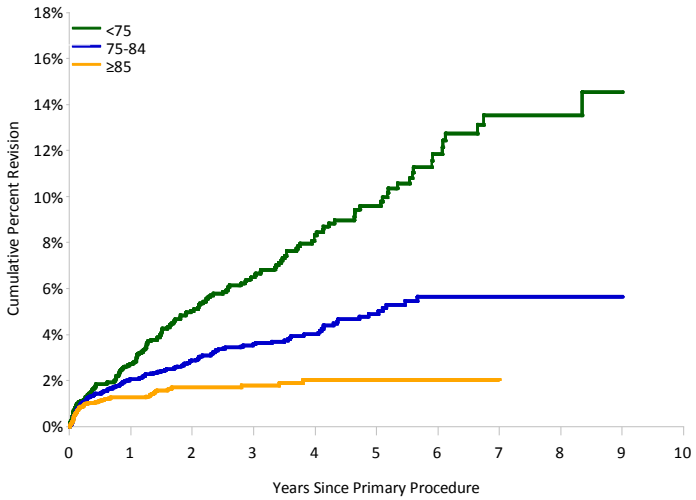
**Table HP25: Revision Rates of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <75 | 175 | 2871 | 7795 | 2.25 (1.92, 2.60) |
| 75-84 | 178 | 6204 | 14582 | 1.22 (1.05, 1.41) |
| ≥85 | 74 | 5579 | 9451 | 0.78 (0.61, 0.98) |
| **TOTAL** | **427** | **14654** | **31827** | **1.34 (1.22, 1.48)** |

**Table HP26: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <75 | 2.7 (2.1, 3.4) | 6.5 (5.5, 7.7) | 9.6 (8.1, 11.3) | 13.5 (11.2, 16.3) | |
| 75-84 | 2.1 (1.7, 2.5) | 3.6 (3.0, 4.2) | 4.9 (4.1, 5.8) | 5.6 (4.7, 6.8) | |
| ≥85 | 1.3 (1.0, 1.6) | 1.8 (1.4, 2.3) | 2.0 (1.5, 2.7) | 2.0 (1.5, 2.7) | |

**Figure HP13: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)**




HR - adjusted for gender

<75 vs ≥85
0 - 3Mth: HR=1.22 (0.79, 1.91),p=0.371
3Mth - 1.5Yr: HR=5.87 (3.65, 9.43),p<0.001
1.5Yr+: HR=7.65 (4.67, 12.53),p<0.001

75-84 vs ≥85
0 - 3Mth: HR=1.13 (0.78, 1.65),p=0.512
3Mth+: HR=2.89 (1.88, 4.43),p<0.001

<75 vs 75-84
0 - 1.5Yr: HR=1.56 (1.20, 2.04),p<0.001
1.5Yr+: HR=2.62 (1.86, 3.68),p<0.001

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <75 | 2871 | 2026 | 1093 | 501 | 184 | 17 |
| 75-84 | 6204 | 4110 | 1967 | 749 | 245 | 12 |
| ≥85 | 5579 | 3086 | 1099 | 270 | 58 | 2 |

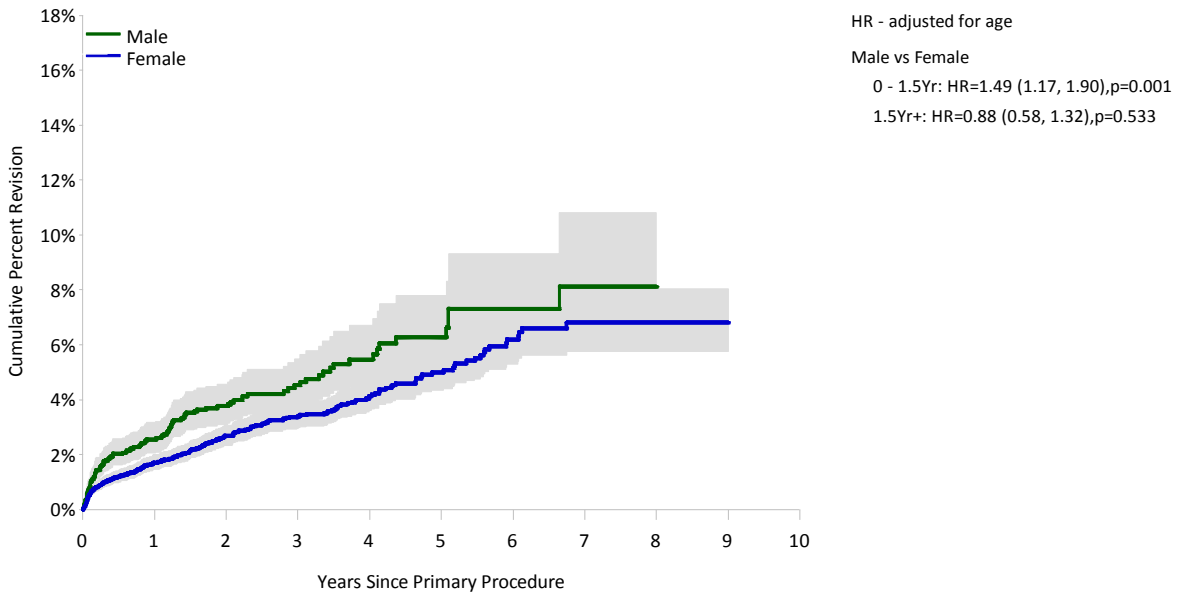
**Table HP27: Revision Rates of Primary Unipolar Modular Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 132 | 4021 | 7191 | 1.84 (1.54, 2.18) |
| Female | 295 | 10633 | 24636 | 1.20 (1.06, 1.34) |
| **TOTAL** | **427** | **14654** | **31827** | **1.34 (1.22, 1.48)** |

**Table HP28: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 2.5 (2.1, 3.2) | 4.5 (3.7, 5.5) | 6.3 (5.1, 7.8) | 8.1 (6.1, 10.8) | |
| Female | 1.7 (1.5, 2.0) | 3.4 (3.0, 3.8) | 5.0 (4.3, 5.7) | 6.8 (5.8, 8.0) | |

**Figure HP14: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 4021 | 2214 | 851 | 287 | 86 | 6 |
| Female | 10633 | 7008 | 3308 | 1233 | 401 | 25 |

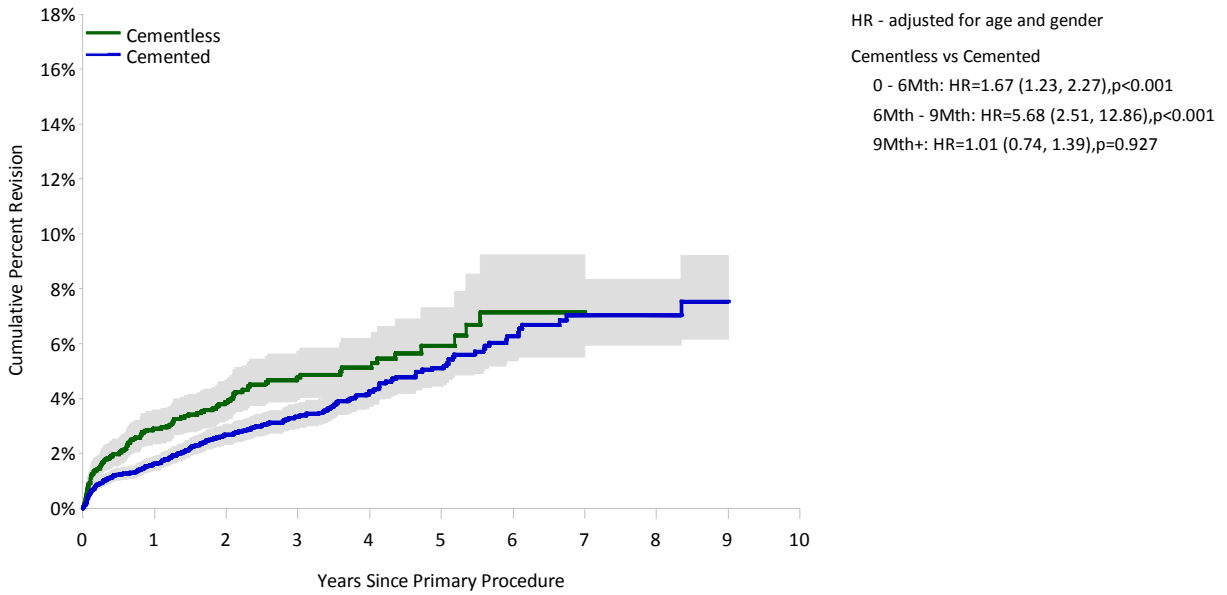
**Table HP29: Revision Rates of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| Femoral Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Cementless | 128 | 3467 | 7473 | 1.71 (1.43, 2.04) |
| Cemented | 299 | 11187 | 24354 | 1.23 (1.09, 1.38) |
| **TOTAL** | **427** | **14654** | **31827** | **1.34 (1.22, 1.48)** |

**Table HP30: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Cementless | 2.9 (2.3, 3.6) | 4.8 (4.0, 5.7) | 5.9 (4.8, 7.3) | 7.1 (5.5, 9.2) | |
| Cemented | 1.6 (1.4, 1.9) | 3.3 (2.9, 3.8) | 5.1 (4.4, 5.9) | 7.0 (6.0, 8.3) | |

**Figure HP15: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cementless | 3467 | 2264 | 1017 | 292 | 58 | 0 |
| Cemented | 11187 | 6958 | 3142 | 1228 | 429 | 31 |

**Table HP31: Revision Rates of Primary Unipolar Modular Hip Replacement**

| Unipolar Head | Femoral Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Hemi Head (Mathys) | CCA | 7 | 357 | 1354 | 0.52 (0.21, 1.06) |
| Hemi Head (Mathys) | Fullfix Stem | 6 | 226 | 797 | 0.75 (0.28, 1.64) |
| Metasul | Alloclassic | 2 | 185 | 264 | 0.76 (0.09, 2.73) |
| Modular Cathcart | Corail | 25 | 758 | 1208 | 2.07 (1.34, 3.06) |
| Ultima | Thompson Modular Stem | 1 | 133 | 582 | 0.17 (0.00, 0.96) |
| Unipolar Head (Corin) | Metafix | 0 | 104 | 96 | 0.00 (0.00, 3.86) |
| Unipolar Head (Corin) | Taper Fit | 12 | 277 | 571 | 2.10 (1.09, 3.67) |
| Unipolar Head (Corin) | Trifit | 6 | 287 | 697 | 0.86 (0.32, 1.87) |
| Unipolar Head (Plus) | SL-Plus | 20 | 501 | 1358 | 1.47 (0.90, 2.27) |
| Unipolar Head (S&N) | CPCS | 35 | 1664 | 2786 | 1.26 (0.88, 1.75) |
| Unipolar Head (S&N) | Platform | 4 | 107 | 194 | 2.06 (0.56, 5.29) |
| Unipolar Head (S&N) | Spectron EF | 47 | 2052 | 4660 | 1.01 (0.74, 1.34) |
| Unipolar Head (Zimmer) | Alloclassic | 39 | 955 | 2593 | 1.50 (1.07, 2.06) |
| Unipolar Head (Zimmer) | CPT | 8 | 158 | 852 | 0.94 (0.41, 1.85) |
| Unitrax | Accolade | 6 | 101 | 240 | 2.50 (0.92, 5.44) |
| Unitrax | Exeter V40 | 140 | 4652 | 9403 | 1.49 (1.25, 1.76) |
| Unitrax | Omnifit | 3 | 101 | 218 | 1.38 (0.28, 4.02) |
| VerSys Endo | CPT | 48 | 1872 | 3542 | 1.36 (1.00, 1.80) |
| VerSys Endo | VerSys | 5 | 139 | 299 | 1.67 (0.54, 3.90) |
| Other (134) | | 54 | 1112 | 2413 | 2.24 (1.68, 2.92) |
| **TOTAL** | | **468** | **15741** | **34128** | **1.37 (1.25, 1.50)** |

Note: Only prostheses with over 100 procedures have been listed.

**Table HP32: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement**

| Unipolar Head | Femoral Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Hemi Head (Mathys) | CCA | 1.0 (0.3, 3.0) | 2.6 (1.2, 5.3) | 2.6 (1.2, 5.3) | 2.6 (1.2, 5.3) | |
| Hemi Head (Mathys) | Fullfix Stem | 1.5 (0.5, 4.7) | 2.7 (1.1, 6.5) | 2.7 (1.1, 6.5) | | |
| Metasul | Alloclassic | 1.1 (0.3, 4.5) | | | | |
| Modular Cathcart | Corail | 3.4 (2.2, 5.2) | 5.2 (3.4, 8.0) | | | |
| Ultima | Thompson Modular Stem | 0.8 (0.1, 5.5) | 0.8 (0.1, 5.5) | 0.8 (0.1, 5.5) | | |
| Unipolar Head (Corin) | Metafix | 0.0 (0.0, 0.0) | | | | |
| Unipolar Head (Corin) | Taper Fit | 2.1 (0.9, 4.9) | 6.6 (3.5, 12.0) | | | |
| Unipolar Head (Corin) | Trifit | 1.5 (0.6, 4.1) | 2.7 (1.2, 6.0) | | | |
| Unipolar Head (Plus) | SL-Plus | 2.1 (1.1, 3.9) | 4.9 (3.1, 7.8) | 6.0 (3.6, 10.0) | | |
| Unipolar Head (S&N) | CPCS | 1.7 (1.2, 2.5) | 2.9 (2.0, 4.2) | | | |
| Unipolar Head (S&N) | Platform | 4.2 (1.6, 10.8) | | | | |
| Unipolar Head (S&N) | Spectron EF | 1.4 (0.9, 2.1) | 3.1 (2.2, 4.4) | 4.7 (3.4, 6.5) | 5.1 (3.6, 7.1) | |
| Unipolar Head (Zimmer) | Alloclassic | 3.1 (2.1, 4.5) | 4.3 (3.1, 6.1) | 5.7 (4.0, 8.1) | | |
| Unipolar Head (Zimmer) | CPT | 0.7 (0.1, 4.9) | 3.1 (1.2, 8.0) | 5.1 (2.3, 11.1) | 6.4 (3.1, 13.3) | |
| Unitrax | Accolade | 1.0 (0.1, 7.1) | | | | |
| Unitrax | Exeter V40 | 1.8 (1.4, 2.2) | 3.6 (2.9, 4.4) | 6.5 (5.2, 8.0) | 9.5 (7.3, 12.4) | |
| Unitrax | Omnifit | 4.2 (1.3, 13.0) | 4.2 (1.3, 13.0) | 4.2 (1.3, 13.0) | | |
| VerSys Endo | CPT | 1.7 (1.2, 2.5) | 3.7 (2.7, 5.0) | 4.3 (2.9, 6.3) | | |
| VerSys Endo | VerSys | 3.9 (1.4, 10.2) | 3.9 (1.4, 10.2) | | | |
| Other (134) | | 4.2 (3.0, 5.8) | 5.7 (4.2, 7.7) | 7.6 (5.6, 10.3) | 11.0 (7.6, 15.8) | |

# Bipolar

## Demographics

There have been 10,653 bipolar procedures reported to the Registry, an additional 842 procedures compared to the last report.

The number of bipolar procedures undertaken in 2010 was 4.1% more than 2009 but 39.2% less than 2003.

Fractured neck of femur is the principal diagnosis for bipolar hip replacement (89.2%).

Most patients are female (72.9%) and aged 75 years or older (74.6%). The proportion of patients aged 85 years or older has increased from 25.8% in 2003 to 43.8% in 2010 (Figures HP16 and HP17).

**Figure HP16: Primary Bipolar Hip Replacement by Gender**

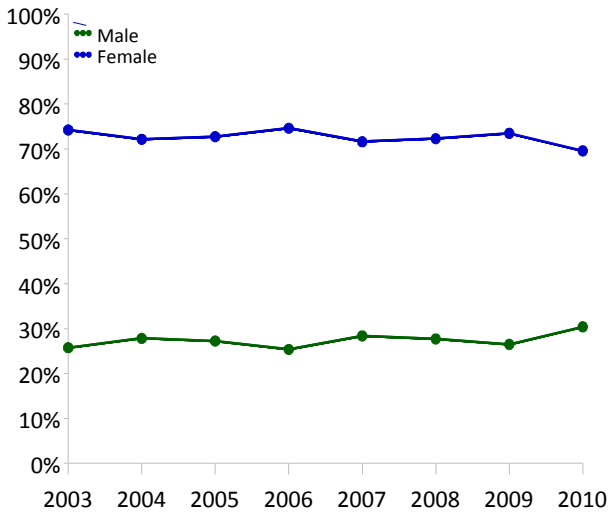
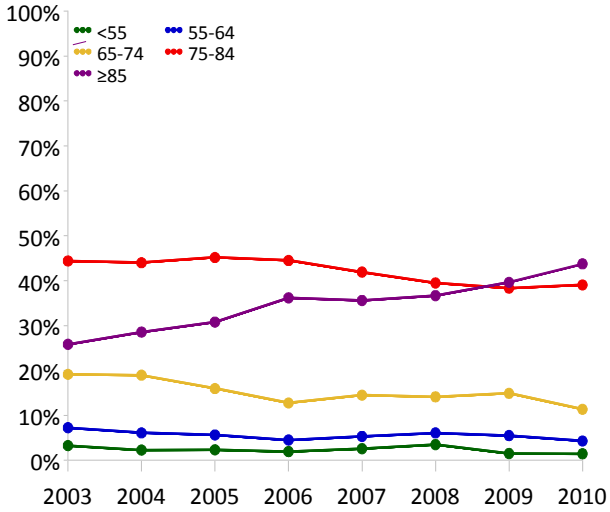



**Figure HP17: Primary Bipolar Hip Replacement by Age**




There were 13 different bipolar head prostheses and 43 different stem prostheses used in 2010. Overall there have been 283 bipolar head and stem combinations reported to the Registry.

In 2010, the UHR remains the most frequently used bipolar head (55.4%) and the Exeter V40 remains the most frequently used stem (49.1%).

The ten most used bipolar head prostheses account for 99.4% of all bipolar hip procedures. The ten most used femoral stems account for 87.6% of all bipolar hip procedures (Tables HP33 and HP34).

**Table HP33: Ten Most Used Bipolar Head Prostheses in Primary Bipolar Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 750 | UHR | 445 | UHR | 469 | UHR | 407 | UHR | 448 | UHR |
| 140 | Hastings | 173 | Tandem | 128 | Tandem | 123 | Tandem | 122 | Tandem |
| 115 | Convene | 144 | Multipolar Bipolar | 118 | Multipolar Bipolar | 114 | Multipolar Bipolar | 92 | Multipolar Bipolar |
| 91 | Bipolar (Zimmer) | 66 | Hastings | 71 | Hastings | 64 | Hastings | 69 | Hastings |
| 87 | Self-Centering | 53 | Self-Centering | 36 | Self-Centering | 30 | Self-Centering | 35 | Self-Centering |
| 59 | Multipolar Bipolar | 18 | Ringloc | 17 | Ringloc | 16 | Bipolar (Medacta) | 13 | Ringloc |
| 39 | Bipolar (Mathys) | 6 | UHL | 8 | UHL | 11 | Ringloc | 12 | Bipolar (Medacta) |
| 19 | Bipolar (Lima) | 5 | Bipolar (Eska) | 1 | Bipolar (Lima) | 6 | UHL | 5 | Bipolar (Lima) |
| 19 | Ringloc | 3 | Bipolar (Lima) | | | 5 | Bipolar (Eska) | 5 | UHL |
| 5 | UHL | 2 | Bipolar (Plus) | | | 1 | Bipolar (Generic) | 3 | Furlong |
| **Ten Most Used** | | | | | | | | | |
| 1324 | (10) 99.5% | 915 | (10) 99.9% | 848 | (8) 100.0% | 777 | (10) 100.0% | 804 | (10) 99.4% |
| **Remainder** | | | | | | | | | |
| 7 | (2) 0.5% | 1 | (1) 0.1% | 0 | (0) 0% | 0 | (0) 0% | 5 | (3) 0.6% |
| **TOTAL** | | | | | | | | | |
| 1331 | (12) 100.0% | 916 | (11) 100.0% | 848 | (8) 100.0% | 777 | (10) 100.0% | 809 | (13) 100.0% |

**Table HP34: Ten Most Used Femoral Stem Prostheses in Primary Bipolar Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 622 | Exeter V40 | 375 | Exeter V40 | 380 | Exeter V40 | 335 | Exeter V40 | 397 | Exeter V40 |
| 94 | Elite Plus | 133 | CPCS | 76 | CPCS | 83 | CPCS | 90 | CPCS |
| 75 | Alloclassic | 64 | Corail | 65 | VerSys | 46 | CPT | 55 | Corail |
| 65 | CPCS | 57 | CPT | 53 | Corail | 44 | VerSys | 48 | CPT |
| 61 | C-Stem | 46 | VerSys | 35 | Accolade | 43 | Corail | 32 | VerSys |
| 59 | Omnifit | 32 | Alloclassic | 34 | Spectron EF | 41 | Accolade | 31 | Accolade |
| 45 | VerSys | 31 | Accolade | 33 | CPT | 27 | C-Stem | 20 | Spectron EF |
| 30 | Spectron EF | 31 | Spectron EF | 20 | ABGII | 26 | Spectron EF | 14 | C-Stem |
| 26 | ABGII | 19 | C-Stem | 17 | Alloclassic | 12 | GMRS | 11 | GMRS |
| 25 | CCA | 15 | ABGII | 17 | C-Stem | 11 | Alloclassic | 11 | Summit |
| **Ten Most Used** | | | | | | | | | |
| 1102 | (10) 82.8% | 803 | (10) 87.7% | 730 | (10) 86.1% | 668 | (10) 86.0% | 709 | (10) 87.6% |
| **Remainder** | | | | | | | | | |
| 229 | (43) 17.2% | 113 | (26) 12.3% | 118 | (23) 13.9% | 109 | (26) 14.0% | 100 | (33) 12.4% |
| **TOTAL** | | | | | | | | | |
| 1331 | (53) 100.0% | 916 | (36) 100.0% | 848 | (33) 100.0% | 777 | (36) 100.0% | 809 | (43) 100.0% |

## Outcome

The cumulative percent revision at ten years for this procedure when undertaken for fractured neck of femur is 5.2% (Table HP35 and Figure HP18).

The main reasons for revision of bipolar hip replacement are fracture (22.8%), loosening/lysis (22.2%), infection (18.0%) and prosthesis dislocation (17.8%). The majority of revisions of primary bipolar are acetabular only (37%), followed by THR (femoral/acetabular) revisions (23.7%) and bipolar head and femoral revisions (13.9%) (Tables HP36 and HP37).

Age and fixation of the femoral stem are risk factors for revision.

There is a higher rate of revision in patients less than 75 years of age. There is however, no difference in the rate of revision between the two older age groups (75-84 and ≥85 years) (Tables HP38 and HP39 and Figure HP19).

There is no difference in the rate of revision between males and females (Tables HP40 and HP41 and Figure HP20).

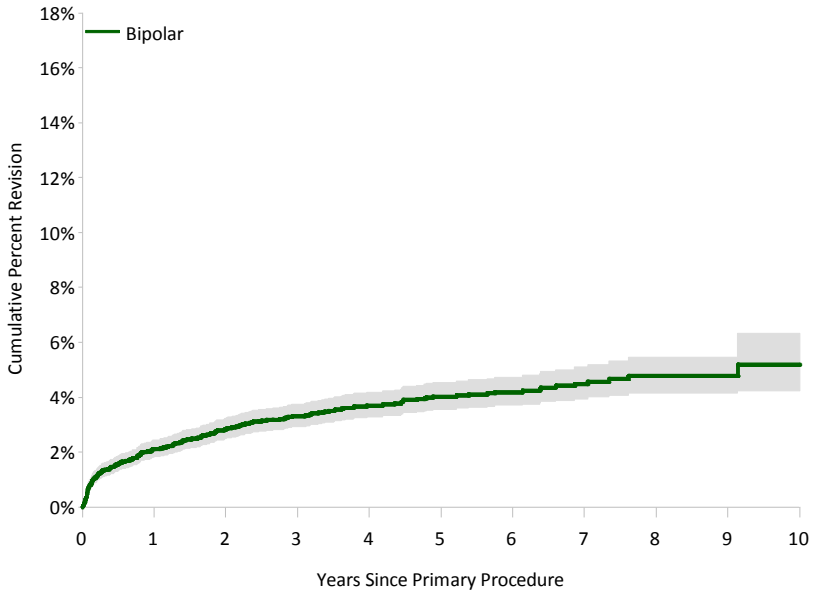
Bipolar hip replacement has a higher rate of revision in the first three months when cementless stems are used. This is due largely to an increased incidence of femoral fracture when a cementless stem is used (53.8% compared to 10.9%). There is no difference in the rate of revision after three months (Tables HP42 and HP43 and Figure HP21).

The revision rates and yearly cumulative percent revision of individual combinations of bipolar stem/head prostheses with 100 or more procedures are detailed in Tables HP44 and HP45.

**Table HP35: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Bipolar | 2.1 (1.8, 2.4) | 3.3 (2.9, 3.7) | 4.0 (3.6, 4.5) | 4.5 (3.9, 5.1) | 5.2 (4.2, 6.3) |

**Figure HP18: Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Bipolar | 9503 | 7020 | 4662 | 2796 | 1241 | 72 |

**Table HP36: Primary Bipolar Hip Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Fracture | 77 | 22.8 |
| Loosening/Lysis | 75 | 22.2 |
| Infection | 61 | 18.0 |
| Prosthesis Dislocation | 60 | 17.8 |
| Pain | 29 | 8.6 |
| Chondrolysis/Acetab. Erosion | 22 | 6.5 |
| Malposition | 2 | 0.6 |
| Other | 12 | 3.6 |
| **TOTAL** | **338** | **100.0** |

**Table HP37: Primary Bipolar Hip Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| Acetabular Component | 125 | 37.0 |
| THR (Femoral/Acetabular) | 80 | 23.7 |
| Bipolar Head and Femoral | 47 | 13.9 |
| Bipolar Only | 30 | 8.9 |
| Femoral Component | 18 | 5.3 |
| Cement Spacer | 15 | 4.4 |
| Head Only | 12 | 3.6 |
| Minor Components | 7 | 2.1 |
| Removal of Prostheses | 4 | 1.2 |
| **TOTAL** | **338** | **100.0** |

Note: Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised.

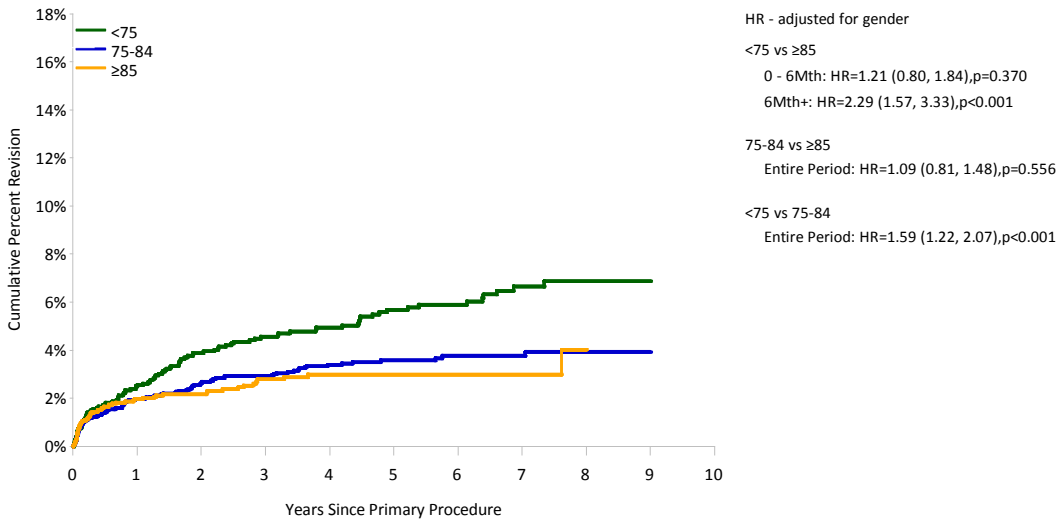
**Table HP38: Revision Rates of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <75 | 108 | 2213 | 9428 | 1.15 (0.94, 1.38) |
| 75-84 | 118 | 4204 | 15199 | 0.78 (0.64, 0.93) |
| ≥85 | 67 | 3086 | 7752 | 0.86 (0.67, 1.10) |
| **TOTAL** | **293** | **9503** | **32379** | **0.90 (0.80, 1.01)** |

**Table HP39: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <75 | 2.6 (1.9, 3.3) | 4.6 (3.7, 5.6) | 5.7 (4.7, 6.9) | 6.6 (5.4, 8.1) | |
| 75-84 | 2.0 (1.6, 2.5) | 2.9 (2.4, 3.5) | 3.6 (3.0, 4.3) | 3.8 (3.1, 4.5) | |
| ≥85 | 2.0 (1.5, 2.6) | 2.8 (2.2, 3.6) | 3.0 (2.3, 3.9) | 3.0 (2.3, 3.9) | |

**Figure HP19: Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <75 | 2213 | 1787 | 1314 | 941 | 491 | 36 |
| 75-84 | 4204 | 3241 | 2241 | 1355 | 590 | 33 |
| ≥85 | 3086 | 1992 | 1107 | 500 | 160 | 3 |

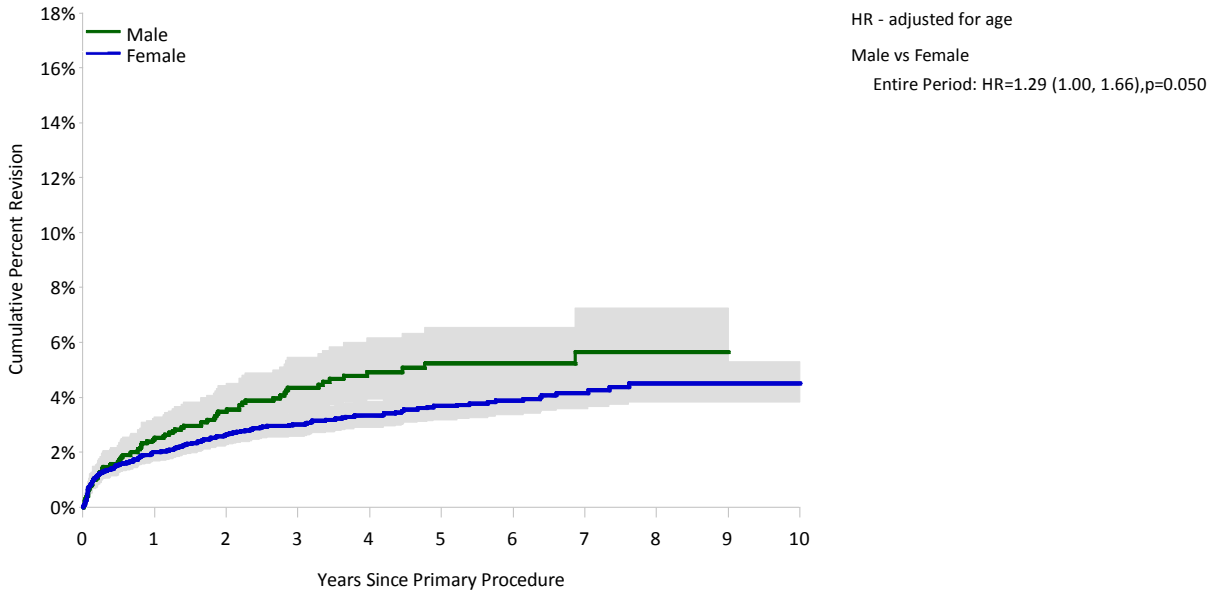
**Table HP40: Revision Rates of Primary Bipolar Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 85 | 2503 | 6934 | 1.23 (0.98, 1.52) |
| Female | 208 | 7000 | 25444 | 0.82 (0.71, 0.94) |
| **TOTAL** | **293** | **9503** | **32379** | **0.90 (0.80, 1.01)** |

**Table HP41: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 2.5 (1.9, 3.3) | 4.3 (3.5, 5.4) | 5.2 (4.2, 6.6) | 5.6 (4.4, 7.3) | |
| Female | 2.0 (1.7, 2.4) | 3.0 (2.6, 3.5) | 3.7 (3.2, 4.2) | 4.2 (3.6, 4.8) | 4.5 (3.8, 5.3) |

**Figure HP20: Cumulative Percent Revision of Primary Bipolar Hip Replacement by Gender (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 2503 | 1629 | 966 | 531 | 215 | 18 |
| Female | 7000 | 5391 | 3696 | 2265 | 1026 | 54 |

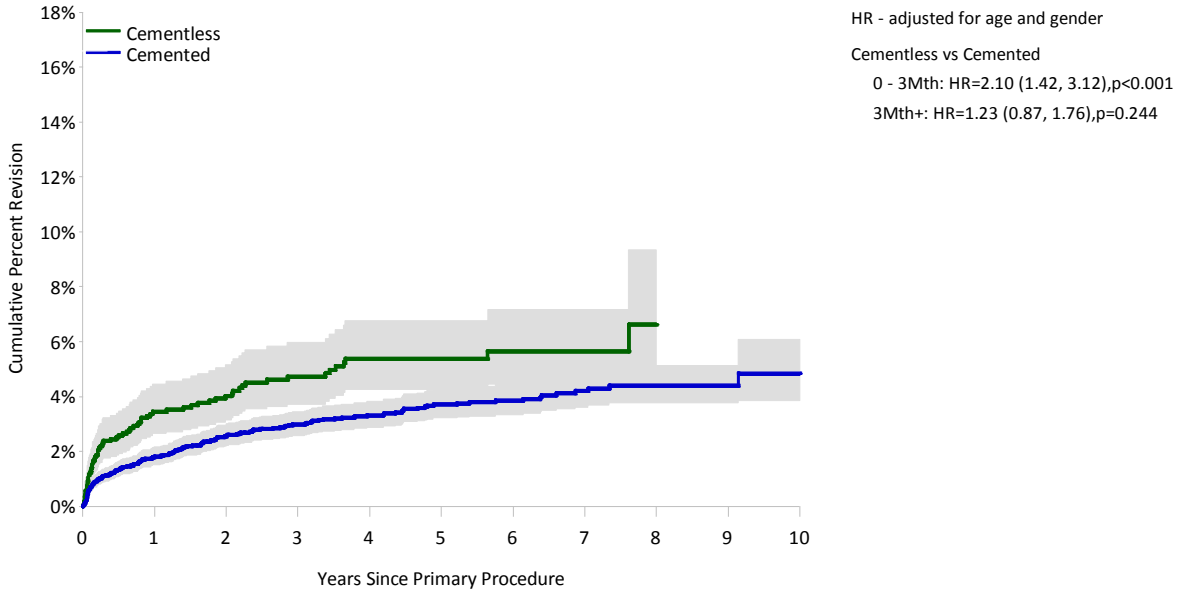
**Table HP42: Revision Rates of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| Femoral Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Cementless | 76 | 1792 | 5619 | 1.35 (1.07, 1.69) |
| Cemented | 217 | 7711 | 26760 | 0.81 (0.71, 0.93) |
| **TOTAL** | **293** | **9503** | **32379** | **0.90 (0.80, 1.01)** |

**Table HP43: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Cementless | 3.4 (2.6, 4.5) | 4.7 (3.7, 6.0) | 5.4 (4.3, 6.8) | 5.7 (4.4, 7.2) | |
| Cemented | 1.8 (1.5, 2.2) | 3.0 (2.6, 3.4) | 3.7 (3.2, 4.3) | 4.2 (3.6, 4.9) | 4.8 (3.8, 6.1) |

**Figure HP21: Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cementless | 1792 | 1293 | 840 | 442 | 156 | 9 |
| Cemented | 7711 | 5727 | 3822 | 2354 | 1085 | 63 |

**Table HP44: Revision Rates of Primary Bipolar Hip Replacement**

| Bipolar Head | Femoral Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Bipolar Head (Zimmer) | Alloclassic | 8 | 358 | 1546 | 0.52 (0.22, 1.02) |
| Centrax | Exeter | 7 | 202 | 1126 | 0.62 (0.25, 1.28) |
| Convene | CPCS | 14 | 345 | 1374 | 1.02 (0.56, 1.71) |
| Convene | Spectron EF | 8 | 165 | 726 | 1.10 (0.48, 2.17) |
| Hastings | C-Stem | 9 | 198 | 745 | 1.21 (0.55, 2.29) |
| Hastings | Corail | 8 | 247 | 628 | 1.27 (0.55, 2.51) |
| Hastings | Elite Plus | 14 | 298 | 1376 | 1.02 (0.56, 1.71) |
| Multipolar Bipolar | CPT | 9 | 265 | 536 | 1.68 (0.77, 3.19) |
| Multipolar Bipolar | VerSys | 7 | 420 | 1083 | 0.65 (0.26, 1.33) |
| Self-Centering | C-Stem | 2 | 110 | 421 | 0.48 (0.06, 1.72) |
| Self-Centering | Corail | 5 | 136 | 352 | 1.42 (0.46, 3.31) |
| Self-Centering | Elite Plus | 3 | 238 | 1042 | 0.29 (0.06, 0.84) |
| Tandem | CPCS | 15 | 662 | 1440 | 1.04 (0.58, 1.72) |
| Tandem | Spectron EF | 10 | 158 | 336 | 2.98 (1.43, 5.47) |
| UHR | ABGII | 11 | 177 | 596 | 1.85 (0.92, 3.30) |
| UHR | Accolade | 6 | 166 | 309 | 1.94 (0.71, 4.22) |
| UHR | Exeter | 8 | 203 | 1117 | 0.72 (0.31, 1.41) |
| UHR | Exeter V40 | 101 | 4153 | 13180 | 0.77 (0.62, 0.93) |
| UHR | Omnifit | 21 | 346 | 1483 | 1.42 (0.88, 2.16) |
| Other (180) | | 72 | 1806 | 6245 | 1.15 (0.90, 1.45) |
| **TOTAL** | | **338** | **10653** | **35660** | **0.95 (0.85, 1.05)** |

Note: Only prostheses with over 100 procedures have been listed.

**Table HP45: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement**

| Bipolar Head | Femoral Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Bipolar Head (Zimmer) | Alloclassic | 0.9 (0.3, 2.8) | 2.3 (1.1, 4.9) | 2.8 (1.4, 5.4) | 2.8 (1.4, 5.4) | |
| Centrax | Exeter | 2.1 (0.8, 5.5) | 2.7 (1.1, 6.5) | 2.7 (1.1, 6.5) | 2.7 (1.1, 6.5) | |
| Convene | CPCS | 2.2 (1.1, 4.6) | 3.3 (1.8, 6.1) | 4.7 (2.8, 8.1) | | |
| Convene | Spectron EF | 2.0 (0.6, 6.0) | 3.7 (1.5, 8.9) | 5.9 (2.8, 12.3) | 5.9 (2.8, 12.3) | |
| Hastings | C-Stem | 2.7 (1.1, 6.3) | 5.8 (3.0, 11.1) | 5.8 (3.0, 11.1) | 5.8 (3.0, 11.1) | |
| Hastings | Corail | 3.7 (1.8, 7.2) | 3.7 (1.8, 7.2) | 3.7 (1.8, 7.2) | | |
| Hastings | Elite Plus | 1.9 (0.8, 4.6) | 4.3 (2.3, 7.9) | 5.4 (3.1, 9.4) | 7.0 (4.1, 11.7) | |
| Multipolar Bipolar | CPT | 3.5 (1.7, 6.8) | 4.3 (2.2, 8.2) | | | |
| Multipolar Bipolar | VerSys | 1.2 (0.4, 3.1) | 2.3 (1.1, 4.9) | 2.3 (1.1, 4.9) | | |
| Self-Centering | C-Stem | 1.0 (0.1, 6.6) | 2.1 (0.5, 8.3) | | | |
| Self-Centering | Corail | 3.9 (1.7, 9.2) | 3.9 (1.7, 9.2) | | | |
| Self-Centering | Elite Plus | 0.0 (0.0, 0.0) | 0.6 (0.1, 3.9) | 1.3 (0.3, 5.2) | 3.2 (0.9, 11.3) | |
| Tandem | CPCS | 2.1 (1.2, 3.8) | 3.3 (2.0, 5.6) | | | |
| Tandem | Spectron EF | 2.1 (0.7, 6.4) | 9.8 (5.0, 18.6) | | | |
| UHR | ABGII | 4.4 (2.1, 9.1) | 5.3 (2.7, 10.4) | 8.9 (4.9, 15.9) | | |
| UHR | Accolade | 2.9 (1.1, 7.7) | | | | |
| UHR | Exeter | 1.6 (0.5, 5.0) | 3.5 (1.6, 7.7) | 5.0 (2.5, 9.7) | 5.0 (2.5, 9.7) | |
| UHR | Exeter V40 | 1.7 (1.4, 2.2) | 2.5 (2.0, 3.1) | 3.4 (2.7, 4.1) | 3.8 (3.0, 4.7) | |
| UHR | Omnifit | 5.3 (3.3, 8.4) | 5.7 (3.6, 8.9) | 6.1 (3.9, 9.5) | 7.8 (4.9, 12.1) | |
| Other (180) | | 2.8 (2.1, 3.8) | 4.2 (3.3, 5.4) | 5.1 (4.0, 6.5) | 5.6 (4.3, 7.1) | |

# PRIMARY TOTAL HIP REPLACEMENT

## Classes of Total Hip Replacement

The Registry sub-categorises primary total hip replacement into three classes. These are defined by the type of femoral prosthesis used. A total hip procedure replaces both the femoral and acetabular articular surfaces.

1. **Total conventional** includes acetabular replacement combined with resection of the femoral head and replacement with a stemmed femoral prosthesis and femoral head prosthesis.

2. **Total resurfacing** includes acetabular replacement and the use of a femoral prosthesis that replaces the femoral articular surface without resecting the head.

3. **Thrust plate** includes acetabular replacement combined with resection of the femoral head and replacement with a femoral component that has a lateral fixation plate and femoral head prosthesis.

## Use of Total Hip Replacement

Total conventional is the most common primary total hip replacement (93.1%), followed by total resurfacing (6.8%). The Registry has recorded only a small number of thrust plate procedures (Table HT1).

**Table HT1: Total Hip Replacement by Class**

| Total Hip Class | Number | Percent |
|---|---|---|
| Total Conventional | 196582 | 93.1 |
| Total Resurfacing | 14298 | 6.8 |
| Thrust Plate | 234 | 0.1 |
| **TOTAL** | **211114** | **100.0** |

Osteoarthritis is the principal diagnosis for primary total hip replacement (88.8%).

At ten years, total conventional hip replacement has a lower cumulative percent revision compared to total resurfacing (Tables HT2 and HT3).

*Detailed information on the demographics of each class of primary total hip replacement is provided in the supplementary report 'Demographics of Hip Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

**Table HT2: Revision Rates of Primary Total Hip Replacement by Class**

| Total Hip Class | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Total Conventional | 6321 | 196582 | 812718 | 0.78 (0.76, 0.80) |
| Total Resurfacing | 660 | 14298 | 68673 | 0.96 (0.89, 1.04) |
| Thrust Plate | 5 | 234 | 1266 | 0.40 (0.13, 0.92) |
| **TOTAL** | **6986** | **211114** | **882656** | **0.79 (0.77, 0.81)** |

**Table HT3: Yearly Cumulative Percent Revision of Primary Total Hip Replacement by Class**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Total Conventional | 1.6 (1.5, 1.6) | 2.7 (2.7, 2.8) | 3.6 (3.5, 3.7) | 4.5 (4.4, 4.7) | 6.4 (6.1, 6.7) |
| Total Resurfacing | 1.9 (1.6, 2.1) | 3.2 (2.9, 3.5) | 4.7 (4.3, 5.1) | 6.3 (5.8, 6.9) | 7.7 (6.8, 8.8) |
| Thrust Plate | 0.9 (0.2, 3.4) | 1.4 (0.4, 4.3) | 2.7 (1.1, 6.4) | 2.7 (1.1, 6.4) | |

# Primary Total Conventional Hip Replacement

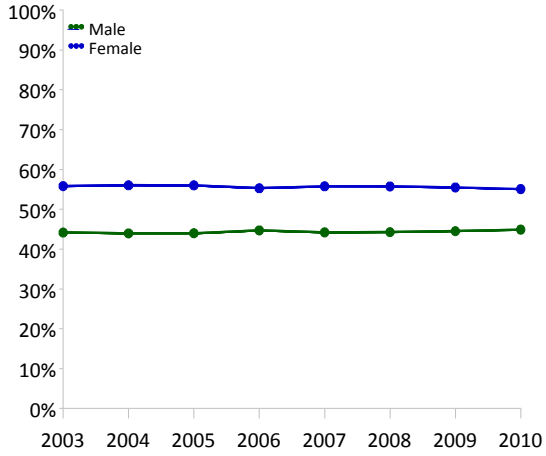
## Demographics

There have been 196,582 total conventional procedures reported to the Registry, an additional 25,478 procedures compared to the last report.

Osteoarthritis is the principal diagnosis for total conventional hip replacement (88.3%), followed by fractured neck of femur (3.7%), osteonecrosis (3.7%), developmental dysplasia (1.3%) and rheumatoid arthritis (1.3%).

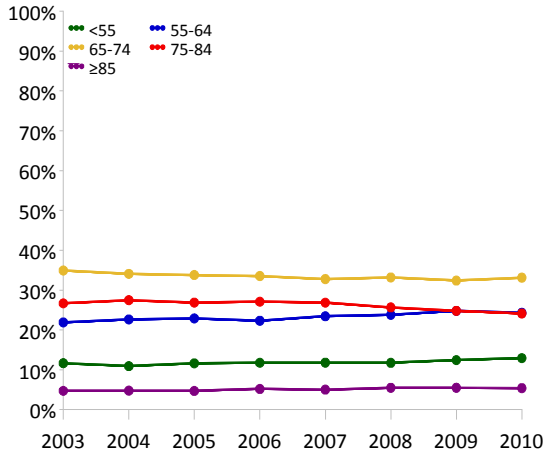
Total conventional hip replacement is more common in females (55.4%). This proportion has remained constant since 2003 (Figure HT1).

**Figure HT1: Primary Total Conventional Hip Replacement by Gender**



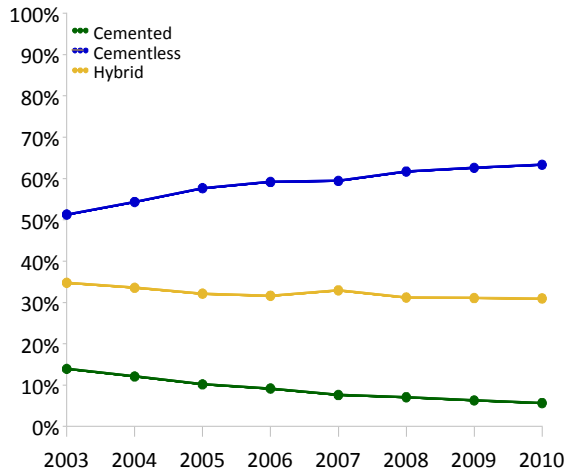

There has been a small increase in the proportion of patients aged 55-64 years (21.9% in 2003 to 24.3% in 2010). There has also been a small increase in the proportion of patients younger than 55 years receiving total conventional hip replacement during this period (11.7% in 2003 and 13.0% in 2010) (Figure HT2).

**Figure HT2: Primary Total Conventional Hip Replacement by Age**




The use of cementless fixation has increased from 51.3% in 2003 to 63.3% in 2010. During the same period, cemented fixation has declined from 13.9% to 5.7% and hybrid from 34.8% to 31.0% (Figure HT3).

**Figure HT3: Primary Total Conventional Hip Replacement by Fixation**




The Exeter V40 and the Corail remain the most used femoral stems for total conventional hip replacement. The Quadra-H, Anthology and M/L Taper Kinectiv have made the ten most used list for the first time in 2010. SL-Plus, CPCS and Spectron EF stems have not been listed in 2010 (Table HT4). In 2010, 66.3% of conventional hip replacements used stems that are reported in the ten most used femoral component list. Eight of these stems are cementless stems. The ten most used cemented and cementless stems are listed separately in Tables HT6 and HT7.

Since 2003, the Trident has been the most frequently used acetabular prosthesis. The Continuum and Tritanium prostheses are listed for the first time. The Trabecular Metal Shell and ASR have not been listed. The ASR acetabular component was withdrawn from the Australian market in 2009. In 2010, 77.7% of total conventional hip replacements used acetabular components from the ten most used acetabular component list (Table HT5). All of the acetabular components in this list are cementless prostheses. The ten most used cemented and cementless acetabular prostheses are listed separately in Tables HT8 and HT9.

**Table HT4: Ten Most Used Femoral Components in Primary Total Conventional Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 3901 | Exeter V40 | 4724 | Exeter V40 | 4877 | Exeter V40 | 5295 | Exeter V40 | 5556 | Exeter V40 |
| 1028 | ABGII | 2054 | Corail | 3153 | Corail | 3603 | Corail | 3986 | Corail |
| 1000 | Synergy | 1570 | Accolade | 1184 | Accolade | 1123 | Accolade | 1176 | CPT |
| 885 | VerSys | 1116 | Synergy | 1110 | Synergy | 1038 | CPT | 1024 | Secur-Fit |
| 819 | Alloclassic | 1080 | Alloclassic | 1076 | Alloclassic | 1027 | Synergy | 970 | Quadra-H |
| 783 | Spectron EF | 829 | Spectron EF | 1068 | CPT | 920 | Secur-Fit | 970 | Synergy |
| 713 | Secur-Fit Plus | 738 | CPT | 709 | Anthology | 917 | Alloclassic | 898 | Accolade |
| 618 | Omnifit | 565 | SL-Plus | 695 | Spectron EF | 737 | Spectron EF | 753 | Anthology |
| 565 | C-Stem | 563 | Summit | 663 | SL-Plus | 701 | CPCS | 682 | Alloclassic |
| 484 | S-Rom | 522 | VerSys | 663 | Summit | 701 | SL-Plus | 629 | M/L Taper Kinectiv |
| **Ten Most Used** | | | | | | | | | |
| 10796 | (10) 63.2% | 13761 | (10) 67.4% | 15198 | (10) 68.0% | 16062 | (10) 67.8% | 16644 | (10) 66.3% |
| **Remainder** | | | | | | | | | |
| 6276 | (69) 36.8% | 6656 | (96) 32.6% | 7165 | (99) 32.0% | 7643 | (101) 32.2% | 8458 | (104) 33.7% |
| **TOTAL** | | | | | | | | | |
| 17072 | (79) 100.0% | 20417 | (106) 100.0% | 22363 | (109) 100.0% | 23705 | (111) 100.0% | 25102 | (114) 100.0% |

**Table HT5: Ten Most Used Acetabular Components in Primary Total Conventional Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 3986 | Trident | 6077 | Trident | 5664 | Trident | 6520 | Trident | 6106 | Trident |
| 1748 | Reflection (cementless) | 2325 | Reflection (cementless) | 3264 | Pinnacle | 4031 | Pinnacle | 5059 | Pinnacle |
| 1524 | Trilogy | 2153 | Pinnacle | 1904 | R3 | 2276 | R3 | 2416 | R3 |
| 955 | Vitalock | 1365 | Trilogy | 1637 | Trilogy | 1409 | Trilogy | 1209 | Trilogy |
| 905 | Duraloc | 1185 | ASR | 1195 | Reflection (cementless) | 982 | Reflection (cementless) | 1081 | Continuum |
| 826 | ABGII | 893 | Allofit | 1173 | ASR | 909 | Allofit | 803 | Reflection (cementless) |
| 793 | Allofit | 580 | BHR | 954 | Allofit | 819 | Trabecular Metal Shell | 802 | Versafit |
| 729 | Mallory-Head | 490 | Trabecular Metal Shell | 617 | Trabecular Metal Shell | 512 | DeltaMotion | 790 | Allofit |
| 539 | Contemporary | 444 | Contemporary | 475 | BHR | 452 | Versafit | 676 | DeltaMotion |
| 537 | Pinnacle | 432 | EPF-Plus | 427 | Contemporary | 427 | ASR | 571 | Tritanium |
| **Ten Most Used** | | | | | | | | | |
| 12542 | (10) 73.5% | 15944 | (10) 78.1% | 17310 | (10) 77.4% | 18337 | (10) 77.4% | 19513 | (10) 77.7% |
| **Remainder** | | | | | | | | | |
| 4530 | (67) 26.5% | 4473 | (76) 21.9% | 5053 | (75) 22.6% | 5368 | (73) 22.6% | 5589 | (71) 22.3% |
| **TOTAL** | | | | | | | | | |
| 17072 | (77) 100.0% | 20417 | (86) 100.0% | 22363 | (85) 100.0% | 23705 | (83) 100.0% | 25102 | (81) 100.0% |

**Table HT6: Ten Most Used Femoral Components in Primary Total Conventional Hip Replacement with Cement Fixation**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 3901 | Exeter V40 | 4723 | Exeter V40 | 4877 | Exeter V40 | 5295 | Exeter V40 | 5555 | Exeter V40 |
| 783 | Spectron EF | 829 | Spectron EF | 1068 | CPT | 1037 | CPT | 1175 | CPT |
| 565 | C-Stem | 738 | CPT | 694 | Spectron EF | 737 | Spectron EF | 625 | Spectron EF |
| 477 | CPT | 497 | CPCS | 639 | CPCS | 701 | CPCS | 615 | CPCS |
| 445 | Elite Plus | 383 | C-Stem | 243 | C-Stem | 235 | C-Stem | 367 | C-Stem |
| 358 | MS 30 | 193 | MS 30 | 219 | MS 30 | 223 | Omnifit | 235 | Omnifit |
| 339 | Omnifit | 165 | Omnifit | 181 | Omnifit | 148 | MS 30 | 176 | MS 30 |
| 321 | Charnley | 130 | VerSys | 162 | Charnley | 118 | Charnley | 59 | Charnley |
| 244 | CPCS | 108 | Charnley | 53 | R120 | 26 | R120 | 44 | Quadra-C |
| 146 | VerSys | 53 | Adapter | 38 | Adapter | 24 | Lubinus SP II | 43 | Profemur Xm |
| **Ten Most Used** | | | | | | | | | |
| 7579 | (10) 91.8% | 7819 | (10) 95.3% | 8174 | (10) 96.2% | 8544 | (10) 97.3% | 8894 | (10) 97.5% |
| **Remainder** | | | | | | | | | |
| 677 | (35) 8.2% | 387 | (26) 4.7% | 325 | (35) 3.8% | 241 | (32) 2.7% | 232 | (31) 2.5% |
| **TOTAL** | | | | | | | | | |
| 8256 | (45) 100.0% | 8206 | (36) 100.0% | 8499 | (45) 100.0% | 8785 | (42) 100.0% | 9126 | (41) 100.0% |

**Table HT7: Ten Most Used Femoral Components in Primary Total Conventional Hip Replacement with Cementless Fixation**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 1025 | ABGII | 2054 | Corail | 3153 | Corail | 3602 | Corail | 3983 | Corail |
| 979 | Synergy | 1568 | Accolade | 1184 | Accolade | 1121 | Accolade | 1024 | Secur-Fit |
| 819 | Alloclassic | 1104 | Synergy | 1101 | Synergy | 1018 | Synergy | 970 | Quadra-H |
| 739 | VerSys | 1080 | Alloclassic | 1076 | Alloclassic | 920 | Secur-Fit | 970 | Synergy |
| 712 | Secur-Fit Plus | 565 | SL-Plus | 705 | Anthology | 917 | Alloclassic | 898 | Accolade |
| 483 | S-Rom | 558 | Summit | 662 | SL-Plus | 701 | SL-Plus | 751 | Anthology |
| 482 | Secur-Fit | 508 | Anthology | 643 | Summit | 690 | Anthology | 682 | Alloclassic |
| 376 | Corail | 476 | S-Rom | 616 | Secur-Fit | 531 | Quadra-H | 628 | M/L Taper Kinectiv |
| 333 | Accolade | 443 | Secur-Fit | 450 | S-Rom | 433 | Summit | 512 | Summit |
| 329 | Mallory-Head | 429 | ABGII | 369 | ABGII | 385 | Taperloc | 473 | SL-Plus |
| **Ten Most Used** | | | | | | | | | |
| 6277 | (10) 71.2% | 8785 | (10) 71.9% | 9959 | (10) 71.8% | 10318 | (10) 69.2% | 10891 | (10) 68.2% |
| **Remainder** | | | | | | | | | |
| 2539 | (47) 28.8% | 3426 | (74) 28.1% | 3905 | (75) 28.2% | 4602 | (79) 30.8% | 5085 | (86) 31.8% |
| **TOTAL** | | | | | | | | | |
| 8816 | (57) 100.0% | 12211 | (84) 100.0% | 13864 | (85) 100.0% | 14920 | (89) 100.0% | 15976 | (96) 100.0% |

**Table HT8: Ten Most Used Acetabular Components in Primary Total Conventional Hip Replacement with Cement Fixation**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 539 | Contemporary | 444 | Contemporary | 427 | Contemporary | 393 | Exeter Contemporary | 380 | Exeter Contemporary |
| 256 | Exeter | 355 | Exeter Contemporary | 356 | Exeter Contemporary | 341 | Contemporary | 289 | Contemporary |
| 250 | Reflection (cemented) | 216 | Reflection (cemented) | 213 | Reflection (cemented) | 145 | Reflection (cemented) | 141 | Marathon |
| 227 | Exeter Contemporary | 109 | Exeter | 115 | Exeter | 142 | Exeter | 128 | Reflection (cemented) |
| 199 | Charnley Ogee | 72 | Brunswick | 89 | ZCA | 73 | Brunswick | 123 | Exeter |
| 149 | Elite Plus LPW | 60 | ZCA | 79 | Charnley | 69 | ZCA | 111 | ZCA |
| 130 | Low Profile Cup | 55 | Charnley | 70 | Brunswick | 58 | CCB | 97 | Brunswick |
| 110 | Elite Plus Ogee | 52 | CCB | 48 | CCB | 53 | Charnley | 46 | CCB |
| 102 | Charnley | 41 | Elite Plus LPW | 42 | Low Profile Cup | 43 | Marathon | 46 | Exeter X3 Rimfit |
| 90 | ZCA | 36 | Low Profile Cup | 36 | Charnley Ogee | 30 | Charnley Ogee | 30 | Low Profile Cup |
| **Ten Most Used** | | | | | | | | | |
| 2052 | (10) 84.1% | 1440 | (10) 88.1% | 1475 | (10) 89.5% | 1347 | (10) 85.5% | 1391 | (10) 92.7% |
| **Remainder** | | | | | | | | | |
| 388 | (34) 15.9% | 194 | (32) 11.9% | 173 | (33) 10.5% | 229 | (32) 14.5% | 110 | (26) 7.3% |
| **TOTAL** | | | | | | | | | |
| 2440 | (44) 100.0% | 1634 | (42) 100.0% | 1648 | (43) 100.0% | 1576 | (42) 100.0% | 1501 | (36) 100.0% |

**Table HT9: Ten Most Used Acetabular Components in Primary Total Conventional Hip Replacement with Cementless Fixation**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 3983 | Trident | 6057 | Trident | 5642 | Trident | 6491 | Trident | 6092 | Trident |
| 1742 | Reflection (cementless) | 2317 | Reflection (cementless) | 3262 | Pinnacle | 4031 | Pinnacle | 5057 | Pinnacle |
| 1524 | Trilogy | 2150 | Pinnacle | 1902 | R3 | 2273 | R3 | 2410 | R3 |
| 954 | Vitalock | 1363 | Trilogy | 1629 | Trilogy | 1401 | Trilogy | 1209 | Trilogy |
| 900 | Duraloc | 1185 | ASR | 1193 | Reflection (cementless) | 975 | Reflection (cementless) | 1081 | Continuum |
| 825 | ABGII | 891 | Allofit | 1171 | ASR | 905 | Allofit | 802 | Versafit |
| 786 | Allofit | 577 | BHR | 949 | Allofit | 803 | Trabecular Metal Shell | 795 | Reflection (cementless) |
| 728 | Mallory-Head | 479 | Trabecular Metal Shell | 606 | Trabecular Metal Shell | 512 | DeltaMotion | 789 | Allofit |
| 536 | Pinnacle | 431 | EPF-Plus | 474 | BHR | 452 | Versafit | 676 | DeltaMotion |
| 521 | Fitmore | 395 | Mallory-Head | 411 | EPF-Plus | 426 | ASR | 568 | Tritanium |
| **Ten Most Used** | | | | | | | | | |
| 12499 | (10) 85.4% | 15845 | (10) 84.4% | 17239 | (10) 83.2% | 18269 | (10) 82.6% | 19479 | (10) 82.5% |
| **Remainder** | | | | | | | | | |
| 2133 | (41) 14.6% | 2938 | (51) 15.6% | 3476 | (49) 16.8% | 3860 | (46) 17.4% | 4122 | (48) 17.5% |
| **TOTAL** | | | | | | | | | |
| 14632 | (51) 100.0% | 18783 | (61) 100.0% | 20715 | (59) 100.0% | 22129 | (56) 100.0% | 23601 | (58) 100.0% |

## Outcome by Patient Characteristics

The cumulative percent revision at ten years for primary total conventional hip replacement undertaken for osteoarthritis is 6.2% (Table HT10 and Figure HT4).

### Reason for Revision

The most common reasons for revision of primary total conventional hip replacement are loosening/lysis (30.1%), followed by prostheses dislocation (25.9%), infection (16.8%), fracture (14.6%) and metal sensitivity (2.1%) (Table HT11). In the last year metal sensitivity as a reason for revision increased from 1.2% to 2.1%.

The Registry links loosening/lysis as they often occur in association, particularly in late revision, secondary to wear related inflammation. The aetiology of loosening however varies with time. Early revision with a diagnosis of loosening is usually a consequence of not obtaining adequate initial fixation.

The term metal sensitivity when used in this report is a diagnosis that encompasses the entire spectrum of metal related pathology.

The incidence of the five most common reasons for revision all increase with time, however the rate of increase varies depending on the reason for revision. Initially the incidence of revision for dislocation increases rapidly, however, after the first few months it increases at a slower rate. Loosening/lysis shows a linear increase and at three years exceeds dislocation to become the most common reason for revision. In a similar way to dislocation, infection and fracture show a high initial increase in incidence but to a lesser extent. Metal sensitivity is the fifth most common reason for revision. It has a linear increase but the incidence remains low over the entire period. (Figure HT5).

### Type of Revision

The type of revision is influenced by the reason for revision. As these change with time, the relative proportion of each type of revision will also change. Currently, the five most common types of revision of primary total conventional hip replacement recorded by the Registry are femoral only revision (28.7%), acetabular only (25.6%), head and insert (17.3%), THR (femoral/acetabular) (12.9%) and head only (5.5%) (Table HT12).

### Primary Diagnosis

Ten diagnoses for primary total conventional hip replacement have been recorded by the Registry. The outcomes of the five most common (osteoarthritis, osteonecrosis, fractured neck of femur, rheumatoid arthritis and developmental dysplasia) are listed in Tables HT13 and HT14.

Primary total conventional hip replacement performed for osteoarthritis has a significantly lower rate of revision compared to osteonecrosis, fractured neck of femur and rheumatoid arthritis. Osteoarthritis has a significantly lower rate of revision compared to developmental dysplasia in the first month, but there is no difference after that time (Figure HT6).

### Age and Gender

There is a significant difference in the rate of revision with respect to age. In the first six months, patients over 75 years of age have a significantly higher rate of revision compared to those aged 65 to 74 years. After this time, the rate of revision decreases with increasing age (Tables HT15 and HT16 and Figure HT7).

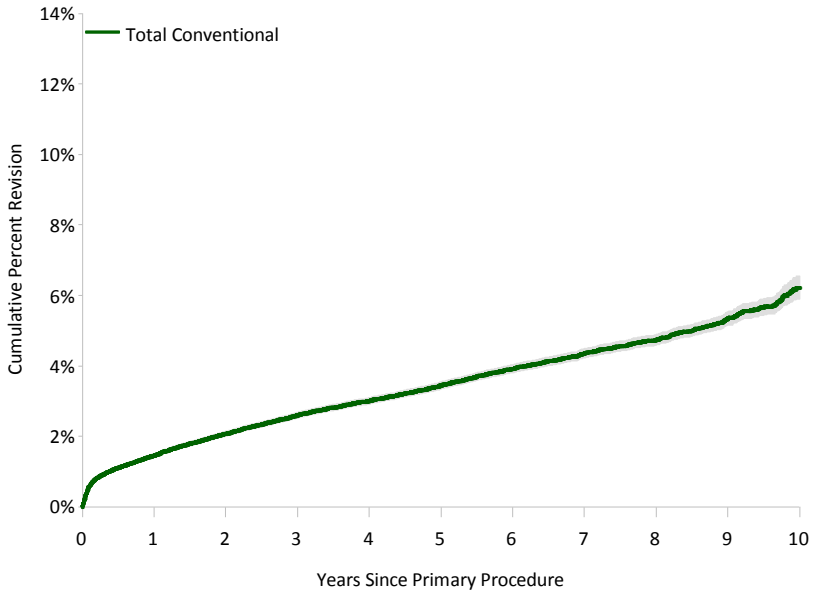
Last year for the first time the Registry identified a difference in the rate of revision with respect to gender. Although the difference is small, it remains significant (Tables HT17 and HT18 and Figure HT8).

The Registry continues to report a difference in the rate of revision between age within gender. For females, the rate of revision decreases with increasing age. Females under 55 years have a higher cumulative percent revision at 10 years (7%) compared to females 75 years or older (4.6%). The relationship between revision rate and age for males is not as apparent although there is a higher cumulative percent revision at ten years in the two age groups below 65 years compared to the two older age groups (Tables HT19 and HT20 and Figures HT9 and HT10).

**Table HT10: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Total Conventional | 1.5 (1.4, 1.5) | 2.6 (2.5, 2.7) | 3.4 (3.3, 3.5) | 4.4 (4.2, 4.5) | 6.2 (5.9, 6.5) |

**Figure HT4: Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Total Conventional | 173591 | 147321 | 102828 | 65860 | 34269 | 2463 |

**Table HT11: Primary Total Conventional Hip Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Loosening/Lysis | 1902 | 30.1 |
| Prosthesis Dislocation | 1634 | 25.9 |
| Infection | 1061 | 16.8 |
| Fracture | 925 | 14.6 |
| Metal Sensitivity | 133 | 2.1 |
| Pain | 132 | 2.1 |
| Leg Length Discrepancy | 82 | 1.3 |
| Malposition | 68 | 1.1 |
| Implant Breakage Acetabular | 59 | 0.9 |
| Implant Breakage Stem | 53 | 0.8 |
| Incorrect Sizing | 43 | 0.7 |
| Implant Breakage Hip Insert | 38 | 0.6 |
| Instability | 33 | 0.5 |
| Wear Hip Insert | 25 | 0.4 |
| Implant Breakage Head | 23 | 0.4 |
| Other | 110 | 1.7 |
| **TOTAL** | **6321** | **100.0** |

**Table HT12: Primary Total Conventional Hip Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| Femoral Component | 1817 | 28.7 |
| Acetabular Component | 1619 | 25.6 |
| Head/Insert | 1095 | 17.3 |
| THR (Femoral/Acetabular) | 813 | 12.9 |
| Head Only | 348 | 5.5 |
| Cement Spacer | 304 | 4.8 |
| Minor Components | 101 | 1.6 |
| Insert Only | 83 | 1.3 |
| Removal of Prostheses | 43 | 0.7 |
| Head/Neck | 43 | 0.7 |
| Head/Neck/Insert | 39 | 0.6 |
| Reinsertion of Components | 8 | 0.1 |
| Bipolar Only | 3 | 0.0 |
| Neck Only | 3 | 0.0 |
| Saddle | 2 | 0.0 |
| **TOTAL** | **6321** | **100.0** |

Note: Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised.

**Figure HT5: Revision Diagnosis Cumulative Incidence of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)**

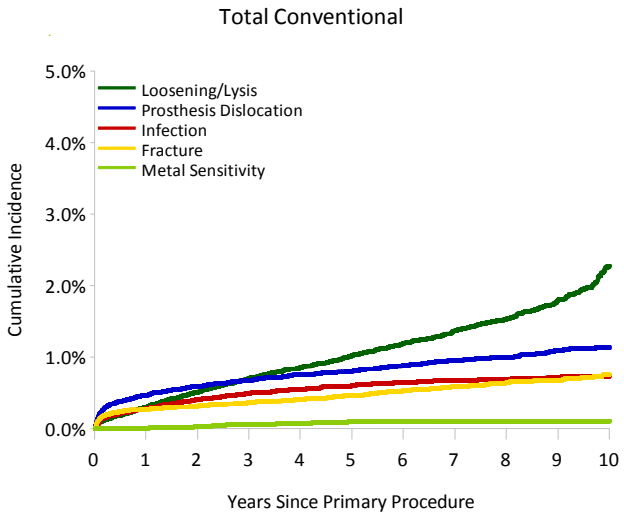


**Table HT13: Revision Rates of Primary Total Conventional Hip Replacement by Primary Diagnosis**

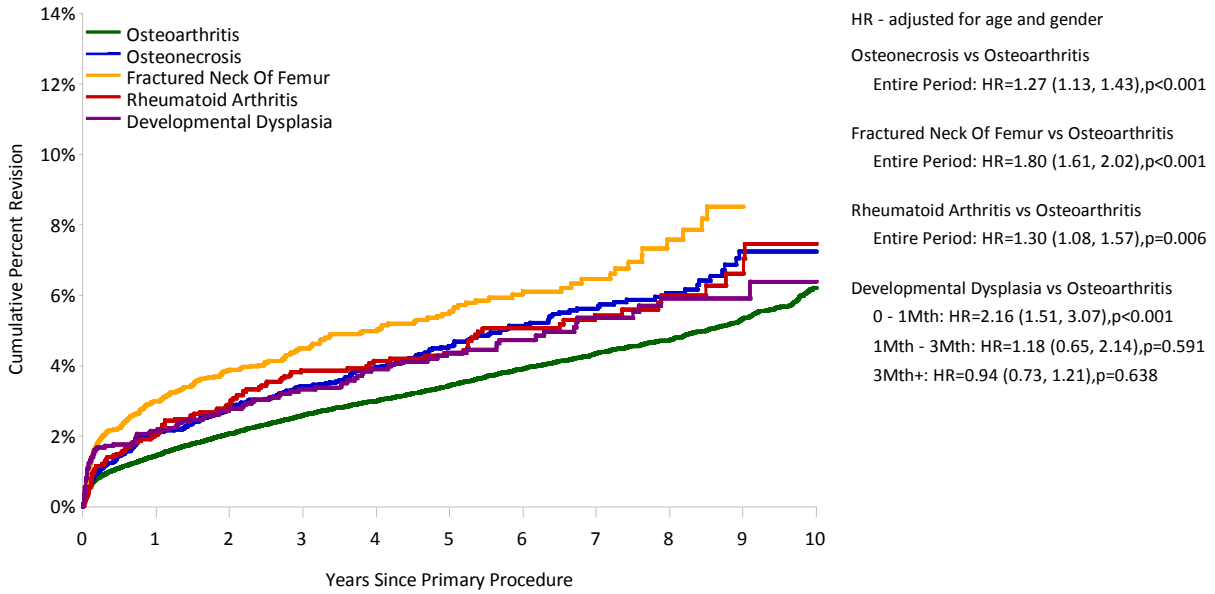
| Primary Diagnosis | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Osteoarthritis | 5353 | 173591 | 725009 | 0.74 (0.72, 0.76) |
| Osteonecrosis | 296 | 7180 | 30945 | 0.96 (0.85, 1.07) |
| Fractured Neck Of Femur | 316 | 7353 | 22147 | 1.43 (1.27, 1.59) |
| Rheumatoid Arthritis | 113 | 2519 | 12019 | 0.94 (0.77, 1.13) |
| Developmental Dysplasia | 105 | 2570 | 11794 | 0.89 (0.73, 1.08) |
| Other (6) | 138 | 3369 | 10803 | 1.28 (1.07, 1.51) |
| **TOTAL** | **6321** | **196582** | **812718** | **0.78 (0.76, 0.80)** |

Note: Only prostheses with over 1000 procedures have been listed.

**Table HT14: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Osteoarthritis | 1.5 (1.4, 1.5) | 2.6 (2.5, 2.7) | 3.4 (3.3, 3.5) | 4.4 (4.2, 4.5) | 6.2 (5.9, 6.5) |
| Osteonecrosis | 2.1 (1.8, 2.5) | 3.4 (3.0, 3.9) | 4.6 (4.0, 5.2) | 5.6 (5.0, 6.4) | 7.2 (6.2, 8.5) |
| Fractured Neck Of Femur | 3.0 (2.6, 3.4) | 4.5 (4.0, 5.1) | 5.5 (4.9, 6.3) | 6.5 (5.6, 7.4) | |
| Rheumatoid Arthritis | 2.0 (1.6, 2.7) | 3.9 (3.1, 4.8) | 4.4 (3.6, 5.3) | 5.4 (4.5, 6.6) | 7.5 (5.8, 9.6) |
| Developmental Dysplasia | 2.2 (1.7, 2.8) | 3.3 (2.7, 4.1) | 4.4 (3.5, 5.4) | 5.4 (4.4, 6.6) | 6.4 (5.0, 8.1) |
| Other (6) | 2.8 (2.3, 3.5) | 4.4 (3.7, 5.3) | 5.2 (4.3, 6.2) | 6.0 (5.0, 7.3) | 7.6 (5.7, 10.1) |

**Figure HT6: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Osteoarthritis | 173591 | 147321 | 102828 | 65860 | 34269 | 2463 |
| Osteonecrosis | 7180 | 6132 | 4337 | 2907 | 1576 | 131 |
| Fractured Neck Of Femur | 7353 | 5454 | 3076 | 1545 | 679 | 37 |
| Rheumatoid Arthritis | 2519 | 2219 | 1685 | 1170 | 685 | 72 |
| Developmental Dysplasia | 2570 | 2218 | 1642 | 1153 | 655 | 57 |

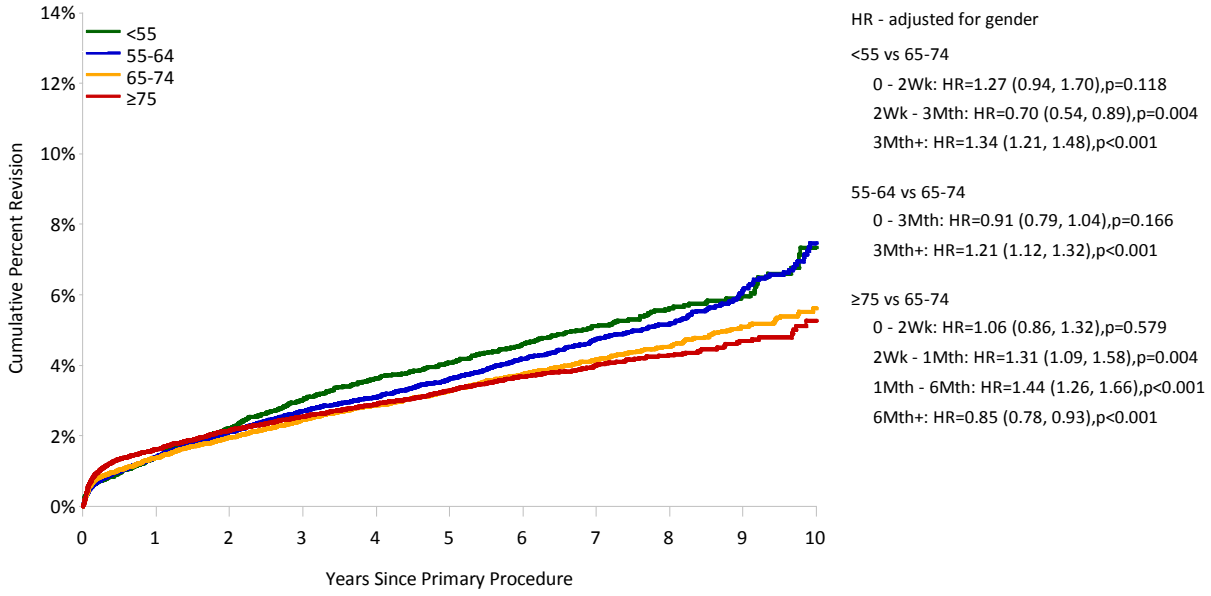
**Table HT15: Revision Rates of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <55 | 640 | 17919 | 76038 | 0.84 (0.78, 0.91) |
| 55-64 | 1363 | 41069 | 172929 | 0.79 (0.75, 0.83) |
| 65-74 | 1822 | 61065 | 262867 | 0.69 (0.66, 0.73) |
| ≥75 | 1528 | 53538 | 213175 | 0.72 (0.68, 0.75) |
| **TOTAL** | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT16: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <55 | 1.4 (1.2, 1.6) | 3.0 (2.8, 3.3) | 4.1 (3.7, 4.4) | 5.1 (4.7, 5.6) | 7.3 (6.4, 8.4) |
| 55-64 | 1.4 (1.3, 1.5) | 2.7 (2.5, 2.9) | 3.6 (3.4, 3.8) | 4.7 (4.5, 5.0) | 7.5 (6.7, 8.3) |
| 65-74 | 1.4 (1.3, 1.5) | 2.5 (2.3, 2.6) | 3.3 (3.1, 3.4) | 4.2 (4.0, 4.4) | 5.6 (5.2, 6.1) |
| ≥75 | 1.6 (1.5, 1.7) | 2.5 (2.4, 2.7) | 3.3 (3.1, 3.5) | 4.0 (3.8, 4.2) | 5.3 (4.7, 5.9) |

**Figure HT7: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <55 | 17919 | 15061 | 10582 | 6978 | 3948 | 347 |
| 55-64 | 41069 | 34852 | 24219 | 15853 | 8449 | 707 |
| 65-74 | 61065 | 52218 | 37105 | 24399 | 13034 | 934 |
| ≥75 | 53538 | 45190 | 30922 | 18630 | 8838 | 475 |

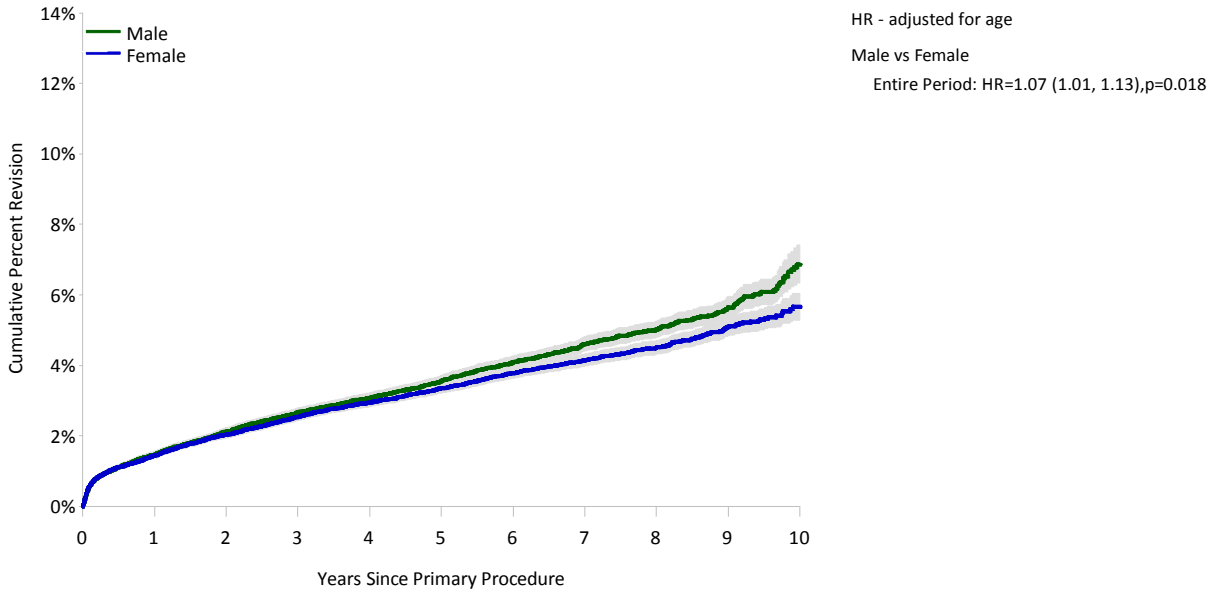
**Table HT17: Revision Rates of Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 2547 | 79577 | 330398 | 0.77 (0.74, 0.80) |
| Female | 2806 | 94014 | 394611 | 0.71 (0.69, 0.74) |
| **TOTAL** | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT18: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 1.5 (1.4, 1.6) | 2.7 (2.5, 2.8) | 3.6 (3.4, 3.7) | 4.6 (4.4, 4.8) | 6.9 (6.3, 7.4) |
| Female | 1.4 (1.4, 1.5) | 2.5 (2.4, 2.6) | 3.3 (3.2, 3.5) | 4.1 (4.0, 4.3) | 5.7 (5.3, 6.0) |

**Figure HT8: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 79577 | 67300 | 46742 | 29775 | 15628 | 1132 |
| Female | 94014 | 80021 | 56086 | 36085 | 18641 | 1331 |

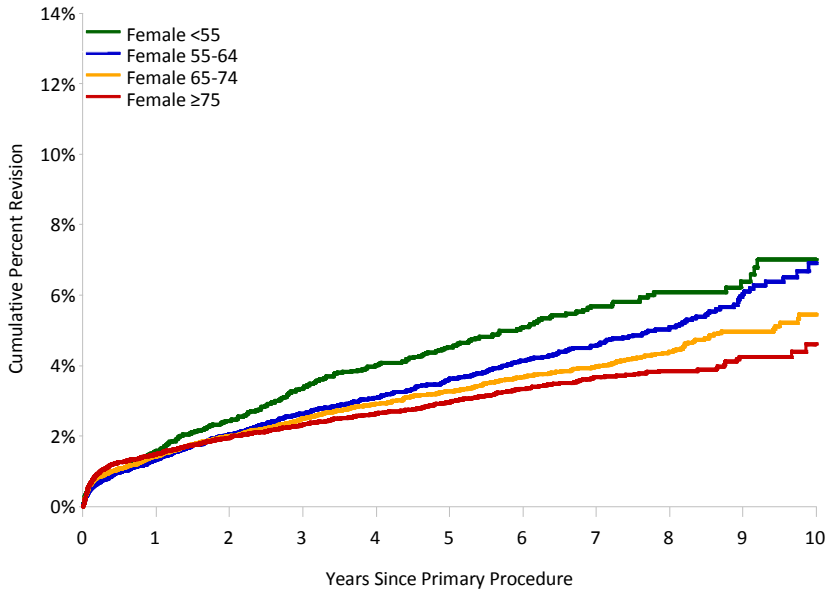
**Table HT19: Revision Rates of Primary Total Conventional Hip Replacement by Age and Gender (Primary Diagnosis OA)**

| Gender | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | <55 | 320 | 9657 | 41311 | 0.77 (0.69, 0.86) |
| | 55-64 | 695 | 20270 | 86611 | 0.80 (0.74, 0.86) |
| | 65-74 | 869 | 28996 | 124220 | 0.70 (0.65, 0.75) |
| | ≥75 | 663 | 20654 | 78257 | 0.85 (0.78, 0.91) |
| Female | <55 | 320 | 8262 | 34728 | 0.92 (0.82, 1.03) |
| | 55-64 | 668 | 20799 | 86317 | 0.77 (0.72, 0.83) |
| | 65-74 | 953 | 32069 | 138647 | 0.69 (0.64, 0.73) |
| | ≥75 | 865 | 32884 | 134919 | 0.64 (0.60, 0.69) |
| **TOTAL** | | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT20: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age and Gender (Primary Diagnosis OA)**

| Gender | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | <55 | 1.2 (1.0, 1.5) | 2.7 (2.4, 3.1) | 3.7 (3.3, 4.2) | 4.6 (4.1, 5.2) | 7.5 (6.1, 9.2) |
| | 55-64 | 1.5 (1.3, 1.6) | 2.8 (2.5, 3.0) | 3.6 (3.3, 3.9) | 4.9 (4.5, 5.3) | 8.0 (6.9, 9.3) |
| | 65-74 | 1.3 (1.2, 1.4) | 2.4 (2.2, 2.6) | 3.3 (3.1, 3.5) | 4.4 (4.1, 4.7) | 5.8 (5.1, 6.5) |
| | ≥75 | 1.8 (1.6, 2.0) | 2.9 (2.7, 3.2) | 3.8 (3.5, 4.2) | 4.6 (4.2, 5.0) | 6.4 (5.4, 7.7) |
| Female | <55 | 1.6 (1.3, 1.9) | 3.4 (3.0, 3.8) | 4.5 (4.0, 5.1) | 5.7 (5.0, 6.4) | 7.0 (6.0, 8.2) |
| | 55-64 | 1.3 (1.2, 1.5) | 2.6 (2.4, 2.9) | 3.6 (3.3, 3.9) | 4.6 (4.2, 5.0) | 6.9 (6.0, 7.9) |
| | 65-74 | 1.4 (1.3, 1.6) | 2.5 (2.3, 2.7) | 3.3 (3.0, 3.5) | 4.0 (3.7, 4.3) | 5.4 (4.9, 6.1) |
| | ≥75 | 1.5 (1.4, 1.6) | 2.3 (2.1, 2.5) | 3.0 (2.7, 3.2) | 3.7 (3.4, 3.9) | 4.6 (4.0, 5.3) |

**Figure HT9: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Females by Age (Primary Diagnosis OA)**



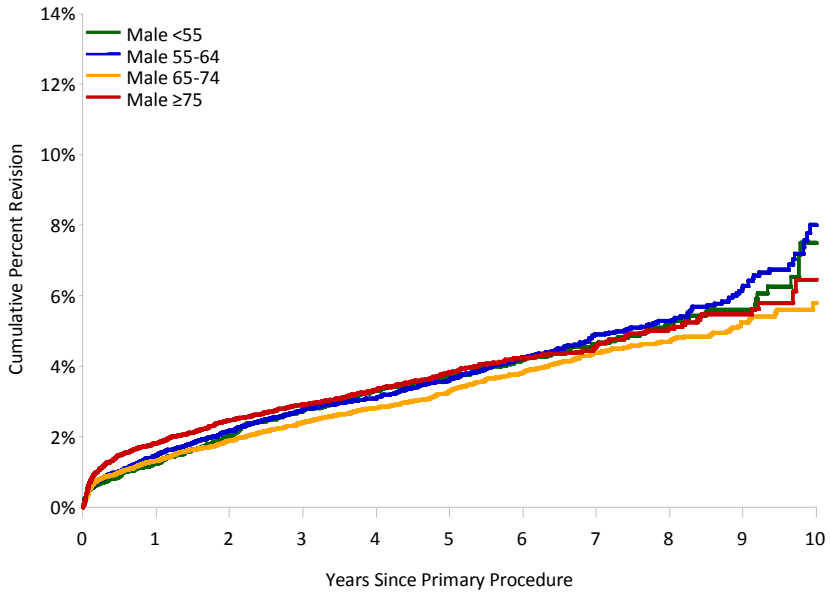

Female <55 vs Female ≥75
0 - 2Wk: HR=1.24 (0.83, 1.84),p=0.295
2Wk - 3Mth: HR=0.56 (0.39, 0.79),p=0.001
3Mth+: HR=1.90 (1.64, 2.21),p<0.001

Female 55-64 vs Female ≥75
0 - 3Mth: HR=0.71 (0.58, 0.86),p<0.001
3Mth - 6Mth: HR=1.34 (0.96, 1.88),p=0.083
6Mth+: HR=1.55 (1.37, 1.76),p<0.001

Female 65-74 vs Female ≥75
0 - 1Mth: HR=0.98 (0.81, 1.18),p=0.813
1Mth - 3Mth: HR=0.64 (0.50, 0.83),p<0.001
3Mth+: HR=1.25 (1.12, 1.40),p<0.001

| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Female | <55 | 8262 | 6944 | 4852 | 3199 | 1770 | 138 |
| | 55-64 | 20799 | 17657 | 12135 | 7849 | 4053 | 361 |
| | 65-74 | 32069 | 27469 | 19529 | 12947 | 6932 | 507 |
| | ≥75 | 32884 | 27951 | 19570 | 12090 | 5886 | 325 |

**Figure HT10: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Males by Age (Primary Diagnosis OA)**




Male <55 vs Male 65-74
Entire Period: HR=1.11 (0.97, 1.26),p=0.125

Male 55-64 vs Male 65-74
Entire Period: HR=1.15 (1.04, 1.27),p=0.007

Male ≥75 vs Male 65-74
0 - 3Mth: HR=1.50 (1.27, 1.77),p<0.001
3Mth - 6Mth: HR=2.06 (1.51, 2.81),p<0.001
6Mth+: HR=0.97 (0.85, 1.10),p=0.589

| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | <55 | 9657 | 8117 | 5730 | 3779 | 2178 | 209 |
| | 55-64 | 20270 | 17195 | 12084 | 8004 | 4396 | 346 |
| | 65-74 | 28996 | 24749 | 17576 | 11452 | 6102 | 427 |
| | ≥75 | 20654 | 17239 | 11352 | 6540 | 2952 | 150 |

## Outcome by Prostheses Characteristics

### Fixation

At ten years hybrid fixation has the lowest cumulative percent revision of 5.3% compared to cemented (6.2%) and cementless fixation (6.8%) (Tables HT21 and HT22).

The differences in outcome based on fixation vary with time. Cementless fixation has a higher rate of revision in the first three years compared to cemented fixation, after this time there is no difference in the rate of revision. Similarly, hybrid fixation has a higher rate of revision compared to cemented fixation in the first month however, after six months hybrid fixation has a lower rate of revision. When hybrid fixation is compared to cementless fixation, it has a lower rate of revision in the first three months and between six months and 3.5 years. After this time, there is no difference in the rate of revision (Figure HT11).

There continues to be age related differences in the rate of revision for the different types of fixation. Cementless fixation has the highest rate of revision in the oldest age group (≥75 years of age). There is no difference in hybrid or cemented fixation in this age group after the first two weeks (Tables HT23 and HT24 and Figure HT15).

In younger age groups cemented fixation has a higher rate of revision as time progresses with the exception of the under 55 year age group, however only a small number of procedures using cemented fixation have been undertaken in this group. In the age groups less than 75 years, there is no difference between hybrid and cementless fixation apart from an early increased rate of revision in the cementless fixation group. This difference is evident for the first 4.5 years in the 55-64 year age group and for the first 3 months only in the 65-74 year age group. There is no difference in hybrid and cementless fixation in the under 55 year age group (Tables HT23 and HT24 and Figures HT12-HT14).

### Femoral Stems with Exchangeable Necks

A femoral stem with an exchangeable neck has a separate neck that connects proximally to the stem. Femoral stems with exchangeable necks were introduced to enable surgeons to have increased choice with respect to determining femoral neck version, offset and length during total hip arthroplasty. This year the Registry has performed a more detailed analysis on femoral stems with exchangeable necks.

Femoral stems with exchangeable necks were used in 6,659 primary total conventional hip procedures undertaken for the treatment of osteoarthritis. Outcomes were compared to 166,932 procedures using fixed neck femoral stems for the same diagnosis. The cumulative percent revision at seven years for exchangeable neck prostheses was 8.9% compared to 4.2% for fixed femoral stems (adj HR=2.11; 95%CI(1.90, 2.36), p<0.001) (Tables HT25, HT26 and Figure HT16). The increased rate of revision when exchangeable necks were used was evident for all bearing surfaces. This difference is significant for all bearing surfaces with greater than four year follow up (Tables HT27 and HT28 and Figure HT17).

Seven exchangeable femoral necks had a cumulative percent revision of at least three years (Tables HT29, HT30). All had a cumulative percent revision at least two times higher than fixed neck stems. The increase in revision was due to a higher incidence of loosening (3.2% at seven years compared to 1.3% for fixed femoral neck), dislocation (2.0% compared to 0.9%) and fracture (0.8% compared to 0.6%) (Figure HT18).

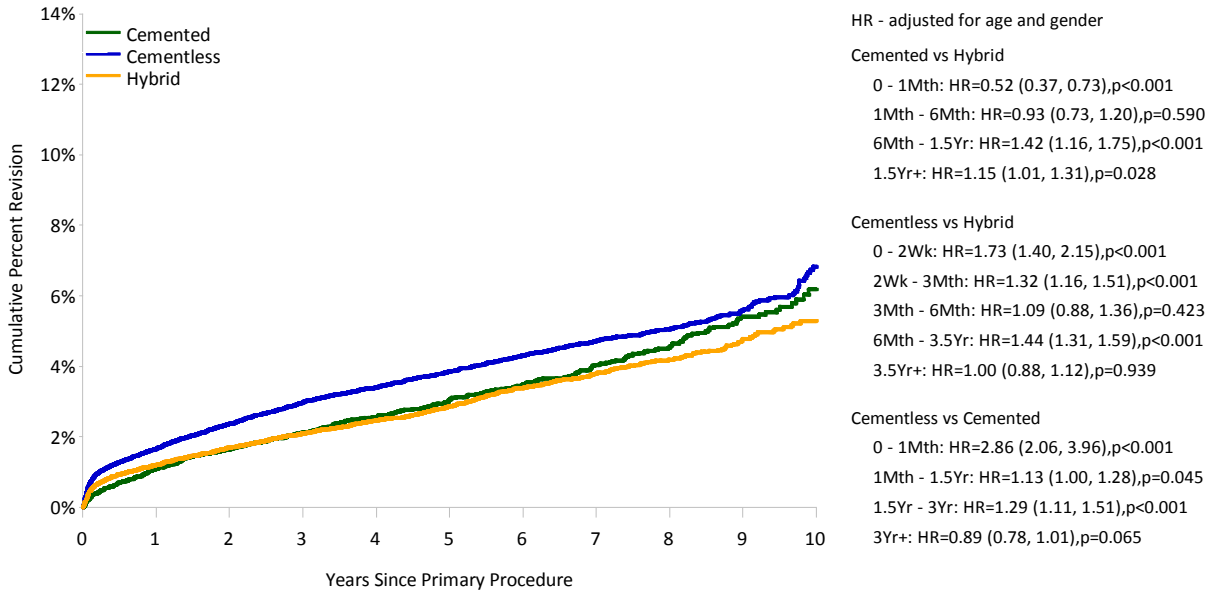
**Table HT21: Revision Rates of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)**

| Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Cemented | 548 | 16676 | 86631 | 0.63 (0.58, 0.69) |
| Cementless | 3298 | 100259 | 394668 | 0.84 (0.81, 0.86) |
| Hybrid | 1507 | 56656 | 243710 | 0.62 (0.59, 0.65) |
| **TOTAL** | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT22: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Cemented | 1.1 (0.9, 1.3) | 2.1 (1.9, 2.4) | 3.1 (2.8, 3.4) | 4.0 (3.7, 4.4) | 6.2 (5.4, 7.0) |
| Cementless | 1.7 (1.6, 1.7) | 3.0 (2.9, 3.1) | 3.8 (3.7, 4.0) | 4.7 (4.5, 4.9) | 6.8 (6.3, 7.4) |
| Hybrid | 1.2 (1.1, 1.3) | 2.1 (2.0, 2.2) | 2.9 (2.7, 3.0) | 3.8 (3.6, 4.0) | 5.3 (4.9, 5.7) |

**Figure HT11: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 16676 | 15102 | 11999 | 8771 | 5334 | 532 |
| Cementless | 100259 | 83671 | 56264 | 34666 | 16952 | 968 |
| Hybrid | 56656 | 48548 | 34565 | 22423 | 11983 | 963 |

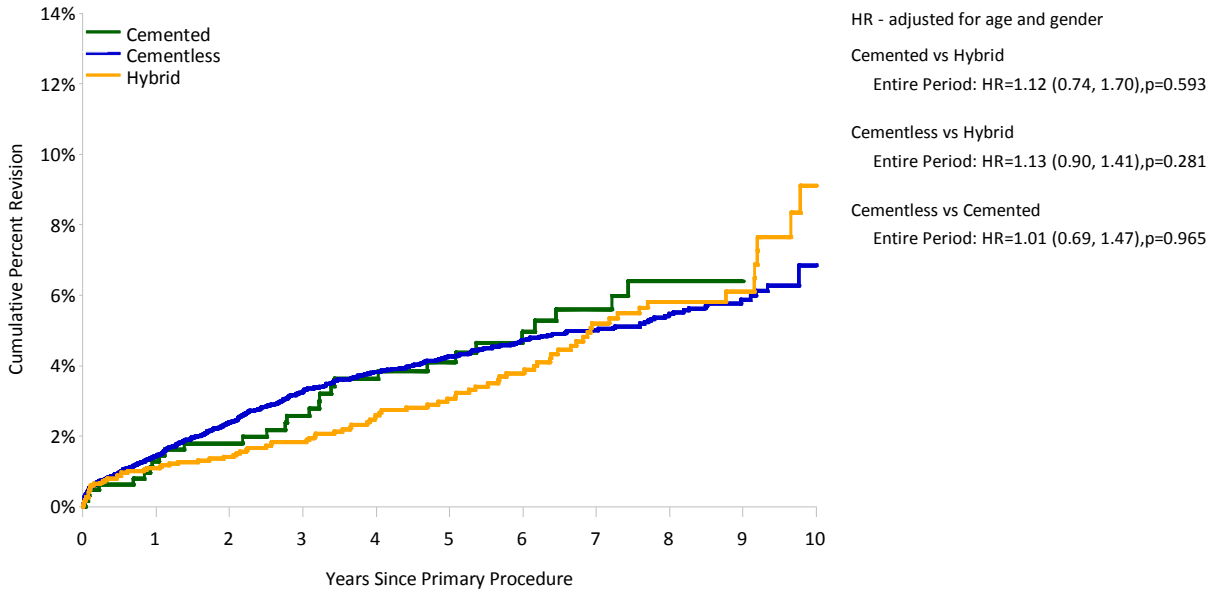
**Table HT23: Revision Rates of Primary Total Conventional Hip Replacement by Fixation and Age (Primary Diagnosis OA)**

| Age | Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| <55 | Cemented | 29 | 641 | 3597 | 0.81 (0.54, 1.16) |
| | Cementless | 519 | 14608 | 60160 | 0.86 (0.79, 0.94) |
| | Hybrid | 92 | 2670 | 12281 | 0.75 (0.60, 0.92) |
| 55-64 | Cemented | 107 | 2068 | 11429 | 0.94 (0.77, 1.13) |
| | Cementless | 990 | 29853 | 120871 | 0.82 (0.77, 0.87) |
| | Hybrid | 266 | 9148 | 40629 | 0.65 (0.58, 0.74) |
| 65-74 | Cemented | 217 | 5742 | 31869 | 0.68 (0.59, 0.78) |
| | Cementless | 1028 | 34601 | 137306 | 0.75 (0.70, 0.80) |
| | Hybrid | 577 | 20722 | 93692 | 0.62 (0.57, 0.67) |
| ≥75 | Cemented | 195 | 8225 | 39736 | 0.49 (0.42, 0.56) |
| | Cementless | 761 | 21197 | 76331 | 1.00 (0.93, 1.07) |
| | Hybrid | 572 | 24116 | 97108 | 0.59 (0.54, 0.64) |
| **TOTAL** | | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT24: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation and Age (Primary Diagnosis OA)**

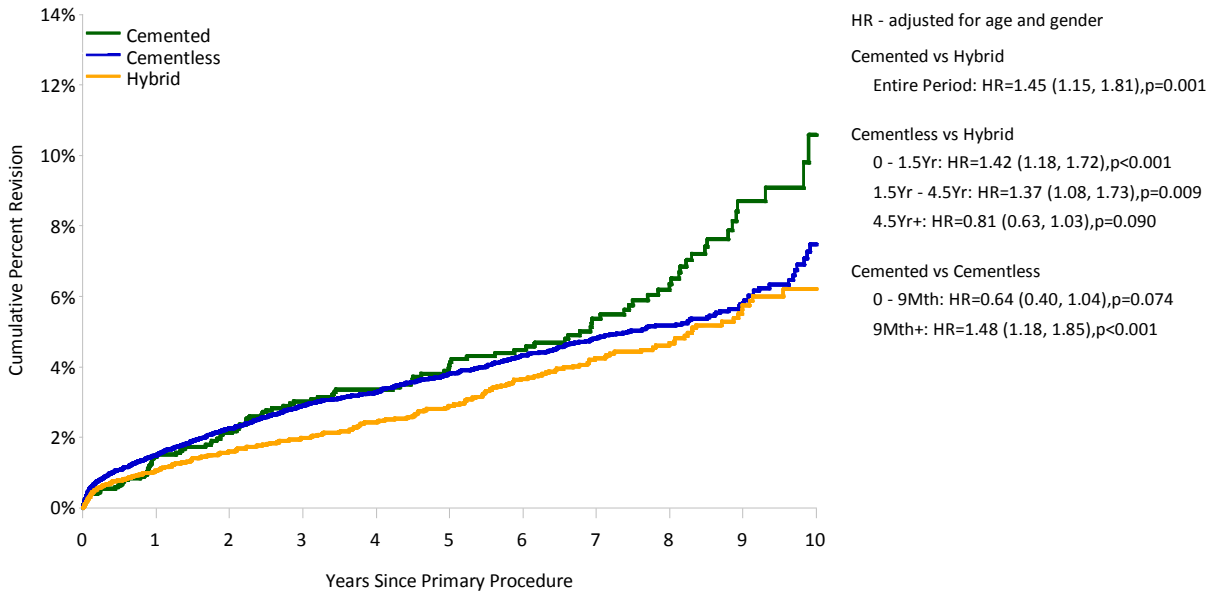
| Age | Fixation | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <55 | Cemented | 1.3 (0.6, 2.6) | 2.6 (1.6, 4.2) | 4.1 (2.7, 6.2) | 5.6 (3.8, 8.2) | |
| | Cementless | 1.4 (1.3, 1.7) | 3.3 (3.0, 3.6) | 4.3 (3.9, 4.7) | 5.0 (4.6, 5.5) | 6.8 (5.8, 8.0) |
| | Hybrid | 1.1 (0.8, 1.6) | 1.8 (1.4, 2.5) | 3.1 (2.4, 3.9) | 5.2 (4.1, 6.6) | 9.1 (6.6, 12.4) |
| 55-64 | Cemented | 1.5 (1.0, 2.1) | 3.0 (2.3, 3.9) | 4.1 (3.3, 5.2) | 5.4 (4.3, 6.7) | 10.6 (8.0, 13.9) |
| | Cementless | 1.5 (1.4, 1.6) | 2.9 (2.7, 3.1) | 3.8 (3.6, 4.1) | 4.8 (4.5, 5.2) | 7.5 (6.5, 8.6) |
| | Hybrid | 1.0 (0.9, 1.3) | 2.0 (1.7, 2.3) | 2.9 (2.5, 3.3) | 4.2 (3.7, 4.9) | 6.2 (5.3, 7.3) |
| 65-74 | Cemented | 1.0 (0.8, 1.3) | 2.2 (1.8, 2.6) | 3.2 (2.7, 3.7) | 4.6 (4.0, 5.3) | 6.3 (5.4, 7.5) |
| | Cementless | 1.5 (1.4, 1.7) | 2.6 (2.5, 2.8) | 3.5 (3.3, 3.7) | 4.2 (4.0, 4.5) | 5.9 (5.0, 6.9) |
| | Hybrid | 1.2 (1.1, 1.4) | 2.2 (2.0, 2.4) | 3.0 (2.7, 3.2) | 3.8 (3.5, 4.1) | 5.0 (4.5, 5.6) |
| ≥75 | Cemented | 1.0 (0.8, 1.3) | 1.8 (1.5, 2.1) | 2.6 (2.2, 3.0) | 3.0 (2.6, 3.5) | 4.4 (3.4, 5.6) |
| | Cementless | 2.3 (2.1, 2.5) | 3.4 (3.2, 3.7) | 4.2 (3.9, 4.5) | 5.2 (4.8, 5.7) | 7.2 (5.6, 9.2) |
| | Hybrid | 1.2 (1.1, 1.4) | 2.1 (1.9, 2.3) | 2.7 (2.5, 3.0) | 3.4 (3.1, 3.7) | 4.3 (3.7, 5.0) |

**Figure HT12: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Patients Aged <55 Years by Fixation (Primary Diagnosis OA)**



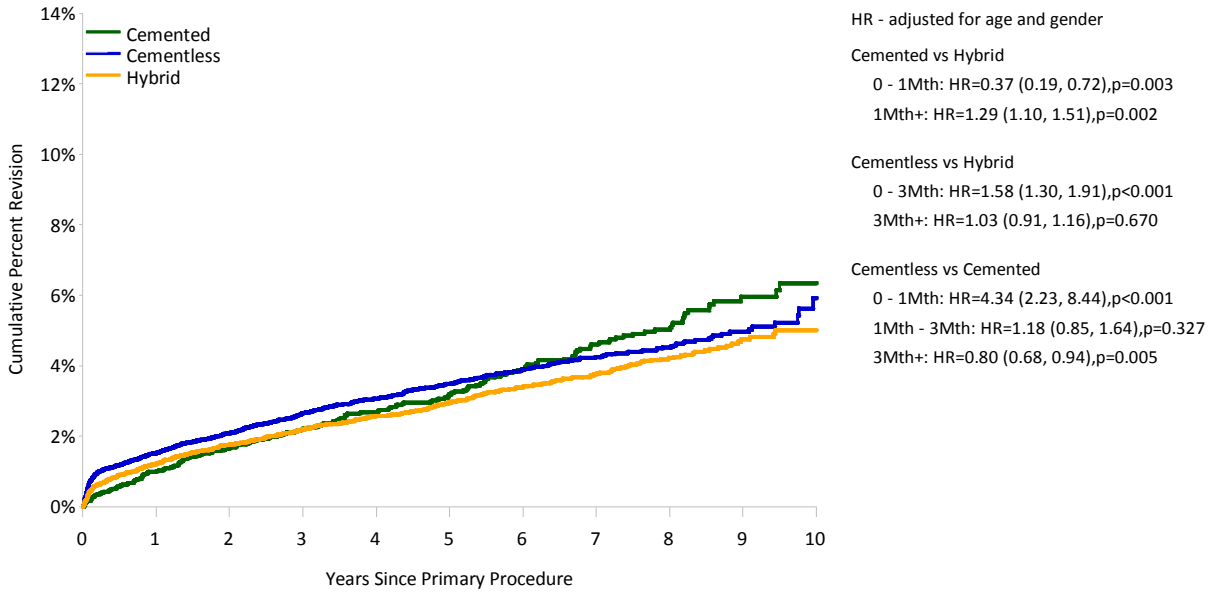

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 641 | 591 | 476 | 364 | 259 | 31 |
| Cementless | 14608 | 12181 | 8417 | 5460 | 2974 | 219 |
| Hybrid | 2670 | 2289 | 1689 | 1154 | 715 | 97 |

**Figure HT13: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Patients Aged 55-64 Years by Fixation (Primary Diagnosis OA)**



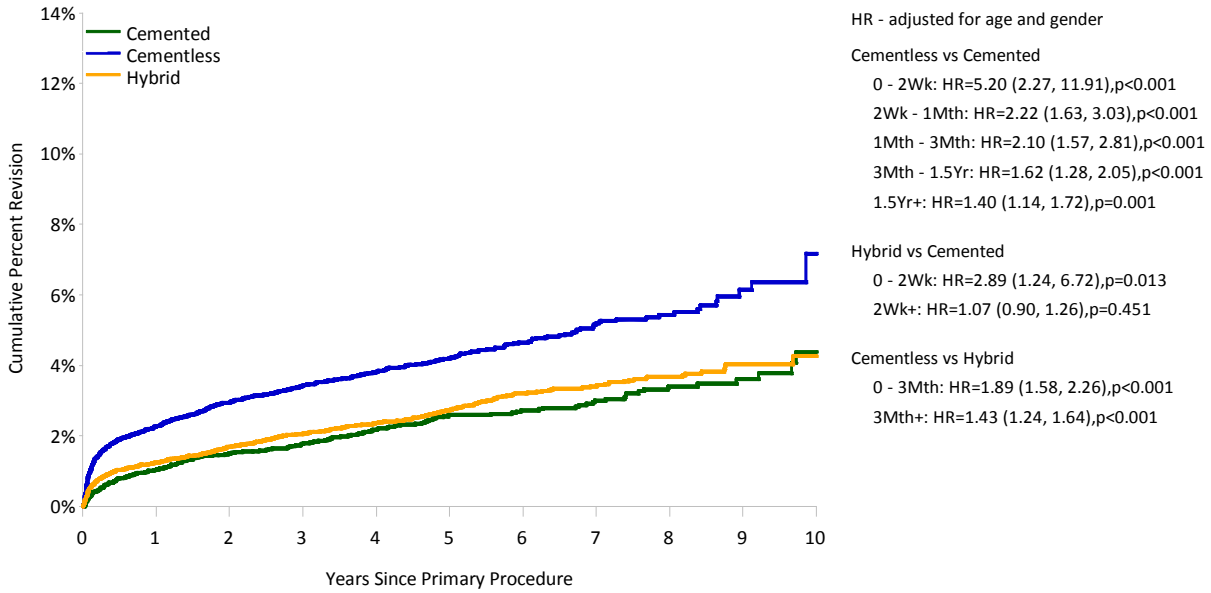

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 2068 | 1889 | 1514 | 1165 | 794 | 97 |
| Cementless | 29853 | 25131 | 17067 | 10884 | 5525 | 378 |
| Hybrid | 9148 | 7832 | 5638 | 3804 | 2130 | 232 |

**Figure HT14: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Patients Aged 65-74 Years by Fixation (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 5742 | 5269 | 4362 | 3353 | 2117 | 220 |
| Cementless | 34601 | 28935 | 19573 | 12164 | 5923 | 293 |
| Hybrid | 20722 | 18014 | 13170 | 8882 | 4994 | 421 |

**Figure HT15: Cumulative Percent Revision of Primary Total Conventional Hip Replacement for Patients Aged ≥75 Years by Fixation (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 8225 | 7353 | 5647 | 3889 | 2164 | 184 |
| Cementless | 21197 | 17424 | 11207 | 6158 | 2530 | 78 |
| Hybrid | 24116 | 20413 | 14068 | 8583 | 4144 | 213 |

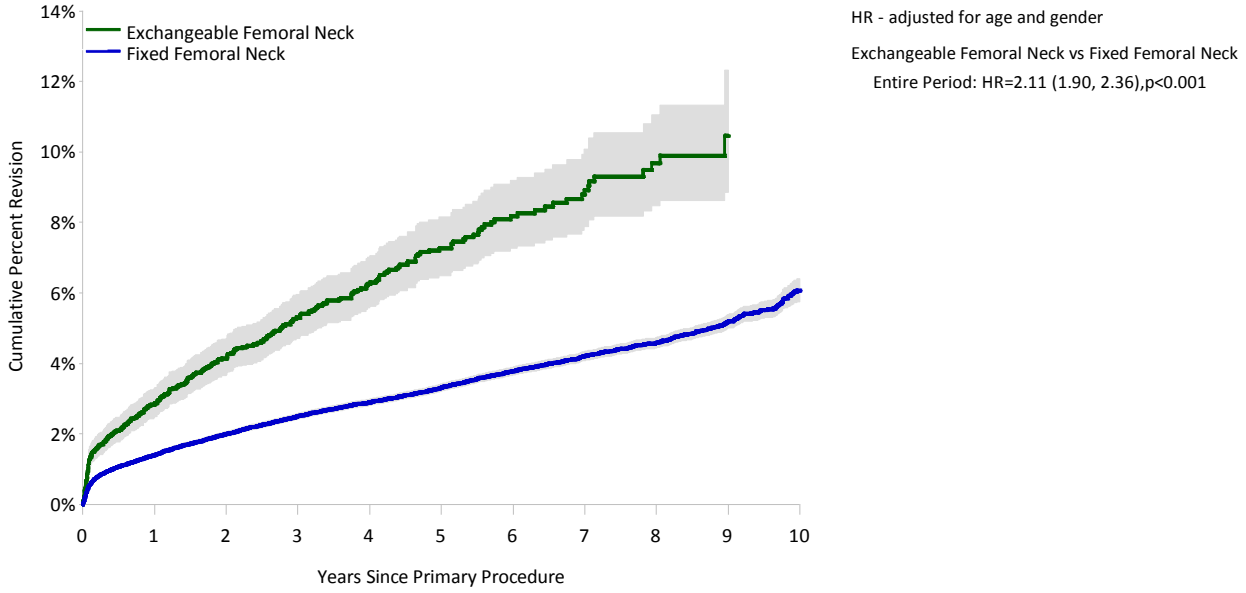
**Table HT25: Revision Rates of Primary Total Conventional Hip Replacement by Type of Femoral Neck (Primary Diagnosis OA)**

| Femoral Neck | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Exchangeable Femoral Neck | 352 | 6659 | 21161 | 1.66 (1.49, 1.85) |
| Fixed Femoral Neck | 5001 | 166932 | 703848 | 0.71 (0.69, 0.73) |
| **TOTAL** | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

**Table HT26: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Femoral Neck (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Exchangeable Femoral Neck | 2.9 (2.5, 3.3) | 5.3 (4.7, 6.0) | 7.3 (6.5, 8.1) | 8.9 (7.9, 10.1) | |
| Fixed Femoral Neck | 1.4 (1.3, 1.5) | 2.5 (2.4, 2.6) | 3.3 (3.2, 3.4) | 4.2 (4.1, 4.3) | 6.1 (5.7, 6.4) |

**Figure HT16: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Femoral Neck (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Exchangeable Femoral Neck | 6659 | 5025 | 2900 | 1565 | 726 | 32 |
| Fixed Femoral Neck | 166932 | 142296 | 99928 | 64295 | 33543 | 2431 |

**Table HT27: Revision Rates of Primary Total Conventional Hip Replacement by Type of Femoral Neck and Bearing Surface (Primary Diagnosis OA)**

| Femoral Neck | Bearing Surface | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Exchangeable Femoral Neck | Ceramic/Ceramic | 205 | 3660 | 13352 | 1.54 (1.33, 1.76) |
| | Ceramic/Polyethylene | 15 | 260 | 680 | 2.21 (1.24, 3.64) |
| | Ceramic/Modified Polyethylene | 8 | 324 | 612 | 1.31 (0.56, 2.57) |
| | Metal/Metal | 62 | 1236 | 3204 | 1.93 (1.48, 2.48) |
| | Metal/Polyethylene | 28 | 400 | 1460 | 1.92 (1.27, 2.77) |
| | Metal/Modified Polyethylene | 33 | 719 | 1787 | 1.85 (1.27, 2.59) |
| | Other (5) | 1 | 54 | 40 | 2.52 (0.06, 14.04) |
| Fixed Femoral Neck | Ceramic/Ceramic | 852 | 32999 | 132545 | 0.64 (0.60, 0.69) |
| | Ceramic/Polyethylene | 159 | 4092 | 24247 | 0.66 (0.56, 0.77) |
| | Ceramic/Modified Polyethylene | 283 | 11819 | 40239 | 0.70 (0.62, 0.79) |
| | Metal/Metal | 863 | 17644 | 72256 | 1.19 (1.12, 1.28) |
| | Metal/Polyethylene | 889 | 21441 | 122411 | 0.73 (0.68, 0.78) |
| | Metal/Modified Polyethylene | 1812 | 71409 | 287500 | 0.63 (0.60, 0.66) |
| | Ceramicised Metal/ Modified Polyethylene | 103 | 6416 | 21474 | 0.48 (0.39, 0.58) |
| | Other (5) | 33 | 998 | 2543 | 1.30 (0.89, 1.82) |
| **TOTAL** | | **5346** | **173471** | **724349** | **0.74 (0.72, 0.76)** |

Note: Excludes 120 procedures where the bearing surface is yet to be identified.

**Table HT28: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Femoral Neck and Bearing Surface (Primary Diagnosis OA)**

| Femoral Neck | Bearing Surface | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Exchangeable Femoral Neck | Ceramic/Ceramic | 3.1 (2.6, 3.8) | 5.3 (4.5, 6.2) | 6.8 (5.9, 7.9) | 8.5 (7.3, 9.9) | |
| | Ceramic/Polyethylene | 3.7 (2.0, 7.1) | 6.4 (3.7, 11.1) | 7.6 (4.4, 13.1) | | |
| | Ceramic/Modified Polyethylene | 1.5 (0.6, 4.1) | 4.3 (1.9, 9.5) | | | |
| | Metal/Metal | 2.1 (1.4, 3.1) | 5.1 (3.8, 6.8) | 10.6 (7.6, 14.5) | | |
| | Metal/Polyethylene | 2.9 (1.6, 5.1) | 6.9 (4.6, 10.3) | 7.9 (5.4, 11.6) | 9.8 (6.5, 14.7) | |
| | Metal/Modified Polyethylene | 2.8 (1.8, 4.4) | 4.8 (3.1, 7.3) | 7.6 (5.0, 11.5) | 9.3 (6.1, 14.1) | |
| | Other (5) | 1.9 (0.3, 12.4) | | | | |
| Fixed Femoral Neck | Ceramic/Ceramic | 1.3 (1.2, 1.4) | 2.3 (2.1, 2.5) | 3.0 (2.8, 3.2) | 3.7 (3.5, 4.0) | 5.0 (4.4, 5.8) |
| | Ceramic/Polyethylene | 1.5 (1.1, 1.9) | 2.3 (1.9, 2.8) | 3.0 (2.5, 3.6) | 4.0 (3.3, 4.7) | 8.0 (6.3, 10.1) |
| | Ceramic/Modified Polyethylene | 1.3 (1.1, 1.6) | 2.4 (2.1, 2.8) | 2.9 (2.6, 3.3) | 3.7 (3.2, 4.3) | 6.1 (4.7, 7.9) |
| | Metal/Metal | 1.6 (1.4, 1.8) | 4.1 (3.8, 4.4) | 5.9 (5.5, 6.3) | 7.2 (6.7, 7.8) | 8.7 (7.6, 10.0) |
| | Metal/Polyethylene | 1.4 (1.2, 1.6) | 2.4 (2.2, 2.7) | 3.5 (3.2, 3.8) | 4.7 (4.4, 5.1) | 7.0 (6.4, 7.7) |
| | Metal/Modified Polyethylene | 1.4 (1.3, 1.5) | 2.2 (2.1, 2.4) | 2.9 (2.7, 3.0) | 3.5 (3.4, 3.7) | 4.7 (4.3, 5.1) |
| | Ceramicised Metal/ Modified Polyethylene | 1.2 (0.9, 1.5) | 1.6 (1.3, 2.0) | 1.9 (1.5, 2.3) | 2.2 (1.8, 2.8) | |
| | Other (5) | 2.2 (1.4, 3.4) | 3.6 (2.4, 5.4) | 4.0 (2.7, 6.0) | 7.3 (4.3, 12.2) | |

**Figure HT17: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Femoral Neck and Bearing Surface (Primary Diagnosis OA)**

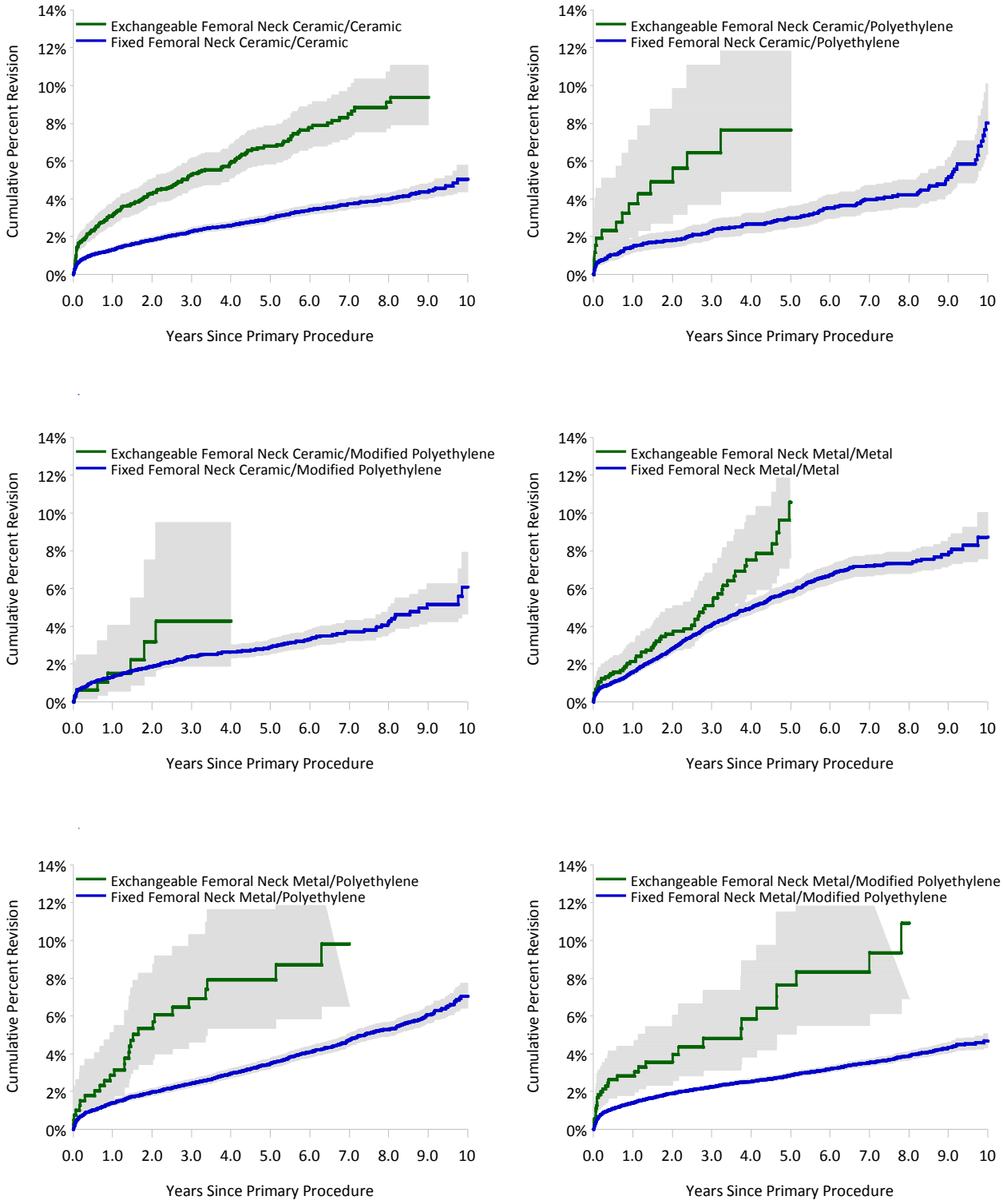


**Table HT29: Revision Rates of Primary Total Conventional Hip Replacement using an Exchangeable Femoral Neck by Component Used (Primary Diagnosis OA)**

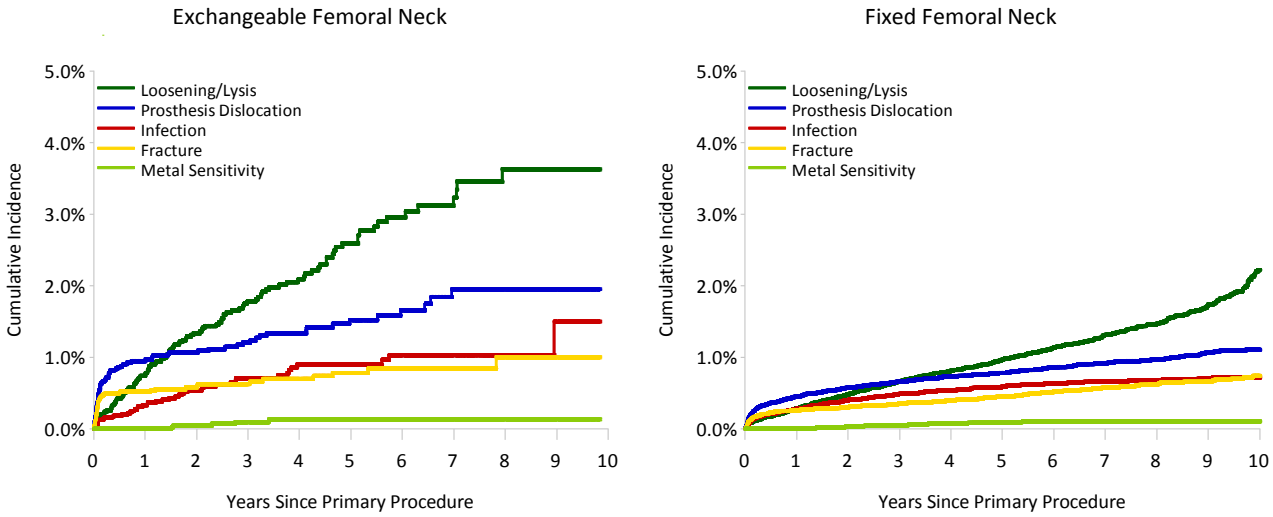
| Femoral Neck | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| ABGII | 10 | 164 | 239 | 4.18 (2.00, 7.68) |
| Adapter | 46 | 674 | 1783 | 2.58 (1.89, 3.44) |
| Apex | 60 | 1517 | 3526 | 1.70 (1.30, 2.19) |
| F2L | 53 | 692 | 4605 | 1.15 (0.86, 1.51) |
| Integrale | 3 | 376 | 601 | 0.50 (0.10, 1.46) |
| M-Cor | 1 | 111 | 289 | 0.35 (0.01, 1.93) |
| M/L Taper Kinectiv | 19 | 910 | 757 | 2.51 (1.51, 3.92) |
| Margron | 65 | 553 | 3388 | 1.92 (1.48, 2.45) |
| Modular Neck (Group Lepine) | 33 | 514 | 2591 | 1.27 (0.88, 1.79) |
| Profemur | 38 | 632 | 1870 | 2.03 (1.44, 2.79) |
| R120 | 3 | 120 | 261 | 1.15 (0.24, 3.35) |
| UniSyn | 16 | 253 | 896 | 1.79 (1.02, 2.90) |
| Other (8) | 5 | 143 | 355 | 1.41 (0.46, 3.29) |
| **TOTAL** | **352** | **6659** | **21161** | **1.66 (1.49, 1.85)** |

Note: Only prostheses with over 50 procedures have been listed

**Table HT30: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement using an Exchangeable Femoral Neck by Component Used (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| ABGII | 3.7 (1.7, 8.1) | | | | |
| Adapter | 3.2 (2.1, 4.9) | 6.7 (4.8, 9.2) | | | |
| Apex | 2.7 (2.0, 3.7) | 4.8 (3.7, 6.3) | 6.4 (4.6, 8.9) | | |
| F2L | 3.2 (2.1, 4.8) | 5.5 (4.1, 7.5) | 6.9 (5.3, 9.1) | 7.7 (5.9, 10.0) | |
| Integrale | 0.3 (0.0, 1.9) | | | | |
| M-Cor | 0.0 (0.0, 0.0) | | | | |
| M/L Taper Kinectiv | 2.2 (1.3, 3.5) | | | | |
| Margron | 5.3 (3.7, 7.5) | 7.3 (5.4, 9.8) | 9.6 (7.3, 12.4) | 12.9 (10.2, 16.4) | |
| Modular Neck (Group Lepine) | 2.4 (1.3, 4.1) | 4.4 (2.9, 6.7) | 6.2 (4.2, 8.9) | 7.5 (5.2, 10.7) | |
| Profemur | 3.8 (2.5, 5.7) | 6.6 (4.7, 9.2) | 7.6 (5.5, 10.5) | | |
| R120 | 0.9 (0.1, 5.9) | | | | |
| UniSyn | 3.6 (1.9, 6.8) | 6.1 (3.6, 10.1) | 7.7 (4.7, 12.5) | | |
| Other (7) | 0.0 (0.0, 0.0) | 2.7 (0.7, 10.4) | | | |

**Figure HT18: Revision Diagnosis Cumulative Incidence of Primary Total Conventional Hip Replacement by Type of Femoral Neck (Primary Diagnosis OA)**



## Bearing Surface

The Registry has reported on bearing surface for a number of years. It now has information on 12 different bearing surface combinations. A number of these have a short follow up and only small numbers of procedures undertaken. The bearing surface combinations the Registry has focused on this year are those with at least a seven year cumulative percent revision rate.

The bearing surfaces reported include metal and ceramic femoral heads which have been combined with modified (crosslinked) polyethylene and non-modified polyethylene as well as metal on metal (MoM) and ceramic on ceramic (CoC). Ceramicised metal is again reported as a separate bearing surface. This has a shorter follow up than the other bearing surfaces being reported. It has been combined with both modified and non-modified polyethylene however the numbers used with non-modified polyethylene are small (574) and the follow up for this bearing surface combination is only to five years, so it has not been reported.

***Comparison of Bearing Surfaces***

At ten years the outcome of bearing surface varies depending on the type of surface. MoM had the highest rate of revision of all bearing surfaces (Tables HT31 and HT32 and Figure HT19). This difference however is only evident for head sizes greater than 32mm (Tables HT33 and HT34 and Figures HT20 and HT21).

Although the ceramicised metal/modified polyethylene combination has the lowest reported cumulative percent revision at seven years this result should be interpreted with caution (Tables HT31 and HT32). It is the Registry's view that this articulation cannot be compared to other articulations as it has only been used with a small number of femoral stem and acetabular combinations from a single company. The results should not be compared due to the inability to correct for the confounding effect of the limited number of stem/acetabular combinations.

***Metal on Metal***

For a number of years the Registry has identified that Metal on Metal (MoM) bearing surface has a higher rate of revision compared to all other bearing surfaces. In the 2010 report it was identified that this increase was specific to head sizes >32 mm. This finding is replicated in this year's analysis (Table HT33 and HT34 and Figures HT20 and HT21).

To further evaluate the effect of head size with MoM bearing surface, analysis was undertaken comparing four head size groups (≤28, 30-32, 36-40, >40mm). There is no difference in the rate of revision for head sizes ≤28mm and 30-32mm. The two larger head size groups were associated with an increased rate of revision compared to the two groups with head sizes 32mm or less (Tables HT35 and HT36 and Figure HT22).

There is no difference with the rate of revision for MoM with regard to age (Tables HT37 and HT38 and Figure HT23).

There is, however an interaction between age and head size. The rate of revision for head sizes greater than 32mm is higher regardless of age. Younger patients with a head size greater than 32mm have a higher rate of revision than older patients (Tables HT39 and HT40 and Figure HT24).

Females have a higher rate of revision for MoM (Tables HT41 and HT42 and Figure HT25). This difference is related to head size. For head sizes greater than 32mm both males and females have a higher rate of revision however females have the highest rate. There is no gender difference for head sizes ≤32mm (Tables HT43 and HT44 and Figure HT26).

There are differences in the reasons for revision when MoM and MoP bearing surfaces are compared. The cumulative incidence of reasons for revision demonstrate a higher incidence of revision for loosening/lysis, infection and metal sensitivity for the MoM group. The cumulative incidence for these three revision diagnoses for MoM at ten years is 3.9%, 1.4% and 1.0% respectively compared to MoP 2.0%, 0.7% and 0.0% respectively (Figure HT27). It is uncertain why there is a higher incidence of reported infection. The diagnosis of infection is reported to the Registry at the time of surgery and has not been confirmed by linking to results of microbiological investigation.

The differences between MoM and MoP are more evident in the MoM prostheses with a head size larger than 32mm. Metal sensitivity is largely confined to head sizes greater than 32mm. The cumulative incidence of metal sensitivity at nine years is 1.6% for head sizes greater than 32mm and 0.1% for head sizes less than 32mm. The incidence of metal sensitivity is potentially higher as it is possible that undiagnosed metal sensitivity contributes to the increased rate of loosening/lysis and infection reported in MoM articulations with larger head sizes (Figure HT28).

In the MoM bearing group the Metasul articulation (86%) is the principal recorded femoral head for MoM bearings with a head size ≤32mm.

In order to determine if the higher revision rate of MoM articulations with greater than 32mm head sizes

is prosthesis specific, the Registry has analysed all prosthesis head/acetabular combinations with head size greater than 32mm with more than 200 procedures. There are 12 combinations that meet these criteria and the cumulative percent revision ranges from 3.4% to 10.3% at 5 years (Tables HT45 and HT46).

***Modified Polyethylene***

Modified polyethylene includes all polyethylene that has been cross-linked or has the addition of Vitamin E. Non-modified polyethylene includes all other polyethylene.

Modified polyethylene has a lower rate of revision compared to non-modified polyethylene (Tables HT47 and HT48 and Figure HT29). Modified polyethylene has a cumulative percent revision at ten years of 4.8% compared to non-modified polyethylene 7.5%. The difference between the two types of polyethylene becomes significant after nine months. When modified polyethylene is used there is no difference in outcome when head sizes ≤32 mm and >32 mm are compared. At this time there is also no significant difference related to head size with non-modified polyethylene however the number of procedures where larger head sizes have been used with non-modified polyethylene is small compared to the smaller head sizes and the follow up is shorter (Tables HT49 and HT50 and Figure HT30).

Modified polyethylene and non-modified polyethylene are combined with three different femoral head bearing surfaces, ceramic, metal and ceramicised metal.

There is no difference in the rate of revision for modified polyethylene compared to non-modified polyethylene when a ceramic head is used (HR=0.90 (0.74, 1.09) p=0.274) (Figure HT31).

When a metal head is used there is a significantly lower rate of revision from three months onwards in the modified polyethylene group (3 Mth – 3.5 Yr: HR=0.79 (0.70, 0.89) p<0.001, 3.5 Yr+: HR=0.53 (0.46, 0.62) p<0.001). With ceramicised metal there is a significantly lower rate of revision at all times HR=0.43 (0.27, 0.69) p<0.001 (Figure HT31).

***Ceramic on Ceramic Bearing***

There is a difference in outcome related to head size when CoC bearings are used. There are three head sizes that have been reported for this bearing surface, ≤28mm, 32mm and >32mm. There is no difference in the rate of revision for 32mm and >32mm, however ≤28mm CoC bearings have a significantly higher rate of revision compared to the other two head sizes (Tables HT51 and HT52 and Figure HT32).

***Ceramic and Metal Bearing***

The Registry has some early data on this relatively new bearing surface. There are two types of ceramic and metal bearing. The Registry has information on 272 ceramic head/metal bearings and 203 metal head/ceramic bearings. The early indication is that these bearings may have a higher rate of revision compared to bearings other than MoM. The revision rate per 100 observed component years for metal head/ceramic bearing is 2.01 (0.87, 3.95) and for ceramic head/metal is 1.23 (0.42, 2.87). This compares to 0.74 (0.72, 0.76) for all total conventional hip replacements (Tables HT53 and HT54).

**Table HT31: Revision Rates of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)**

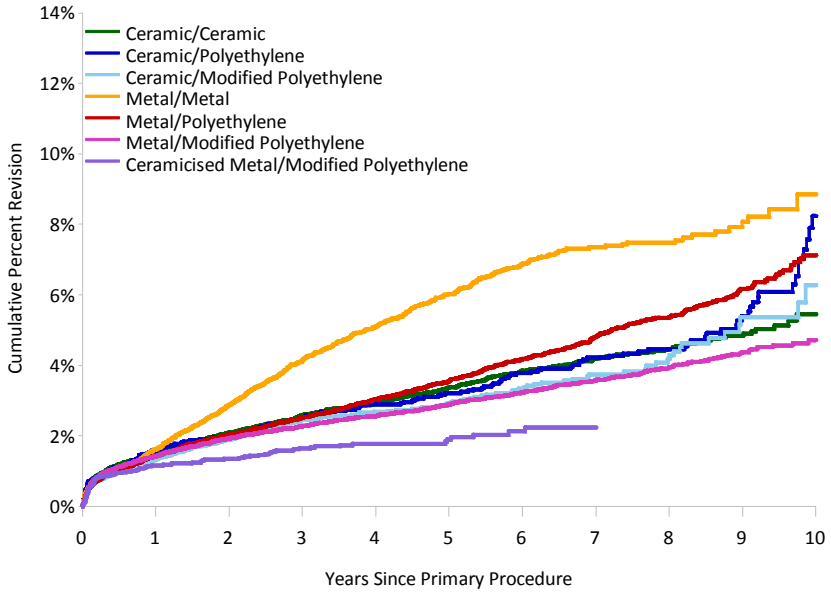
| Bearing Surface | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Ceramic/Ceramic | 1057 | 36659 | 145897 | 0.72 (0.68, 0.77) |
| Ceramic/Polyethylene | 174 | 4352 | 24926 | 0.70 (0.60, 0.81) |
| Ceramic/Modified Polyethylene | 291 | 12143 | 40851 | 0.71 (0.63, 0.80) |
| Metal/Metal | 925 | 18880 | 75461 | 1.23 (1.15, 1.31) |
| Metal/Polyethylene | 917 | 21841 | 123871 | 0.74 (0.69, 0.79) |
| Metal/Modified Polyethylene | 1845 | 72128 | 289287 | 0.64 (0.61, 0.67) |
| Ceramicised Metal/Modified Polyethylene | 103 | 6416 | 21474 | 0.48 (0.39, 0.58) |
| Other (6) | 41 | 1172 | 3243 | 1.26 (0.91, 1.72) |
| **TOTAL** | **5353** | **173591** | **725009** | **0.74 (0.72, 0.76)** |

Note: Only bearing surfaces with a follow up of seven or more years have been listed.
Other includes Ceramic/Metal, Metal/Ceramic, Ceramicised Metal/Metal, Ceramicised Metal/Polyethylene, Ceramicised Metal/Ceramic

**Table HT32: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Ceramic/Ceramic | 1.5 (1.4, 1.6) | 2.6 (2.4, 2.8) | 3.4 (3.2, 3.6) | 4.2 (3.9, 4.5) | 5.4 (4.8, 6.1) |
| Ceramic/Polyethylene | 1.6 (1.3, 2.0) | 2.5 (2.1, 3.0) | 3.2 (2.7, 3.8) | 4.2 (3.6, 5.0) | 8.2 (6.6, 10.3) |
| Ceramic/Modified Polyethylene | 1.3 (1.1, 1.6) | 2.4 (2.1, 2.8) | 2.9 (2.6, 3.3) | 3.7 (3.2, 4.3) | 6.3 (4.8, 8.1) |
| Metal/Metal | 1.6 (1.4, 1.8) | 4.2 (3.9, 4.5) | 6.0 (5.6, 6.5) | 7.3 (6.8, 7.9) | 8.8 (7.7, 10.1) |
| Metal/Polyethylene | 1.4 (1.3, 1.6) | 2.5 (2.3, 2.7) | 3.6 (3.3, 3.8) | 4.8 (4.5, 5.2) | 7.1 (6.5, 7.8) |
| Metal/Modified Polyethylene | 1.4 (1.3, 1.5) | 2.3 (2.2, 2.4) | 2.9 (2.7, 3.0) | 3.6 (3.4, 3.8) | 4.7 (4.3, 5.1) |
| Ceramicised Metal/Modified Polyethylene | 1.2 (0.9, 1.5) | 1.6 (1.3, 2.0) | 1.9 (1.5, 2.3) | 2.2 (1.8, 2.8) | |
| Other (6) | 2.2 (1.5, 3.3) | 3.8 (2.7, 5.4) | 4.1 (2.8, 5.8) | 6.3 (4.1, 9.7) | |

**Figure HT19: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Ceramic/Ceramic | 36659 | 29969 | 20334 | 13388 | 6946 | 301 |
| Ceramic/Polyethylene | 4352 | 3956 | 3307 | 2621 | 1775 | 261 |
| Ceramic/Modified Polyethylene | 12143 | 9421 | 5661 | 3083 | 1551 | 150 |
| Metal/Metal | 18880 | 17423 | 11667 | 5609 | 2270 | 124 |
| Metal/Polyethylene | 21841 | 20345 | 16992 | 13270 | 8382 | 668 |
| Metal/Modified Polyethylene | 72128 | 60110 | 41027 | 26029 | 12992 | 944 |
| Ceramicised Metal/Modified Polyethylene | 6416 | 5285 | 3464 | 1586 | 253 | 0 |

| Comparison | Hazard Ratio |
|---|---|
| Ceramic/Ceramic vs Metal/Modified Polyethylene | Entire Period: HR=1.11 (1.03, 1.20),p=0.008 |
| Ceramic/Polyethylene vs Metal/Modified Polyethylene | Entire Period: HR=1.22 (1.04, 1.42),p=0.014 |
| Ceramic/Modified Polyethylene vs Metal/Modified Polyethylene | Entire Period: HR=1.03 (0.91, 1.16),p=0.660 |
| Metal/Metal vs Metal/Modified Polyethylene | 0 - 1.5Yr: HR=1.31 (1.17, 1.47),p<0.001<br>1.5Yr - 4.5Yr: HR=3.10 (2.75, 3.50),p<0.001<br>4.5Yr - 6.5Yr: HR=2.34 (1.84, 2.99),p<0.001<br>6.5Yr+: HR=0.79 (0.47, 1.33),p=0.380 |
| Metal/Polyethylene vs Metal/Modified Polyethylene | 0 - 3Mth: HR=0.95 (0.80, 1.12),p=0.523<br>3Mth - 3.5Yr: HR=1.21 (1.08, 1.36),p=0.001<br>3.5Yr+: HR=1.77 (1.55, 2.01),p<0.001 |

Note: HR – adjusted for age and gender

**Table HT33: Revision Rates of Primary Total Conventional Hip Replacement by Bearing Surface and Head Size (Primary Diagnosis OA)**

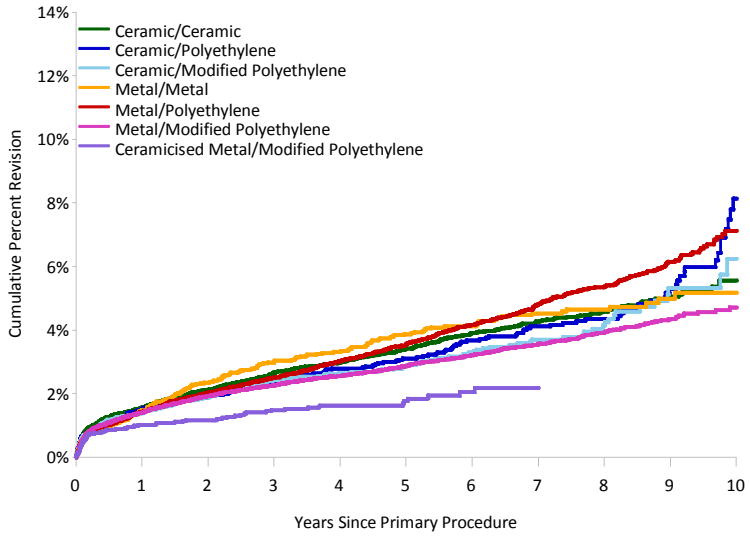
| Bearing Surface | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Ceramic/Ceramic | ≤32mm | 780 | 23059 | 112883 | 0.69 (0.64, 0.74) |
| | >32mm | 277 | 13600 | 33013 | 0.84 (0.74, 0.94) |
| Ceramic/Polyethylene | ≤32mm | 166 | 4118 | 24623 | 0.67 (0.58, 0.78) |
| | >32mm | 8 | 234 | 303 | 2.64 (1.14, 5.21) |
| Ceramic/Modified Polyethylene | ≤32mm | 221 | 8063 | 33579 | 0.66 (0.57, 0.75) |
| | >32mm | 70 | 4080 | 7272 | 0.96 (0.75, 1.22) |
| Metal/Metal | ≤32mm | 186 | 4791 | 26800 | 0.69 (0.60, 0.80) |
| | >32mm | 739 | 14089 | 48661 | 1.52 (1.41, 1.63) |
| Metal/Polyethylene | ≤32mm | 908 | 21436 | 123084 | 0.74 (0.69, 0.79) |
| | >32mm | 9 | 405 | 786 | 1.14 (0.52, 2.17) |
| Metal/Modified Polyethylene | ≤32mm | 1615 | 60372 | 263083 | 0.61 (0.58, 0.64) |
| | >32mm | 230 | 11756 | 26204 | 0.88 (0.77, 1.00) |
| Ceramicised Metal/Modified Polyethylene | ≤32mm | 65 | 4160 | 15405 | 0.42 (0.33, 0.54) |
| | >32mm | 38 | 2256 | 6069 | 0.63 (0.44, 0.86) |
| Other (5) | ≤32mm | 18 | 378 | 1770 | 1.02 (0.60, 1.61) |
| | >32mm | 16 | 674 | 813 | 1.97 (1.13, 3.20) |
| **TOTAL** | | **5346** | **173471** | **724349** | **0.74 (0.72, 0.76)** |

Note: Excludes 120 procedures where the bearing surface is yet to be identified

**Table HT34: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface and Head Size (Primary Diagnosis OA)**

| Bearing Surface | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Ceramic/Ceramic | ≤32mm | 1.6 (1.4, 1.7) | 2.7 (2.4, 2.9) | 3.4 (3.2, 3.7) | 4.3 (4.0, 4.6) | 5.6 (4.9, 6.3) |
| | >32mm | 1.4 (1.2, 1.6) | 2.4 (2.1, 2.8) | 3.4 (2.9, 3.9) | 3.9 (3.3, 4.6) | |
| Ceramic/Polyethylene | ≤32mm | 1.5 (1.2, 1.9) | 2.4 (2.0, 2.9) | 3.1 (2.6, 3.7) | 4.1 (3.5, 4.9) | 8.1 (6.5, 10.2) |
| | >32mm | 3.6 (1.7, 7.6) | | | | |
| Ceramic/Modified Polyethylene | ≤32mm | 1.4 (1.2, 1.7) | 2.4 (2.1, 2.8) | 2.9 (2.5, 3.3) | 3.7 (3.2, 4.3) | 6.2 (4.8, 8.1) |
| | >32mm | 1.2 (0.9, 1.7) | 2.6 (2.0, 3.4) | 3.5 (2.4, 5.0) | | |
| Metal/Metal | ≤32mm | 1.5 (1.2, 1.9) | 3.0 (2.6, 3.6) | 3.9 (3.3, 4.5) | 4.5 (3.9, 5.2) | 5.2 (4.4, 6.1) |
| | >32mm | 1.7 (1.5, 1.9) | 4.6 (4.2, 5.0) | 7.1 (6.6, 7.7) | 9.4 (8.5, 10.4) | |
| Metal/Polyethylene | ≤32mm | 1.4 (1.3, 1.6) | 2.5 (2.3, 2.7) | 3.6 (3.3, 3.8) | 4.8 (4.5, 5.2) | 7.1 (6.5, 7.8) |
| | >32mm | 1.7 (0.7, 3.7) | 4.2 (1.9, 9.2) | | | |
| Metal/Modified Polyethylene | ≤32mm | 1.4 (1.3, 1.5) | 2.3 (2.1, 2.4) | 2.9 (2.7, 3.0) | 3.6 (3.4, 3.8) | 4.7 (4.3, 5.1) |
| | >32mm | 1.5 (1.3, 1.7) | 2.3 (2.0, 2.7) | 3.2 (2.7, 3.8) | 3.8 (3.0, 4.8) | |
| Ceramicised Metal/Modified Polyethylene | ≤32mm | 1.0 (0.8, 1.4) | 1.5 (1.1, 1.9) | 1.8 (1.4, 2.3) | 2.2 (1.6, 2.9) | |
| | >32mm | 1.4 (1.0, 2.0) | 1.9 (1.4, 2.7) | 2.1 (1.5, 2.9) | | |
| Other (5) | ≤32mm | 1.9 (0.9, 4.0) | 3.6 (2.0, 6.3) | 4.0 (2.3, 6.8) | 7.2 (4.1, 12.5) | |
| | >32mm | 2.3 (1.4, 3.9) | | | | |

**Figure HT20: Cumulative Percent Revision of Primary Total Conventional Hip Replacement using ≤32mm Head Size by Bearing Surface (Primary Diagnosis OA)**

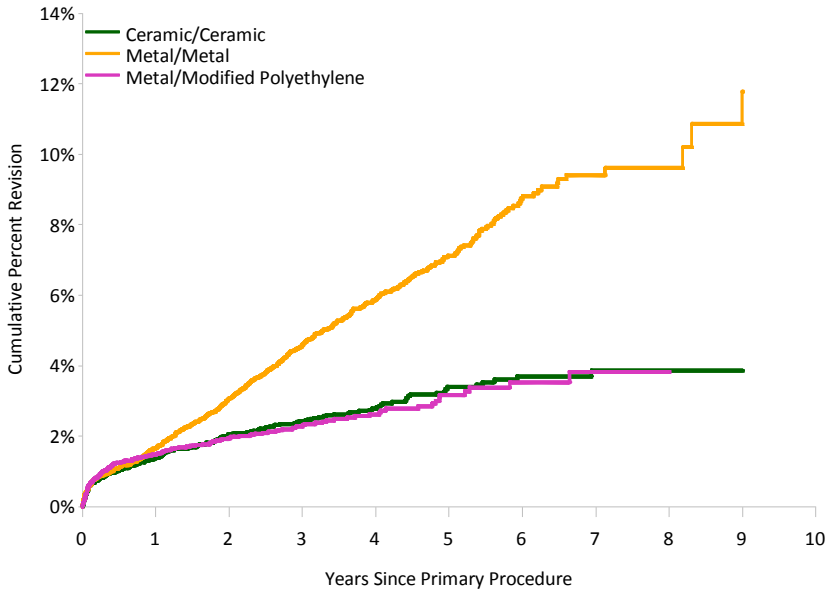



| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Ceramic/Ceramic | 23059 | 20557 | 16208 | 11670 | 6327 | 280 |
| Ceramic/Polyethylene | 4118 | 3841 | 3291 | 2620 | 1775 | 261 |
| Ceramic/Modified Polyethylene | 8063 | 6753 | 4892 | 3021 | 1540 | 150 |
| Metal/Metal | 4791 | 4509 | 3744 | 2836 | 1749 | 97 |
| Metal/Polyethylene | 21436 | 20080 | 16918 | 13242 | 8382 | 668 |
| Metal/Modified Polyethylene | 60372 | 51803 | 37766 | 24961 | 12741 | 944 |
| Ceramicised Metal/Modified Polyethylene | 4160 | 3568 | 2549 | 1267 | 238 | 0 |

| Comparison | Hazard Ratio |
|---|---|
| Ceramic/Ceramic vs Metal/Modified Polyethylene | 0 - 2Wk: HR=1.34 (1.02, 1.75),p=0.035 |
| | 2Wk - 3Mth: HR=1.06 (0.89, 1.27),p=0.496 |
| | 3Mth+: HR=1.15 (1.04, 1.28),p=0.007 |
| Ceramic/Polyethylene vs Metal/Modified Polyethylene | Entire Period: HR=1.19 (1.02, 1.40),p=0.031 |
| Ceramic/Modified Polyethylene vs Metal/Modified Polyethylene | Entire Period: HR=1.04 (0.90, 1.19),p=0.626 |
| Metal/Metal vs Metal/Modified Polyethylene | Entire Period: HR=1.19 (1.02, 1.39),p=0.028 |
| Metal/Polyethylene vs Metal/Modified Polyethylene | 0 - 3Mth: HR=0.90 (0.76, 1.07),p=0.221 |
| | 3Mth - 3.5Yr: HR=1.24 (1.10, 1.40),p<0.001 |
| | 3.5Yr+: HR=1.83 (1.60, 2.09),p<0.001 |

Note: HR – adjusted for age and gender

**Figure HT21: Cumulative Percent Revision of Primary Total Conventional Hip Replacement using >32mm Head Size by Bearing Surface (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Ceramic/Ceramic | 13600 | 9412 | 4126 | 1718 | 619 | 21 |
| Metal/Metal | 14089 | 12914 | 7923 | 2773 | 521 | 27 |
| Metal/Modified Polyethylene | 11756 | 8307 | 3261 | 1068 | 251 | 0 |

Note: Only bearing surfaces with at least seven years follow up are displayed in Figure HT21

| Comparison | Hazard Ratio |
|---|---|
| Ceramic/Ceramic vs Metal/Modified Polyethylene | Entire Period: HR=1.03 (0.86, 1.23),p=0.773 |
| Metal/Metal vs Metal/Modified Polyethylene | 0 - 2Wk: HR=1.41 (0.97, 2.05),p=0.075 |
| | 2Wk - 9Mth: HR=0.93 (0.73, 1.17),p=0.525 |
| | 9Mth - 1.5Yr: HR=2.49 (1.83, 3.39),p<0.001 |
| | 1.5Yr - 2Yr: HR=2.54 (1.71, 3.77),p<0.001 |
| | 2Yr+: HR=3.70 (2.86, 4.80),p<0.001 |
| Metal/Metal vs Ceramic/Ceramic | 0 - 2Wk: HR=1.37 (0.95, 1.99),p=0.095 |
| | 2Wk - 1Mth: HR=0.54 (0.34, 0.85),p=0.008 |
| | 1Mth - 9Mth: HR=1.07 (0.83, 1.39),p=0.585 |
| | 9Mth - 2Yr: HR=2.44 (1.91, 3.12),p<0.001 |
| | 2Yr+: HR=3.61 (2.82, 4.61),p<0.001 |

Note: HR – adjusted for age and gender

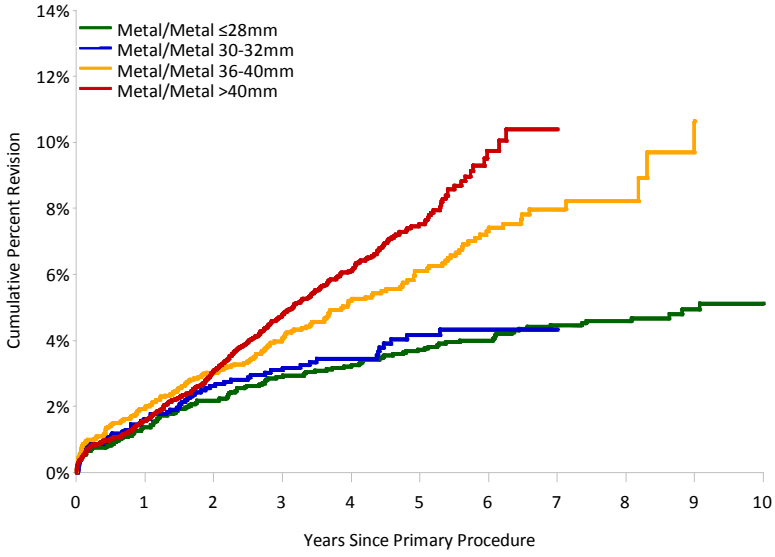
**Table HT35: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**

| Bearing Surface | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Metal/Metal | ≤28mm | 120 | 2802 | 19167 | 0.63 (0.52, 0.75) |
| | 30-32mm | 66 | 1989 | 7632 | 0.86 (0.67, 1.10) |
| | 36-40mm | 189 | 3590 | 14457 | 1.31 (1.13, 1.51) |
| | >40mm | 550 | 10499 | 34204 | 1.61 (1.48, 1.75) |
| **TOTAL** | | **925** | **18880** | **75461** | **1.23 (1.15, 1.31)** |

**Table HT36: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**

| Bearing Surface | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Metal/Metal | ≤28mm | 1.4 (1.0, 1.9) | 2.9 (2.4, 3.6) | 3.7 (3.1, 4.5) | 4.5 (3.7, 5.3) | 5.1 (4.2, 6.2) |
| | 30-32mm | 1.6 (1.1, 2.3) | 3.2 (2.4, 4.1) | 4.2 (3.2, 5.3) | 4.3 (3.4, 5.6) | |
| | 36-40mm | 2.0 (1.6, 2.5) | 4.1 (3.4, 4.8) | 6.1 (5.2, 7.1) | 8.0 (6.8, 9.3) | |
| | >40mm | 1.6 (1.3, 1.8) | 4.8 (4.4, 5.3) | 7.5 (6.8, 8.3) | 10.4 (9.0, 12.0) | |

**Figure HT22: Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**




HR - adjusted for age and gender

Metal/Metal 30-32mm vs Metal/Metal ≤28mm
Entire Period: HR=1.19 (0.88, 1.62),p=0.265

Metal/Metal 36-40mm vs Metal/Metal ≤28mm
Entire Period: HR=1.80 (1.42, 2.27),p<0.001

Metal/Metal >40mm vs Metal/Metal ≤28mm
0 - 1.5Yr: HR=1.45 (1.12, 1.87),p=0.004
1.5Yr+: HR=3.04 (2.39, 3.86),p<0.001

Metal/Metal >40mm vs Metal/Metal 36-40mm
0 - 2Yr: HR=0.91 (0.74, 1.11),p=0.327
2Yr - 2.5Yr: HR=1.89 (1.18, 3.01),p=0.007
2.5Yr+: HR=1.70 (1.31, 2.21),p<0.001

| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Metal/Metal | ≤28mm | 2802 | 2720 | 2506 | 2159 | 1632 | 97 |
| | 30-32mm | 1989 | 1789 | 1238 | 677 | 117 | 0 |
| | 36-40mm | 3590 | 3175 | 2172 | 1304 | 411 | 27 |
| | >40mm | 10499 | 9739 | 5751 | 1469 | 110 | 0 |

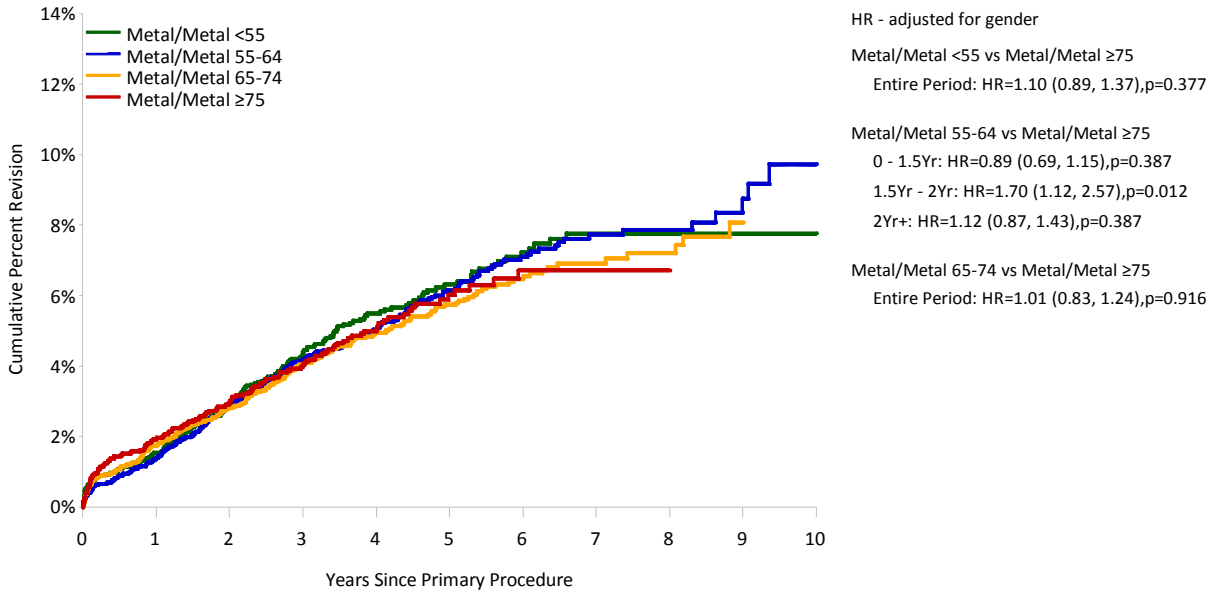
**Table HT37: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**

| Bearing Surface | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Metal/Metal | <55 | 188 | 3663 | 15084 | 1.25 (1.07, 1.44) |
| | 55-64 | 313 | 6245 | 25127 | 1.25 (1.11, 1.39) |
| | 65-74 | 283 | 5880 | 23938 | 1.18 (1.05, 1.33) |
| | ≥75 | 141 | 3092 | 11312 | 1.25 (1.05, 1.47) |
| **TOTAL** | | **925** | **18880** | **75461** | **1.23 (1.15, 1.31)** |

**Table HT38: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**

| Bearing Surface | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Metal/Metal | <55 | 1.5 (1.2, 2.0) | 4.4 (3.7, 5.2) | 6.3 (5.4, 7.3) | 7.8 (6.6, 9.1) | 7.8 (6.6, 9.1) |
| | 55-64 | 1.4 (1.1, 1.7) | 4.2 (3.7, 4.8) | 6.1 (5.5, 6.9) | 7.7 (6.8, 8.8) | 9.7 (7.9, 11.9) |
| | 65-74 | 1.8 (1.4, 2.1) | 4.1 (3.5, 4.6) | 5.7 (5.1, 6.5) | 6.9 (6.1, 7.9) | |
| | ≥75 | 2.0 (1.5, 2.5) | 4.0 (3.3, 4.8) | 6.0 (5.0, 7.2) | 6.7 (5.6, 8.1) | |

**Figure HT23: Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Metal/Metal | <55 | 3663 | 3380 | 2280 | 1135 | 526 | 50 |
| | 55-64 | 6245 | 5788 | 3844 | 1892 | 806 | 48 |
| | 65-74 | 5880 | 5439 | 3704 | 1852 | 715 | 24 |
| | ≥75 | 3092 | 2816 | 1839 | 730 | 223 | 2 |

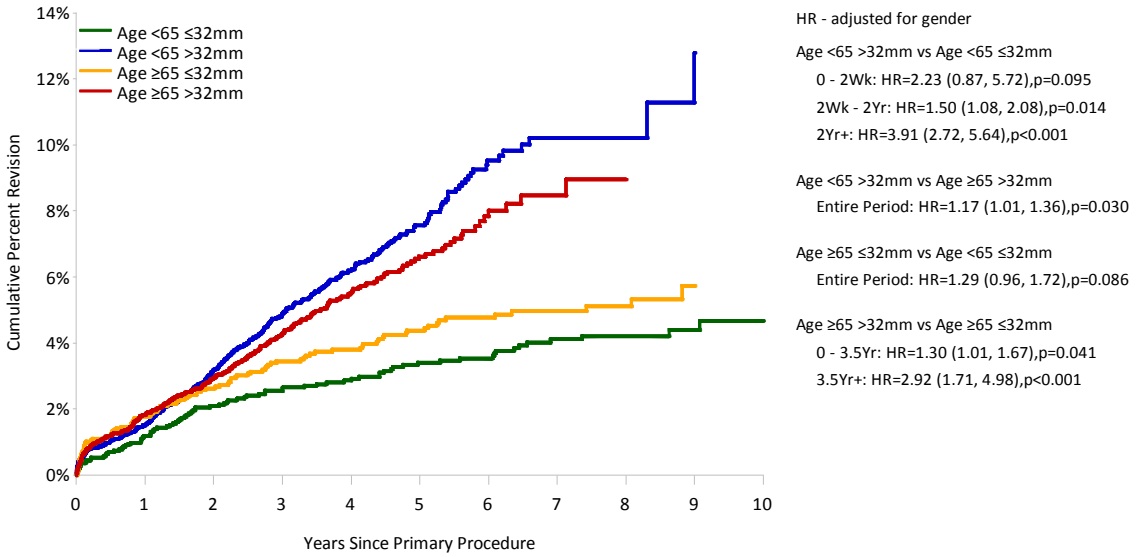
**Table HT39: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement by Age and Head Size (Primary Diagnosis OA)**

| Head Size | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| ≤32mm | <65 | 87 | 2489 | 14493 | 0.60 (0.48, 0.74) |
| | ≥65 | 99 | 2302 | 12306 | 0.80 (0.65, 0.98) |
| >32mm | <65 | 414 | 7419 | 25718 | 1.61 (1.46, 1.77) |
| | ≥65 | 325 | 6670 | 22943 | 1.42 (1.27, 1.58) |
| **TOTAL** | | **925** | **18880** | **75461** | **1.23 (1.15, 1.31)** |

**Table HT40: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age and Head Size (Primary Diagnosis OA)**

| Head Size | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| ≤32mm | <65 | 1.2 (0.8, 1.7) | 2.6 (2.1, 3.4) | 3.4 (2.7, 4.3) | 4.1 (3.3, 5.1) | 4.7 (3.7, 5.9) |
| | ≥65 | 1.8 (1.3, 2.4) | 3.4 (2.8, 4.3) | 4.4 (3.6, 5.4) | 5.0 (4.1, 6.1) | |
| >32mm | <65 | 1.5 (1.3, 1.8) | 4.9 (4.4, 5.5) | 7.6 (6.8, 8.4) | 10.2 (9.0, 11.6) | |
| | ≥65 | 1.8 (1.5, 2.2) | 4.3 (3.8, 4.8) | 6.6 (5.9, 7.5) | 8.5 (7.3, 9.9) | |

**Figure HT24: Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age and Head Size (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| ≤32mm | <65 | 2489 | 2373 | 1967 | 1520 | 1018 | 78 |
| | ≥65 | 2302 | 2136 | 1777 | 1316 | 731 | 19 |
| >32mm | <65 | 7419 | 6795 | 4157 | 1507 | 314 | 20 |
| | ≥65 | 6670 | 6119 | 3766 | 1266 | 207 | 7 |

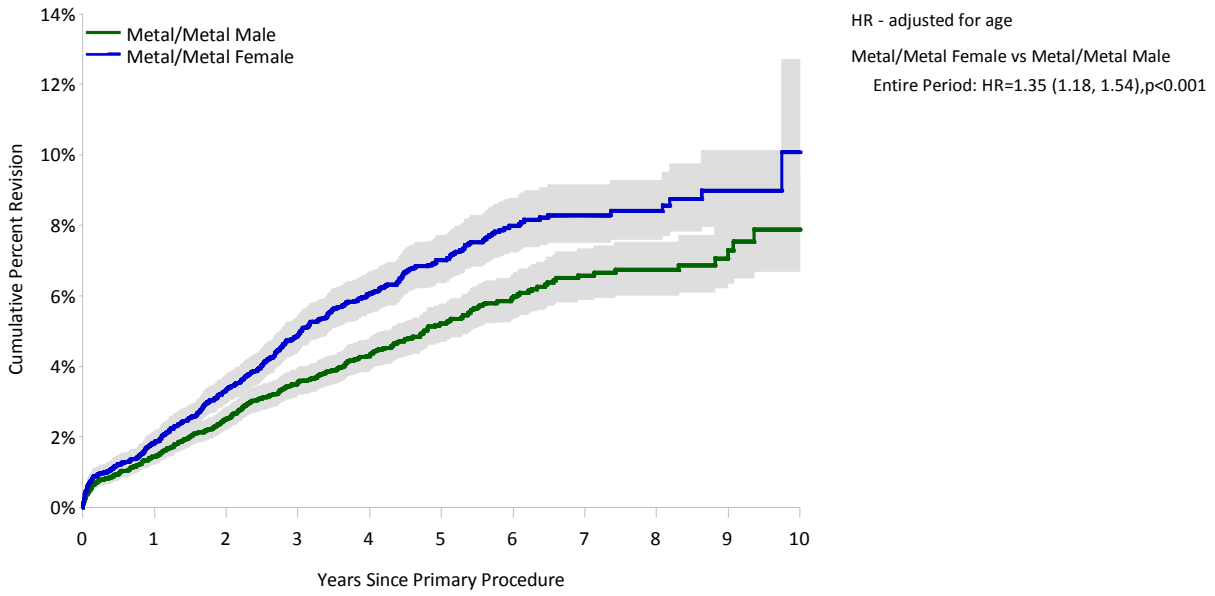
**Table HT41: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**

| Bearing Surface | Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Metal/Metal | Male | 444 | 10600 | 41714 | 1.06 (0.97, 1.17) |
| | Female | 481 | 8280 | 33747 | 1.43 (1.30, 1.56) |
| **TOTAL** | | **925** | **18880** | **75461** | **1.23 (1.15, 1.31)** |

**Table HT42: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**

| Bearing Surface | Gender | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Metal/Metal | Male | 1.4 (1.2, 1.7) | 3.6 (3.2, 4.0) | 5.2 (4.7, 5.8) | 6.6 (5.9, 7.3) | 7.9 (6.7, 9.3) |
| | Female | 1.8 (1.6, 2.2) | 4.9 (4.4, 5.4) | 7.0 (6.4, 7.7) | 8.3 (7.5, 9.1) | 10.1 (8.0, 12.7) |

**Figure HT25: Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Metal/Metal | Male | 10600 | 9710 | 6400 | 3032 | 1269 | 74 |
| | Female | 8280 | 7713 | 5267 | 2577 | 1001 | 50 |

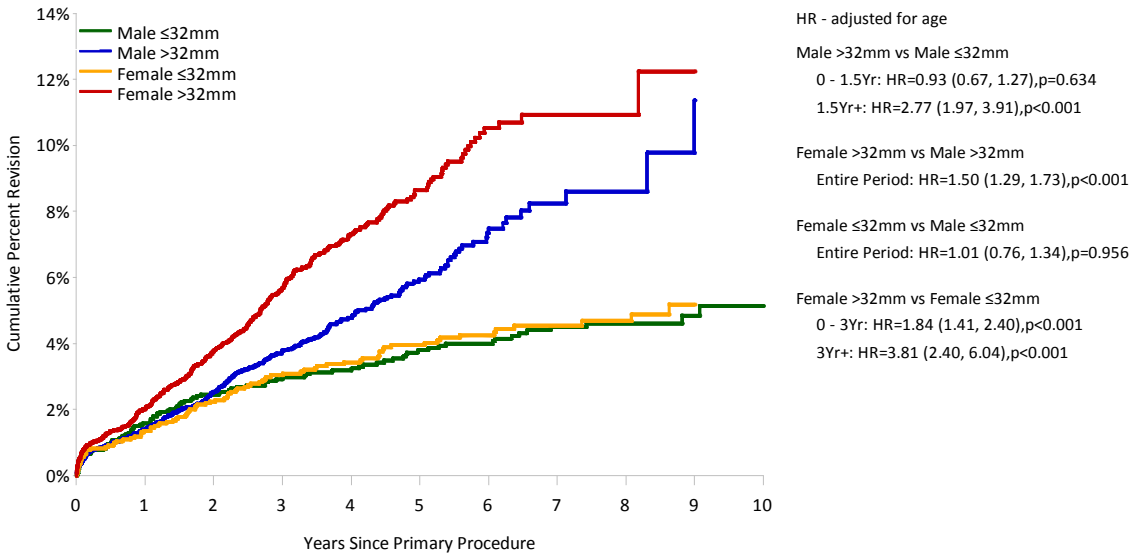
**Table HT43: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**

| Gender | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | ≤32mm | 95 | 2463 | 14107 | 0.67 (0.54, 0.82) |
| | >32mm | 349 | 8137 | 27606 | 1.26 (1.14, 1.40) |
| Female | ≤32mm | 91 | 2328 | 12692 | 0.72 (0.58, 0.88) |
| | >32mm | 390 | 5952 | 21055 | 1.85 (1.67, 2.05) |
| **TOTAL** | | **925** | **18880** | **75461** | **1.23 (1.15, 1.31)** |

**Table HT44: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**

| Gender | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | ≤32mm | 1.6 (1.1, 2.2) | 3.0 (2.4, 3.7) | 3.8 (3.1, 4.7) | 4.5 (3.7, 5.5) | 5.1 (4.1, 6.5) |
| | >32mm | 1.4 (1.2, 1.7) | 3.8 (3.4, 4.3) | 5.9 (5.3, 6.7) | 8.2 (7.1, 9.6) | |
| Female | ≤32mm | 1.4 (1.0, 1.9) | 3.1 (2.4, 3.9) | 3.9 (3.2, 4.9) | 4.5 (3.7, 5.6) | |
| | >32mm | 2.0 (1.7, 2.4) | 5.7 (5.1, 6.4) | 8.6 (7.8, 9.6) | 10.9 (9.6, 12.4) | |

**Figure HT26: Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | ≤32mm | 2463 | 2314 | 1926 | 1488 | 982 | 59 |
| | >32mm | 8137 | 7396 | 4474 | 1544 | 287 | 15 |
| Female | ≤32mm | 2328 | 2195 | 1818 | 1348 | 767 | 38 |
| | >32mm | 5952 | 5518 | 3449 | 1229 | 234 | 12 |

**Figure HT27: Revision Diagnosis Cumulative Incidence of Metal/Metal and Metal/Polyethylene Primary Total Conventional Hip Replacement (Primary Diagnosis OA)**

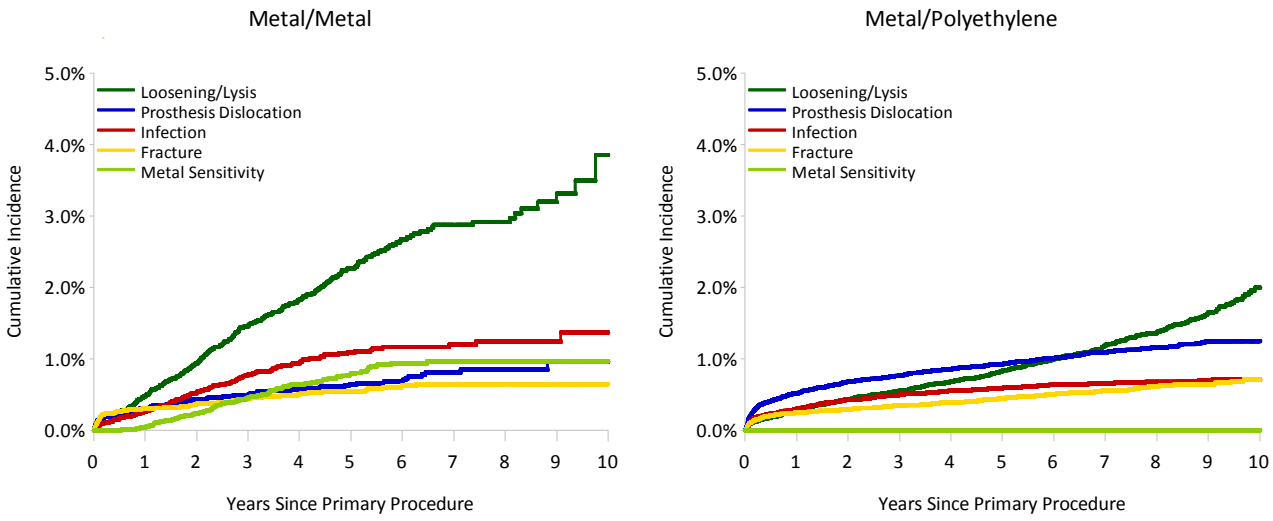



**Figure HT28: Revision Diagnosis Cumulative Incidence of Metal/Metal and Metal/Polyethylene Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**

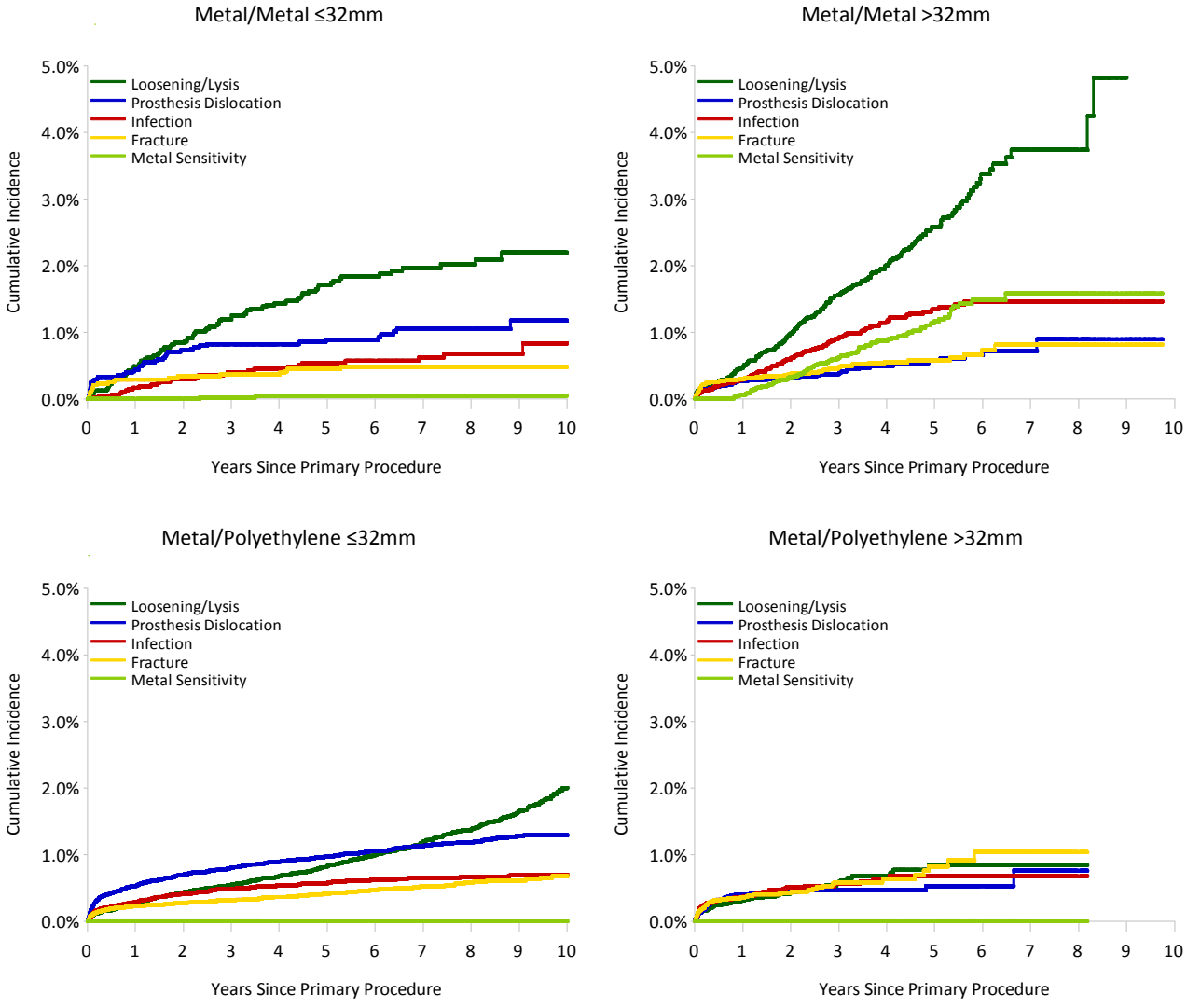


**Table HT45: Revision Rates of Metal/Metal Primary Total Conventional Hip Replacement using Head Size >32mm by Prostheses Used (Primary Diagnosis OA)**

| Head Surface | Acetabular Surface | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| ASR | ASR | 295 | 3971 | 13282 | 2.22 (1.97, 2.49) |
| Articul/Eze | Ultamet | 45 | 1395 | 5367 | 0.84 (0.61, 1.12) |
| BHR | BHR | 76 | 2349 | 7841 | 0.97 (0.76, 1.21) |
| BHR | R3 | 22 | 496 | 886 | 2.48 (1.56, 3.76) |
| Bionik | Bionik | 32 | 376 | 1110 | 2.88 (1.97, 4.07) |
| Cormet 2000 | Cormet | 27 | 615 | 2133 | 1.27 (0.83, 1.84) |
| Icon | Icon | 24 | 330 | 925 | 2.59 (1.66, 3.86) |
| M2a | M2a | 45 | 779 | 4008 | 1.12 (0.82, 1.50) |
| M2a | Recap | 23 | 916 | 2843 | 0.81 (0.51, 1.21) |
| Metasul | Durom | 52 | 1099 | 4211 | 1.23 (0.92, 1.62) |
| Mitch TRH | Mitch TRH | 25 | 613 | 1532 | 1.63 (1.06, 2.41) |
| S-Rom | Ultamet | 10 | 279 | 1589 | 0.63 (0.30, 1.16) |
| Other (27) | | 63 | 871 | 2933 | 2.15 (1.65, 2.75) |
| **TOTAL** | | **739** | **14089** | **48661** | **1.52 (1.41, 1.63)** |

Note: Only prostheses with over 200 procedures have been listed.

**Table HT46: Yearly Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement using Head Size >32mm by Prostheses Used (Primary Diagnosis OA)**

| Head Surface | Acetabular Surface | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| ASR | ASR | 1.7 (1.4, 2.2) | 6.6 (5.8, 7.5) | 10.3 (9.0, 11.6) | | |
| Articul/Eze | Ultamet | 1.8 (1.2, 2.6) | 2.8 (2.0, 3.9) | 4.0 (2.9, 5.5) | 4.6 (3.3, 6.3) | |
| BHR | BHR | 0.9 (0.6, 1.4) | 2.8 (2.2, 3.7) | 4.9 (3.8, 6.3) | 6.7 (4.8, 9.4) | |
| BHR | R3 | 2.4 (1.3, 4.2) | | | | |
| Bionik | Bionik | 3.5 (2.0, 5.9) | 7.1 (4.7, 10.6) | | | |
| Cormet 2000 | Cormet | 1.2 (0.6, 2.4) | 3.2 (2.0, 5.2) | 6.0 (3.9, 9.1) | 9.3 (5.9, 14.4) | |
| Icon | Icon | 2.5 (1.2, 4.9) | 7.4 (4.7, 11.6) | | | |
| M2a | M2a | 1.8 (1.1, 3.0) | 3.7 (2.6, 5.4) | 5.3 (3.8, 7.2) | 7.2 (5.3, 9.7) | |
| M2a | Recap | 1.5 (0.8, 2.5) | 1.9 (1.1, 3.1) | 3.4 (2.1, 5.5) | | |
| Metasul | Durom | 1.3 (0.8, 2.2) | 4.0 (3.0, 5.5) | 5.5 (4.1, 7.3) | | |
| Mitch TRH | Mitch TRH | 1.9 (1.0, 3.3) | 4.6 (3.1, 7.0) | | | |
| S-Rom | Ultamet | 2.2 (1.0, 4.7) | 3.3 (1.7, 6.2) | 3.7 (2.0, 6.7) | 3.7 (2.0, 6.7) | |
| Other (27) | | 2.3 (1.5, 3.6) | 5.4 (3.9, 7.6) | 10.1 (7.4, 13.6) | 15.4 (11.6, 20.3) | |

Note: Only prostheses with over 200 procedures have been listed.

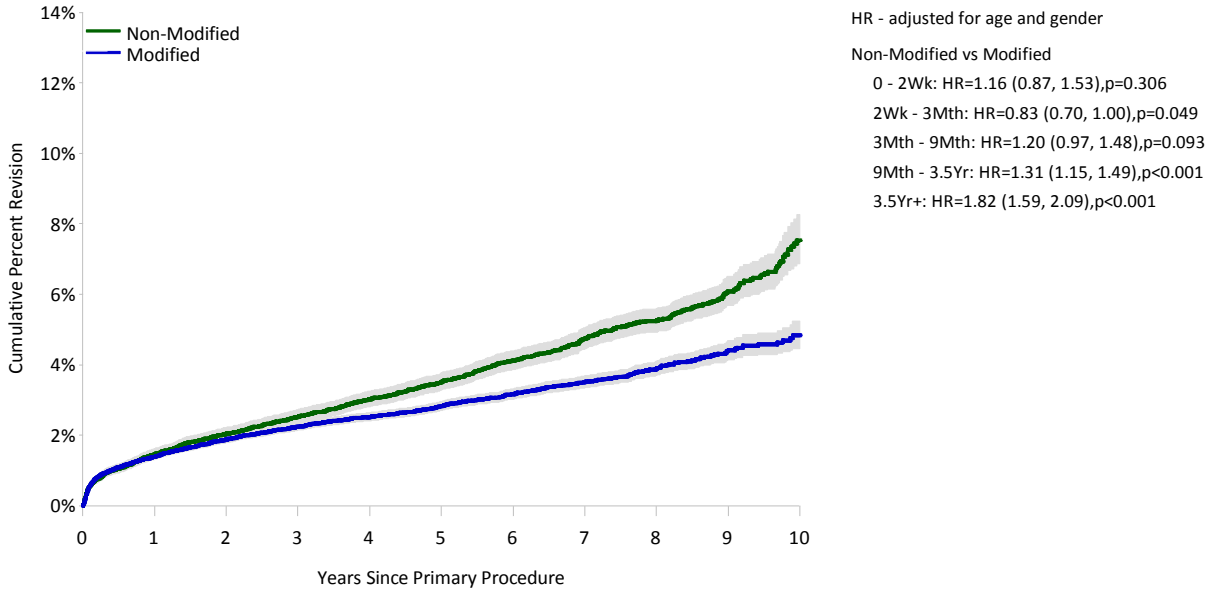
**Table HT47: Revision Rates of Primary Total Conventional Hip Replacement by Type of Polyethylene (Primary Diagnosis OA)**

| Polyethylene Surface | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Non-Modified | 1112 | 26767 | 150570 | 0.74 (0.70, 0.78) |
| Modified | 2239 | 90687 | 351612 | 0.64 (0.61, 0.66) |
| **TOTAL** | **3351** | **117454** | **502182** | **0.67 (0.64, 0.69)** |

**Table HT48: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Polyethylene (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Non-Modified | 1.5 (1.3, 1.6) | 2.5 (2.3, 2.7) | 3.5 (3.3, 3.8) | 4.7 (4.5, 5.1) | 7.5 (6.9, 8.3) |
| Modified | 1.4 (1.3, 1.5) | 2.2 (2.1, 2.4) | 2.8 (2.7, 3.0) | 3.5 (3.4, 3.7) | 4.8 (4.5, 5.2) |

**Figure HT29: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Polyethylene (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Non-Modified | 26767 | 24725 | 20530 | 16065 | 10196 | 929 |
| Modified | 90687 | 74816 | 50152 | 30698 | 14796 | 1094 |

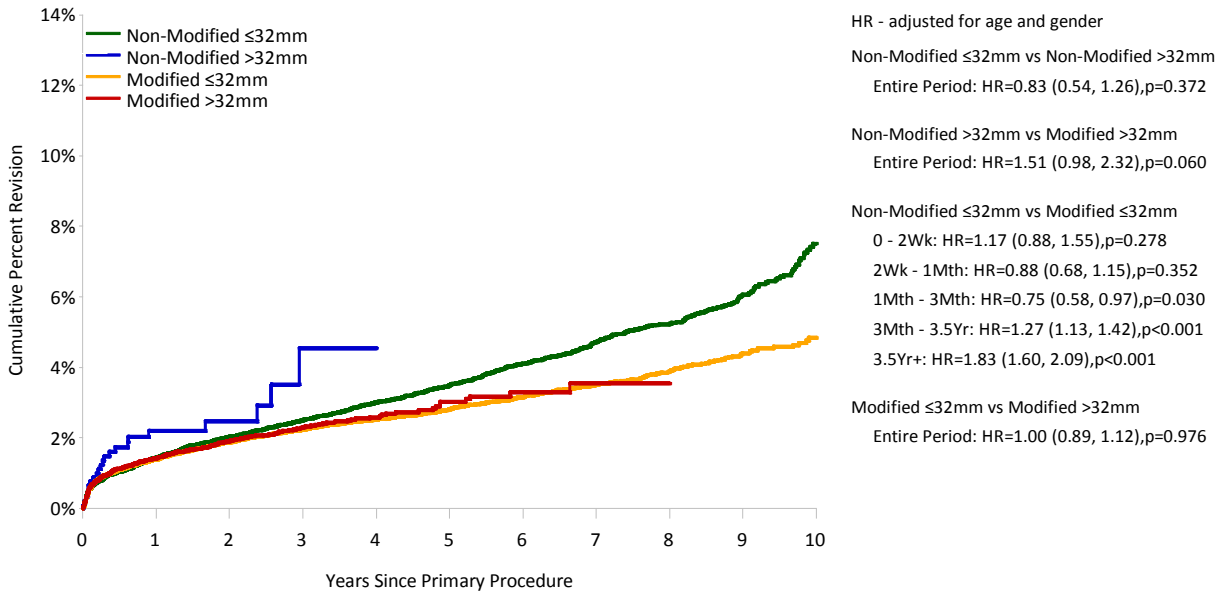
**Table HT49: Revision Rates of Primary Total Conventional Hip Replacement by Type of Polyethylene and Head Size (Primary Diagnosis OA)**

| Polyethylene Surface | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Non-Modified | ≤32mm | 1090 | 25827 | 149125 | 0.73 (0.69, 0.78) |
| | >32mm | 22 | 940 | 1445 | 1.52 (0.95, 2.31) |
| Modified | ≤32mm | 1901 | 72595 | 312067 | 0.61 (0.58, 0.64) |
| | >32mm | 338 | 18092 | 39545 | 0.85 (0.77, 0.95) |
| **TOTAL** | | **3351** | **117454** | **502182** | **0.67 (0.64, 0.69)** |

**Table HT50: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Polyethylene and Head Size (Primary Diagnosis OA)**

| Polyethylene Surface | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Non-Modified | ≤32mm | 1.4 (1.3, 1.6) | 2.5 (2.3, 2.7) | 3.5 (3.3, 3.7) | 4.7 (4.4, 5.0) | 7.5 (6.8, 8.2) |
| | >32mm | 2.2 (1.4, 3.5) | 4.5 (2.5, 8.2) | | | |
| Modified | ≤32mm | 1.4 (1.3, 1.5) | 2.2 (2.1, 2.4) | 2.8 (2.7, 3.0) | 3.5 (3.3, 3.7) | 4.8 (4.4, 5.2) |
| | >32mm | 1.4 (1.2, 1.6) | 2.3 (2.0, 2.6) | 3.0 (2.6, 3.5) | 3.5 (2.9, 4.3) | |

**Figure HT30: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Type of Polyethylene and Head Size (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Non-Modified | ≤32mm | 25827 | 24184 | 20438 | 16035 | 10196 | 929 |
| | >32mm | 940 | 541 | 92 | 30 | 0 | 0 |
| Modified | ≤32mm | 72595 | 62124 | 45207 | 29249 | 14519 | 1094 |
| | >32mm | 18092 | 12692 | 4945 | 1449 | 277 | 0 |

**Figure HT31: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Surface and Type of Polyethylene (Primary Diagnosis OA)**

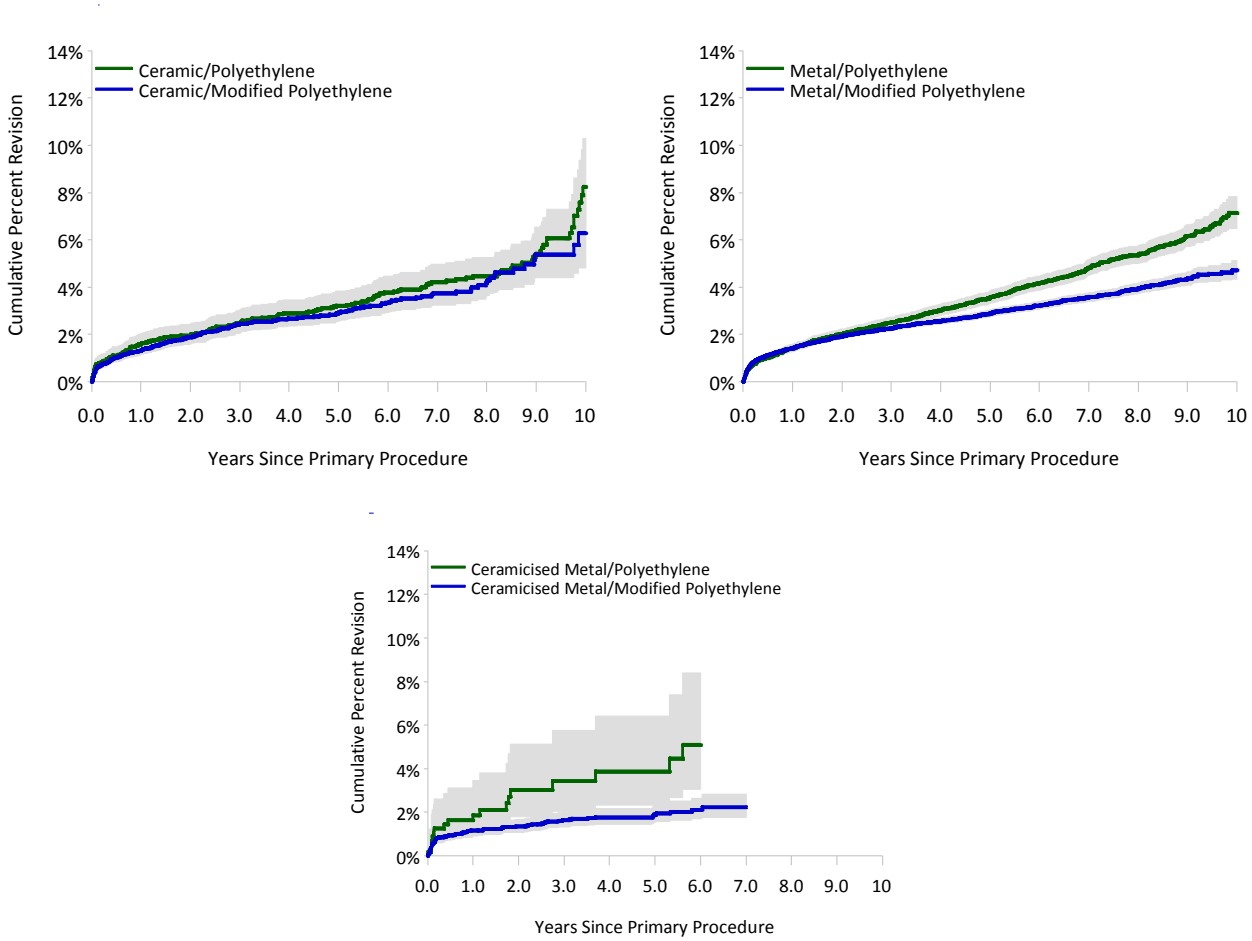


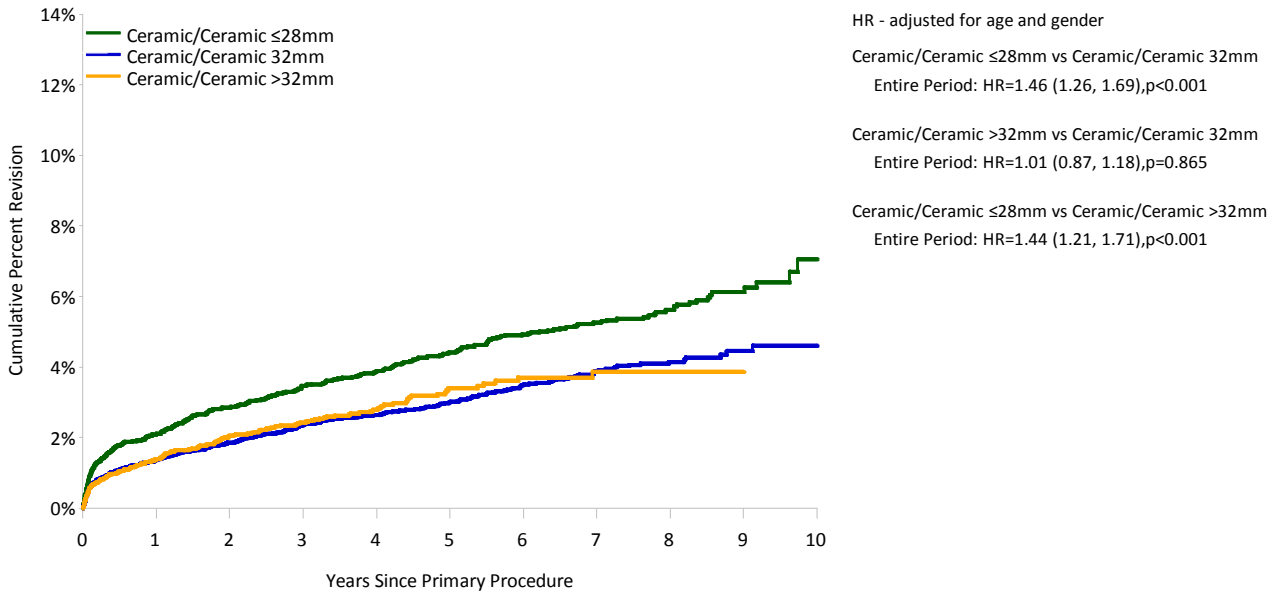
**Table HT51: Revision Rates of Ceramic/Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**

| Bearing Surface | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Ceramic/Ceramic | ≤28mm | 299 | 6002 | 36880 | 0.81 (0.72, 0.91) |
| | 32mm | 481 | 17057 | 76003 | 0.63 (0.58, 0.69) |
| | >32mm | 277 | 13600 | 33013 | 0.84 (0.74, 0.94) |
| **TOTAL** | | **1057** | **36659** | **145897** | **0.72 (0.68, 0.77)** |

**Table HT52: Yearly Cumulative Percent Revision of Ceramic/Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**

| Bearing Surface | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Ceramic/Ceramic | ≤28mm | 2.1 (1.8, 2.5) | 3.5 (3.0, 4.0) | 4.4 (3.9, 5.0) | 5.3 (4.7, 5.9) | 7.1 (5.9, 8.4) |
| | 32mm | 1.4 (1.2, 1.6) | 2.4 (2.1, 2.6) | 3.0 (2.7, 3.3) | 3.9 (3.5, 4.3) | 4.6 (4.0, 5.2) |
| | >32mm | 1.4 (1.2, 1.6) | 2.4 (2.1, 2.8) | 3.4 (2.9, 3.9) | 3.9 (3.3, 4.6) | |

**Figure HT32: Cumulative Percent Revision of Ceramic/Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Ceramic/Ceramic | ≤28mm | 6002 | 5696 | 5092 | 4172 | 2680 | 160 |
| | 32mm | 17057 | 14861 | 11116 | 7498 | 3647 | 120 |
| | >32mm | 13600 | 9412 | 4126 | 1718 | 619 | 21 |

**Table HT53: Revision Rates of Primary Total Conventional Hip Replacement using Ceramic and Metal Bearing Surfaces (Primary Diagnosis OA)**

| Bearing Surface | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Ceramic/Metal | 5 | 272 | 407 | 1.23 (0.40, 2.87) |
| Metal/Ceramic | 8 | 203 | 399 | 2.01 (0.87, 3.95) |
| **TOTAL** | **13** | **475** | **805** | **1.61 (0.86, 2.76)** |

**Table HT54: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement using Ceramic and Metal Bearing Surfaces (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Ceramic/Metal | 1.2 (0.4, 3.6) | | | | |
| Metal/Ceramic | 4.8 (2.4, 9.6) | | | | |

## Prostheses Types

There are 1,869 different stem and acetabular combinations for primary total conventional hip replacement recorded by the Registry, 330 more than 2009. The revision rates and yearly cumulative percent revision of the 81 combinations with more than 400 procedures are listed in Tables HT55 – HT60. Although the listed combinations are a small proportion of the possible combinations, they represent 78.3% of all primary total conventional hip replacements.

The 'Other' group is the combined outcome of all prostheses combinations with less than 400 procedures. This group has a total of 1,788 stem and acetabular combinations, making up 21.7% of all primary total conventional hip replacement.

There are 11 total conventional stem and acetabular combinations with more than 400 procedures using cement fixation. The number of revisions per 100 observed component years varies from 0.20 to 0.93. The MS30/Low Profile Cup and the Exeter/Exeter have the lowest ten-year cumulative percent revision of 1.6% and 5.6% respectively (Tables HT55 and HT56).

There are 46 cementless total conventional stem and acetabular combinations listed. The number of revisions per 100 observed component years varies from 0.23 to 2.48 revisions. The Natural Hip/Fitmore and Alloclassic/Trilogy cementless combinations have less than 0.5 revisions per 100 observed component years. Of the six combinations reported with a ten year cumulative percent revision the Secure-Fit Plus/Trident combination has the lowest cumulative percentage revision (3.3%) (Tables HT57 and HT58).

There are 24 combinations of total conventional hip replacement with hybrid fixation. The rate of revision per 100 observed component years varies from 0.23 to 2.68. The Exeter/Vitalock has the lowest cumulative percent revision at ten years (4.4%) (Tables HT59 and HT60).

**Table HT55: Revision Rates of Primary Total Conventional Hip Replacement with Cement Fixation**

| Femoral Component | Acetabular Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| CPCS | Reflection (cemented) | 21 | 646 | 2758 | 0.76 (0.47, 1.16) |
| CPT | ZCA | 17 | 609 | 3166 | 0.54 (0.31, 0.86) |
| Charnley | Charnley | 18 | 590 | 3186 | 0.57 (0.33, 0.89) |
| Charnley | Charnley Ogee | 38 | 709 | 4067 | 0.93 (0.66, 1.28) |
| Exeter | Contemporary | 27 | 490 | 3639 | 0.74 (0.49, 1.08) |
| Exeter | Exeter | 19 | 420 | 3414 | 0.56 (0.34, 0.87) |
| Exeter V40 | Contemporary | 119 | 4168 | 18558 | 0.64 (0.53, 0.77) |
| Exeter V40 | Exeter | 50 | 1711 | 8680 | 0.58 (0.43, 0.76) |
| Exeter V40 | Exeter Contemporary | 72 | 2663 | 9534 | 0.76 (0.59, 0.95) |
| MS 30 | Low Profile Cup | 8 | 649 | 4063 | 0.20 (0.09, 0.39) |
| Spectron EF | Reflection (cemented) | 61 | 1535 | 7927 | 0.77 (0.59, 0.99) |
| Other (315) | | 229 | 6230 | 31171 | 0.73 (0.64, 0.84) |
| **TOTAL** | | **679** | **20420** | **100161** | **0.68 (0.63, 0.73)** |

Note: Some cementless components have been cemented
Only prostheses with over 400 procedures have been listed.

**Table HT56: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cement Fixation**

| Femoral Component | Acetabular Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| CPCS | Reflection (cemented) | 1.4 (0.7, 2.7) | 2.9 (1.8, 4.7) | 3.4 (2.1, 5.4) | 5.2 (3.1, 8.5) | |
| CPT | ZCA | 0.5 (0.2, 1.6) | 1.9 (1.0, 3.6) | 2.4 (1.3, 4.3) | 3.2 (1.8, 5.5) | |
| Charnley | Charnley | 0.5 (0.2, 1.6) | 1.1 (0.5, 2.5) | 2.5 (1.4, 4.5) | 3.8 (2.2, 6.6) | |
| Charnley | Charnley Ogee | 1.0 (0.5, 2.1) | 3.0 (2.0, 4.7) | 4.9 (3.4, 6.9) | 6.6 (4.8, 9.1) | |
| Exeter | Contemporary | 1.9 (1.0, 3.6) | 3.9 (2.5, 6.1) | 4.4 (2.8, 6.7) | 5.7 (3.9, 8.3) | 6.3 (4.4, 9.1) |
| Exeter | Exeter | 1.0 (0.4, 2.6) | 1.2 (0.5, 2.9) | 2.3 (1.2, 4.4) | 3.5 (2.0, 6.0) | 5.6 (3.6, 8.7) |
| Exeter V40 | Contemporary | 1.3 (1.0, 1.7) | 2.4 (2.0, 3.0) | 2.9 (2.4, 3.5) | 3.6 (2.9, 4.4) | |
| Exeter V40 | Exeter | 0.8 (0.5, 1.4) | 2.0 (1.4, 2.9) | 3.0 (2.2, 4.0) | 3.9 (2.9, 5.3) | |
| Exeter V40 | Exeter Contemporary | 1.3 (1.0, 1.9) | 2.5 (1.9, 3.2) | 3.1 (2.4, 4.1) | 4.5 (3.4, 6.0) | |
| MS 30 | Low Profile Cup | 0.5 (0.2, 1.5) | 0.7 (0.2, 1.7) | 1.1 (0.5, 2.4) | 1.1 (0.5, 2.4) | 1.6 (0.7, 3.6) |
| Spectron EF | Reflection (cemented) | 1.1 (0.7, 1.8) | 2.0 (1.3, 2.9) | 3.0 (2.2, 4.2) | 4.6 (3.4, 6.2) | 8.9 (6.3, 12.5) |
| Other (315) | | 1.4 (1.2, 1.8) | 2.4 (2.0, 2.8) | 3.7 (3.2, 4.3) | 4.6 (4.0, 5.3) | 7.2 (5.9, 8.7) |

Note: Some cementless components have been cemented
Only prostheses with over 400 procedures have been listed.

**Table HT57: Revision Rates of Primary Total Conventional Hip Replacement with Cementless Fixation**

| Femoral Component | Acetabular Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| ABGII | ABGII | 139 | 2850 | 17972 | 0.77 (0.65, 0.91) |
| ABGII | ABGII (Shell/Insert) | 28 | 755 | 4138 | 0.68 (0.45, 0.98) |
| ABGII | Trident | 92 | 2011 | 8671 | 1.06 (0.86, 1.30) |
| Accolade | Trident | 222 | 7046 | 24369 | 0.91 (0.80, 1.04) |
| Adapter | Bionik | 32 | 508 | 1389 | 2.30 (1.58, 3.25) |
| Alloclassic | Allofit | 136 | 4649 | 20313 | 0.67 (0.56, 0.79) |
| Alloclassic | Durom | 37 | 620 | 2361 | 1.57 (1.10, 2.16) |
| Alloclassic | Fitmore | 67 | 1476 | 7878 | 0.85 (0.66, 1.08) |
| Alloclassic | Trabecular Metal Shell | 22 | 751 | 1988 | 1.11 (0.69, 1.68) |
| Alloclassic | Trilogy | 4 | 599 | 1724 | 0.23 (0.06, 0.59) |
| Anthology | R3 | 24 | 1535 | 2091 | 1.15 (0.74, 1.71) |
| Anthology | Reflection (cementless) | 13 | 825 | 2362 | 0.55 (0.29, 0.94) |
| Apex | Fin II | 9 | 542 | 1337 | 0.67 (0.31, 1.28) |
| CLS | Allofit | 25 | 669 | 3381 | 0.74 (0.48, 1.09) |
| CLS | Fitmore | 23 | 559 | 3377 | 0.68 (0.43, 1.02) |
| Citation | Trident | 31 | 1139 | 5186 | 0.60 (0.41, 0.85) |
| Citation | Vitalock | 22 | 555 | 4070 | 0.54 (0.34, 0.82) |
| Corail | ASR | 226 | 2891 | 9118 | 2.48 (2.17, 2.82) |
| Corail | Duraloc | 36 | 1329 | 5858 | 0.61 (0.43, 0.85) |
| Corail | Pinnacle | 230 | 11200 | 22237 | 1.03 (0.90, 1.18) |
| Epoch | Trilogy | 28 | 929 | 3517 | 0.80 (0.53, 1.15) |
| F2L | SPH-Blind | 43 | 613 | 4307 | 1.00 (0.72, 1.34) |
| Mallory-Head | Mallory-Head | 90 | 2389 | 12905 | 0.70 (0.56, 0.86) |
| Mallory-Head | Recap | 9 | 435 | 1336 | 0.67 (0.31, 1.28) |
| Natural Hip | Fitmore | 21 | 869 | 5207 | 0.40 (0.25, 0.62) |
| Omnifit | Secur-Fit | 43 | 508 | 3627 | 1.19 (0.86, 1.60) |
| Omnifit | Trident | 45 | 1158 | 6858 | 0.66 (0.48, 0.88) |
| Quadra-H | Versafit | 31 | 1428 | 1547 | 2.00 (1.36, 2.84) |
| S-Rom | Option | 28 | 666 | 4851 | 0.58 (0.38, 0.83) |
| S-Rom | Pinnacle | 68 | 2231 | 7700 | 0.88 (0.69, 1.12) |
| SL-Plus | EPF-Plus | 72 | 2167 | 7447 | 0.97 (0.76, 1.22) |
| SL-Plus | R3 | 18 | 729 | 1074 | 1.68 (0.99, 2.65) |
| Secur-Fit | DeltaMotion | 4 | 431 | 445 | 0.90 (0.25, 2.30) |
| Secur-Fit | Trident | 126 | 4945 | 20123 | 0.63 (0.52, 0.75) |
| Secur-Fit Plus | Trident | 106 | 4436 | 24014 | 0.44 (0.36, 0.53) |
| Stability | Duraloc | 23 | 401 | 3005 | 0.77 (0.49, 1.15) |
| Summit | ASR | 68 | 1118 | 4256 | 1.60 (1.24, 2.03) |
| Summit | Pinnacle | 47 | 2735 | 9172 | 0.51 (0.38, 0.68) |
| Synergy | BHR | 20 | 791 | 2710 | 0.74 (0.45, 1.14) |
| Synergy | R3 | 37 | 1792 | 2534 | 1.46 (1.03, 2.01) |
| Synergy | Reflection (cementless) | 214 | 7212 | 38498 | 0.56 (0.48, 0.64) |
| Taperloc | Exceed | 7 | 512 | 587 | 1.19 (0.48, 2.46) |
| Taperloc | M2a | 23 | 512 | 2342 | 0.98 (0.62, 1.47) |
| Taperloc | Mallory-Head | 30 | 892 | 4580 | 0.65 (0.44, 0.94) |
| Taperloc | Recap | 18 | 497 | 1549 | 1.16 (0.69, 1.84) |
| VerSys | Trilogy | 142 | 3978 | 21462 | 0.66 (0.56, 0.78) |
| Other (852) | | 1022 | 24579 | 93334 | 1.09 (1.03, 1.16) |
| **TOTAL** | | **3801** | **111462** | **438808** | **0.87 (0.84, 0.89)** |

Note: Only prostheses with over 400 procedures have been listed.

**Table HT58: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cementless Fixation**

| Femoral Component | Acetabular Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| ABGII | ABGII | 1.8 (1.3, 2.3) | 3.1 (2.5, 3.8) | 4.1 (3.4, 4.9) | 5.4 (4.5, 6.4) | 6.3 (5.2, 7.7) |
| ABGII | ABGII (Shell/Insert) | 1.7 (1.0, 3.0) | 2.6 (1.7, 4.0) | 3.2 (2.2, 4.8) | 4.4 (3.0, 6.4) | |
| ABGII | Trident | 2.2 (1.6, 2.9) | 3.9 (3.1, 5.0) | 4.9 (3.9, 6.1) | 6.5 (5.2, 8.1) | |
| Accolade | Trident | 1.6 (1.3, 1.9) | 3.1 (2.7, 3.6) | 4.0 (3.5, 4.6) | 4.8 (4.0, 5.8) | |
| Adapter | Bionik | 3.0 (1.8, 4.9) | 5.5 (3.7, 8.2) | | | |
| Alloclassic | Allofit | 1.5 (1.2, 1.9) | 2.5 (2.1, 3.0) | 3.3 (2.8, 4.0) | 3.5 (2.9, 4.2) | |
| Alloclassic | Durom | 1.3 (0.7, 2.6) | 5.0 (3.5, 7.2) | 6.8 (4.8, 9.5) | | |
| Alloclassic | Fitmore | 2.4 (1.7, 3.3) | 3.7 (2.8, 4.8) | 4.3 (3.3, 5.5) | 5.1 (4.0, 6.5) | |
| Alloclassic | Trabecular Metal Shell | 2.5 (1.6, 3.9) | 3.1 (2.0, 4.7) | 3.5 (2.2, 5.4) | | |
| Alloclassic | Trilogy | 0.5 (0.2, 1.6) | 0.7 (0.3, 1.9) | 0.7 (0.3, 1.9) | | |
| Anthology | R3 | 1.4 (0.9, 2.2) | | | | |
| Anthology | Reflection (cementless) | 1.2 (0.7, 2.3) | 1.7 (1.0, 2.8) | | | |
| Apex | Fin II | 1.4 (0.7, 2.9) | 2.0 (1.0, 4.0) | | | |
| CLS | Allofit | 1.5 (0.8, 2.8) | 3.1 (2.0, 4.8) | 3.6 (2.3, 5.4) | 4.7 (3.1, 7.2) | |
| CLS | Fitmore | 1.8 (1.0, 3.4) | 3.9 (2.5, 6.0) | 4.1 (2.7, 6.3) | 4.8 (3.2, 7.1) | |
| Citation | Trident | 1.7 (1.1, 2.6) | 2.4 (1.6, 3.5) | 3.0 (2.1, 4.4) | 3.0 (2.1, 4.4) | |
| Citation | Vitalock | 0.5 (0.2, 1.7) | 2.2 (1.2, 3.8) | 2.8 (1.7, 4.5) | 3.5 (2.2, 5.5) | 5.0 (3.3, 7.7) |
| Corail | ASR | 2.2 (1.7, 2.8) | 7.3 (6.3, 8.4) | 11.4 (9.8, 13.2) | | |
| Corail | Duraloc | 1.5 (0.9, 2.3) | 2.2 (1.5, 3.1) | 3.0 (2.1, 4.2) | 3.6 (2.5, 5.1) | |
| Corail | Pinnacle | 1.7 (1.5, 2.0) | 2.6 (2.2, 3.0) | 3.3 (2.8, 4.0) | 4.0 (3.1, 5.0) | |
| Epoch | Trilogy | 2.2 (1.4, 3.4) | 2.9 (2.0, 4.3) | 2.9 (2.0, 4.3) | 3.7 (2.4, 5.6) | |
| F2L | SPH-Blind | 3.1 (2.0, 4.8) | 4.9 (3.5, 7.0) | 6.1 (4.5, 8.4) | 6.9 (5.1, 9.3) | |
| Mallory-Head | Mallory-Head | 1.9 (1.4, 2.6) | 2.4 (1.9, 3.2) | 3.2 (2.6, 4.1) | 4.1 (3.3, 5.2) | 6.3 (4.9, 8.2) |
| Mallory-Head | Recap | 1.2 (0.5, 2.8) | 1.4 (0.6, 3.1) | 1.9 (0.9, 4.1) | | |
| Natural Hip | Fitmore | 1.0 (0.5, 2.0) | 1.4 (0.8, 2.5) | 2.2 (1.3, 3.5) | 2.8 (1.8, 4.4) | |
| Omnifit | Secur-Fit | 3.2 (1.9, 5.1) | 5.0 (3.4, 7.3) | 6.7 (4.8, 9.2) | 8.2 (6.0, 11.0) | |
| Omnifit | Trident | 1.9 (1.3, 2.9) | 2.9 (2.1, 4.1) | 3.9 (2.8, 5.3) | 4.3 (3.2, 5.8) | |
| Quadra-H | Versafit | 2.1 (1.4, 3.0) | 3.9 (2.4, 6.4) | | | |
| S-Rom | Option | 1.5 (0.8, 2.8) | 2.4 (1.5, 3.9) | 3.4 (2.2, 5.1) | 4.1 (2.8, 6.0) | |
| S-Rom | Pinnacle | 2.0 (1.5, 2.6) | 3.4 (2.7, 4.3) | 3.8 (3.0, 4.8) | 3.8 (3.0, 4.8) | |
| SL-Plus | EPF-Plus | 1.8 (1.3, 2.5) | 3.2 (2.5, 4.1) | 4.0 (3.1, 5.1) | 5.7 (3.9, 8.2) | |
| SL-Plus | R3 | 2.3 (1.4, 3.8) | | | | |
| Secur-Fit | DeltaMotion | 1.0 (0.4, 2.7) | | | | |
| Secur-Fit | Trident | 1.3 (1.0, 1.7) | 2.3 (1.9, 2.9) | 2.9 (2.4, 3.5) | 3.7 (3.1, 4.5) | |
| Secur-Fit Plus | Trident | 1.2 (0.9, 1.6) | 2.0 (1.6, 2.4) | 2.4 (2.0, 3.0) | 2.7 (2.2, 3.2) | 3.3 (2.5, 4.2) |
| Stability | Duraloc | 0.7 (0.2, 2.3) | 2.3 (1.2, 4.3) | 2.5 (1.4, 4.6) | 4.8 (3.1, 7.6) | |
| Summit | ASR | 1.2 (0.7, 2.0) | 4.9 (3.8, 6.4) | 7.7 (5.9, 10.0) | | |
| Summit | Pinnacle | 1.0 (0.7, 1.5) | 1.7 (1.3, 2.4) | 2.3 (1.7, 3.1) | 2.6 (1.9, 3.6) | |
| Synergy | BHR | 1.3 (0.7, 2.4) | 2.1 (1.2, 3.4) | 3.2 (2.0, 5.0) | | |
| Synergy | R3 | 1.6 (1.1, 2.3) | | | | |
| Synergy | Reflection (cementless) | 1.5 (1.2, 1.8) | 2.3 (2.0, 2.7) | 2.6 (2.3, 3.1) | 3.2 (2.8, 3.7) | 7.1 (4.9, 10.1) |
| Taperloc | Exceed | 1.0 (0.4, 2.5) | | | | |
| Taperloc | M2a | 1.8 (0.9, 3.4) | 3.4 (2.1, 5.4) | 5.0 (3.2, 7.6) | 5.4 (3.5, 8.2) | |
| Taperloc | Mallory-Head | 1.7 (1.0, 2.8) | 2.6 (1.7, 4.0) | 3.2 (2.1, 4.7) | 4.1 (2.8, 6.0) | |
| Taperloc | Recap | 2.3 (1.3, 4.1) | 3.4 (2.0, 5.6) | 5.2 (3.1, 8.8) | | |
| VerSys | Trilogy | 2.2 (1.8, 2.7) | 2.9 (2.5, 3.5) | 3.5 (3.0, 4.1) | 4.0 (3.4, 4.7) | 4.5 (3.7, 5.6) |
| Other (852) | | 2.1 (1.9, 2.3) | 3.8 (3.5, 4.1) | 5.0 (4.7, 5.4) | 6.3 (5.9, 6.7) | 9.4 (8.2, 10.7) |

Note: Only prostheses with over 400 procedures have been listed.

**Table HT59: Revision Rates of Primary Total Conventional Hip Replacement with Hybrid Fixation**

| Femoral Component | Acetabular Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| C-Stem | Duraloc | 46 | 1042 | 6005 | 0.77 (0.56, 1.02) |
| C-Stem | Pinnacle | 17 | 942 | 2420 | 0.70 (0.41, 1.12) |
| CPCS | R3 | 20 | 881 | 1244 | 1.61 (0.98, 2.48) |
| CPCS | Reflection (cementless) | 41 | 2169 | 8140 | 0.50 (0.36, 0.68) |
| CPT | Allofit | 7 | 491 | 1226 | 0.57 (0.23, 1.18) |
| CPT | Trabecular Metal Shell | 23 | 808 | 1956 | 1.18 (0.75, 1.76) |
| CPT | Trilogy | 121 | 4440 | 17821 | 0.68 (0.56, 0.81) |
| Elite Plus | Duraloc | 78 | 1078 | 7448 | 1.05 (0.83, 1.31) |
| Exeter | Vitalock | 49 | 1218 | 10220 | 0.48 (0.35, 0.63) |
| Exeter V40 | ABGII | 29 | 1020 | 6714 | 0.43 (0.29, 0.62) |
| Exeter V40 | Hemispherical | 10 | 432 | 1352 | 0.74 (0.35, 1.36) |
| Exeter V40 | Mallory-Head | 17 | 971 | 4707 | 0.36 (0.21, 0.58) |
| Exeter V40 | Pinnacle | 11 | 548 | 1223 | 0.90 (0.45, 1.61) |
| Exeter V40 | R3 | 4 | 425 | 591 | 0.68 (0.18, 1.73) |
| Exeter V40 | Trident | 505 | 24093 | 82720 | 0.61 (0.56, 0.67) |
| Exeter V40 | Trilogy | 14 | 516 | 2183 | 0.64 (0.35, 1.08) |
| Exeter V40 | Vitalock | 52 | 1959 | 12835 | 0.41 (0.30, 0.53) |
| MS 30 | Allofit | 26 | 1120 | 5357 | 0.49 (0.32, 0.71) |
| MS 30 | Fitmore | 6 | 418 | 2651 | 0.23 (0.08, 0.49) |
| Omnifit | Trident | 57 | 1841 | 8812 | 0.65 (0.49, 0.84) |
| Spectron EF | BHR | 11 | 509 | 1482 | 0.74 (0.37, 1.33) |
| Spectron EF | R3 | 18 | 555 | 672 | 2.68 (1.59, 4.23) |
| Spectron EF | Reflection (cementless) | 159 | 4588 | 22960 | 0.69 (0.59, 0.81) |
| VerSys | Trilogy | 13 | 717 | 4054 | 0.32 (0.17, 0.55) |
| Other (621) | | 507 | 11919 | 58954 | 0.86 (0.79, 0.94) |
| **TOTAL** | | **1841** | **64700** | **273749** | **0.67 (0.64, 0.70)** |

Note: Only prostheses with over 400 procedures have been listed.

**Table HT60: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Hybrid Fixation**

| Femoral Component | Acetabular Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| C-Stem | Duraloc | 2.2 (1.5, 3.3) | 3.0 (2.1, 4.3) | 3.7 (2.7, 5.1) | 4.7 (3.4, 6.4) | |
| C-Stem | Pinnacle | 1.5 (0.9, 2.6) | 2.3 (1.4, 3.8) | 2.3 (1.4, 3.8) | | |
| CPCS | R3 | 1.7 (1.0, 2.9) | | | | |
| CPCS | Reflection (cementless) | 0.9 (0.6, 1.5) | 1.3 (0.9, 1.9) | 1.7 (1.2, 2.5) | 3.8 (2.5, 5.7) | |
| CPT | Allofit | 0.9 (0.3, 2.3) | 1.6 (0.7, 3.7) | 2.2 (1.0, 5.0) | | |
| CPT | Trabecular Metal Shell | 1.8 (1.1, 3.1) | 3.2 (2.0, 5.0) | 4.2 (2.6, 6.9) | | |
| CPT | Trilogy | 1.4 (1.1, 1.8) | 2.3 (1.9, 2.8) | 3.0 (2.5, 3.7) | 3.9 (3.2, 4.7) | |
| Elite Plus | Duraloc | 1.9 (1.2, 2.9) | 3.5 (2.6, 4.9) | 5.3 (4.1, 6.9) | 7.0 (5.6, 8.9) | 9.5 (7.5, 12.0) |
| Exeter | Vitalock | 1.6 (1.0, 2.5) | 2.3 (1.6, 3.4) | 2.5 (1.8, 3.6) | 3.3 (2.4, 4.5) | 4.4 (3.3, 5.9) |
| Exeter V40 | ABGII | 1.2 (0.7, 2.1) | 1.5 (0.9, 2.5) | 2.2 (1.4, 3.3) | 3.3 (2.3, 4.7) | |
| Exeter V40 | Hemispherical | 1.5 (0.7, 3.3) | 2.7 (1.5, 5.0) | 2.7 (1.5, 5.0) | | |
| Exeter V40 | Mallory-Head | 0.5 (0.2, 1.3) | 1.1 (0.6, 2.1) | 1.2 (0.7, 2.3) | 2.3 (1.4, 3.9) | |
| Exeter V40 | Pinnacle | 1.3 (0.6, 2.8) | 2.5 (1.3, 4.6) | 2.5 (1.3, 4.6) | | |
| Exeter V40 | R3 | 1.1 (0.4, 2.9) | | | | |
| Exeter V40 | Trident | 1.2 (1.1, 1.3) | 2.0 (1.8, 2.2) | 2.6 (2.4, 2.9) | 3.4 (3.1, 3.8) | |
| Exeter V40 | Trilogy | 1.8 (0.9, 3.4) | 2.5 (1.4, 4.4) | 2.9 (1.7, 5.1) | 3.5 (2.0, 6.0) | |
| Exeter V40 | Vitalock | 0.9 (0.6, 1.5) | 1.7 (1.2, 2.3) | 2.2 (1.6, 3.0) | 2.8 (2.1, 3.7) | |
| MS 30 | Allofit | 1.3 (0.8, 2.2) | 1.9 (1.2, 3.0) | 2.3 (1.5, 3.5) | 2.8 (1.9, 4.2) | |
| MS 30 | Fitmore | 0.0 (0.0, 0.0) | 0.3 (0.0, 2.0) | 0.9 (0.3, 2.9) | 1.7 (0.7, 4.1) | |
| Omnifit | Trident | 1.8 (1.2, 2.5) | 3.0 (2.2, 3.9) | 3.3 (2.5, 4.3) | 3.7 (2.8, 4.9) | |
| Spectron EF | BHR | 0.6 (0.2, 2.0) | 2.5 (1.3, 4.9) | 4.6 (2.2, 9.3) | | |
| Spectron EF | R3 | 2.4 (1.3, 4.2) | | | | |
| Spectron EF | Reflection (cementless) | 1.1 (0.8, 1.4) | 2.1 (1.7, 2.5) | 3.1 (2.5, 3.7) | 4.6 (3.8, 5.4) | 7.8 (6.1, 10.0) |
| VerSys | Trilogy | 1.1 (0.6, 2.3) | 1.6 (0.9, 2.8) | 1.6 (0.9, 2.8) | 1.8 (1.0, 3.3) | |
| Other (621) | | 1.8 (1.6, 2.1) | 3.2 (2.8, 3.5) | 4.3 (3.9, 4.8) | 5.4 (4.9, 5.9) | 6.8 (6.1, 7.6) |

Note: Only prostheses with over 400 procedures have been listed.

# Primary Total Resurfacing Hip Replacement

## Demographics

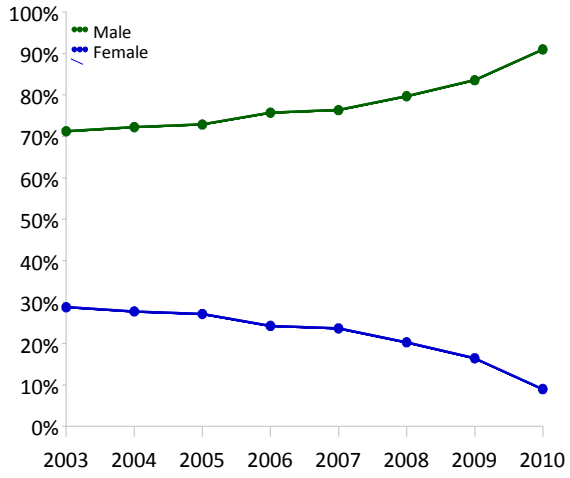
There have been 14,298 total resurfacing procedures reported to the Registry, an additional 991 procedures compared to the last report.

The use of resurfacing hip replacement in Australia continues to decline. The number of procedures reported in 2010 was 22.1% less than in 2009 and 48.6% less compared to the peak in 2005.

Osteoarthritis is the principal diagnosis for total resurfacing hip replacement (94.8%), followed by developmental dysplasia (2.6%) and osteonecrosis (1.8%).

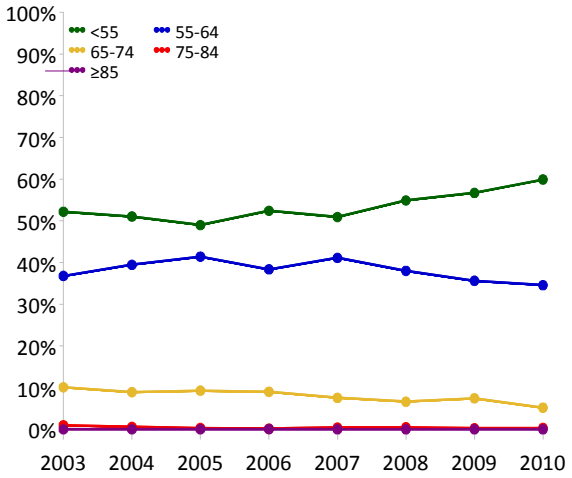
Most patients are male and the proportion of males has increased from 71.2% in 2003 to 91.0% in 2010 (Figure HT33).

**Figure HT33: Primary Total Resurfacing Hip Replacement by Gender**




There continues to be a shift in the use of primary total resurfacing hip replacement to younger patients. The proportion of patients under the age of 55 years has continued to increase. There has been a corresponding decrease in use for patients older than 55 years (Figure HT34).

**Figure HT34: Primary Total Resurfacing Hip Replacement by Age**




The majority of total resurfacings use hybrid fixation (94.4% in 2010). There has been an increase in the proportion of cementless fixation, increasing from 2.3% in 2003 to 5.5% in 2010. The bearing surface for resurfacing hip replacement is metal on metal in almost all cases.

In 2010, the BHR remains the most used resurfacing hip prosthesis. Although its use has declined in absolute numbers in 2010, the proportion has increased. All other resurfacing prostheses have also declined in use with the exception of the Icon, which has increased by a few procedures from a very small base. (Table HT61).

**Table HT61: Ten Most Used Resurfacing Heads in Primary Total Resurfacing Hip Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** |
| 1359 | BHR | 889 | BHR | 743 | BHR | 627 | BHR | 587 | BHR |
| 58 | Durom | 208 | Mitch TRH | 231 | Mitch TRH | 195 | Mitch TRH | 188 | Mitch TRH |
| 43 | ASR | 176 | ASR | 133 | ASR | 91 | ASR | 53 | Adept |
| 42 | Cormet | 105 | Durom | 88 | Durom | 70 | Adept | 42 | Cormet |
| 38 | Cormet 2000 HAP | 85 | Adept | 73 | Cormet | 54 | Bionik | 24 | Durom |
| 7 | Conserve Plus | 61 | Cormet Bi-Coated | 62 | Adept | 52 | Cormet | 16 | Recap |
| | | 42 | Recap | 46 | Recap | 46 | Durom | 15 | Bionik |
| | | 33 | Bionik | 45 | Bionik | 45 | Recap | 10 | Icon |
| | | 25 | Icon | 21 | Cormet Bi-Coated | 23 | Cormet Bi-Coated | 8 | Cormet Bi-Coated |
| | | 15 | Cormet | 20 | Icon | 6 | Icon | | |
| **Ten Most Used** | | | | | | | | | |
| 1547 | (6) 100.0% | 1639 | (10) 99.7% | 1462 | (10) 99.9% | 1209 | (10) 99.9% | 943 | (9) 100.0% |
| **Remainder** | | | | | | | | | |
| 0 | (0) 0% | 5 | (2) 0.3% | 1 | (1) 0.1% | 1 | (1) 0.1% | 0 | (0) 0% |
| **TOTAL** | | | | | | | | | |
| 1547 | (6) 100.0% | 1644 | (12) 100.0% | 1463 | (11) 100.0% | 1210 | (11) 100.0% | 943 | (9) 100.0% |

Note: Cormet 2000 HAP Bi-Coated has been reported in the above table as Cormet Bi-Coated

## Outcome

The cumulative percent revision at ten years for primary total resurfacing hip replacement undertaken for osteoarthritis is 7.5% (Table HT62 and Figure HT35).

### Reasons for Revision

The main reasons for revision of primary resurfacing hip replacements are loosening/lysis (34.8%), fracture (32.3%), infection (8.0%), metal sensitivity (8.0%) and pain (5.6%) (Table HT63).

The five most common reasons for revision are shown in Figure HT36. The incidence of revision for fracture increases rapidly in the first year, however after this time the incidence increases at a slower rate. Loosening/lysis shows a linear increase and at just over five years exceeds fracture to become the most common reason for revision. The remaining reasons for revision have a low incidence.

### Type of Revision

The main types of revision of resurfacing hip replacement are isolated femoral (48.2%), total hip replacement (41.7%) and acetabular only (6.8%) (Table HT64).

### Primary Diagnosis

The outcomes of the three most common primary diagnoses (osteoarthritis, developmental dysplasia and osteonecrosis) are listed in Tables HT65 and HT66. Primary resurfacing hip replacement for osteoarthritis has a significantly lower rate of revision compared to developmental dysplasia (Figure HT37).

### Age and Gender

There is a higher rate of revision for patients 65 years or older for the first six months only and after this time there is no difference (Tables HT67 and HT68 and Figure HT38).

Females have an increased rate of revision compared to males. After three and half years, females have over three times the rate of revision compared to males (Tables HT69 and HT70 and Figure HT39). There is no age related difference in the rate of revision for females (Tables HT71 and HT72 and Figure HT40). The age related revision rate is only associated with males. Males over the age of 65 years have an increased rate of revision compared to males between the ages of 55 to 64 years (Tables HT71 and HT72 and Figure HT41).

### Head Size

There is a relationship between femoral component head size and the rate of revision. Head sizes of 44mm or less have more than five times the rate of revision compared to sizes 55mm or greater (Tables HT73 and HT74 and Figure HT42). The effect of femoral component head size is evident in both males and females. Previously the Registry has reported that the head size effect explained the gender difference in outcome. This year however for the first time, females have an increased rate of revision independent of head size (Tables HT75, HT76 and Figure HT43).

Revision diagnosis cumulative incidence varies with head size. Head sizes less than 50mm have a higher incidence of the five most common reasons for revision (Figure HT44).

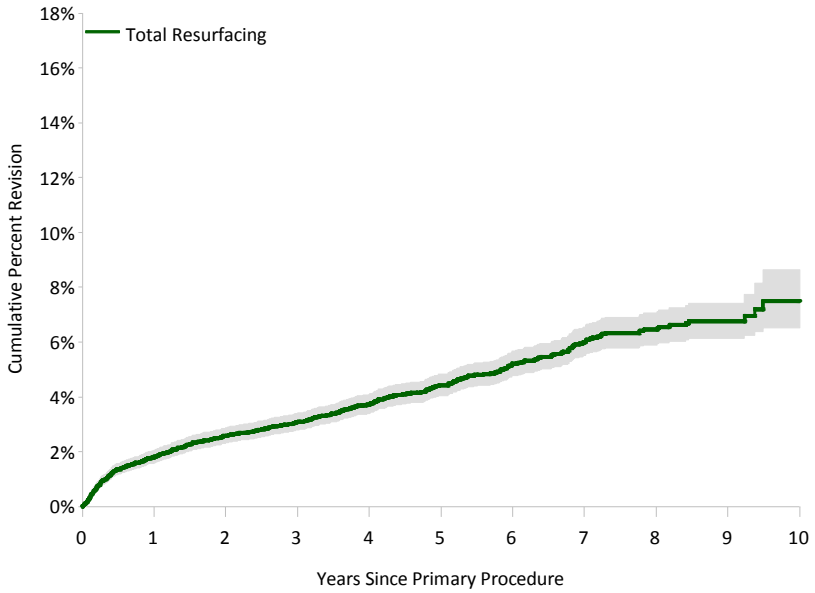
### Prosthesis Types

The revision rates and yearly cumulative percent revision of total resurfacing hip prostheses are listed in Tables HT77 and HT78. There are six prostheses with over 1,000 observed component years, the ASR, Adept, BHR, Cormet, Durom and Mitch TRH. At seven years, the BHR has the lowest cumulative percent revision (5.0%) compared to Cormet (11.1%), Durom (9.6%) and ASR (13.0%). The BHR is the only resurfacing prosthesis with a cumulative percent revision at ten years (6.3%).

**Table HT62: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Total Resurfacing | 1.8 (1.6, 2.1) | 3.1 (2.8, 3.4) | 4.4 (4.0, 4.8) | 6.0 (5.5, 6.6) | 7.5 (6.5, 8.6) |

**Figure HT35: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Total Resurfacing | 13557 | 12376 | 9658 | 6405 | 3181 | 84 |

**Table HT63: Primary Total Resurfacing Hip Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Loosening/Lysis | 230 | 34.8 |
| Fracture | 213 | 32.3 |
| Metal Sensitivity | 53 | 8.0 |
| Infection | 53 | 8.0 |
| Pain | 37 | 5.6 |
| Osteonecrosis | 21 | 3.2 |
| Prosthesis Dislocation | 18 | 2.7 |
| Malposition | 16 | 2.4 |
| Other | 19 | 2.9 |
| **TOTAL** | **660** | **100.0** |

**Table HT64: Primary Total Resurfacing Hip Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| Femoral Component | 318 | 48.2 |
| THR (Femoral/Acetabular) | 275 | 41.7 |
| Acetabular Component | 45 | 6.8 |
| Cement Spacer | 17 | 2.6 |
| Removal of Prostheses | 4 | 0.6 |
| Head Only | 1 | 0.2 |
| **TOTAL** | **660** | **100.0** |

**Figure HT36: Revision Diagnosis Cumulative Incidence of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)**

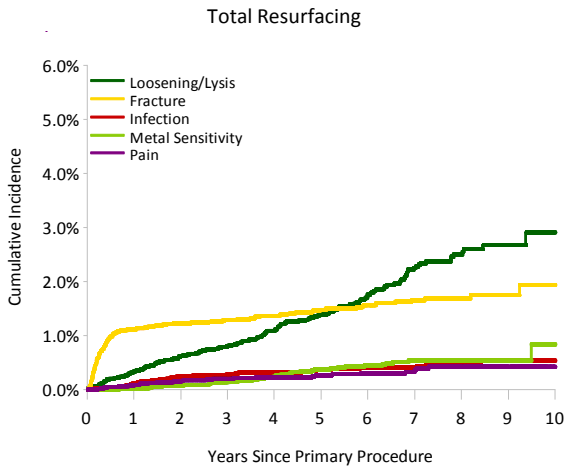


**Table HT65: Revision Rates of Primary Total Resurfacing Hip Replacement by Primary Diagnosis**

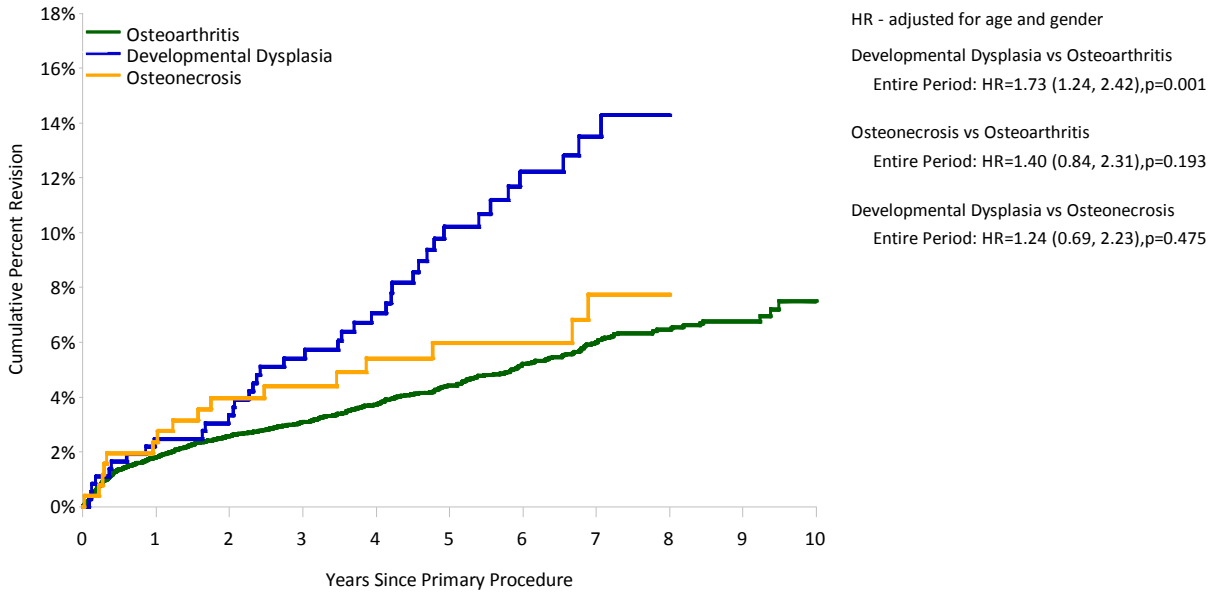
| Primary Diagnosis | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Osteoarthritis | 595 | 13557 | 64571 | 0.92 (0.85, 1.00) |
| Developmental Dysplasia | 39 | 366 | 2006 | 1.94 (1.38, 2.66) |
| Osteonecrosis | 16 | 258 | 1479 | 1.08 (0.62, 1.76) |
| Other (6) | 10 | 117 | 617 | 1.62 (0.78, 2.98) |
| **TOTAL** | **660** | **14298** | **68673** | **0.96 (0.89, 1.04)** |

Note: Only prostheses with over 100 procedures have been listed.

**Table HT66: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Osteoarthritis | 1.8 (1.6, 2.1) | 3.1 (2.8, 3.4) | 4.4 (4.0, 4.8) | 6.0 (5.5, 6.6) | 7.5 (6.5, 8.6) |
| Developmental Dysplasia | 2.5 (1.3, 4.7) | 5.4 (3.5, 8.3) | 10.2 (7.3, 14.2) | 13.5 (9.9, 18.3) | |
| Osteonecrosis | 2.4 (1.1, 5.2) | 4.4 (2.5, 7.8) | 6.0 (3.6, 9.9) | 7.7 (4.7, 12.7) | |
| Other (6) | 2.6 (0.8, 7.8) | 5.4 (2.5, 11.6) | 9.0 (4.7, 16.7) | 10.5 (5.7, 18.9) | |

**Figure HT37: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Osteoarthritis | 13557 | 12376 | 9658 | 6405 | 3181 | 84 |
| Developmental Dysplasia | 366 | 351 | 303 | 203 | 113 | 4 |
| Osteonecrosis | 258 | 245 | 204 | 166 | 98 | 6 |

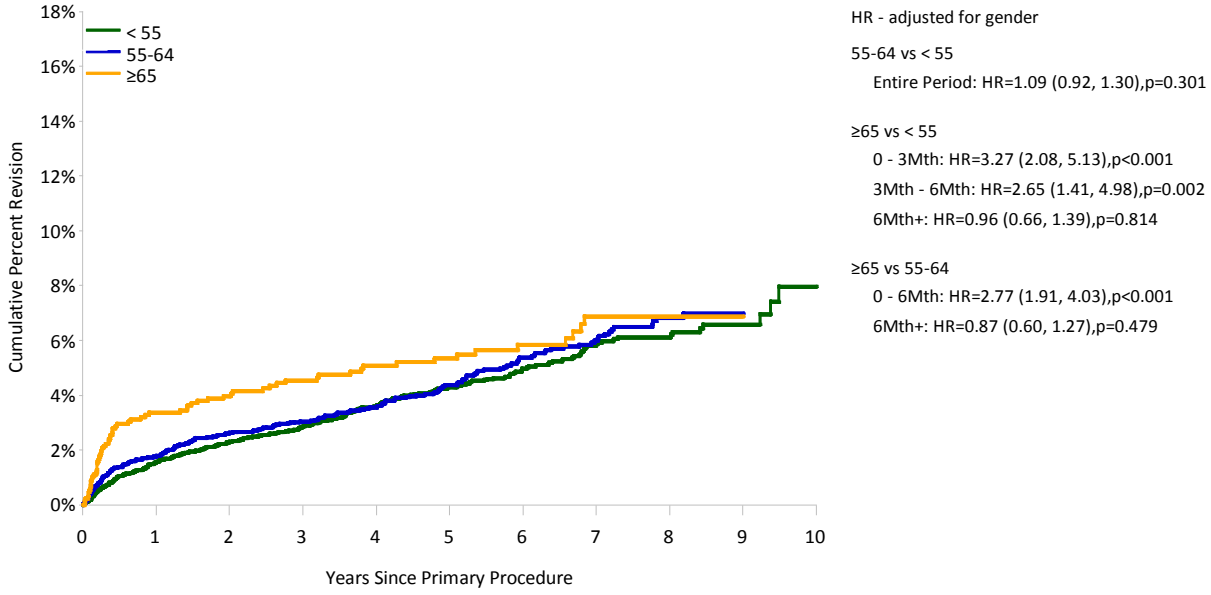
**Table HT67: Revision Rates of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| < 55 | 288 | 6960 | 32657 | 0.88 (0.78, 0.99) |
| 55-64 | 238 | 5336 | 25608 | 0.93 (0.82, 1.06) |
| ≥65 | 69 | 1261 | 6306 | 1.09 (0.85, 1.38) |
| **TOTAL** | **595** | **13557** | **64571** | **0.92 (0.85, 1.00)** |

**Table HT68: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| < 55 | 1.6 (1.3, 1.9) | 2.8 (2.5, 3.3) | 4.3 (3.8, 4.9) | 5.9 (5.2, 6.7) | 8.0 (6.3, 10.0) |
| 55-64 | 1.8 (1.5, 2.2) | 3.0 (2.6, 3.6) | 4.4 (3.8, 5.0) | 6.0 (5.2, 6.9) | |
| ≥65 | 3.4 (2.5, 4.5) | 4.5 (3.5, 5.9) | 5.3 (4.2, 6.8) | 6.9 (5.3, 8.8) | |

**Figure HT38: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| < 55 | 6960 | 6301 | 4824 | 3192 | 1641 | 54 |
| 55-64 | 5336 | 4913 | 3886 | 2558 | 1214 | 26 |
| ≥65 | 1261 | 1162 | 948 | 655 | 326 | 4 |

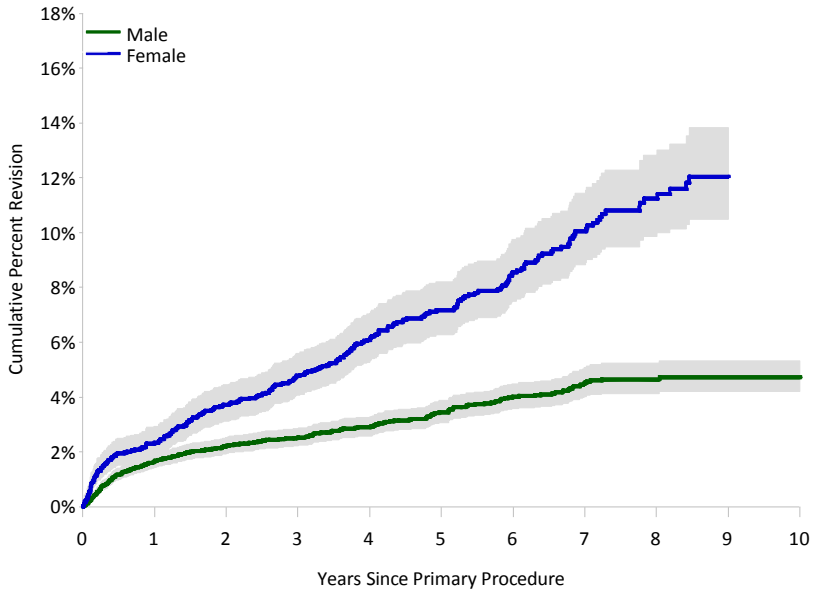
**Table HT69: Revision Rates of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 338 | 10368 | 47835 | 0.71 (0.63, 0.79) |
| Female | 257 | 3189 | 16736 | 1.54 (1.35, 1.74) |
| **TOTAL** | **595** | **13557** | **64571** | **0.92 (0.85, 1.00)** |

**Table HT70: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 1.7 (1.4, 1.9) | 2.5 (2.2, 2.9) | 3.5 (3.1, 3.9) | 4.5 (4.0, 5.1) | 4.7 (4.2, 5.3) |
| Female | 2.3 (1.9, 2.9) | 4.8 (4.1, 5.6) | 7.2 (6.3, 8.2) | 10.1 (8.8, 11.4) | |

**Figure HT39: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA)**




HR - adjusted for age

Female vs Male

0 - 3Mth: HR=2.09 (1.44, 3.04),p<0.001
3Mth - 6Mth: HR=1.13 (0.65, 1.97),p=0.654
6Mth - 1Yr: HR=0.81 (0.43, 1.53),p=0.523
1Yr - 2.5Yr: HR=2.50 (1.74, 3.59),p<0.001
2.5Yr - 3Yr: HR=5.85 (2.63, 13.02),p<0.001
3Yr - 3.5Yr: HR=2.04 (0.97, 4.27),p=0.059
3.5Yr+: HR=3.38 (2.52, 4.54),p<0.001

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 10368 | 9344 | 7149 | 4654 | 2278 | 58 |
| Female | 3189 | 3032 | 2509 | 1751 | 903 | 26 |

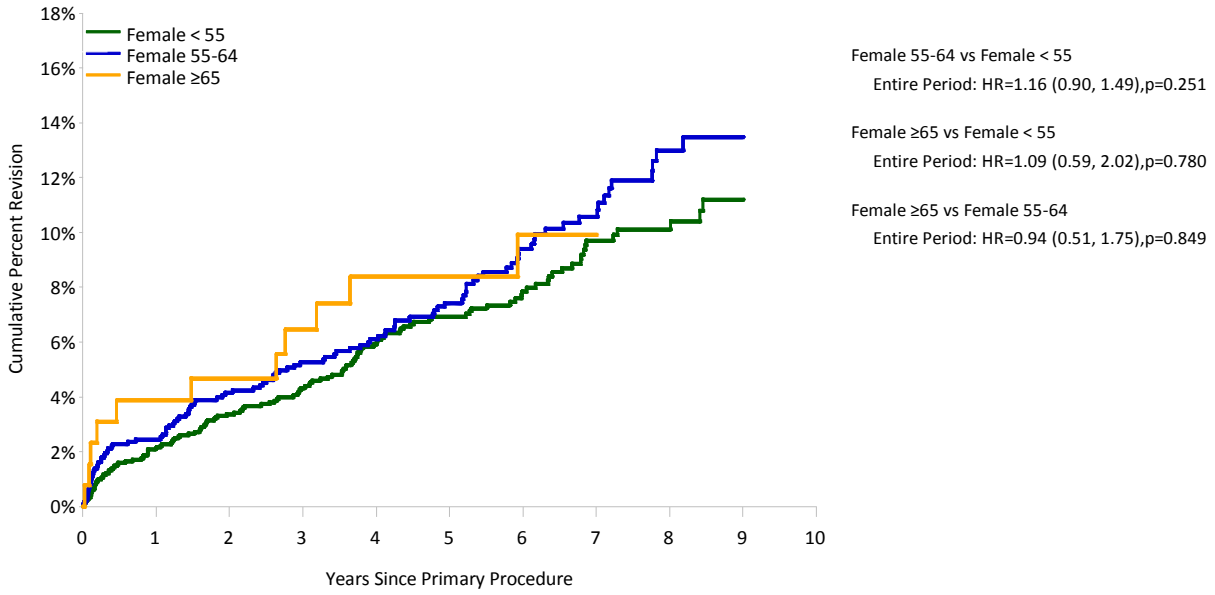
**Table HT71: Revision Rates of Primary Total Resurfacing Hip Replacement by Age and Gender (Primary Diagnosis OA)**

| Gender | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | < 55 | 151 | 5129 | 23169 | 0.65 (0.55, 0.76) |
| | 55-64 | 129 | 4108 | 19063 | 0.68 (0.56, 0.80) |
| | ≥65 | 58 | 1131 | 5603 | 1.04 (0.79, 1.34) |
| Female | < 55 | 137 | 1831 | 9487 | 1.44 (1.21, 1.71) |
| | 55-64 | 109 | 1228 | 6545 | 1.67 (1.37, 2.01) |
| | ≥65 | 11 | 130 | 703 | 1.56 (0.78, 2.80) |
| **TOTAL** | | **595** | **13557** | **64571** | **0.92 (0.85, 1.00)** |

**Table HT72: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age and Gender (Primary Diagnosis OA)**

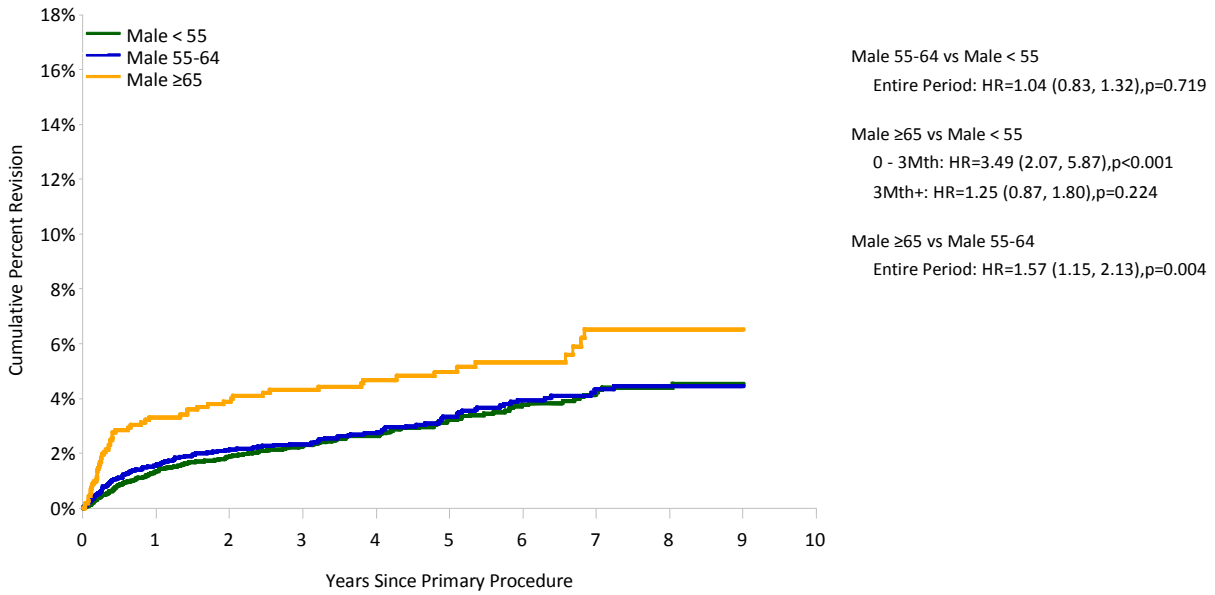
| Gender | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | < 55 | 1.3 (1.1, 1.7) | 2.3 (1.9, 2.7) | 3.2 (2.7, 3.8) | 4.2 (3.5, 5.0) | |
| | 55-64 | 1.6 (1.3, 2.0) | 2.3 (1.9, 2.9) | 3.3 (2.8, 4.0) | 4.3 (3.6, 5.2) | |
| | ≥65 | 3.3 (2.4, 4.5) | 4.3 (3.3, 5.7) | 5.0 (3.8, 6.5) | 6.5 (4.9, 8.6) | |
| Female | < 55 | 2.2 (1.6, 2.9) | 4.3 (3.5, 5.4) | 6.9 (5.8, 8.3) | 9.7 (8.1, 11.6) | |
| | 55-64 | 2.4 (1.7, 3.5) | 5.3 (4.1, 6.7) | 7.4 (6.0, 9.2) | 10.6 (8.7, 12.9) | |
| | ≥65 | 3.9 (1.6, 9.0) | 6.5 (3.3, 12.5) | 8.4 (4.6, 15.1) | 9.9 (5.5, 17.5) | |

**Figure HT40: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement for Females by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Female | < 55 | 1831 | 1741 | 1429 | 964 | 501 | 18 |
| | 55-64 | 1228 | 1168 | 978 | 710 | 357 | 8 |
| | ≥65 | 130 | 123 | 102 | 77 | 45 | 0 |

**Figure HT41: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement for Males by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | < 55 | 5129 | 4560 | 3395 | 2228 | 1140 | 36 |
| | 55-64 | 4108 | 3745 | 2908 | 1848 | 857 | 18 |
| | ≥65 | 1131 | 1039 | 846 | 578 | 281 | 4 |

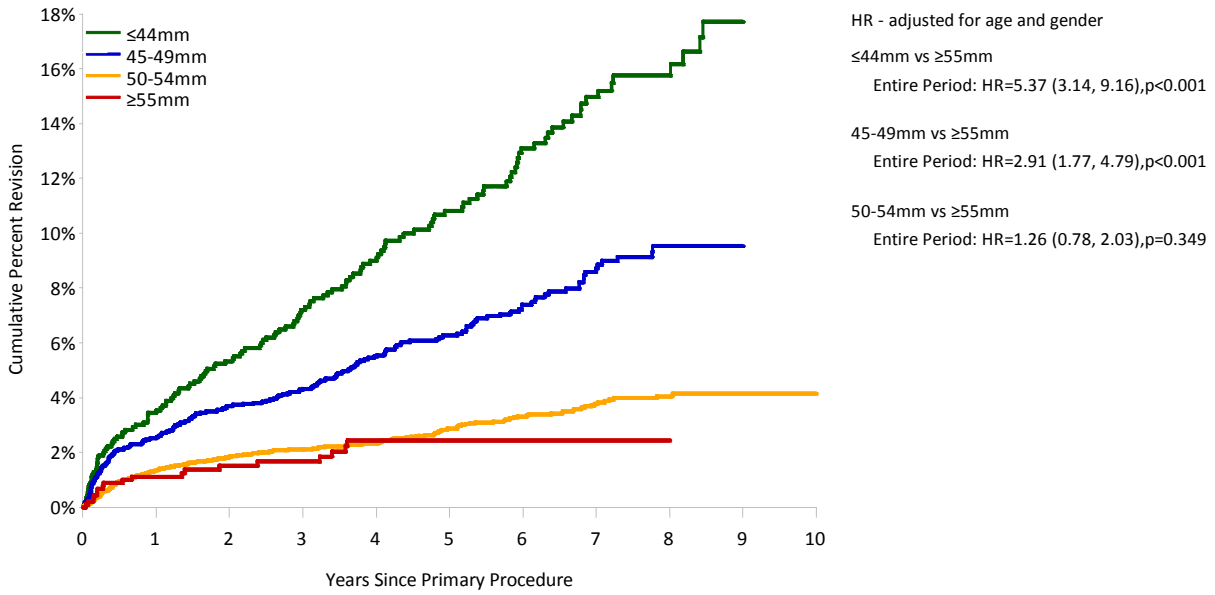
**Table HT73: Revision Rates of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)**

| Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| ≤44mm | 143 | 1173 | 6096 | 2.35 (1.98, 2.76) |
| 45-49mm | 204 | 3255 | 15281 | 1.33 (1.16, 1.53) |
| 50-54mm | 230 | 8204 | 39405 | 0.58 (0.51, 0.66) |
| ≥55mm | 18 | 925 | 3789 | 0.48 (0.28, 0.75) |
| **TOTAL** | **595** | **13557** | **64571** | **0.92 (0.85, 1.00)** |

**Table HT74: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| ≤44mm | 3.5 (2.6, 4.8) | 7.2 (5.8, 8.9) | 10.8 (9.0, 12.9) | 15.0 (12.6, 17.7) | |
| 45-49mm | 2.6 (2.1, 3.2) | 4.3 (3.7, 5.1) | 6.3 (5.4, 7.3) | 8.7 (7.5, 10.1) | |
| 50-54mm | 1.4 (1.1, 1.6) | 2.1 (1.8, 2.5) | 2.9 (2.5, 3.3) | 3.8 (3.3, 4.3) | 4.1 (3.6, 4.8) |
| ≥55mm | 1.1 (0.6, 2.1) | 1.7 (1.0, 2.8) | 2.4 (1.5, 3.9) | 2.4 (1.5, 3.9) | |

**Figure HT42: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| ≤44mm | 1173 | 1099 | 896 | 628 | 359 | 12 |
| 45-49mm | 3255 | 3007 | 2315 | 1473 | 688 | 13 |
| 50-54mm | 8204 | 7455 | 5882 | 3973 | 1985 | 53 |
| ≥55mm | 925 | 815 | 565 | 331 | 149 | 6 |

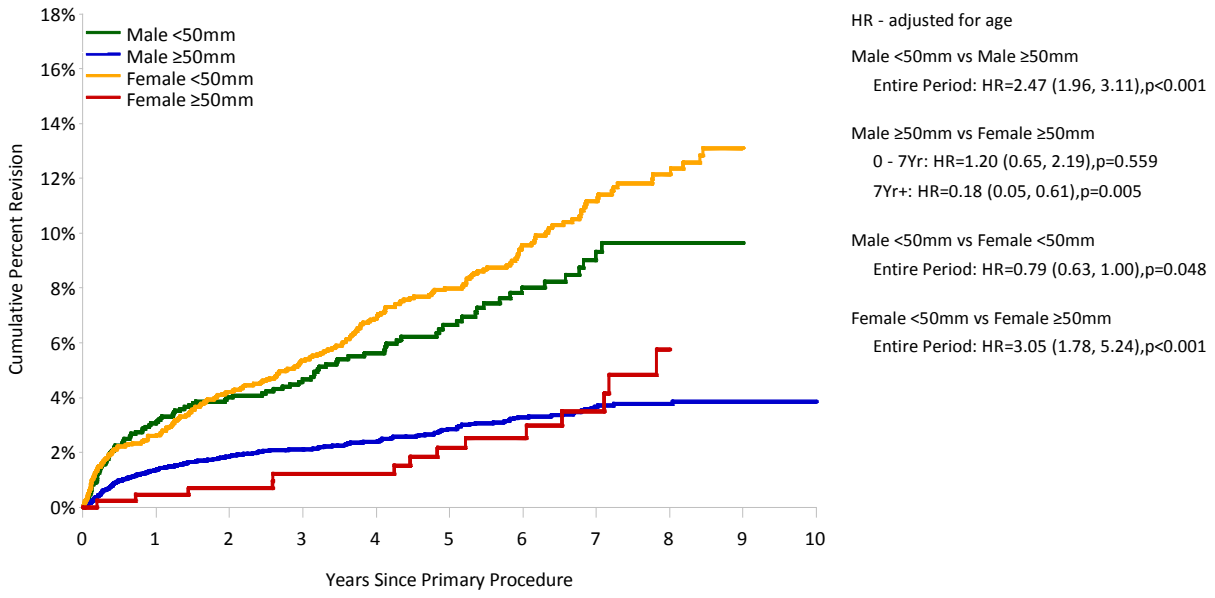
**Table HT75: Revision Rates of Primary Total Resurfacing Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**

| Gender | Head Size | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | <50mm | 104 | 1676 | 7175 | 1.45 (1.18, 1.76) |
| | ≥50mm | 234 | 8692 | 40660 | 0.58 (0.50, 0.65) |
| Female | <50mm | 243 | 2752 | 14202 | 1.71 (1.50, 1.94) |
| | ≥50mm | 14 | 437 | 2534 | 0.55 (0.30, 0.93) |
| **TOTAL** | | **595** | **13557** | **64571** | **0.92 (0.85, 1.00)** |

**Table HT76: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**

| Gender | Head Size | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | <50mm | 3.1 (2.4, 4.1) | 4.7 (3.7, 5.8) | 6.6 (5.4, 8.2) | 9.3 (7.5, 11.5) | |
| | ≥50mm | 1.4 (1.2, 1.7) | 2.1 (1.8, 2.4) | 2.9 (2.5, 3.3) | 3.7 (3.2, 4.2) | 3.9 (3.3, 4.4) |
| Female | <50mm | 2.6 (2.1, 3.3) | 5.3 (4.5, 6.3) | 8.0 (7.0, 9.2) | 11.2 (9.8, 12.7) | |
| | ≥50mm | 0.5 (0.1, 1.8) | 1.2 (0.5, 2.9) | 2.2 (1.1, 4.3) | 3.5 (1.9, 6.4) | |

**Figure HT43: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Head Size (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | <50mm | 1676 | 1499 | 1074 | 639 | 297 | 3 |
| | ≥50mm | 8692 | 7845 | 6075 | 4015 | 1981 | 55 |
| Female | <50mm | 2752 | 2607 | 2137 | 1462 | 750 | 22 |
| | ≥50mm | 437 | 425 | 372 | 289 | 153 | 4 |

**Figure HT44: Revision Diagnosis Cumulative Incidence of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)**

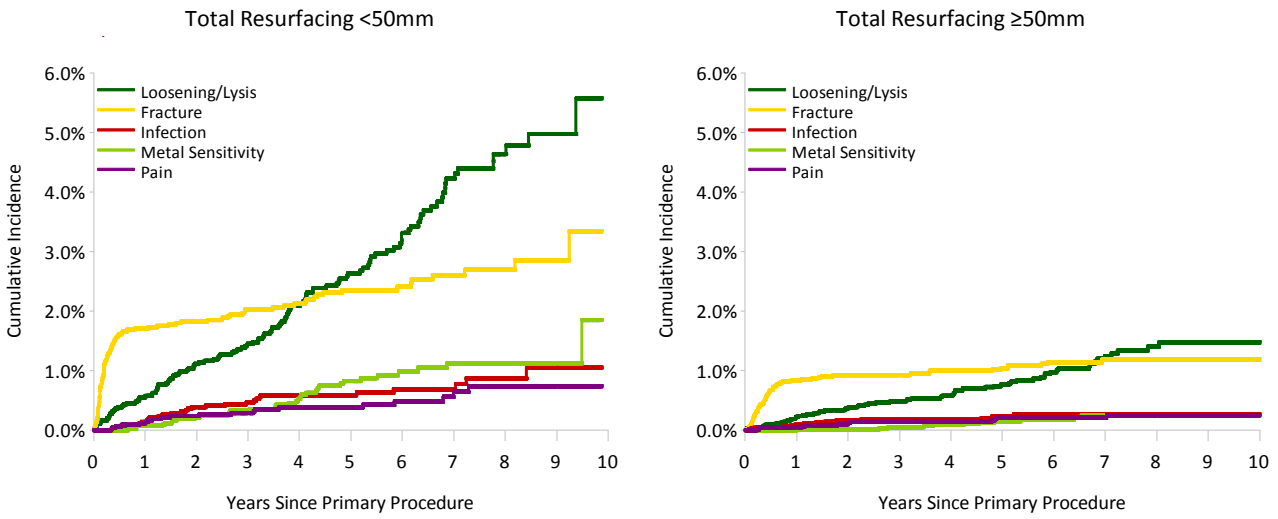



**Table HT77: Revision Rates of Primary Total Resurfacing Hip Replacement**

| Head Component | Acetabular Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| ASR | ASR | 103 | 1167 | 4932 | 2.09 (1.70, 2.53) |
| Adept | Adept | 8 | 415 | 1223 | 0.65 (0.28, 1.29) |
| BHR | BHR | 373 | 9678 | 51745 | 0.72 (0.65, 0.80) |
| Bionik | Bionik | 18 | 192 | 495 | 3.64 (2.16, 5.75) |
| Cormet | Cormet | 27 | 363 | 1539 | 1.75 (1.16, 2.55) |
| Cormet 2000 HAP Bi-Coated | Cormet | 18 | 245 | 930 | 1.94 (1.15, 3.06) |
| Durom | Durom | 58 | 837 | 3723 | 1.56 (1.18, 2.01) |
| Icon | Icon | 3 | 113 | 401 | 0.75 (0.15, 2.19) |
| Mitch TRH | Mitch TRH | 17 | 918 | 2065 | 0.82 (0.48, 1.32) |
| Recap | Recap | 13 | 192 | 577 | 2.25 (1.20, 3.85) |
| Other (6) | | 22 | 178 | 1046 | 2.10 (1.32, 3.19) |
| **TOTAL** | | **660** | **14298** | **68673** | **0.96 (0.89, 1.04)** |

Note: Only prostheses with over 100 procedures have been listed.

**Table HT78: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement**

| Head Component | Acetabular Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| ASR | ASR | 3.3 (2.5, 4.5) | 5.9 (4.7, 7.5) | 10.5 (8.6, 12.7) | 13.0 (9.3, 17.9) | |
| Adept | Adept | 1.2 (0.5, 2.9) | 1.9 (0.9, 3.9) | | | |
| BHR | BHR | 1.5 (1.2, 1.7) | 2.5 (2.2, 2.8) | 3.5 (3.1, 3.9) | 5.0 (4.4, 5.5) | 6.3 (5.3, 7.4) |
| Bionik | Bionik | 3.8 (1.8, 7.7) | 10.0 (6.1, 16.4) | | | |
| Cormet | Cormet | 2.0 (0.9, 4.1) | 4.5 (2.7, 7.5) | 6.2 (3.8, 9.9) | 11.1 (7.3, 16.7) | |
| Cormet 2000 HAP Bi-Coated | Cormet | 2.5 (1.1, 5.5) | 4.8 (2.7, 8.6) | 7.4 (4.4, 12.1) | | |
| Durom | Durom | 3.1 (2.2, 4.6) | 5.4 (4.0, 7.2) | 7.3 (5.6, 9.5) | 9.6 (6.7, 13.7) | |
| Icon | Icon | 0.9 (0.1, 6.2) | 1.9 (0.5, 7.3) | | | |
| Mitch TRH | Mitch TRH | 1.3 (0.7, 2.3) | 2.2 (1.3, 3.6) | | | |
| Recap | Recap | 4.3 (2.2, 8.4) | 6.0 (3.4, 10.7) | | | |
| Other (6) | | 5.6 (3.1, 10.2) | 8.0 (4.8, 13.1) | 10.4 (6.7, 16.1) | 12.7 (8.4, 18.9) | |

Note: Only prostheses with over 100 procedures have been listed.

# KNEE REPLACEMENT

## Categories of Knee Replacement

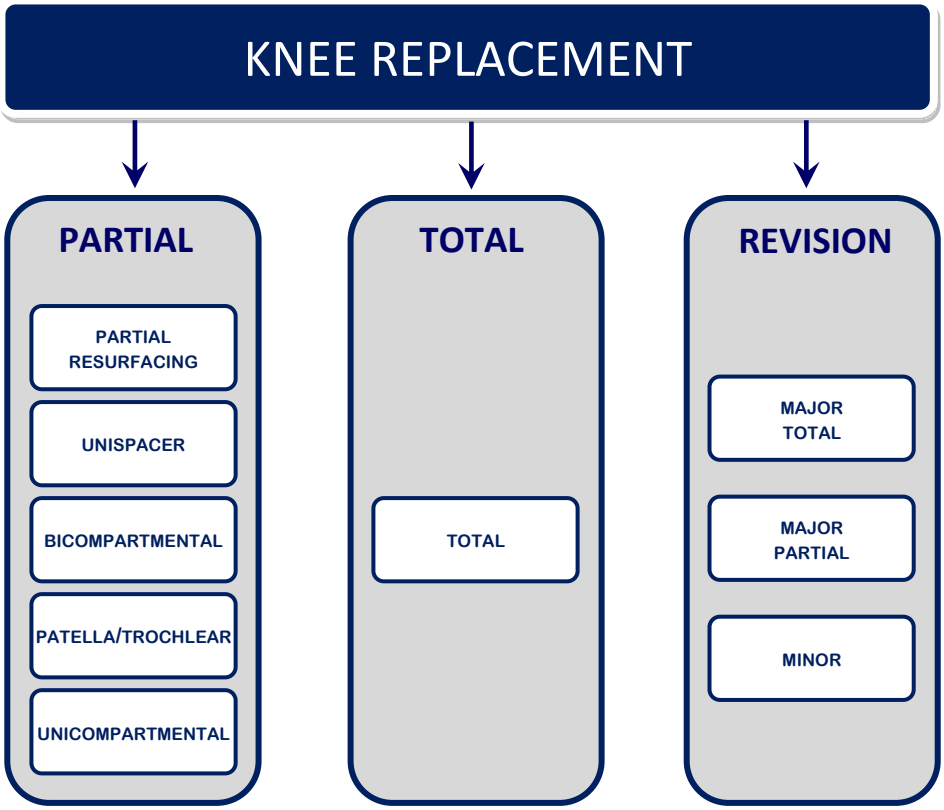
The Registry groups knee replacement into three broad categories, primary partial, primary total and revision knee replacement.

A primary replacement is the initial replacement procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface.

Primary partial knees are sub-categorised into classes depending on the type of prostheses used. The classes of primary partial knee are partial resurfacing, unispacer, bicompartmental, patella/trochlear and unicompartmental. These are defined in the chapter on partial knees.

Revision knees are re-operations of previous knee replacements where one or more of the prosthetic components are replaced, removed or another component is added. Revisions include re-operations of primary partial, primary total or previous revision procedures.

Knee revisions are sub-categorised into three classes, major total, major partial or minor revisions. These are defined in the chapter on revision outcomes.




## Use of Knee Replacement

This report analyses 333,764 knee replacements reported to the Registry with a procedure date up to and including 31 December 2010. This is an additional 44,490 knee procedures compared to the number reported last year. When considering all procedures currently recorded by the Registry, primary partial knees account for 11.0% of all knee replacement, primary total knees 80.7% and revision knee replacement 8.3% (Table K1).

**Table K1: Number of Knee Replacements**

| Knee Category | Number | Percent |
|---|---|---|
| Primary Partial Knee | 36675 | 11.0 |
| Primary Total Knee | 269266 | 80.7 |
| Revision Knee | 27823 | 8.3 |
| **TOTAL** | **333764** | **100.0** |

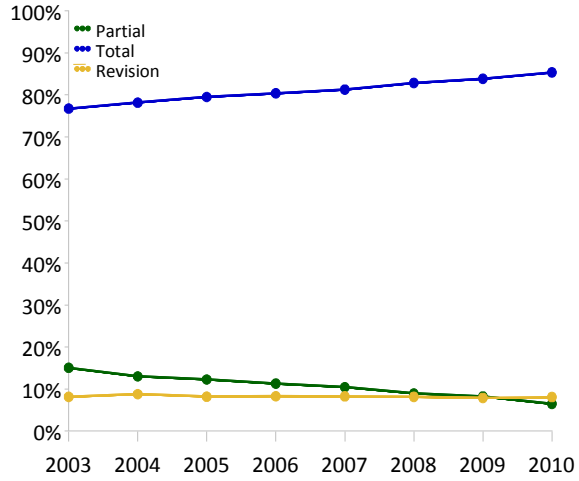
In 2010, the number of knee replacements reported to the Registry increased by 3,102 (7.6%) compared to 2009. During the last 12 months primary partial knees decreased by 14.8%, primary total knees increased by 9.6% and revision knee replacement increased by 10.4%.

Since 2003, the number of knee replacement procedures has increased by 54.9%. Primary total knee replacement has increased by 72.3% and revision knee replacement 53.8%. Primary partial knee replacement has declined by 33.0%.

In 2010, primary total knee replacement accounted for 85.4% of all knee replacement procedures. This has increased from 76.7% in 2003. Primary partial knee replacement decreased from 15.1% in 2003 to 6.5% in 2010 (Figure K1).

The proportion of revision knee procedures has declined from a peak of 8.8% in 2004 to 8.1% in 2010. This is an increase from 7.9% in 2009 however it equates to 299 less revision procedures in 2010 compared to what would have been the case if the proportion of revision procedures had not declined from 8.8%.

**Figure K1: Proportion of Knee Replacements**




*Detailed information on the demographics of each category of knee replacement is provided in the supplementary report 'Demographics of Knee Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

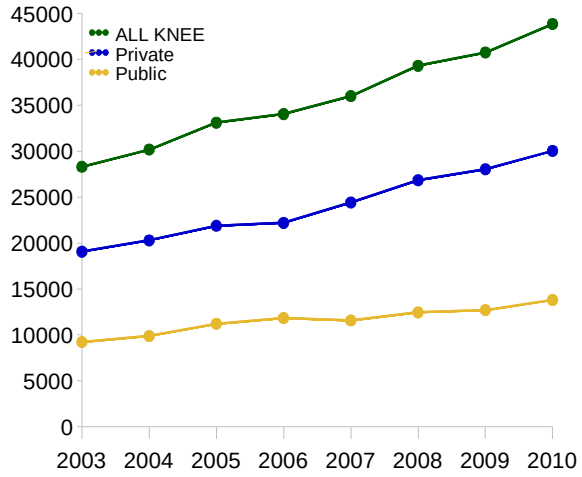
## Public and Private Sector

More than two thirds of all knee replacement procedures reported to the Registry have been undertaken in private hospitals (68.5% in 2010).

There were 30,052 private sector knee replacements reported for 2010, an increase of 7.2% compared to 2009. In the public sector, there were 13,813 knee replacements, an increase of 8.6% compared to 2009.

Since 2003, knee replacement in the private sector has increased by 57.5% compared to 49.5% in the public sector (Figure K2).

**Figure K2: Knee Replacement by Hospital Sector**




There were 2,375 private sector primary partial knee replacements reported for 2010, a decrease of 15.2% compared to 2009. In the public sector, there were 486 partial knee replacements, a decrease of 12.9% compared to 2009. Since 2003, primary partial knee replacement in the private sector has decreased by 30.3% compared to 43.6% in the public sector.

In 2010, 25,198 private sector primary total knee replacements were reported, an increase of 9.5% compared to 2009. In the public sector, there were 12,245 primary total knee replacements, an increase of 9.7% compared to 2009. Since 2003, primary total knee replacement in the private sector has increased by 79.1% compared to 59.9% in the public sector.

There were 2,479 private sector revision knee replacements reported for 2010, an increase of 11.3% compared to 2009. In the public sector, there were 1082 revision knee replacements, an increase of 8.4% compared to 2009. Since 2003, revision knee replacement in the private sector has increased by 55.2% compared to 50.7% in the public sector.

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# PRIMARY PARTIAL KNEE REPLACEMENT

## Classes of Partial Knee Replacement

The Registry sub-categorises partial knee replacement into five classes. These are defined by the type of prostheses used.

1. **Partial resurfacing** involves the use of one or more button prosthesis 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.
2. **Unispacer** involves the use of a medial or lateral femorotibial compartment articular spacer.
3. **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.
4. **Patella/trochlear** involves the use of a trochlear prosthesis to replace the femoral trochlear articular surface and on most occasions a patellar prosthesis.
5. **Unicompartmental** procedure involves the replacement of the femoral and tibial articular surface of either the medial or lateral femorotibial compartment using unicompartmental femoral and tibial prostheses.

## Use of Partial Knee Replacement

The most common primary partial knee is the unicompartmental knee. This accounts for 94.2% of all partial knee replacements. Patella/trochlear replacement (4.9%) is the next most common. The three remaining partial knee procedures (partial resurfacing, unispacer and bicompartmental knee replacement) have been reported in small numbers (Table KP1).

**Table KP1: Partial Knee Replacement by Class**

| Partial Knee Class | Number | Percent |
|---|---|---|
| Partial Resurfacing | 151 | 0.4 |
| Unispacer | 40 | 0.1 |
| Bicompartmental | 150 | 0.4 |
| Patella/Trochlear | 1779 | 4.9 |
| Unicompartmental | 34555 | 94.2 |
| **TOTAL** | **36675** | **100.0** |

Osteoarthritis is the principal diagnosis for the five different classes of partial knee replacement. There is considerable variation in the outcome of primary partial knee depending on the class (Tables KP2 and KP3).

*Detailed information on the demographics of each class of primary partial knee replacement is provided in the supplementary report 'Demographics of Knee Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

**Table KP2: Revision Rates of Primary Partial Knee Replacement by Class**

| Partial Knee Class | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Partial Resurfacing | 31 | 151 | 443 | 7.01 (4.76, 9.94) |
| Unispacer | 29 | 40 | 110 | 26.26 (17.59, 37.71) |
| Bicompartmental | 13 | 150 | 307 | 4.23 (2.25, 7.24) |
| Patella/Trochlear | 227 | 1779 | 6625 | 3.43 (3.00, 3.90) |
| Unicompartmental | 2882 | 34555 | 163422 | 1.76 (1.70, 1.83) |
| **TOTAL** | **3182** | **36675** | **170907** | **1.86 (1.80, 1.93)** |

**Table KP3: Yearly Cumulative Percent Revision of Primary Partial Knee Replacement by Class**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Partial Resurfacing | 6.2 (3.3, 11.6) | 18.2 (12.7, 25.8) | | | |
| Unispacer | 42.5 (29.0, 59.2) | 67.5 (53.0, 81.2) | 67.5 (53.0, 81.2) | | |
| Bicompartmental | 6.4 (3.4, 11.9) | | | | |
| Patella/Trochlear | 2.4 (1.8, 3.3) | 9.3 (7.8, 11.0) | 16.0 (13.9, 18.4) | 23.2 (20.3, 26.5) | |
| Unicompartmental | 2.2 (2.1, 2.4) | 6.0 (5.8, 6.3) | 8.6 (8.2, 8.9) | 11.1 (10.6, 11.5) | 15.1 (14.2, 16.1) |

## Partial Resurfacing

The Registry has data on 151 procedures. This has increased by 17 procedures compared to the number reported last year. The use of partial resurfacing has declined each year for the last four years.

The most common reason reported for undertaking a partial resurfacing procedure is osteoarthritis (88.7%). The majority of procedures have been on patients aged less than 55 years (75.5%). The procedure has been undertaken a little more frequently in males (53.6%).

All recorded partial resurfacing procedures used the 'Hemicap' range of prostheses.

Of the 151 procedures 132 had one cap implanted (108 femoral, 9 patellar, 6 tibial, 7 trochlear and 2 unknown). There have been 17 partial resurfacings with two caps implanted (13 femoral/trochlear and patella , 1 femoral and patellar and 3 where both devices were used on the femoral articular surface). Three devices were implanted in two procedures, both had devices to the femoral, patellar and trochlear articular surfaces.

The cumulative percent revision of partial resurfacing procedures undertaken for osteoarthritis is 6.2% at one year and 18.9% at three years (Table KP4 and Figure KP1).

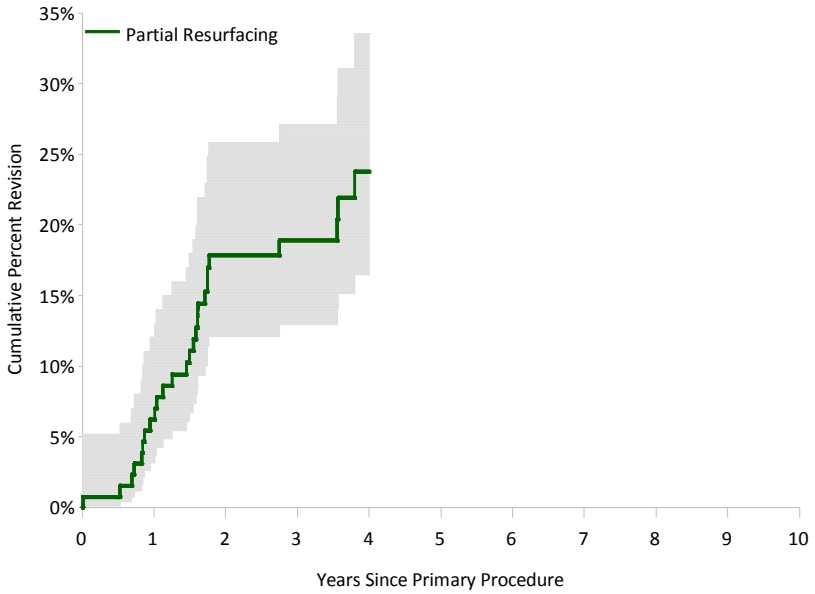
The main reasons for revision are progression of disease (51.6%), loosening (16.1%) and pain (9.7%).

Most primary partial resurfacings are revised to either total knee replacement (45.2%) or unicompartmental (38.7%). In 9.7% of revisions another partial resurfacing prosthesis was used.

**Table KP4: Yearly Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Partial Resurfacing | 6.2 (3.2, 12.0) | 18.9 (12.9, 27.1) | | | |

**Figure KP1: Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Partial Resurfacing | 134 | 120 | 70 | 8 | 0 | 0 |

## Unispacer

There have only been 40 unispacer procedures reported to the Registry. There have been no additional procedures undertaken in Australia since 2005.

Osteoarthritis was the diagnosis reported for all unispacer knee replacements with 52.5% of procedures performed on males and the majority of patients aged less than 65 years (90.0%).

Two types of unispacer prostheses have been used, UniSpacer (Zimmer) (31) and InterCushion (Advance Biosurfaces Inc.) (9).

All InterCushion prostheses were revised within one and half years, most within a year. At seven years 64.5% of Zimmer UniSpacer prostheses have been revised (Tables KP5 and KP6 and Figure KP2).

The main reason for revision was pain (24.1%), followed by loosening, progression of disease and synovitis.

Most unispacer procedures were revised to a unicompartmental knee replacement (65.5%) or a total knee (20.7%). The remainder of the revisions involved a further unispacer replacement.

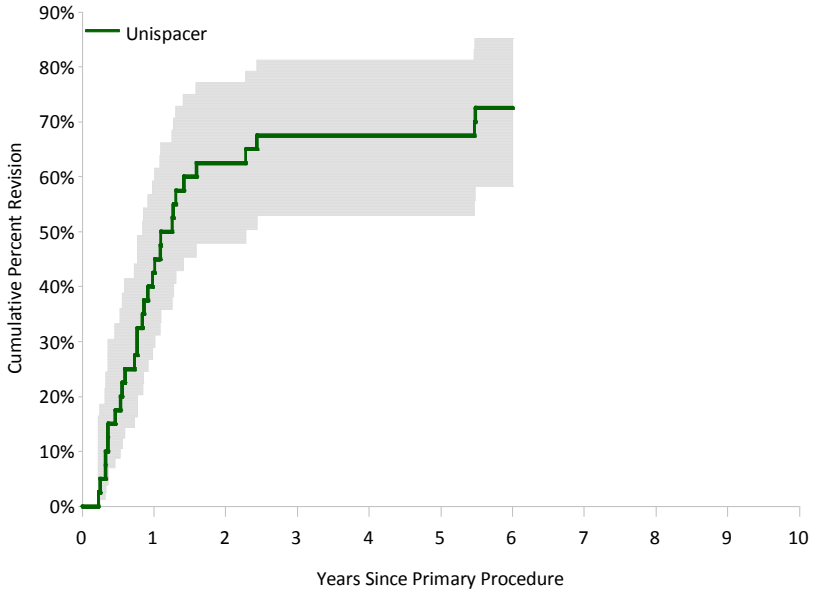
**Table KP5: Revision Rates of Primary Unispacer Knee Replacement**

| Unispacer | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| InterCushion | 9 | 9 | 8 | 110.76 (50.64, 210.3) |
| Unispacer | 20 | 31 | 102 | 19.55 (11.94, 30.19) |
| **Primary Unispacer** | **29** | **40** | **110** | **26.26 (17.59, 37.71)** |

**Table KP6: Yearly Cumulative Percent Revision of Primary Unispacer Knee Replacement**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| InterCushion | 55.6 (28.1, 86.4) | 100.0 (100.0, 100.0) | | | |
| Unispacer | 38.7 (24.2, 58.0) | 58.1 (41.7, 75.3) | 58.1 (41.7, 75.3) | 64.5 (48.1, 80.6) | |
| **Primary Unispacer** | 42.5 (29.0, 59.2) | 67.5 (53.0, 81.2) | 67.5 (53.0, 81.2) | 72.5 (58.3, 85.1) | |

**Figure KP2: Cumulative Percent Revision of Primary Unispacer Knee Replacement**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Unispacer | 40 | 23 | 13 | 13 | 4 | 0 |

## Bicompartmental

The Registry has data on 150 bicompartmental procedures, an additional 24 procedures compared to the last report.

The principal diagnosis for bicompartmental knee replacement is osteoarthritis (97.3%). It is used more frequently in females (58.7%) and 52.7% of patients are aged less than 65 years at the time of surgery.

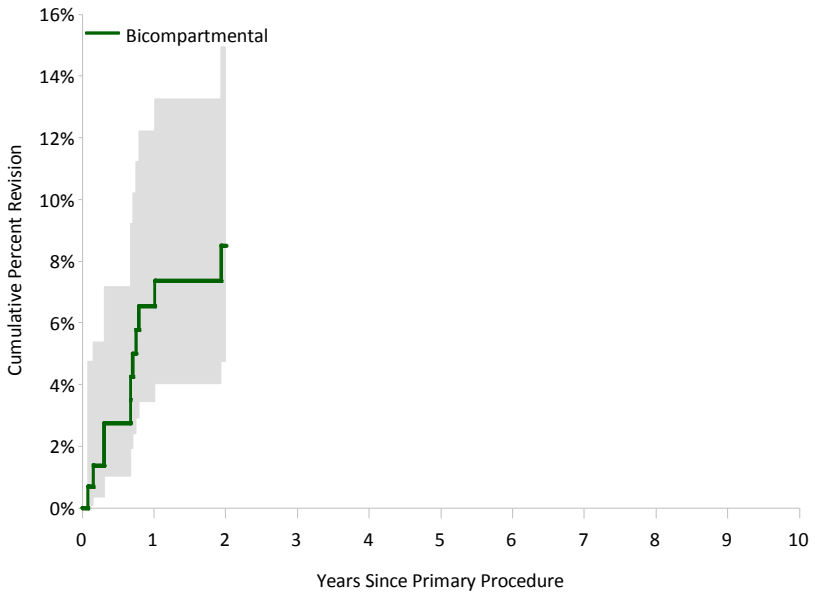
The bicompartmental knee is a single company product. One femoral component, the Journey Deuce, has been combined with two different tibial components the Journey (27.3%) and the Journey Deuce (72.7%). Most have been used with a patellar replacement (82.7%).

The cumulative percent revision of bicompartmental knee replacement at one year is 6.5% (Table KP7 and Figure KP3). Patellofemoral pain was the main reason for revision (38.5%). Eight of the 13 revisions involved the addition of a patellar prosthesis only. Three procedures have been revised to a total knee replacement.

**Table KP7: Yearly Cumulative Percent Revision of Primary Bicompartmental Knee Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Bicompartmental | 6.5 (3.5, 12.2) | | | | |

**Figure KP3: Cumulative Percent Revision of Primary Bicompartmental Knee Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Bicompartmental | 146 | 115 | 33 | 0 | 0 | 0 |

# Patella/Trochlear

## Demographics

There have been 1,779 patella/trochlear procedures reported to the Registry, an additional 260 procedures compared to the last report.

The principal diagnosis for this procedure is osteoarthritis (98.8%). It is more common in females (76.3%). In 2010 there was an increase in the proportion of females receiving patella/trochlear replacement (81.6% compared to 73.8% in 2009) (Figures KP4). The procedure is most often undertaken on patients less than 65 years of age (67.4%) (Figure KP5).

**Figure KP4: Primary Patella/Trochlear Knee Replacement by Gender**

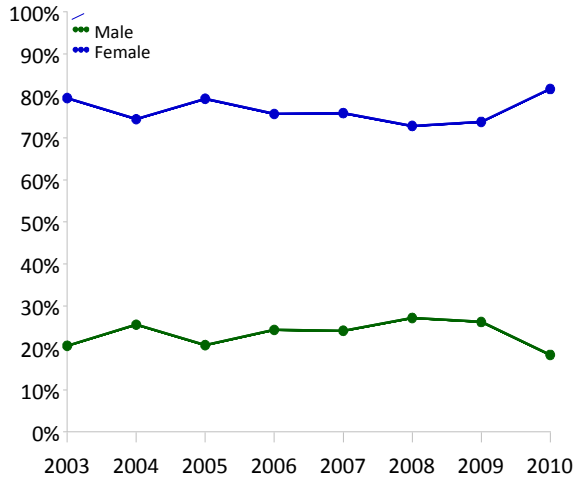
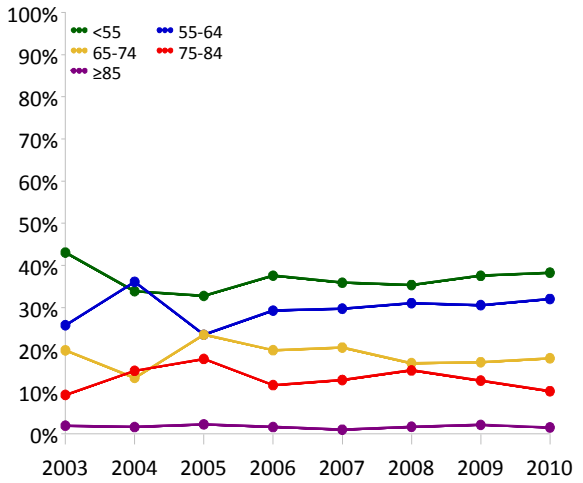



**Figure KP5: Primary Patella/Trochlear Knee Replacement by Age**




In 2010, six different patellar/trochlear prostheses were used, the four most common were the Gender Solutions, Avon, RBK and Competitor. The Gender Solutions prosthesis was reported for the first time in 2009 and is now the most frequently used prosthesis in this class. The LCS and Lubinus Patella Glide prostheses were not used in 2010 (Table KP8).

**Table KP8: Most Used Resurfacing Trochlear Prostheses in Primary Patella/Trochlear Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 56 | LCS | 64 | LCS | 66 | Avon | 56 | Avon | 79 | Gender Solutions |
| 43 | Avon | 51 | Avon | 60 | LCS | 51 | RBK | 66 | Avon |
| 29 | Lubinus Patella Glide | 30 | RBK | 58 | Competitor | 43 | Competitor | 48 | RBK |
| 13 | Themis | 27 | Competitor | 37 | RBK | 42 | Gender Solutions | 46 | Competitor |
| 9 | MOD III | 14 | Sigma HP | 6 | Sigma HP | 27 | LCS | 16 | Sigma HP |
| 1 | RBK | 4 | Vanguard | 5 | Vanguard | 5 | Sigma HP | 1 | Vanguard |
| | | 2 | MOD III | | | 3 | Lubinus Patella Glide | | |
| | | 2 | Themis | | | 2 | Vanguard | | |
| | | 1 | Lubinus Patella Glide | | | | | | |
| **Most Used** | | | | | | | | | |
| 151 | (6) 100.0% | 195 | (9) 100.0% | 232 | (6) 100.0% | 229 | (8) 100.0% | 256 | (6) 100.0% |

## Outcome

The cumulative percent revision at seven years for primary patella/trochlear knee replacement undertaken for osteoarthritis is 22.9% and at nine years is 26.5% (Table KP9 and Figure KP6).

Progression of disease (38.8%) is the most common reason for revision followed by loosening (21.1%) and pain (11.9%) (Table KP10).

When a primary patella/trochlear procedure is revised it is usually revised to a total knee replacement (77.5%) (Table KP11).

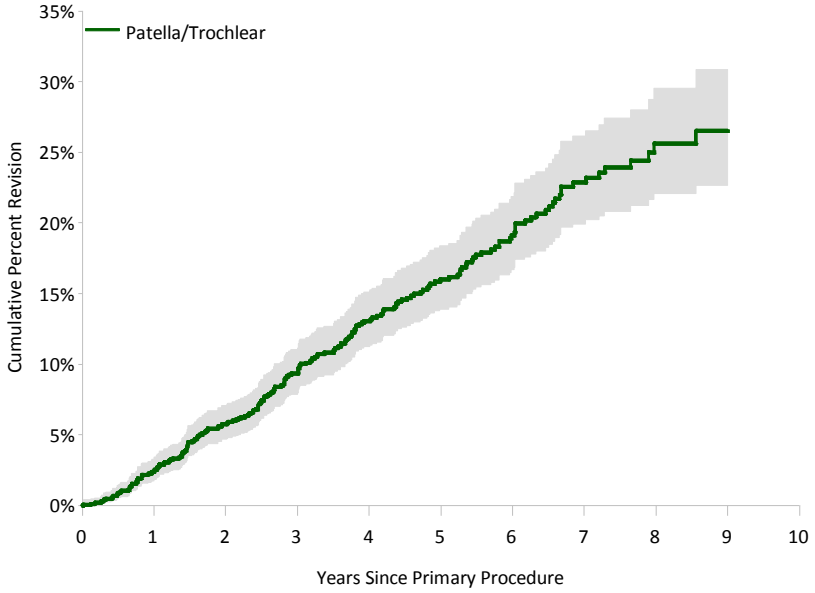
Age and gender are risk factors for revision. The rate of revision in patients younger than 65 years of age is significantly higher than patents 65 years or older (Tables KP12 and KP13 and Figure KP7) Males have a significantly higher rate of revision compared to females (Tables KP14 and KP15 and Figure KP8).

The outcomes of patella/trochlear prostheses with more than 20 procedures are detailed in Table KP16 and those with more than 100 procedures in Table KP17.

**Table KP9: Yearly Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Patella/Trochlear | 2.4 (1.8, 3.3) | 9.3 (7.9, 11.0) | 16.0 (13.9, 18.4) | 22.9 (19.9, 26.1) | |

**Figure KP6: Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Patella/Trochlear | 1757 | 1461 | 937 | 543 | 237 | 22 |

**Table KP10: Primary Patella/Trochlear Knee Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Progression Of Disease | 88 | 38.8 |
| Loosening/Lysis | 48 | 21.1 |
| Pain | 27 | 11.9 |
| Implant Breakage Patella | 13 | 5.7 |
| Patellofemoral Pain | 12 | 5.3 |
| Malalignment | 8 | 3.5 |
| Infection | 6 | 2.6 |
| Other | 25 | 11.0 |
| **TOTAL** | **227** | **100.0** |

**Table KP11: Primary Patella/Trochlear Knee Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| TKR (Tibial/Femoral) | 176 | 77.5 |
| Patella Only | 37 | 16.3 |
| Patella/Trochlear Resurfacing | 9 | 4.0 |
| UKR (Uni Tibial/Uni Femoral) | 3 | 1.3 |
| Removal of Prostheses | 2 | 0.9 |
| **TOTAL** | **227** | **100.0** |

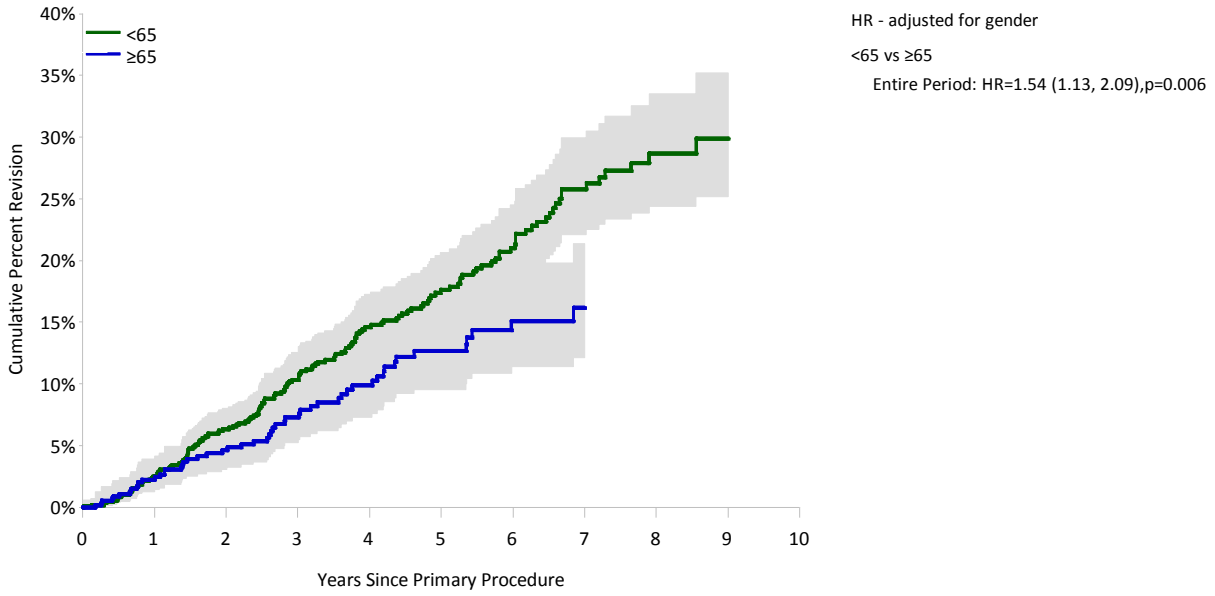
**Table KP12: Revision Rates of Patella/Trochlear Knee Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <65 | 169 | 1178 | 4409 | 3.83 (3.28, 4.46) |
| ≥65 | 54 | 579 | 2137 | 2.53 (1.90, 3.30) |
| **TOTAL** | **223** | **1757** | **6546** | **3.41 (2.97, 3.88)** |

**Table KP13: Yearly Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Age (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <65 | 2.5 (1.7, 3.7) | 10.3 (8.5, 12.5) | 17.6 (15.0, 20.7) | 25.8 (22.1, 30.0) | |
| ≥65 | 2.2 (1.3, 3.9) | 7.3 (5.2, 10.2) | 12.6 (9.6, 16.6) | 16.1 (12.1, 21.4) | |

**Figure KP7: Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <65 | 1178 | 973 | 625 | 361 | 163 | 20 |
| ≥65 | 579 | 488 | 312 | 182 | 74 | 2 |

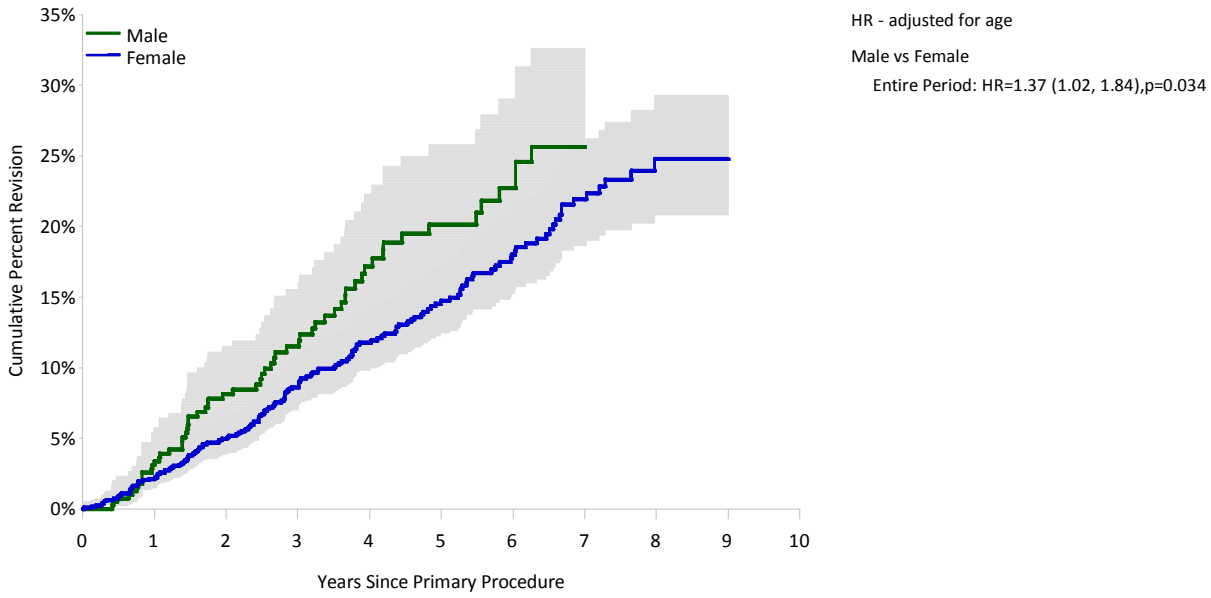
**Table KP14: Revision Rates of Patella/Trochlear Knee Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 63 | 417 | 1500 | 4.20 (3.23, 5.38) |
| Female | 160 | 1340 | 5046 | 3.17 (2.70, 3.70) |
| **TOTAL** | **223** | **1757** | **6546** | **3.41 (2.97, 3.88)** |

**Table KP15: Yearly Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Gender (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 3.4 (2.0, 5.7) | 11.5 (8.5, 15.5) | 20.1 (15.6, 25.8) | 25.6 (19.9, 32.6) | |
| Female | 2.1 (1.5, 3.1) | 8.6 (7.0, 10.5) | 14.7 (12.4, 17.4) | 21.9 (18.6, 25.7) | |

**Figure KP8: Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 417 | 358 | 210 | 112 | 52 | 7 |
| Female | 1340 | 1103 | 727 | 431 | 185 | 15 |

**Table KP16: Revision Rates of Primary Patella/Trochlear Knee Replacement**

| Resurfacing Trochlear | Patella | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Avon | Avon | 13 | 230 | 635 | 2.05 (1.09, 3.50) |
| Avon | Kinemax Plus | 42 | 297 | 1607 | 2.61 (1.88, 3.53) |
| Competitor | Genesis II | 7 | 175 | 332 | 2.11 (0.85, 4.34) |
| Gender Solutions | MBK (Zimmer) | 1 | 110 | 88 | 1.13 (0.03, 6.30) |
| LCS | LCS | 89 | 395 | 1688 | 5.27 (4.23, 6.49) |
| Lubinus Patella Glide | Duracon | 13 | 77 | 447 | 2.91 (1.55, 4.97) |
| Lubinus Patella Glide | Lubinus Patella Glide | 11 | 39 | 226 | 4.86 (2.43, 8.70) |
| MOD III | MOD III | 14 | 64 | 438 | 3.20 (1.75, 5.37) |
| RBK | RBK | 19 | 238 | 622 | 3.06 (1.84, 4.77) |
| Sigma HP | PFC Sigma | 6 | 41 | 64 | 9.42 (3.46, 20.50) |
| Themis | Themis | 3 | 38 | 227 | 1.32 (0.27, 3.86) |
| Other (26) | | 9 | 75 | 251 | 3.59 (1.64, 6.82) |
| **TOTAL** | | **227** | **1779** | **6625** | **3.43 (3.00, 3.90)** |

Note: Only combinations with over 20 procedures have been listed.

**Table KP17: Yearly Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Avon | 1.4 (0.7, 3.0) | 5.7 (3.9, 8.3) | 11.7 (8.7, 15.5) | 18.4 (14.0, 24.0) | |
| Competitor | 0.0 (0.0, 0.0) | | | | |
| Gender Solutions | 0.0 (0.0, 0.0) | | | | |
| LCS | 3.9 (2.4, 6.2) | 12.2 (9.3, 15.9) | 21.8 (17.6, 26.9) | 34.9 (28.5, 42.2) | |
| Lubinus Patella Glide | 3.4 (1.3, 8.8) | 12.1 (7.4, 19.6) | 17.6 (11.7, 26.0) | 21.4 (14.6, 30.6) | |
| RBK | 1.9 (0.7, 5.0) | 9.6 (5.7, 15.9) | | | |
| Other (5) | 5.2 (2.6, 10.1) | 13.2 (8.6, 20.0) | 16.7 (11.4, 24.1) | 18.0 (12.3, 26.0) | |

Note: Only prostheses with over 100 procedures have been listed.
A three year CPR is not available for the Competitor prosthesis, the two year CPR is 2.7 (0.9, 8.1)

# Unicompartmental

## Demographics

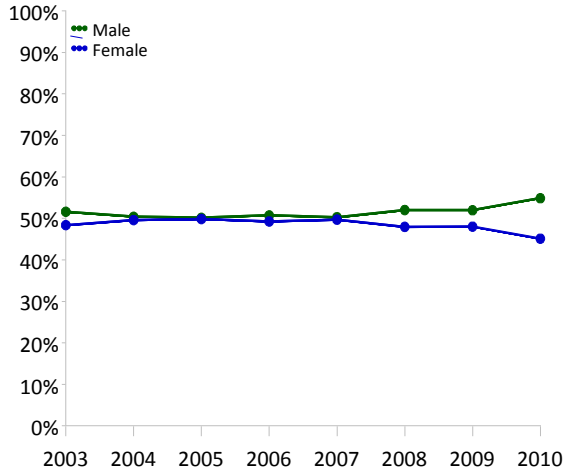
This year the Registry is reporting on 34,555 unicompartmental procedures, an additional 2,671 procedures compared to the last report.

The use of unicompartmental knee replacement continues to decline. The number of procedures reported in 2010 was 16.2% less than 2009 and 37.3% less compared to 2003. Due to the overall increase in other types of knee replacement, the decrease is more apparent when considering the number of unicompartmental knee replacements as a proportion of all knee procedures. In 2003, this proportion was 14.5% reducing to 5.9% in 2010.

Osteoarthritis is the principal diagnosis for almost all unicompartmental knee replacements (98.9%).

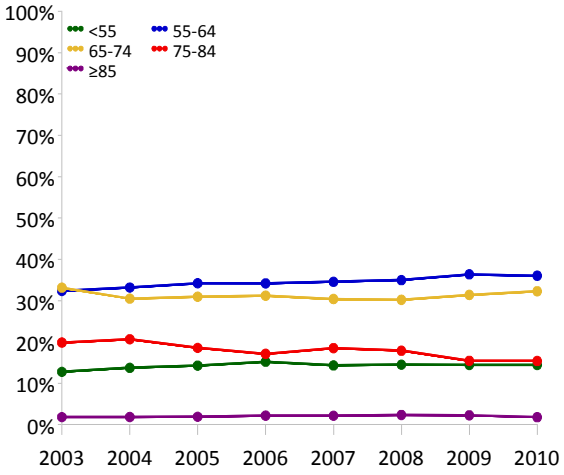
In 2010, there was a small increase in the proportion of males undergoing unicompartmental knee replacement (54.9% compared to 52.0% in 2009) (Figure KP9).

**Figure KP9: Primary Unicompartmental Knee Replacement by Gender**




Although the absolute number of unicompartmental knee replacement procedures have declined for all age groups, there has been little change in the age distribution for many years apart from a small decrease in the 75-84 year age group. Unicompartmental knee replacement is most frequently undertaken in the 55-64 and 65-74 age groups (Figure KP10).

**Figure KP10: Primary Unicompartmental Knee Replacement by Age**




In 2010, the ten most used prostheses account for 87.3% of all unicompartmental prostheses. This is similar to the proportion reported in recent years but almost 10% less than 2003. In that year, 16 prostheses were used compared to 24 in 2010.

The Oxford 3, ZUK and the Oxford were the most used prostheses in 2010. The Oxford is a cementless unicompartmental knee replacement introduced in 2007 and is reported separately from the Oxford 3. The Sigma HP is listed for the first time in the ten most used prostheses table (Table KP18).

**Table KP18: Ten Most Used Tibial Prostheses in Primary Unicompartmental Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** |
| 1366 | Oxford 3 | 962 | Oxford 3 | 947 | Oxford 3 | 800 | Oxford 3 | 589 | Oxford 3 |
| 444 | Repicci | 449 | ZUK | 497 | ZUK | 474 | ZUK | 541 | ZUK |
| 373 | Pres Fixed | 370 | Unix | 362 | Unix | 351 | Unix | 348 | Oxford |
| 352 | M/G | 265 | Freedom Active | 211 | GRU | 226 | Oxford | 271 | Unix |
| 335 | Allegretto Uni | 218 | Genesis | 180 | Pres Fixed | 176 | Journey Deuce | 101 | Freedom Active |
| 321 | GRU | 215 | GRU | 161 | FreedomActive | 170 | Preservation Fixed | 95 | Genesis |
| 276 | Genesis | 199 | Pres Fixed | 125 | Genesis | 149 | Freedom Active | 82 | Repicci |
| 260 | Unix | 173 | Repicci | 119 | Repicci | 133 | Repicci | 80 | GRU |
| 121 | Pres Mobile | 124 | Allegretto Uni | 102 | Allegretto Uni | 128 | GRU | 78 | Allegretto Uni |
| 101 | Endo-Model Sled | 114 | Endo-Model Sled | 93 | AMC | 81 | Allegretto Uni | 64 | Sigma HP |
| **Ten Most Used** | | | | | | | | | |
| 3949 | (10) 96.2% | 3089 | (10) 88.3% | 2797 | (10) 87.0% | 2688 | (10) 87.5% | 2249 | (10) 87.3% |
| **Remainder** | | | | | | | | | |
| 157 | (6) 3.8% | 411 | (16) 11.7% | 419 | (16) 13.0% | 385 | (15) 12.5% | 326 | (14) 12.7% |
| **TOTAL** | | | | | | | | | |
| 4106 | (16) 100.0% | 3500 | (26) 100.0% | 3216 | (26) 100.0% | 3073 | (25) 100.0% | 2575 | (24) 100.0% |

Note: Freedom PKR/Active is reported as Freedom/Active, Preservation-Fixed as Pres-Fixed and Preservation-Mobile as Pres-Mobile

## Outcome

The cumulative percent revision at ten years for primary unicompartmental knee replacement undertaken for osteoarthritis is 15.1% (Table KP19 and Figure KP11).

The main reasons for revision are loosening/lysis (48.3%), progression of disease (21.2%) and pain (11.5%). Most are revised to a total knee replacement (83.6%) (Tables KP20 and KP21).

Age, gender, method of fixation and the type of prostheses affect the rate of revision.

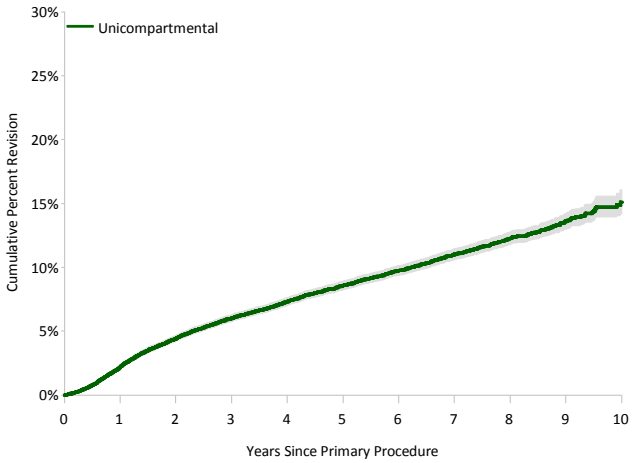
Age is a major risk factor with the rate decreasing with increasing age (Tables KP22 and KP23 and Figure KP12). Females have a higher rate of revision (Tables KP24 and KP25 and Figure KP13). The effect of age on the rate of revision is evident for both males and females (Tables KP26 and KP27 and Figures KP14 and KP15).

Outcomes of unicompartmental knee prostheses with more than 200 procedures reported to the Registry are presented in Tables KP28 and KP29.

**Table KP19: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Unicompartmental | 2.2 (2.1, 2.4) | 6.0 (5.8, 6.3) | 8.6 (8.2, 8.9) | 11.0 (10.6, 11.5) | 15.1 (14.2, 16.1) |

**Figure KP11: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Unicompartmental | 34173 | 30778 | 23262 | 15808 | 8637 | 425 |

**Table KP20: Primary Unicompartmental Knee Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Loosening/Lysis | 1391 | 48.3 |
| Progression Of Disease | 612 | 21.2 |
| Pain | 331 | 11.5 |
| Infection | 133 | 4.6 |
| Fracture | 78 | 2.7 |
| Wear Tibial | 49 | 1.7 |
| Prosthesis Dislocation | 40 | 1.4 |
| Malalignment | 38 | 1.3 |
| Bearing Dislocation | 32 | 1.1 |
| Other | 178 | 6.2 |
| **TOTAL** | **2882** | **100.0** |

**Table KP21: Primary Unicompartmental Knee Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| TKR (Tibial/Femoral) | 2409 | 83.6 |
| Uni Insert Only | 174 | 6.0 |
| Uni Tibial Component | 146 | 5.1 |
| Uni Femoral Component | 59 | 2.0 |
| UKR (Uni Tibial/Uni Femoral) | 49 | 1.7 |
| Cement Spacer | 24 | 0.8 |
| Removal of Prostheses | 7 | 0.2 |
| Patella/Trochlear Resurfacing | 6 | 0.2 |
| Reinsertion of Components | 3 | 0.1 |
| Cement Only | 2 | 0.1 |
| Patella Only | 2 | 0.1 |
| Femoral Component* | 1 | 0.0 |
| **TOTAL** | **2882** | **100.0** |

*Bicompartmental Component

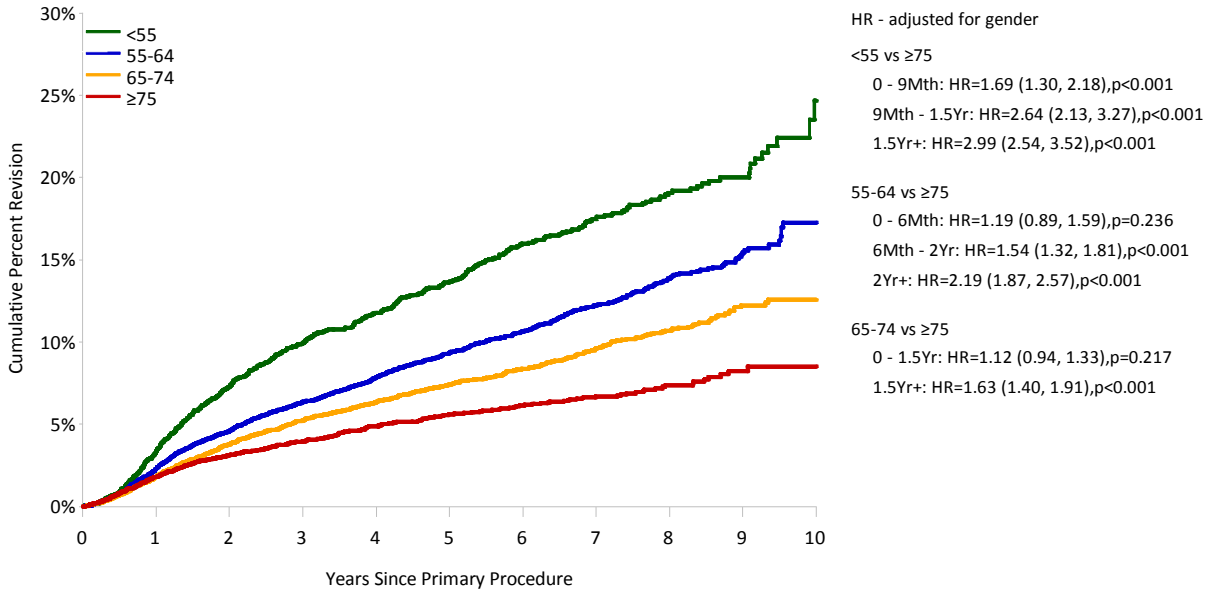
**Table KP22: Revision Rates of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <55 | 639 | 4814 | 22046 | 2.90 (2.68, 3.13) |
| 55-64 | 1042 | 11477 | 53341 | 1.95 (1.84, 2.08) |
| 65-74 | 800 | 10876 | 52972 | 1.51 (1.41, 1.62) |
| ≥75 | 363 | 7006 | 33107 | 1.10 (0.99, 1.22) |
| **TOTAL** | **2844** | **34173** | **161466** | **1.76 (1.70, 1.83)** |

**Table KP23: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <55 | 3.4 (2.9, 4.0) | 9.9 (9.1, 10.9) | 13.6 (12.6, 14.8) | 17.6 (16.3, 19.0) | 24.7 (21.0, 28.8) |
| 55-64 | 2.4 (2.1, 2.7) | 6.4 (5.9, 6.9) | 9.4 (8.8, 10.0) | 12.2 (11.5, 13.0) | 17.3 (15.6, 19.0) |
| 65-74 | 1.8 (1.6, 2.1) | 5.2 (4.8, 5.7) | 7.4 (6.9, 8.0) | 9.6 (8.9, 10.3) | 12.6 (11.5, 13.7) |
| ≥75 | 1.8 (1.5, 2.1) | 4.0 (3.5, 4.5) | 5.6 (5.0, 6.2) | 6.7 (6.0, 7.4) | 8.5 (7.4, 9.8) |

**Figure KP12: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <55 | 4814 | 4289 | 3167 | 2099 | 1151 | 65 |
| 55-64 | 11477 | 10284 | 7701 | 5208 | 2767 | 129 |
| 65-74 | 10876 | 9839 | 7555 | 5253 | 3026 | 158 |
| ≥75 | 7006 | 6366 | 4839 | 3248 | 1693 | 73 |

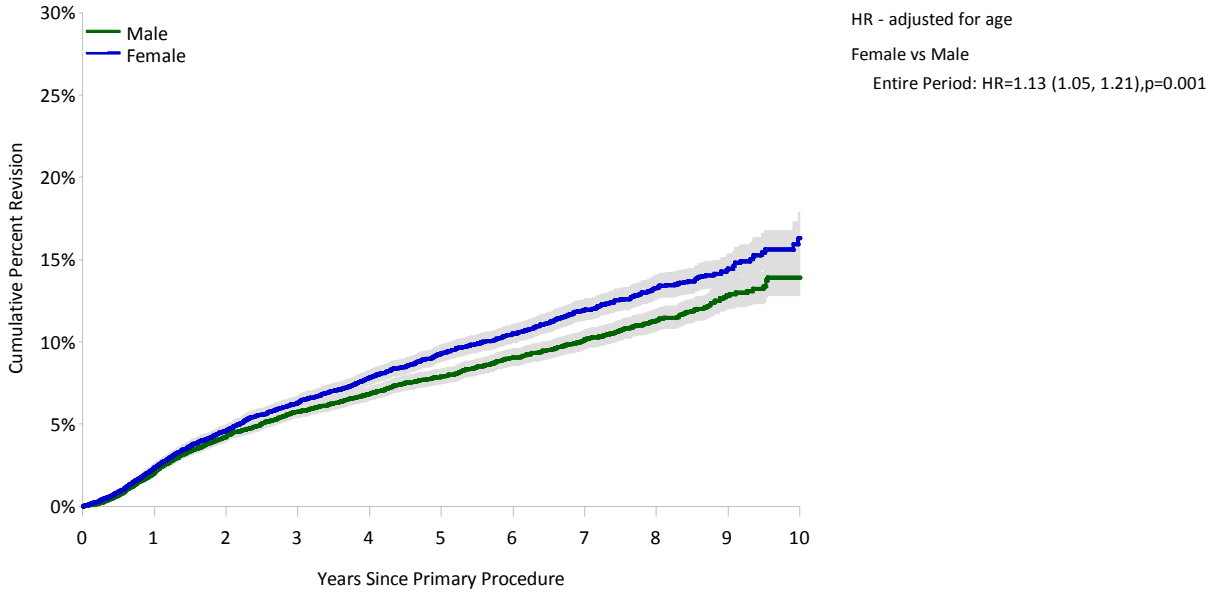
**Table KP24: Revision Rates of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 1349 | 17649 | 82571 | 1.63 (1.55, 1.72) |
| Female | 1495 | 16524 | 78895 | 1.89 (1.80, 1.99) |
| **TOTAL** | **2844** | **34173** | **161466** | **1.76 (1.70, 1.83)** |

**Table KP25: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 2.1 (1.9, 2.3) | 5.7 (5.4, 6.1) | 7.9 (7.4, 8.4) | 10.1 (9.6, 10.7) | 13.9 (12.8, 15.1) |
| Female | 2.4 (2.2, 2.6) | 6.3 (5.9, 6.7) | 9.3 (8.8, 9.8) | 11.9 (11.3, 12.6) | 16.3 (14.9, 17.9) |

**Figure KP13: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 17649 | 15808 | 11847 | 8039 | 4435 | 213 |
| Female | 16524 | 14970 | 11415 | 7769 | 4202 | 212 |

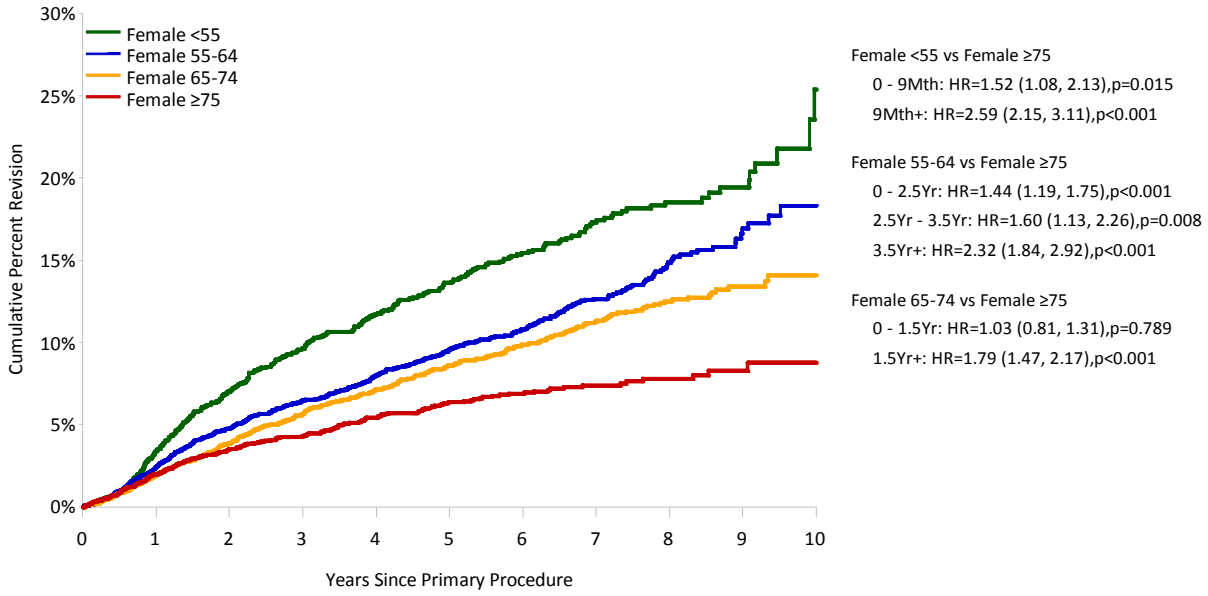
**Table KP26: Revision Rates of Primary Unicompartmental Knee Replacement by Gender and Age (Primary Diagnosis OA)**

| Gender | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | <55 | 280 | 2071 | 9385 | 2.98 (2.64, 3.35) |
| | 55-64 | 521 | 5963 | 27760 | 1.88 (1.72, 2.05) |
| | 65-74 | 381 | 5960 | 28719 | 1.33 (1.20, 1.47) |
| | ≥75 | 167 | 3655 | 16708 | 1.00 (0.85, 1.16) |
| Female | <55 | 359 | 2743 | 12661 | 2.84 (2.55, 3.14) |
| | 55-64 | 521 | 5514 | 25581 | 2.04 (1.87, 2.22) |
| | 65-74 | 419 | 4916 | 24253 | 1.73 (1.57, 1.90) |
| | ≥75 | 196 | 3351 | 16399 | 1.20 (1.03, 1.37) |
| **TOTAL** | | **2844** | **34173** | **161466** | **1.76 (1.70, 1.83)** |

**Table KP27: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender and Age (Primary Diagnosis OA)**

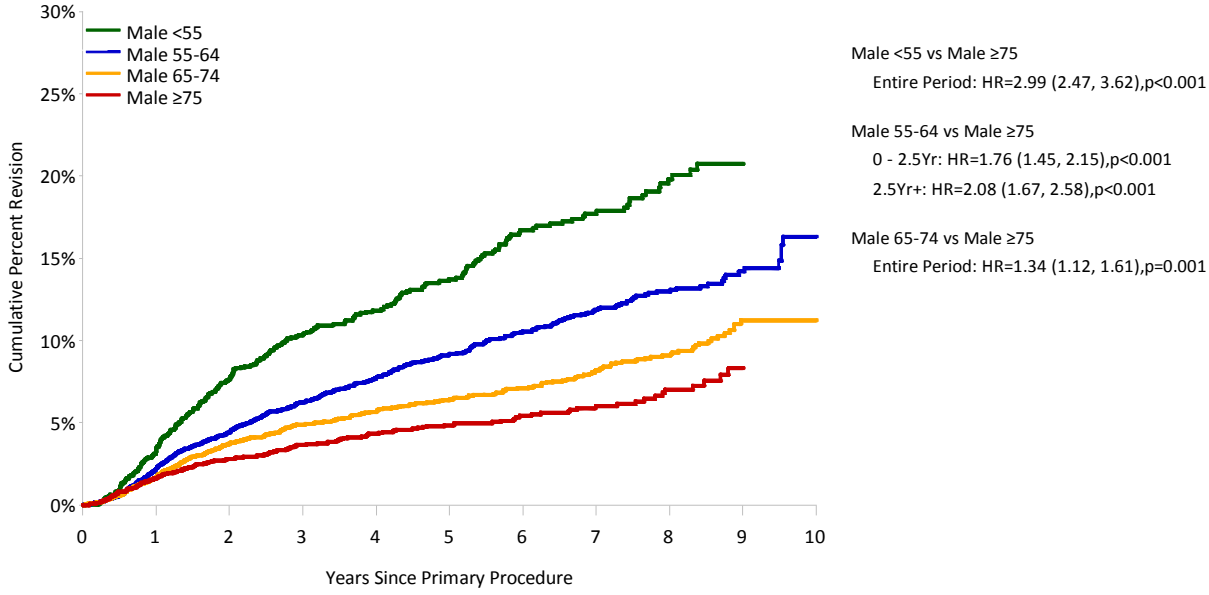
| Gender | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | <55 | 3.5 (2.8, 4.4) | 10.4 (9.1, 11.9) | 13.7 (12.1, 15.5) | 17.9 (15.9, 20.1) | |
| | 55-64 | 2.2 (1.9, 2.7) | 6.3 (5.6, 7.0) | 9.2 (8.4, 10.1) | 11.9 (10.8, 13.0) | 16.3 (14.1, 18.8) |
| | 65-74 | 1.7 (1.4, 2.1) | 4.9 (4.3, 5.5) | 6.4 (5.7, 7.1) | 8.2 (7.3, 9.1) | 11.2 (9.8, 12.8) |
| | ≥75 | 1.6 (1.3, 2.1) | 3.6 (3.0, 4.3) | 4.9 (4.1, 5.7) | 6.0 (5.1, 7.1) | |
| Female | <55 | 3.4 (2.7, 4.1) | 9.6 (8.5, 10.9) | 13.6 (12.2, 15.1) | 17.4 (15.7, 19.3) | 25.4 (20.1, 31.7) |
| | 55-64 | 2.5 (2.1, 2.9) | 6.5 (5.8, 7.2) | 9.6 (8.7, 10.5) | 12.6 (11.5, 13.8) | 18.3 (16.0, 20.9) |
| | 65-74 | 2.0 (1.6, 2.5) | 5.7 (5.0, 6.4) | 8.6 (7.8, 9.6) | 11.3 (10.2, 12.4) | 14.1 (12.5, 15.9) |
| | ≥75 | 2.0 (1.5, 2.5) | 4.3 (3.6, 5.1) | 6.4 (5.5, 7.4) | 7.4 (6.4, 8.5) | 8.8 (7.3, 10.5) |

**Figure KP14: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Females by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Female | <55 | 2743 | 2449 | 1824 | 1217 | 652 | 40 |
| | 55-64 | 5514 | 4963 | 3719 | 2505 | 1286 | 48 |
| | 65-74 | 4916 | 4481 | 3476 | 2408 | 1384 | 81 |
| | ≥75 | 3351 | 3077 | 2396 | 1639 | 880 | 43 |

**Figure KP15: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Males by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | <55 | 2071 | 1840 | 1343 | 882 | 499 | 25 |
| | 55-64 | 5963 | 5321 | 3982 | 2703 | 1481 | 81 |
| | 65-74 | 5960 | 5358 | 4079 | 2845 | 1642 | 77 |
| | ≥75 | 3655 | 3289 | 2443 | 1609 | 813 | 30 |

**Table KP28: Revision Rates of Primary Unicompartmental Knee Replacement by Prostheses Used**

| Uni Femoral | Uni Tibial | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| AMC | AMC | 73 | 643 | 2505 | 2.91 (2.28, 3.66) |
| Allegretto Uni | Allegretto Uni | 191 | 1938 | 11315 | 1.69 (1.46, 1.95) |
| BalanSys Uni | BalanSys Uni Fixed | 10 | 234 | 792 | 1.26 (0.61, 2.32) |
| Endo-Model Sled | Endo-Model Sled | 74 | 972 | 4351 | 1.70 (1.34, 2.13) |
| Freedom PKR/Active | Freedom PKR/Active | 90 | 1199 | 3981 | 2.26 (1.82, 2.78) |
| GRU | GRU | 118 | 1813 | 8188 | 1.44 (1.19, 1.73) |
| Genesis | Genesis | 197 | 1857 | 9043 | 2.18 (1.88, 2.50) |
| M/G | M/G | 157 | 2086 | 12424 | 1.26 (1.07, 1.48) |
| Oxford 3 | Oxford | 12 | 581 | 482 | 2.49 (1.29, 4.35) |
| Oxford 3 | Oxford 3 | 985 | 10921 | 56360 | 1.75 (1.64, 1.86) |
| Preservation | Preservation Fixed | 220 | 2317 | 11647 | 1.89 (1.65, 2.16) |
| Preservation | Preservation Mobile | 86 | 400 | 2453 | 3.51 (2.80, 4.33) |
| Repicci | Repicci | 263 | 2717 | 15953 | 1.65 (1.46, 1.86) |
| Unix | Unix | 179 | 2921 | 12544 | 1.43 (1.23, 1.65) |
| ZUK | ZUK | 63 | 2320 | 5271 | 1.20 (0.92, 1.53) |
| Other (27) | | 164 | 1636 | 6112 | 2.68 (2.29, 3.13) |
| **TOTAL** | | **2882** | **34555** | **163422** | **1.76 (1.70, 1.83)** |

Note: Only prostheses with over 200 procedures have been listed.

**Table KP29: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Prostheses Used**

| Uni Femoral | Uni Tibial | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| AMC | AMC | 4.2 (2.9, 6.1) | 10.5 (8.3, 13.4) | 13.0 (10.3, 16.3) | 15.6 (12.1, 20.1) | |
| Allegretto Uni | Allegretto Uni | 3.1 (2.4, 3.9) | 5.6 (4.6, 6.7) | 7.9 (6.7, 9.3) | 10.5 (9.1, 12.2) | 17.2 (13.5, 21.6) |
| BalanSys Uni | BalanSys Uni Fixed | 2.8 (1.2, 6.0) | 3.8 (1.9, 7.6) | 6.0 (3.1, 11.5) | | |
| Endo-Model Sled | Endo-Model Sled | 1.3 (0.7, 2.2) | 5.3 (4.0, 7.0) | 8.3 (6.6, 10.5) | 9.7 (7.7, 12.3) | |
| Freedom PKR/Active | Freedom PKR/Active | 1.5 (0.9, 2.4) | 6.7 (5.3, 8.4) | 11.5 (9.2, 14.3) | | |
| GRU | GRU | 1.5 (1.1, 2.2) | 4.9 (3.9, 6.0) | 6.7 (5.6, 8.2) | 8.7 (7.2, 10.5) | |
| Genesis | Genesis | 2.6 (2.0, 3.5) | 8.1 (6.9, 9.5) | 10.6 (9.2, 12.2) | 13.1 (11.4, 15.1) | |
| M/G | M/G | 1.6 (1.1, 2.3) | 4.3 (3.5, 5.2) | 6.4 (5.4, 7.6) | 8.4 (7.1, 9.8) | 10.5 (8.8, 12.6) |
| Oxford 3 | Oxford | 2.0 (1.0, 4.0) | | | | |
| Oxford 3 | Oxford 3 | 2.3 (2.1, 2.6) | 6.1 (5.6, 6.5) | 8.8 (8.2, 9.4) | 11.2 (10.5, 12.0) | 14.0 (13.0, 15.2) |
| Preservation | Preservation Fixed | 2.4 (1.8, 3.1) | 7.0 (6.0, 8.2) | 9.3 (8.1, 10.6) | 11.4 (9.9, 13.0) | |
| Preservation | Preservation Mobile | 5.3 (3.5, 7.9) | 15.5 (12.3, 19.5) | 19.0 (15.5, 23.2) | 21.7 (17.9, 26.2) | |
| Repicci | Repicci | 1.5 (1.1, 2.1) | 4.4 (3.7, 5.3) | 7.4 (6.4, 8.6) | 10.4 (9.1, 11.8) | |
| Unix | Unix | 2.0 (1.5, 2.6) | 5.0 (4.2, 6.0) | 6.8 (5.8, 7.9) | 8.8 (7.5, 10.3) | |
| ZUK | ZUK | 1.2 (0.8, 1.8) | 3.8 (2.9, 4.9) | 4.9 (3.6, 6.6) | | |
| Other (27) | | 4.0 (3.1, 5.1) | 9.0 (7.5, 10.7) | 11.8 (10.0, 14.0) | 16.6 (14.0, 19.6) | 20.6 (16.9, 24.9) |

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# PRIMARY TOTAL KNEE REPLACEMENT

## Classes of Total Knee Replacement

The Registry defines a total knee replacement 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 patellar replacement.

In this report the Registry analyses outcomes based on specific patient and prosthesis characteristics. In addition, it presents the outcome for different types of total knee prostheses.

Individual prostheses are usually available as part of a knee system. The Registry subdivides knee systems into specific prosthesis types based on distinguishing prostheses characteristics. The initial characteristic used to subdivide is the method of fixation. Further subdivision of specific knee systems is based on additional prostheses characteristics. These include mobility, stability and flexion capacity. This further system subdivision however is not uniformly applied to all knee systems at this time.

High use prostheses systems are more likely to be subdivided if there are specific reasons to do so. These may include differences or potential differences in outcome between prostheses with different characteristics within a single system.

Low use systems are unlikely to be subdivided because of small numbers or insufficient follow up. The exception is if the system is identified as having a higher than anticipated rate of revision. The Registry then undertakes catalogue range specific analysis to determine if the identified higher than anticipated rate of revision is associated with specific prosthesis characteristics.

To enable the Registry to undertake range specific analysis uniformly across all knee systems it is necessary to link the different catalogue ranges to the specific prosthesis characteristics. This is an ongoing process.

## Demographics

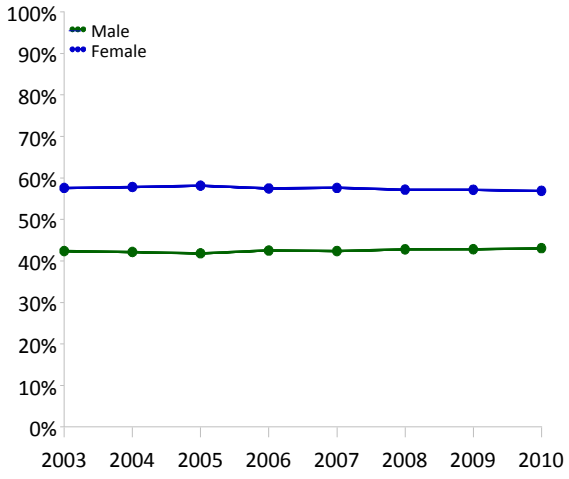
This year the Registry is reporting on 269,266 primary total knee procedures, an additional 37,857 procedures compared to the last report.

The use of primary total knee replacement has increased steadily. In 2010, there were 9.6% more procedures undertaken than 2009 and 72.3% more than 2003. As a proportion of all knee replacement procedures, primary total knee increased from 76.7% in 2003 to 85.4% in 2010.

As with all other types of primary knee replacement, osteoarthritis is the principal diagnosis for primary total knee replacement (97.2%).

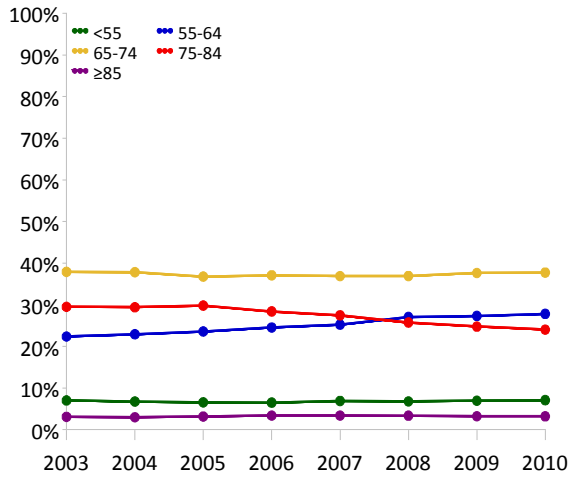
Primary total knee replacement is more common in females (56.9% in 2010). This proportion has remained constant since 2003 (Figure KT1).

**Figure KT1: Primary Total Knee Replacement by Gender**



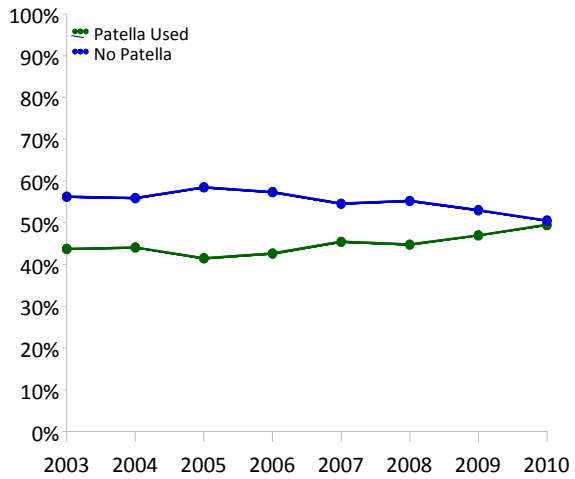
There has been a small increase in the proportion of patients aged 55-64 years (22.4% in 2003 to 27.8% in 2010). The proportion of patients aged 75-84 years has decreased from 29.5% to 24.1% during the same period. The proportion of patients aged less than 55 years is small (7.1% in 2010) and remains unchanged (Figure KT2).

**Figure KT2: Primary Total Knee Replacement by Age**



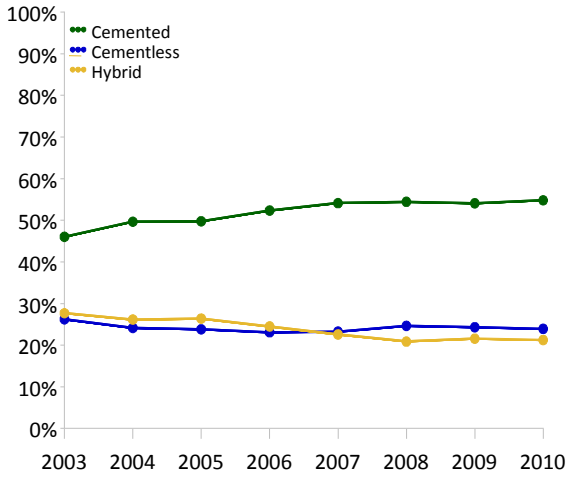

The use of patella resurfacing has increased from a low of 41.5% in 2005 to 49.5% in 2010 (Figure KT3).

**Figure KT3: Primary Total Knee Replacement by Patella Usage**




Cementing both the femoral and tibial components is the most common method of fixation. This has increased from 46.0% in 2003 to 54.8% in 2010 (Figure KT4).

**Figure KT4: Primary Total Knee Replacement by Fixation**




The most used system for primary total knee replacement is based on the femoral prosthesis used. In 2010, this was the Triathlon (15.5%), followed by PFC Sigma (11.6%) and Genesis II (10.3%) (Table KT1). Each of these systems includes a number of different types of femoral prostheses. Unlike these femoral prostheses, Nexgen femoral prostheses are subdivided into Nexgen CR, Nexgen CR Flex, Nexgen LPS, Nexgen LPS Flex and Nexgen LCCK. In 2010, the use of all Nexgen femoral prostheses combined accounted for 19.5% of all primary total knee replacements.

The ten most used femoral prostheses for cemented, cementless and hybrid primary total knee replacement are listed in Tables KT2-KT4.

*Detailed information on the demographics of primary total knee replacement is provided in the supplementary report 'Demographics of Knee Arthroplasty' available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

**Table KT1: Ten Most Used Femoral Prostheses in Primary Total Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** |
| 3184 | LCS | 3745 | LCS | 4047 | PFC Sigma | 4701 | Triathlon | 5787 | Triathlon |
| 2847 | Duracon | 3577 | PFC Sigma | 3792 | LCS | 3896 | PFC Sigma | 4333 | PFC Sigma |
| 2154 | Nexgen CR | 2607 | Nexgen CR Flex | 3480 | Triathlon | 3762 | LCS | 3874 | Genesis II |
| 2115 | Scorpio | 2333 | Triathlon | 3062 | Nexgen CR Flex | 3395 | Nexgen CR Flex | 3745 | Nexgen CR Flex |
| 1944 | PFC Sigma | 2275 | Genesis II | 2602 | Genesis II | 3195 | Genesis II | 3570 | LCS |
| 1521 | Genesis II | 2173 | Nexgen LPS Flex | 2348 | Nexgen LPS Flex | 2479 | Nexgen LPS Flex | 2734 | Nexgen LPS Flex |
| 1033 | Profix | 2095 | Scorpio | 2097 | Genesis II Oxinium | 1972 | Genesis II Oxinium | 2683 | Vanguard |
| 1002 | Natural Knee II | 1967 | Duracon | 1392 | Duracon | 1785 | Vanguard | 2369 | Genesis II Oxinium |
| 902 | Nexgen LPS | 1809 | Genesis II Oxinium | 1383 | Scorpio | 1278 | Scorpio NRG | 1102 | Scorpio |
| 725 | Genesis II Oxinium | 762 | Vanguard | 1256 | Vanguard | 1176 | Scorpio | 1004 | Scorpio NRG |
| **Ten Most Used** | | | | | | | | | |
| 17427 (10) | 80.2% | 23343 (10) | 79.8% | 25459 (10) | 78.2% | 27639 (10) | 80.9% | 31201 (10) | 83.3% |
| **Remainder** | | | | | | | | | |
| 4304 (38) | 19.8% | 5918 (44) | 20.2% | 7114 (45) | 21.8% | 6539 (43) | 19.1% | 6242 (43) | 16.7% |
| **TOTAL** | | | | | | | | | |
| 21731 (48) | 100.0% | 29261 (54) | 100.0% | 32573 (55) | 100.0% | 34178 (53) | 100.0% | 37443 (53) | 100.0% |

**Table KT2: Ten Most Used Femoral Prostheses in Cemented Primary Total Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** | **N** | **Model** |
| 1250 | Duracon | 2091 | PFC Sigma | 2234 | Nexgen LPS Flex | 2614 | Genesis II | 3232 | Genesis II |
| 1089 | Genesis II | 2076 | Nexgen LPS Flex | 2207 | PFC Sigma | 2499 | Triathlon | 2906 | Triathlon |
| 984 | LCS | 1796 | Genesis II Oxinium | 2090 | Genesis II Oxinium | 2337 | Nexgen LPS Flex | 2438 | Nexgen LPS Flex |
| 839 | PFC Sigma | 1765 | Genesis II | 2024 | Genesis II | 2015 | PFC Sigma | 2292 | Genesis II Oxinium |
| 828 | Nexgen LPS | 1343 | Triathlon | 1960 | Triathlon | 1957 | Genesis II Oxinium | 2252 | PFC Sigma |
| 797 | Nexgen CR | 1086 | Duracon | 1094 | Nexgen CR Flex | 1077 | Nexgen CR Flex | 1381 | Nexgen CR Flex |
| 713 | Scorpio | 995 | Nexgen CR Flex | 774 | LCS | 879 | Vanguard | 1293 | Vanguard |
| 690 | Nexgen LPS Flex | 801 | LCS | 746 | Vanguard | 812 | LCS | 897 | LCS |
| 636 | Profix | 801 | Scorpio | 674 | Duracon | 756 | Scorpio NRG | 540 | Scorpio NRG |
| 548 | Genesis II Oxinium | 398 | Profix | 592 | Journey | 596 | Journey | 468 | Scorpio |
| **Ten Most Used** | | | | | | | | | |
| 8374 (10) | 83.7% | 13152 (10) | 83.0% | 14395 (10) | 81.2% | 15542 (10) | 84.1% | 17699 (10) | 86.2% |
| **Remainder** | | | | | | | | | |
| 1632 (32) | 16.3% | 2685 (39) | 17.0% | 3340 (40) | 18.8% | 2945 (39) | 15.9% | 2822 (39) | 13.8% |
| **TOTAL** | | | | | | | | | |
| 10006 (42) | 100.0% | 15837 (49) | 100.0% | 17735 (50) | 100.0% | 18487 (49) | 100.0% | 20521 (49) | 100.0% |

**Table KT3: Ten Most Used Femoral Prostheses in Cementless Primary Total Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 1470 | LCS | 2237 | LCS | 2321 | LCS | 2094 | LCS | 1855 | LCS |
| 788 | Nexgen CR | 798 | Nexgen CR Flex | 1138 | Nexgen CR Flex | 1291 | Triathlon | 1600 | Triathlon |
| 500 | Scorpio | 571 | Triathlon | 920 | Triathlon | 1192 | Nexgen CR Flex | 1247 | Nexgen CR Flex |
| 499 | Natural Knee II | 442 | PFC Sigma | 486 | RBK | 516 | RBK | 613 | RBK |
| 483 | Active Knee | 393 | Scorpio | 446 | PFC Sigma | 500 | PFC Sigma | 566 | PFC Sigma |
| 477 | Duracon | 379 | RBK | 443 | Scorpio NRG | 387 | Scorpio NRG | 470 | Vanguard |
| 314 | PFC Sigma | 373 | Active Knee | 388 | Active Knee | 312 | Active Knee | 387 | Active Knee |
| 302 | RBK | 362 | Duracon | 303 | Duracon | 212 | Score | 368 | Scorpio NRG |
| 187 | Profix | 221 | Natural Knee II | 215 | Scorpio | 209 | Profix | 193 | Scorpio |
| 141 | Maxim | 169 | Profix | 164 | Natural Knee II | 207 | Scorpio | 189 | Nexgen LPS Flex |
| **Ten Most Used** | | | | | | | | | |
| 5161 | (10) 90.5% | 5945 | (10) 87.2% | 6824 | (10) 84.9% | 6920 | (10) 83.2% | 7488 | (10) 83.5% |
| **Remainder** | | | | | | | | | |
| 543 | (13) 9.5% | 869 | (17) 12.8% | 1210 | (20) 15.1% | 1395 | (18) 16.8% | 1476 | (21) 16.5% |
| **TOTAL** | | | | | | | | | |
| 5704 | (23) 100.0% | 6814 | (27) 100.0% | 8034 | (30) 100.0% | 8315 | (28) 100.0% | 8964 | (31) 100.0% |

**Table KT4: Ten Most Used Femoral Prostheses in Hybrid Primary Total Knee Replacement**

| 2003 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 1120 | Duracon | 1044 | PFC Sigma | 1394 | PFC Sigma | 1381 | PFC Sigma | 1515 | PFC Sigma |
| 902 | Scorpio | 901 | Scorpio | 830 | Nexgen CR Flex | 1126 | Nexgen CR Flex | 1281 | Triathlon |
| 791 | PFC Sigma | 814 | Nexgen CR Flex | 697 | LCS | 911 | Triathlon | 1117 | Nexgen CR Flex |
| 730 | LCS | 707 | LCS | 600 | Triathlon | 856 | LCS | 920 | Vanguard |
| 569 | Nexgen CR | 519 | Duracon | 588 | Scorpio | 748 | Vanguard | 818 | LCS |
| 377 | Genesis II | 464 | Genesis II | 471 | Vanguard | 492 | Genesis II | 505 | Genesis II |
| 249 | Maxim | 419 | Triathlon | 455 | Genesis II | 446 | Scorpio | 441 | Scorpio |
| 232 | Natural Knee II | 337 | Vanguard | 415 | Duracon | 223 | Duracon | 135 | RBK |
| 210 | Profix | 204 | Maxim | 202 | Scorpio NRG | 142 | Nexgen LPS Flex | 125 | Gender Solutions |
| 191 | AGC | 154 | Nexgen CR | 128 | Nexgen LPS | 135 | Scorpio NRG | 117 | Nexgen CR |
| **Ten Most Used** | | | | | | | | | |
| 5371 | (10) 89.2% | 5563 | (10) 84.2% | 5780 | (10) 85.0% | 6460 | (10) 87.6% | 6974 | (10) 87.6% |
| **Remainder** | | | | | | | | | |
| 650 | (25) 10.8% | 1047 | (26) 15.8% | 1024 | (29) 15.0% | 916 | (26) 12.4% | 984 | (27) 12.4% |
| **TOTAL** | | | | | | | | | |
| 6021 | (35) 100.0% | 6610 | (36) 100.0% | 6804 | (39) 100.0% | 7376 | (36) 100.0% | 7958 | (37) 100.0% |

## Outcome by Patient Characteristics

Primary total knee replacement has the lowest rate of revision compared to all other primary knee replacement procedures. The cumulative percent revision at ten years for primary total knee undertaken for osteoarthritis is 5.7% (Table KT5 and Figure KT5).

### Reason for Revision

The main reasons for revision are loosening/lysis (30.7%), infection (22.2%), patellofemoral pain (13.5%), pain (9.0%) and instability (5.8%) (Table KT6).

The five most common reasons for revision are shown on the revision diagnosis cumulative incidence graph (Figure KT6). The incidence of revision for infection increases rapidly in the first year, however after this it increases at a slower rate. Loosening/lysis shows a linear increase and exceeds infection to become the most common reason for revision after one and a half years. The remaining reasons for revision have a low incidence.

### Type of Revision

The most common types of revision are replacement of both the femoral and tibial prostheses (24.6%), patella only replacement (21.7%) and insert only exchange (20.3%) (Table KT7).

### Primary Diagnosis

Eight different primary diagnoses for primary total knee replacement have been reported to the Registry. The four most common are osteoarthritis, rheumatoid arthritis, other inflammatory arthritis and osteonecrosis (Tables KT 8 and KT9).

Rheumatoid arthritis has the lowest rate of revision. There is no difference between osteoarthritis, other inflammatory arthritis and osteonecrosis (Tables KT8 and KT9 and Figure KT7).

### Age and Gender

Age is a major factor affecting the outcome of primary total knee replacement. The rate of revision increases with decreasing age. The age related difference in the rate of revision increases with time. After three and a half years, those aged less than 55 years have almost six times the rate of revision compared to those aged 75 or older (Tables KT10 and KT11 and Figure KT8).

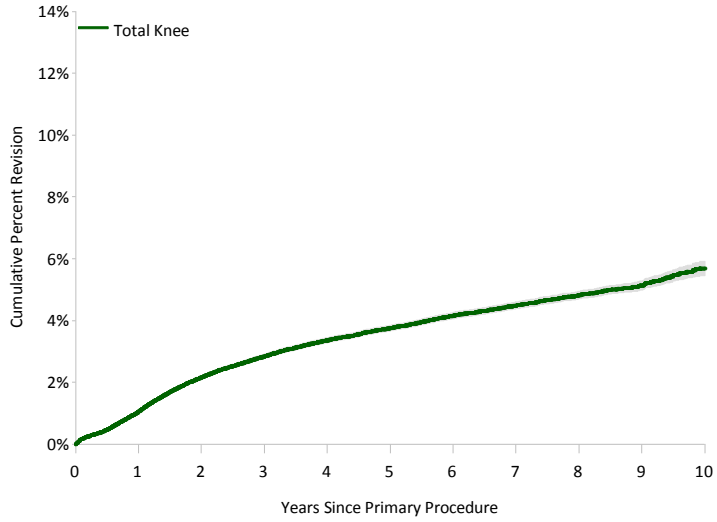
Males have a significantly higher rate of revision (Tables KT12 and KT13 and Figure KT9). Age related differences in outcome are evident for both males and females (Tables K14 and KT15 and Figures KT11 and KT12).

Loosening/lysis is the most common reason for revision in both males and females. Males have a higher incidence of revision for infection than females. At ten years the cumulative incidence of infection is 1.4% for males and 0.6% for females (Figure KT10)

**Table KT5: Yearly Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Total Knee | 1.1 (1.0, 1.1) | 2.8 (2.8, 2.9) | 3.7 (3.7, 3.8) | 4.5 (4.4, 4.6) | 5.7 (5.5, 5.9) |

**Figure KT5: Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Total Knee | 261717 | 220548 | 149040 | 91870 | 45544 | 2977 |

**Table KT6: Primary Total Knee Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Loosening/Lysis | 2502 | 30.7 |
| Infection | 1810 | 22.2 |
| Patellofemoral Pain | 1098 | 13.5 |
| Pain | 736 | 9.0 |
| Instability | 477 | 5.8 |
| Arthrofibrosis | 323 | 4.0 |
| Fracture | 193 | 2.4 |
| Malalignment | 173 | 2.1 |
| Patella Erosion | 136 | 1.7 |
| Wear Tibial | 83 | 1.0 |
| Other | 624 | 7.7 |
| **TOTAL** | **8155** | **100.0** |

**Table KT7: Primary Total Knee Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| TKR (Tibial/Femoral) | 2005 | 24.6 |
| Patella Only | 1770 | 21.7 |
| Insert Only | 1652 | 20.3 |
| Tibial Component | 927 | 11.4 |
| Insert/Patella | 649 | 8.0 |
| Femoral Component | 610 | 7.5 |
| Cement Spacer | 461 | 5.7 |
| Removal of Prostheses | 51 | 0.6 |
| Minor Components | 20 | 0.2 |
| Cement Only | 6 | 0.1 |
| Reinsertion of Components | 2 | 0.0 |
| Reoperation Fusion | 2 | 0.0 |
| **TOTAL** | **8155** | **100.0** |

**Figure KT6: Revision Diagnosis Cumulative Incidence of Primary Total Knee Replacement**

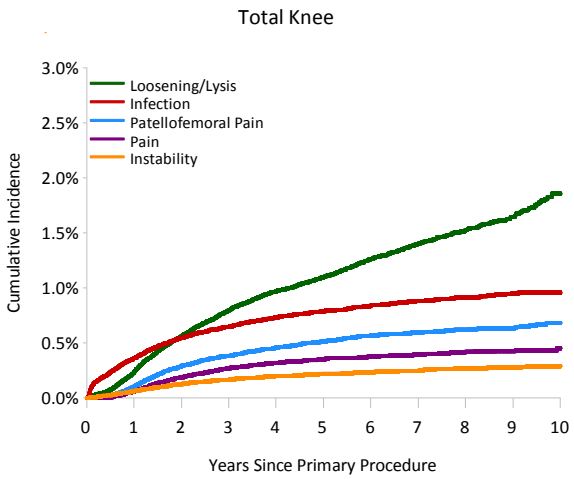


**Table KT8: Revision Rates of Primary Total Knee Replacement by Primary Diagnosis**

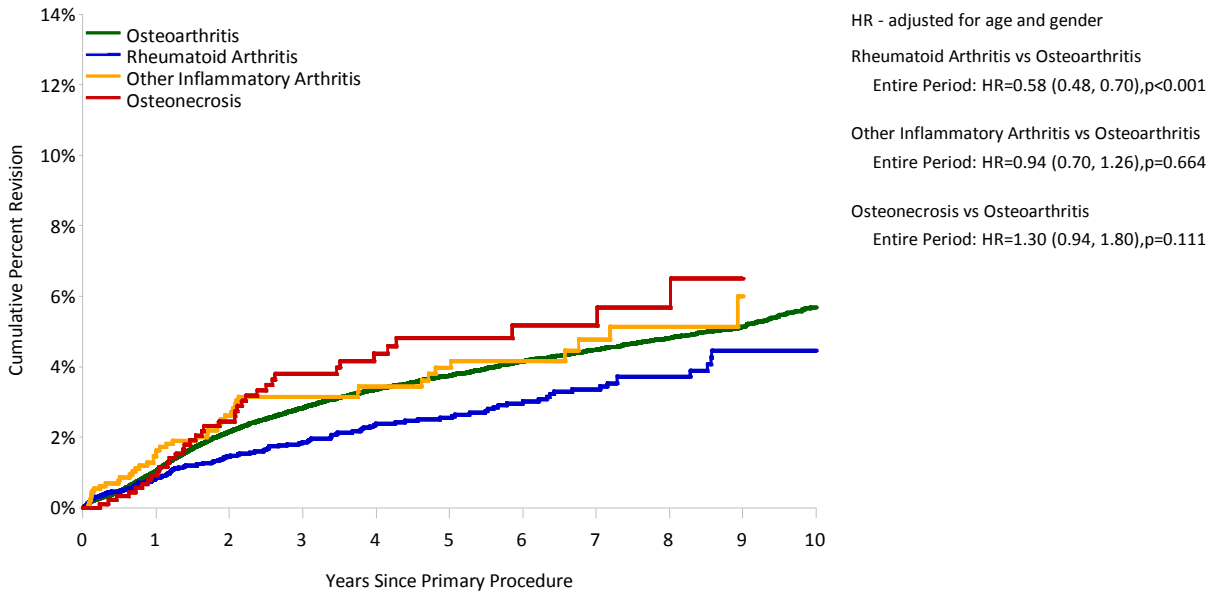
| Primary Diagnosis | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Osteoarthritis | 7919 | 261717 | 1046479 | 0.76 (0.74, 0.77) |
| Rheumatoid Arthritis | 117 | 4692 | 21829 | 0.54 (0.44, 0.64) |
| Other Inflammatory Arthritis | 45 | 1317 | 5592 | 0.80 (0.59, 1.08) |
| Osteonecrosis | 37 | 961 | 3963 | 0.93 (0.66, 1.29) |
| Other (5) | 37 | 579 | 1814 | 2.04 (1.44, 2.81) |
| **TOTAL** | **8155** | **269266** | **1079677** | **0.76 (0.74, 0.77)** |

Note: Only prostheses with over 400 procedures have been listed.

**Table KT9: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Osteoarthritis | 1.1 (1.0, 1.1) | 2.8 (2.8, 2.9) | 3.7 (3.7, 3.8) | 4.5 (4.4, 4.6) | 5.7 (5.5, 5.9) |
| Rheumatoid Arthritis | 0.8 (0.6, 1.2) | 1.9 (1.5, 2.3) | 2.5 (2.1, 3.1) | 3.4 (2.8, 4.1) | 4.5 (3.5, 5.6) |
| Other Inflammatory Arthritis | 1.6 (1.1, 2.5) | 3.1 (2.3, 4.4) | 4.0 (2.9, 5.5) | 4.8 (3.4, 6.6) | |
| Osteonecrosis | 0.9 (0.5, 1.8) | 3.8 (2.6, 5.4) | 4.8 (3.4, 6.7) | 5.2 (3.7, 7.3) | |
| Other (5) | 1.6 (0.8, 3.1) | 6.7 (4.6, 9.7) | 9.7 (6.8, 13.7) | 13.0 (8.8, 19.0) | |

**Figure KT7: Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Osteoarthritis | 261717 | 220548 | 149040 | 91870 | 45544 | 2977 |
| Rheumatoid Arthritis | 4692 | 4142 | 3115 | 2094 | 1144 | 96 |
| Other Inflammatory Arthritis | 1317 | 1110 | 789 | 504 | 287 | 28 |
| Osteonecrosis | 961 | 821 | 567 | 349 | 188 | 6 |

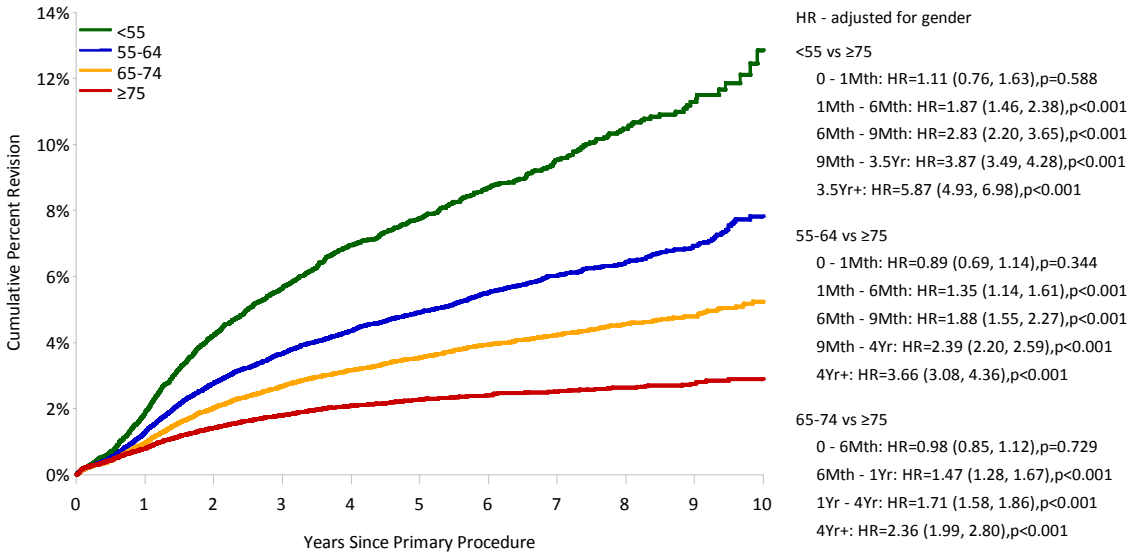
**Table KT10: Revision Rates of Primary Total Knee Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| <55 | 1070 | 16988 | 67201 | 1.59 (1.50, 1.69) |
| 55-64 | 2521 | 65058 | 250784 | 1.01 (0.97, 1.05) |
| 65-74 | 2850 | 98775 | 403819 | 0.71 (0.68, 0.73) |
| ≥75 | 1478 | 80896 | 324676 | 0.46 (0.43, 0.48) |
| **TOTAL** | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT11: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| <55 | 1.9 (1.7, 2.1) | 5.7 (5.3, 6.1) | 7.8 (7.3, 8.3) | 9.5 (8.9, 10.2) | 12.9 (11.4, 14.5) |
| 55-64 | 1.3 (1.2, 1.4) | 3.7 (3.5, 3.8) | 4.9 (4.7, 5.1) | 6.0 (5.8, 6.3) | 7.8 (7.3, 8.4) |
| 65-74 | 1.0 (0.9, 1.0) | 2.7 (2.6, 2.8) | 3.5 (3.4, 3.7) | 4.2 (4.1, 4.4) | 5.2 (4.9, 5.6) |
| ≥75 | 0.8 (0.7, 0.9) | 1.8 (1.7, 1.9) | 2.3 (2.2, 2.4) | 2.5 (2.4, 2.7) | 2.9 (2.7, 3.1) |

**Figure KT8: Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| <55 | 16988 | 14152 | 9433 | 5937 | 3086 | 200 |
| 55-64 | 65058 | 53941 | 35176 | 21519 | 10764 | 715 |
| 65-74 | 98775 | 83505 | 57099 | 36058 | 18491 | 1322 |
| ≥75 | 80896 | 68950 | 47332 | 28356 | 13203 | 740 |

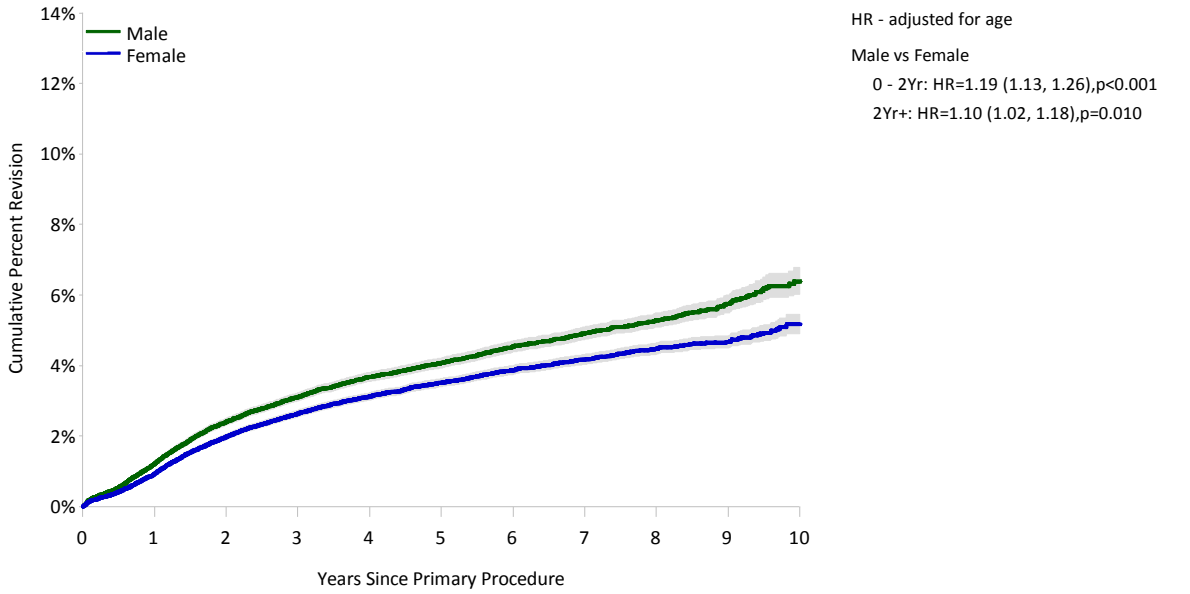
**Table KT12: Revision Rates of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Male | 3721 | 112732 | 444139 | 0.84 (0.81, 0.87) |
| Female | 4198 | 148985 | 602340 | 0.70 (0.68, 0.72) |
| **TOTAL** | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT13: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Male | 1.2 (1.2, 1.3) | 3.1 (3.0, 3.2) | 4.1 (3.9, 4.2) | 4.9 (4.7, 5.1) | 6.4 (6.0, 6.8) |
| Female | 0.9 (0.9, 1.0) | 2.6 (2.5, 2.7) | 3.5 (3.4, 3.6) | 4.2 (4.0, 4.3) | 5.2 (4.9, 5.5) |

**Figure KT9: Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | 112732 | 94463 | 63190 | 38544 | 19037 | 1274 |
| Female | 148985 | 126085 | 85850 | 53326 | 26507 | 1703 |

**Figure KT10: Revision Diagnosis Cumulative Incidence of Primary Total Knee Replacement by Gender**

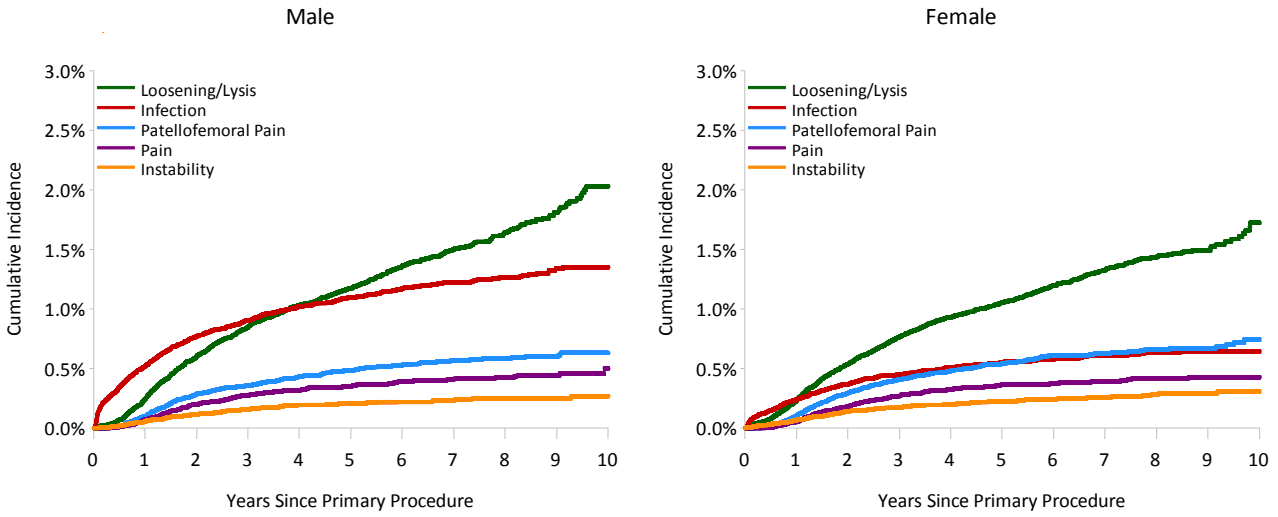


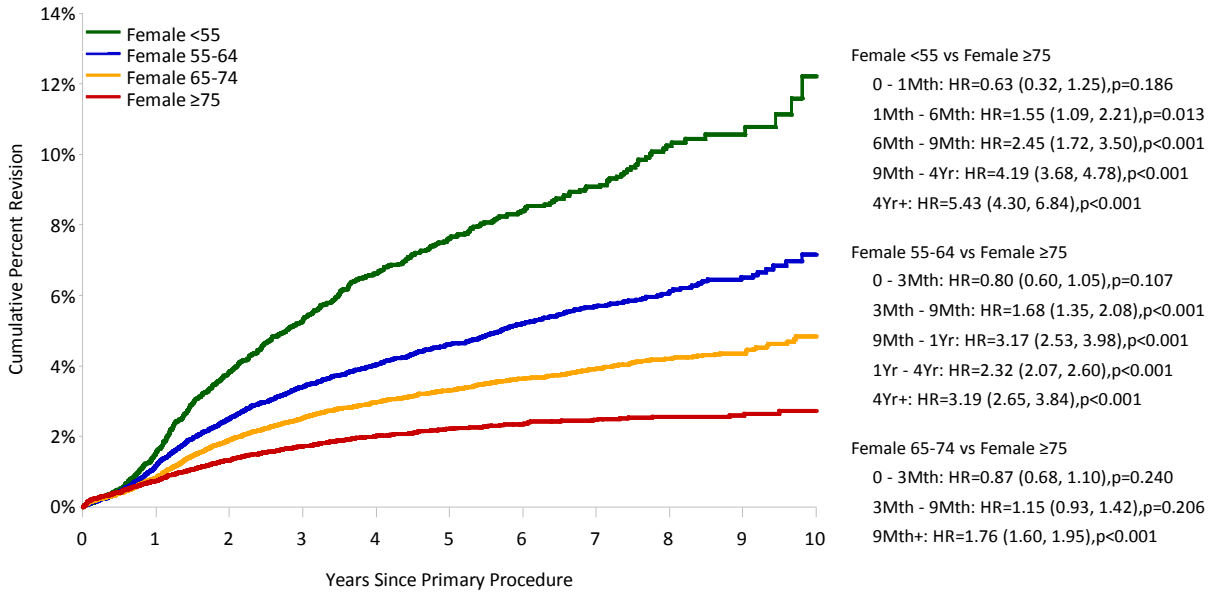

**Table KT14: Revision Rates of Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA)**

| Gender | Age | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Male | <55 | 502 | 7416 | 29681 | 1.69 (1.55, 1.85) |
| | 55-64 | 1245 | 29647 | 113875 | 1.09 (1.03, 1.16) |
| | 65-74 | 1362 | 43591 | 175346 | 0.78 (0.74, 0.82) |
| | ≥75 | 612 | 32078 | 125236 | 0.49 (0.45, 0.53) |
| Female | <55 | 568 | 9572 | 37520 | 1.51 (1.39, 1.64) |
| | 55-64 | 1276 | 35411 | 136909 | 0.93 (0.88, 0.98) |
| | 65-74 | 1488 | 55184 | 228472 | 0.65 (0.62, 0.69) |
| | ≥75 | 866 | 48818 | 199440 | 0.43 (0.41, 0.46) |
| **TOTAL** | | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT15: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA)**

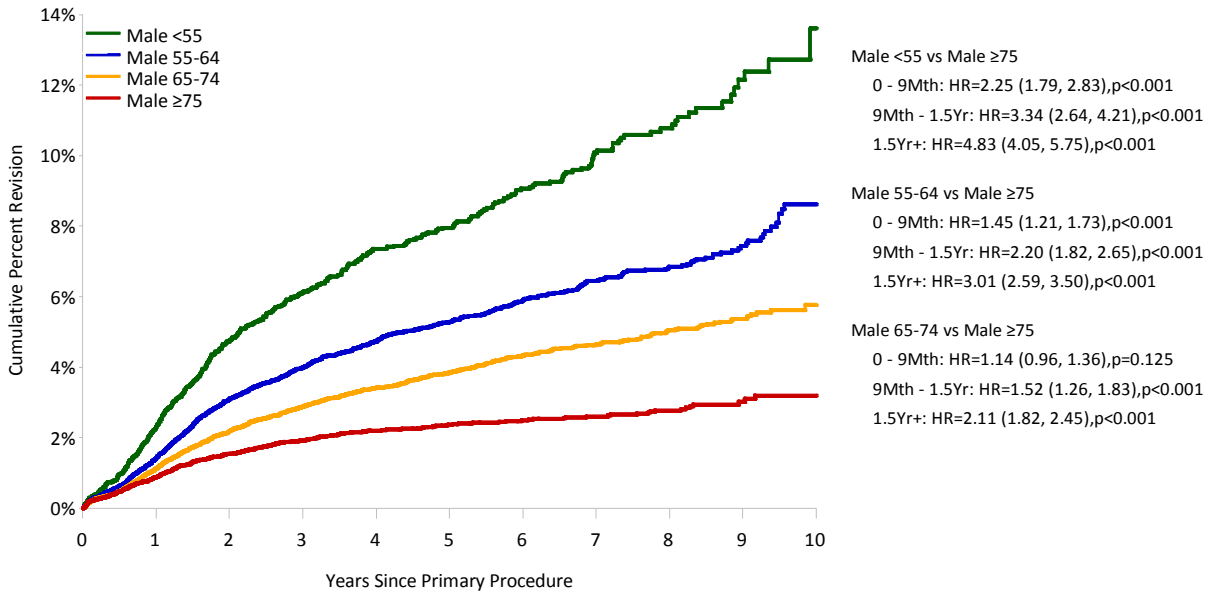
| Gender | Age | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Male | <55 | 2.3 (2.0, 2.7) | 6.1 (5.5, 6.8) | 8.0 (7.2, 8.7) | 10.1 (9.2, 11.1) | 13.6 (11.4, 16.1) |
| | 55-64 | 1.4 (1.3, 1.6) | 4.0 (3.7, 4.2) | 5.3 (5.0, 5.6) | 6.4 (6.1, 6.8) | 8.6 (7.8, 9.6) |
| | 65-74 | 1.1 (1.0, 1.2) | 2.9 (2.7, 3.1) | 3.8 (3.6, 4.1) | 4.6 (4.4, 4.9) | 5.8 (5.3, 6.3) |
| | ≥75 | 0.9 (0.8, 1.0) | 1.9 (1.8, 2.1) | 2.4 (2.2, 2.6) | 2.6 (2.4, 2.8) | 3.2 (2.8, 3.6) |
| Female | <55 | 1.6 (1.3, 1.9) | 5.3 (4.8, 5.8) | 7.6 (7.0, 8.3) | 9.1 (8.3, 9.9) | 12.2 (10.4, 14.4) |
| | 55-64 | 1.2 (1.1, 1.3) | 3.4 (3.2, 3.6) | 4.6 (4.3, 4.9) | 5.7 (5.4, 6.0) | 7.2 (6.5, 7.9) |
| | 65-74 | 0.8 (0.8, 0.9) | 2.5 (2.4, 2.7) | 3.3 (3.1, 3.5) | 3.9 (3.7, 4.1) | 4.8 (4.4, 5.3) |
| | ≥75 | 0.7 (0.7, 0.8) | 1.7 (1.6, 1.8) | 2.2 (2.1, 2.4) | 2.5 (2.3, 2.6) | 2.7 (2.5, 3.0) |

**Figure KT11: Cumulative Percent Revision of Primary Total Knee Replacement for Females by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Female | <55 | 9572 | 7979 | 5289 | 3263 | 1672 | 109 |
| | 55-64 | 35411 | 29411 | 19193 | 11805 | 5878 | 367 |
| | 65-74 | 55184 | 46855 | 32325 | 20627 | 10575 | 775 |
| | ≥75 | 48818 | 41840 | 29043 | 17631 | 8382 | 452 |

**Figure KT12: Cumulative Percent Revision of Primary Total Knee Replacement for Males by Age (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Male | <55 | 7416 | 6173 | 4144 | 2674 | 1414 | 91 |
| | 55-64 | 29647 | 24530 | 15983 | 9714 | 4886 | 348 |
| | 65-74 | 43591 | 36650 | 24774 | 15431 | 7916 | 547 |
| | ≥75 | 32078 | 27110 | 18289 | 10725 | 4821 | 288 |

## Outcome by Prosthesis Characteristics

### Fixed and Mobile Bearing

Tibial prostheses are either modular or non-modular. Modular prostheses have a metal baseplate and tibial insert. The insert may be fixed or mobile. Non-modular are either all-polyethylene or polyethylene moulded to a metal baseplate.

Mobile bearings include inserts that move in one of three ways; rotating, sliding or both rotating and sliding. Fixed bearings include non-modular tibial prostheses as well as fixed inserts that do not move relative to the baseplate.

Fixed bearings have a lower rate of revision compared to all mobile bearings. This difference is significant for rotating and rotating-sliding bearings (Tables KT16 and KT17 and Figure KT13).

There are also differences within the fixed bearing group. All-polyethylene tibial prostheses have a higher rate of revision compared to both moulded non-modular and fixed modular tibial prostheses (Tables KT18 and KT19 and Figure KT14).

### Stability

Stability refers to particular prosthetic features intended to substitute for the intrinsic stability of knee ligaments. The two categories most relevant to primary total knee replacement are minimally and posterior stabilised.

The Registry defines minimally stabilised prostheses as those that have a flat or dished tibial articulation regardless of congruency. Posterior stabilised is defined as a prosthesis with a peg and box design intended to provide additional posterior stability. Alternatively, the additional posterior stability can be provided by a cam and groove design. This design is used less frequently.

Fully stabilised (large peg and box design) and hinged are additional prostheses that provide collateral as well as posterior ligament stability. These prostheses are infrequently used in primary procedures (Table KT20) and if used it is usually in complex clinical situations. Therefore, these prostheses have not been included in any comparative outcome analysis for primary total knee replacement.

Posterior stabilised prostheses have a significantly higher rate of revision compared to minimally stabilised (Tables KT20 and KT21 and Figure KT15).

### Patellar Resurfacing

Resurfacing the patella is associated with a lower rate of revision (Tables KT22 and KT23 and Figure KT16).

The rate of revision when resurfacing the patella varies between minimally and posterior stabilised prostheses. Posterior stabilised without patellar resurfacing has the highest rate of revision (Tables KT24 and KT25 and Figure KT17).

### Fixation

The outcome varies depending on fixation. Hybrid fixation has the lowest rate of revision. There is no difference in revision rates between cemented and cementless fixation (Tables KT26 and KT27 and Figure KT18).

### Prostheses Types

There are 322 femoral and tibial prostheses combinations for primary total knee replacement recorded by the Registry, two more than 2009. The revision rates and yearly cumulative percent revision of the 76 combinations with more than 400 procedures are listed in Tables KT28 – KT33. Although the listed combinations are a small proportion of the possible combinations, they represent 95.0% of all primary total knee replacements.

The 'Other' group is the combined outcome of all prostheses combinations with less than 400 procedures. This group has 246 combinations, making up 5.0% of all primary total knee replacement.

There are 29 cemented total femoral and tibial prostheses combinations with more than 400 procedures. The rate of revision per 100 observed component years varies from 0.32 to 1.79. The Nexgen CR/Nexgen has the lowest cumulative percent revision at ten years of 2.7% (Tables KT28 and KT29).

There are 24 cementless total femoral and tibial prostheses combinations with more than 400 procedures. The rate of revision per 100 observed component years varies from 0.29 to 2.19 revisions. The Advantim/Advantim has the lowest cumulative percent revision at ten years of 1.8% (Tables KT30 and KT31).

There are 23 combinations of total knee replacement with hybrid fixation with more than 400 procedures. The rate of revision per 100 observed component years varies from 0.24 to 1.16. The AGC/AGC has the lowest cumulative percent revision at ten years of 2.7% (Tables KT32 and KT33).

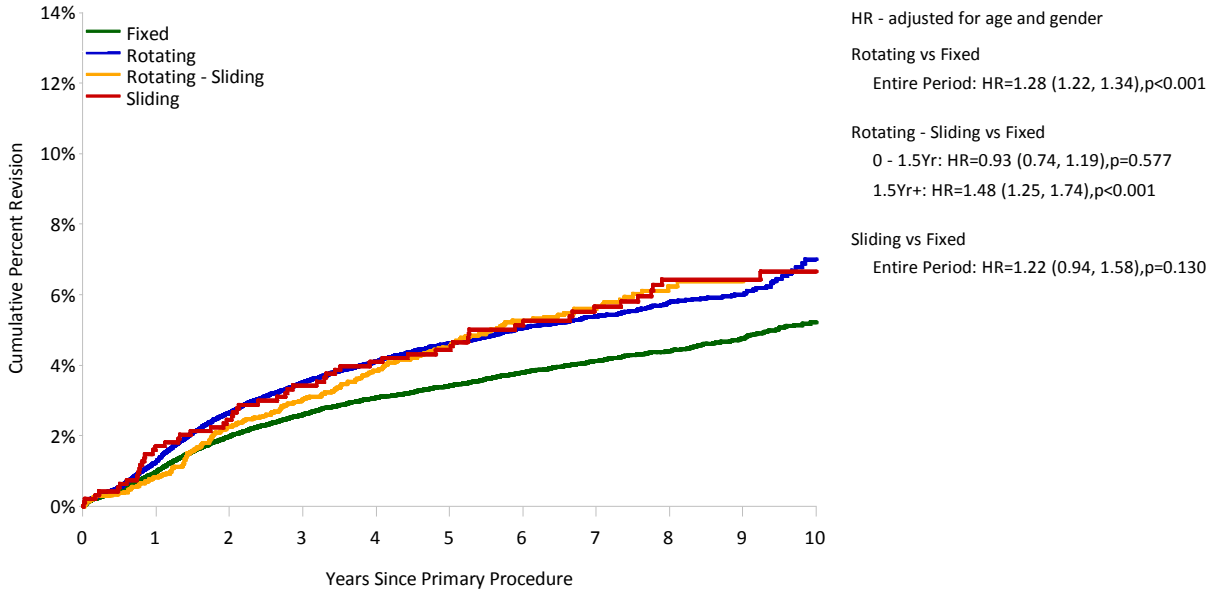
**Table KT16: Revision Rates of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)**

| Bearing Mobility | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Fixed | 5232 | 192254 | 752321 | 0.70 (0.68, 0.71) |
| Rotating | 2409 | 63903 | 261041 | 0.92 (0.89, 0.96) |
| Rotating - Sliding | 216 | 4505 | 24936 | 0.87 (0.75, 0.99) |
| Sliding | 58 | 948 | 7614 | 0.76 (0.58, 0.98) |
| Unknown | 4 | 107 | 567 | 0.71 (0.19, 1.81) |
| **TOTAL** | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT17: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Fixed | 1.0 (0.9, 1.0) | 2.6 (2.5, 2.7) | 3.4 (3.3, 3.5) | 4.1 (4.0, 4.2) | 5.2 (5.0, 5.5) |
| Rotating | 1.3 (1.2, 1.4) | 3.5 (3.3, 3.7) | 4.6 (4.4, 4.8) | 5.4 (5.2, 5.6) | 7.0 (6.4, 7.6) |
| Rotating - Sliding | 0.8 (0.6, 1.1) | 3.0 (2.6, 3.6) | 4.5 (3.9, 5.2) | 5.6 (4.9, 6.4) | |
| Sliding | 1.7 (1.0, 2.8) | 3.4 (2.4, 4.8) | 4.4 (3.3, 6.0) | 5.7 (4.3, 7.4) | 6.7 (5.1, 8.6) |

**Figure KT13: Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Fixed | 192254 | 160070 | 106526 | 65414 | 32281 | 2128 |
| Rotating | 63903 | 55111 | 37674 | 22968 | 11093 | 606 |
| Rotating - Sliding | 4505 | 4343 | 3873 | 2593 | 1462 | 17 |
| Sliding | 948 | 925 | 883 | 833 | 679 | 224 |

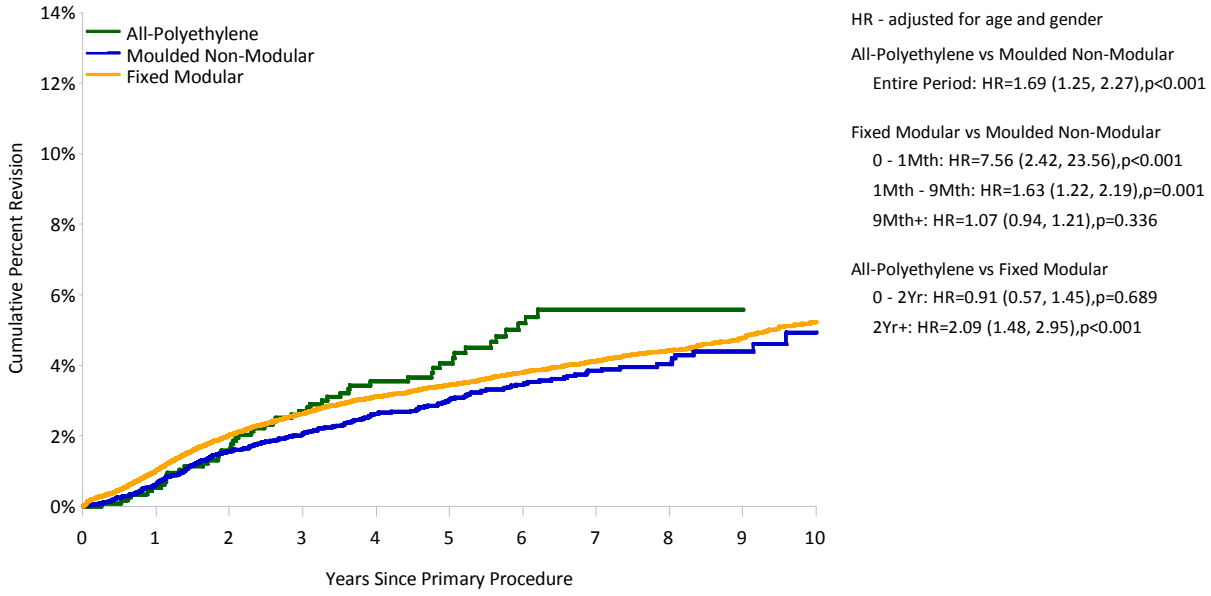
**Table KT18: Revision Rates of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)**

| Fixed Bearing Type | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| All-Polyethylene | 51 | 1190 | 6329 | 0.81 (0.60, 1.06) |
| Moulded Non-Modular | 284 | 12456 | 47116 | 0.60 (0.53, 0.68) |
| Fixed Modular | 4897 | 178608 | 698876 | 0.70 (0.68, 0.72) |
| **TOTAL** | **5232** | **192254** | **752321** | **0.70 (0.68, 0.71)** |

**Table KT19: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| All-Polyethylene | 0.5 (0.2, 1.1) | 2.7 (1.9, 3.8) | 4.1 (3.0, 5.5) | 5.6 (4.2, 7.4) | |
| Moulded Non-Modular | 0.6 (0.5, 0.8) | 2.1 (1.8, 2.4) | 3.0 (2.7, 3.4) | 3.8 (3.4, 4.4) | 4.9 (4.0, 6.0) |
| Fixed Modular | 1.0 (1.0, 1.1) | 2.6 (2.5, 2.7) | 3.4 (3.3, 3.5) | 4.1 (4.0, 4.2) | 5.2 (5.0, 5.5) |

**Figure KT14: Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| All-Polyethylene | 1190 | 1150 | 973 | 671 | 308 | 6 |
| Moulded Non-Modular | 12456 | 10465 | 6692 | 3785 | 1847 | 168 |
| Fixed Modular | 178608 | 148455 | 98861 | 60958 | 30126 | 1954 |

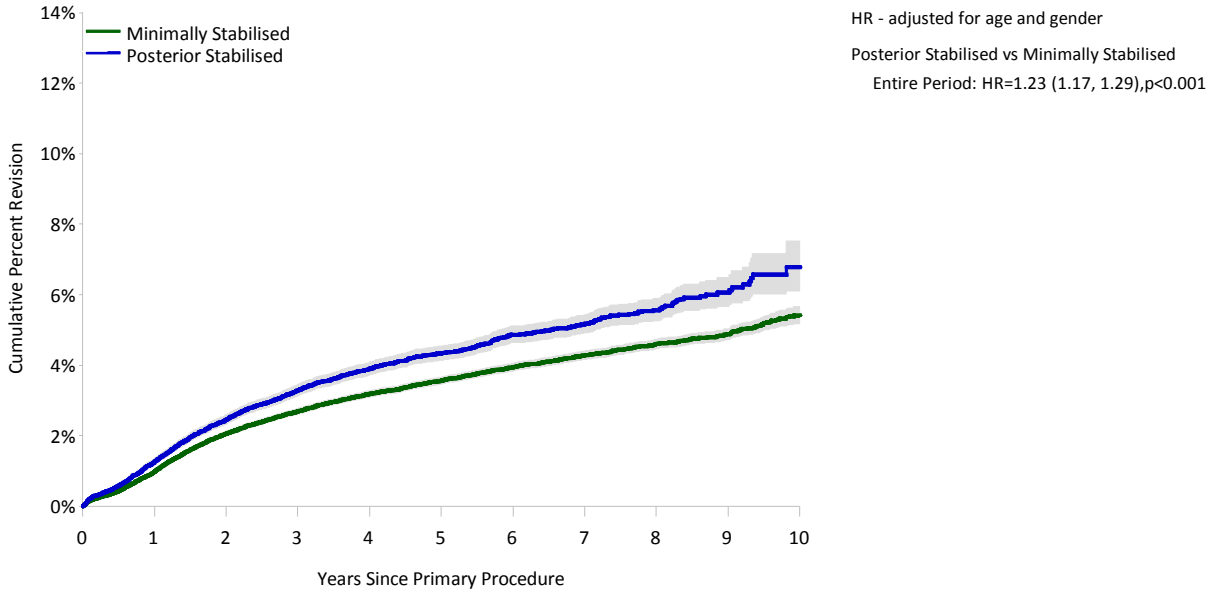
**Table KT20: Revision Rates of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)**

| Stability | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Minimally Stabilised | 5760 | 192828 | 817261 | 0.70 (0.69, 0.72) |
| Posterior Stabilised | 2112 | 67728 | 225026 | 0.94 (0.90, 0.98) |
| Fully Stabilised | 33 | 791 | 2863 | 1.15 (0.79, 1.62) |
| Hinged | 10 | 263 | 762 | 1.31 (0.63, 2.41) |
| Unknown | 4 | 107 | 567 | 0.71 (0.19, 1.81) |
| **TOTAL** | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT21: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Minimally Stabilised | 1.0 (0.9, 1.0) | 2.7 (2.6, 2.8) | 3.6 (3.5, 3.7) | 4.3 (4.2, 4.4) | 5.4 (5.2, 5.7) |
| Posterior Stabilised | 1.3 (1.2, 1.4) | 3.3 (3.1, 3.4) | 4.3 (4.1, 4.5) | 5.2 (4.9, 5.4) | 6.8 (6.1, 7.5) |

**Figure KT15: Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Minimally Stabilised | 192828 | 165029 | 116150 | 75225 | 38896 | 2649 |
| Posterior Stabilised | 67728 | 54593 | 32303 | 16287 | 6474 | 320 |

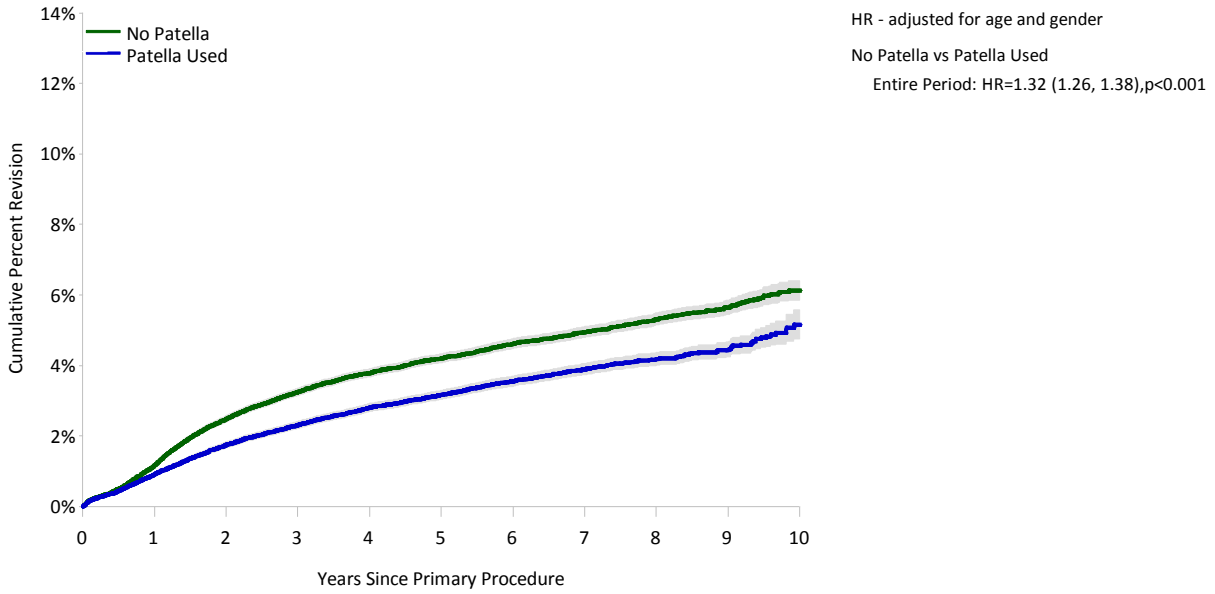
**Table KT22: Revision Rates of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)**

| Patella Usage | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| No Patella | 5013 | 145352 | 594109 | 0.84 (0.82, 0.87) |
| Patella Used | 2906 | 116365 | 452371 | 0.64 (0.62, 0.67) |
| **TOTAL** | **7919** | **261717** | **1046479** | **0.76 (0.74, 0.77)** |

**Table KT23: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| No Patella | 1.2 (1.1, 1.2) | 3.2 (3.1, 3.3) | 4.2 (4.1, 4.3) | 4.9 (4.8, 5.1) | 6.1 (5.8, 6.4) |
| Patella Used | 0.9 (0.9, 1.0) | 2.3 (2.2, 2.4) | 3.2 (3.0, 3.3) | 3.9 (3.7, 4.0) | 5.1 (4.7, 5.6) |

**Figure KT16: Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| No Patella | 145352 | 123998 | 84749 | 52676 | 26102 | 2033 |
| Patella Used | 116365 | 96550 | 64291 | 39194 | 19442 | 944 |

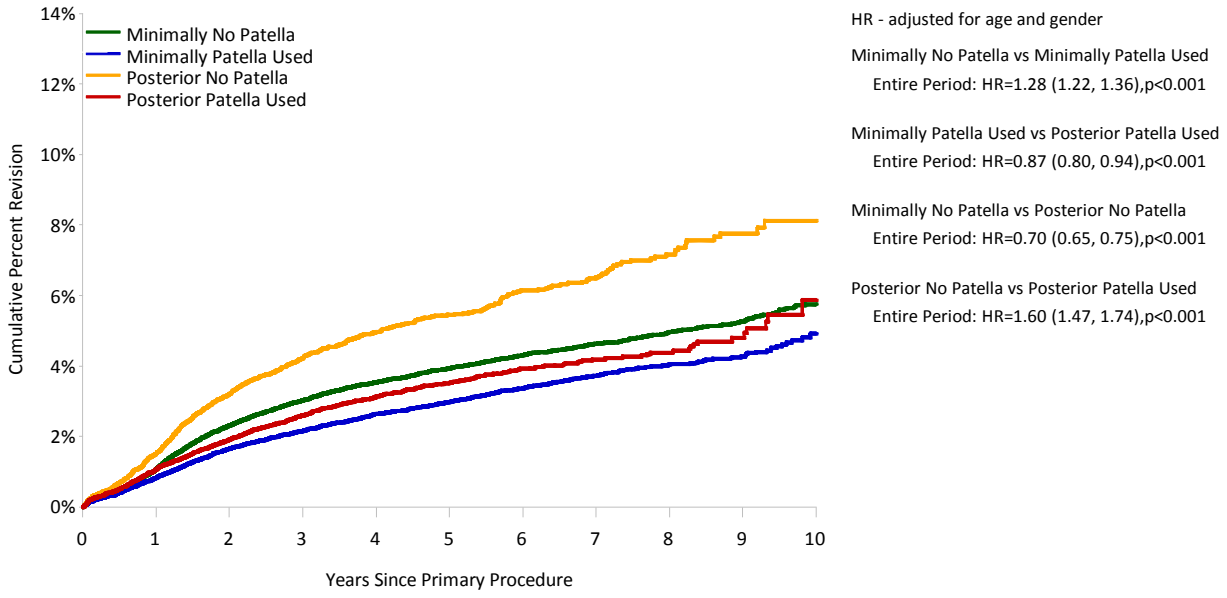
**Table KT24: Revision Rates of Primary Total Knee Replacement by Stability and Patella Usage (Primary Diagnosis OA)**

| Stability | Patella Usage | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Minimally | No Patella | 3854 | 117073 | 496907 | 0.78 (0.75, 0.80) |
| | Patella Used | 1906 | 75755 | 320354 | 0.59 (0.57, 0.62) |
| Posterior | No Patella | 1132 | 27629 | 94707 | 1.20 (1.13, 1.27) |
| | Patella Used | 980 | 40099 | 130320 | 0.75 (0.71, 0.80) |
| **TOTAL** | | **7872** | **260556** | **1042287** | **0.76 (0.74, 0.77)** |

**Table KT25: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Usage (Primary Diagnosis OA)**

| Stability | Patella Usage | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Minimally | No Patella | 1.1 (1.0, 1.1) | 3.0 (2.9, 3.1) | 3.9 (3.8, 4.1) | 4.6 (4.5, 4.8) | 5.8 (5.5, 6.1) |
| | Patella Used | 0.8 (0.8, 0.9) | 2.2 (2.0, 2.3) | 3.0 (2.8, 3.1) | 3.7 (3.5, 3.9) | 4.9 (4.5, 5.4) |
| Posterior | No Patella | 1.5 (1.4, 1.7) | 4.2 (4.0, 4.5) | 5.5 (5.1, 5.8) | 6.5 (6.1, 7.0) | 8.1 (7.3, 9.0) |
| | Patella Used | 1.1 (1.0, 1.2) | 2.6 (2.4, 2.8) | 3.5 (3.3, 3.8) | 4.2 (3.9, 4.5) | 5.9 (4.8, 7.1) |

**Figure KT17: Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Usage (Primary Diagnosis OA)**




| Number at Risk | | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|---|
| Minimally | No Patella | 117073 | 100658 | 70834 | 45500 | 23234 | 1867 |
| | Patella Used | 75755 | 64371 | 45316 | 29725 | 15662 | 782 |
| Posterior | No Patella | 27629 | 22808 | 13559 | 6959 | 2759 | 161 |
| | Patella Used | 40099 | 31785 | 18744 | 9328 | 3715 | 159 |

**Table KT26: Revision Rates of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)**

| Fixation | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Cemented | 3829 | 134832 | 521030 | 0.73 (0.71, 0.76) |
| Cementless | 2047 | 62844 | 250754 | 0.82 (0.78, 0.85) |
| Hybrid | 1856 | 63623 | 272709 | 0.68 (0.65, 0.71) |
| **TOTAL** | **7732** | **261299** | **1044493** | **0.74 (0.72, 0.76)** |

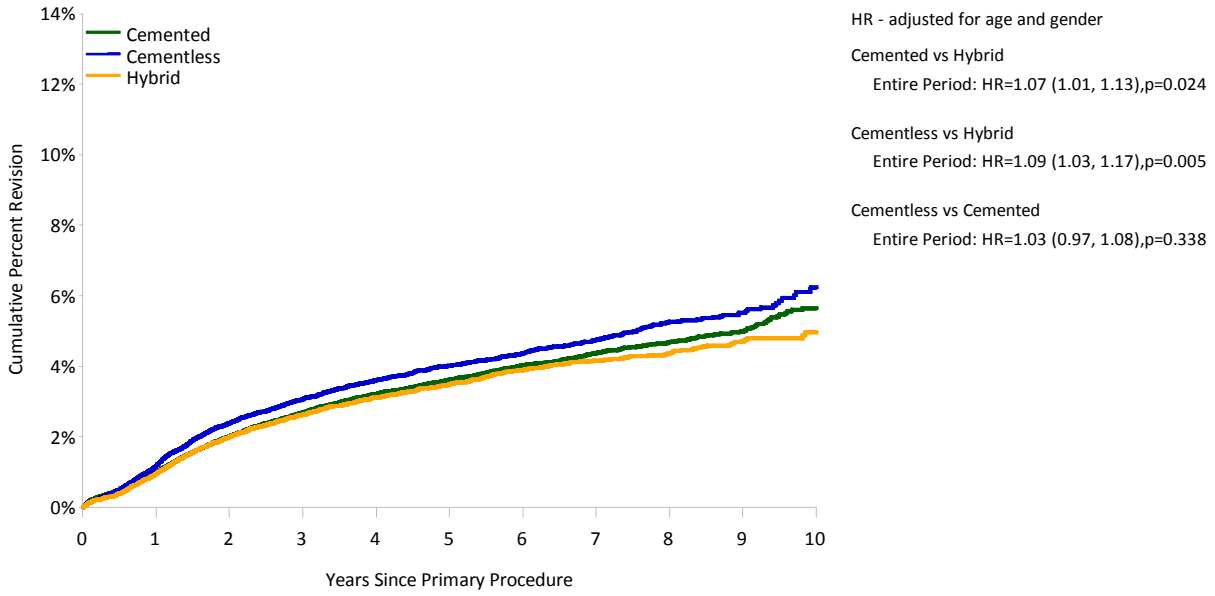
Note: Excluding cementless Genesis Oxinium and Profix Oxinium femoral prostheses

**Table KT27: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Cemented | 1.0 (0.9, 1.1) | 2.7 (2.6, 2.8) | 3.6 (3.5, 3.7) | 4.4 (4.2, 4.5) | 5.6 (5.3, 6.0) |
| Cementless | 1.2 (1.1, 1.3) | 3.1 (2.9, 3.2) | 4.0 (3.8, 4.2) | 4.7 (4.5, 5.0) | 6.2 (5.7, 6.8) |
| Hybrid | 1.0 (0.9, 1.0) | 2.6 (2.5, 2.8) | 3.5 (3.3, 3.7) | 4.2 (4.0, 4.4) | 5.0 (4.6, 5.3) |

Note: Excluding cementless Genesis Oxinium and Profix Oxinium femoral prostheses

**Figure KT18: Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Cemented | 134832 | 112585 | 74192 | 44109 | 21291 | 1455 |
| Cementless | 62844 | 52907 | 35540 | 22246 | 11105 | 667 |
| Hybrid | 63623 | 54700 | 39077 | 25295 | 12940 | 855 |

**Table KT28: Revision Rates of Primary Total Knee Replacement with Cement Fixation**

| Femoral Component | Tibial Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| AGC | AGC | 116 | 3240 | 17630 | 0.66 (0.54, 0.79) |
| Active Knee | Active Knee | 14 | 544 | 1492 | 0.94 (0.51, 1.57) |
| Advance | Advance | 42 | 656 | 3598 | 1.17 (0.84, 1.58) |
| BalanSys | BalanSys | 11 | 428 | 1570 | 0.70 (0.35, 1.25) |
| Duracon | Duracon | 309 | 9276 | 50545 | 0.61 (0.55, 0.68) |
| Genesis II | Genesis II | 477 | 17526 | 64364 | 0.74 (0.68, 0.81) |
| Genesis II Oxinium | Genesis II | 393 | 12539 | 40116 | 0.98 (0.89, 1.08) |
| Journey | Journey | 75 | 2122 | 4181 | 1.79 (1.41, 2.25) |
| Kinemax Plus | Kinemax Plus | 67 | 1827 | 11893 | 0.56 (0.44, 0.72) |
| LCS | LCS | 242 | 4105 | 29267 | 0.83 (0.73, 0.94) |
| LCS | MBT | 129 | 5660 | 19580 | 0.66 (0.55, 0.78) |
| Maxim | Maxim | 26 | 567 | 3445 | 0.75 (0.49, 1.11) |
| Natural Knee II | Natural Knee II | 37 | 1543 | 7576 | 0.49 (0.34, 0.67) |
| Nexgen CR | Nexgen | 73 | 3608 | 22978 | 0.32 (0.25, 0.40) |
| Nexgen CR Flex | Nexgen | 76 | 6020 | 16615 | 0.46 (0.36, 0.57) |
| Nexgen LPS | Nexgen | 144 | 4510 | 26233 | 0.55 (0.46, 0.65) |
| Nexgen LPS Flex | Nexgen | 362 | 14692 | 46962 | 0.77 (0.69, 0.85) |
| Optetrak-PS | Optetrak | 88 | 1555 | 5772 | 1.52 (1.22, 1.88) |
| Optetrak-PS | Optetrak RBK | 19 | 451 | 1081 | 1.76 (1.06, 2.74) |
| PFC Sigma | MBT | 104 | 4722 | 15503 | 0.67 (0.55, 0.81) |
| PFC Sigma | PFC Sigma | 241 | 11169 | 43489 | 0.55 (0.49, 0.63) |
| Profix | Profix | 159 | 4080 | 20965 | 0.76 (0.65, 0.89) |
| RBK | RBK | 35 | 1225 | 3912 | 0.89 (0.62, 1.24) |
| Scorpio | Scorpio | 41 | 816 | 4497 | 0.91 (0.65, 1.24) |
| Scorpio | Scorpio+ | 45 | 1208 | 5309 | 0.85 (0.62, 1.13) |
| Scorpio | Series 7000 | 148 | 4488 | 20586 | 0.72 (0.61, 0.84) |
| Scorpio NRG | Series 7000 | 19 | 2029 | 3374 | 0.56 (0.34, 0.88) |
| Triathlon | Triathlon | 134 | 9640 | 18609 | 0.72 (0.60, 0.85) |
| Vanguard | Maxim | 55 | 3176 | 5282 | 1.04 (0.78, 1.36) |
| Other (118) | | 299 | 6266 | 25092 | 1.19 (1.06, 1.33) |
| **TOTAL** | | **3980** | **139688** | **541512** | **0.73 (0.71, 0.76)** |

Note: Some Cementless components have been cemented.
Only prostheses with over 400 procedures have been listed.

**Table KT29: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Cement Fixation**

| Femoral Component | Tibial Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| AGC | AGC | 0.6 (0.4, 0.9) | 2.4 (1.9, 3.0) | 3.5 (2.8, 4.2) | 4.4 (3.6, 5.4) | 6.0 (4.6, 7.7) |
| Active Knee | Active Knee | 1.2 (0.5, 2.7) | 3.5 (2.0, 6.1) | 4.1 (2.4, 7.1) | | |
| Advance | Advance | 1.8 (1.0, 3.2) | 4.7 (3.3, 6.7) | 5.8 (4.1, 8.0) | 7.5 (5.5, 10.2) | |
| BalanSys | BalanSys | 0.6 (0.1, 2.3) | 3.1 (1.5, 6.1) | 4.3 (2.3, 7.9) | 5.1 (2.8, 9.2) | |
| Duracon | Duracon | 1.0 (0.8, 1.2) | 2.4 (2.1, 2.7) | 3.2 (2.8, 3.6) | 3.8 (3.4, 4.3) | 5.3 (4.4, 6.4) |
| Genesis II | Genesis II | 1.1 (0.9, 1.3) | 2.9 (2.6, 3.2) | 3.6 (3.3, 4.0) | 4.3 (3.9, 4.7) | 4.5 (4.1, 5.0) |
| Genesis II Oxinium | Genesis II | 1.3 (1.1, 1.5) | 3.3 (3.0, 3.7) | 4.5 (4.1, 5.1) | 5.5 (4.9, 6.2) | |
| Journey | Journey | 1.6 (1.1, 2.3) | 5.3 (4.1, 6.7) | | | |
| Kinemax Plus | Kinemax Plus | 0.9 (0.6, 1.5) | 2.4 (1.8, 3.3) | 3.0 (2.3, 4.0) | 3.9 (3.1, 5.0) | 4.7 (3.5, 6.3) |
| LCS | LCS | 1.0 (0.7, 1.4) | 3.7 (3.2, 4.4) | 5.0 (4.3, 5.7) | 5.9 (5.2, 6.7) | 7.4 (6.4, 8.7) |
| LCS | MBT | 0.8 (0.6, 1.1) | 2.3 (1.9, 2.8) | 3.2 (2.6, 3.8) | 4.3 (3.5, 5.3) | |
| Maxim | Maxim | 1.2 (0.6, 2.6) | 2.9 (1.8, 4.6) | 4.6 (3.2, 6.8) | 5.1 (3.4, 7.5) | |
| Natural Knee II | Natural Knee II | 0.5 (0.3, 1.1) | 1.6 (1.0, 2.4) | 2.1 (1.5, 3.1) | 3.4 (2.4, 4.9) | |
| Nexgen CR | Nexgen | 0.4 (0.3, 0.7) | 1.3 (1.0, 1.7) | 1.7 (1.3, 2.1) | 2.0 (1.5, 2.5) | 2.7 (2.1, 3.6) |
| Nexgen CR Flex | Nexgen | 0.6 (0.4, 0.9) | 1.4 (1.1, 1.8) | 2.1 (1.6, 2.7) | | |
| Nexgen LPS | Nexgen | 1.0 (0.7, 1.3) | 2.2 (1.8, 2.7) | 2.8 (2.3, 3.4) | 3.7 (3.1, 4.4) | 4.6 (3.8, 5.7) |
| Nexgen LPS Flex | Nexgen | 0.9 (0.8, 1.1) | 2.6 (2.3, 2.9) | 3.7 (3.3, 4.1) | 4.2 (3.7, 4.9) | |
| Optetrak-PS | Optetrak | 1.6 (1.1, 2.4) | 5.3 (4.2, 6.8) | 7.1 (5.7, 8.7) | 9.4 (7.3, 12.0) | |
| Optetrak-PS | Optetrak RBK | 2.1 (1.1, 4.0) | 5.9 (3.6, 9.5) | | | |
| PFC Sigma | MBT | 0.8 (0.5, 1.1) | 2.3 (1.8, 2.8) | 3.3 (2.6, 4.0) | 3.9 (3.0, 5.1) | |
| PFC Sigma | PFC Sigma | 0.9 (0.8, 1.1) | 2.0 (1.8, 2.3) | 2.7 (2.3, 3.0) | 3.1 (2.7, 3.6) | 4.9 (3.5, 6.9) |
| Profix | Profix | 1.3 (1.0, 1.7) | 3.1 (2.6, 3.7) | 4.0 (3.4, 4.7) | 4.6 (3.9, 5.5) | 5.8 (4.2, 7.9) |
| RBK | RBK | 1.1 (0.6, 1.9) | 3.0 (2.1, 4.4) | 4.4 (3.0, 6.4) | 4.9 (3.3, 7.2) | |
| Scorpio | Scorpio | 0.9 (0.4, 1.8) | 3.1 (2.1, 4.6) | 4.6 (3.3, 6.4) | 6.2 (4.5, 8.3) | |
| Scorpio | Scorpio+ | 1.0 (0.6, 1.8) | 3.2 (2.3, 4.5) | 4.1 (3.0, 5.5) | 4.6 (3.4, 6.2) | |
| Scorpio | Series 7000 | 1.0 (0.7, 1.3) | 2.7 (2.2, 3.3) | 3.6 (3.0, 4.2) | 4.3 (3.6, 5.1) | 6.3 (4.8, 8.3) |
| Scorpio NRG | Series 7000 | 0.4 (0.2, 0.8) | 1.4 (0.8, 2.4) | | | |
| Triathlon | Triathlon | 0.9 (0.7, 1.1) | 2.0 (1.6, 2.4) | 2.5 (1.9, 3.4) | | |
| Vanguard | Maxim | 1.1 (0.8, 1.6) | 3.0 (2.2, 4.1) | | | |
| Other (118) | | 1.3 (1.1, 1.7) | 4.2 (3.6, 4.8) | 6.2 (5.4, 7.0) | 7.5 (6.7, 8.5) | 9.8 (8.5, 11.2) |

Note: Some Cementless components have been cemented.
Only prostheses with over 400 procedures have been listed.

**Table KT30: Revision Rates of Primary Total Knee Replacement with Cementless Fixation**

| Femoral Component | Tibial Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| Active Knee | Active Knee | 145 | 3568 | 15532 | 0.93 (0.79, 1.10) |
| Advance | Advance | 23 | 455 | 1990 | 1.16 (0.73, 1.73) |
| Advantim | Advantim | 12 | 840 | 4112 | 0.29 (0.15, 0.51) |
| Duracon | Duracon | 119 | 3515 | 18979 | 0.63 (0.52, 0.75) |
| Gender Solutions | Natural Knee II | 4 | 478 | 660 | 0.61 (0.17, 1.55) |
| Genesis II | Genesis II | 23 | 451 | 1049 | 2.19 (1.39, 3.29) |
| Genesis II | Mobile Bearing Knee | 17 | 485 | 3506 | 0.48 (0.28, 0.78) |
| LCS | LCS | 126 | 2315 | 17572 | 0.72 (0.60, 0.85) |
| LCS | MBT | 577 | 15981 | 59925 | 0.96 (0.89, 1.04) |
| Maxim | Maxim | 22 | 603 | 4231 | 0.52 (0.33, 0.79) |
| Natural Knee II | Natural Knee II | 125 | 2576 | 14458 | 0.86 (0.72, 1.03) |
| Nexgen CR | Nexgen | 91 | 3673 | 22555 | 0.40 (0.32, 0.50) |
| Nexgen CR Flex | Nexgen | 88 | 6210 | 16959 | 0.52 (0.42, 0.64) |
| Nexgen LPS | Nexgen | 16 | 614 | 1408 | 1.14 (0.65, 1.85) |
| PFC Sigma | AMK | 27 | 1512 | 6373 | 0.42 (0.28, 0.62) |
| PFC Sigma | MBT | 93 | 2178 | 7287 | 1.28 (1.03, 1.56) |
| Profix | Profix | 51 | 1362 | 6075 | 0.84 (0.63, 1.10) |
| RBK | RBK | 113 | 3596 | 12875 | 0.88 (0.72, 1.06) |
| Score | Score | 12 | 543 | 753 | 1.59 (0.82, 2.78) |
| Scorpio | Scorpio+ | 39 | 687 | 3590 | 1.09 (0.77, 1.49) |
| Scorpio | Series 7000 | 133 | 3157 | 15676 | 0.85 (0.71, 1.01) |
| Scorpio NRG | Series 7000 | 24 | 1329 | 2260 | 1.06 (0.68, 1.58) |
| Triathlon | Triathlon | 60 | 4568 | 7574 | 0.79 (0.60, 1.02) |
| Vanguard | Maxim | 15 | 450 | 1208 | 1.24 (0.69, 2.05) |
| Other (48) | | 261 | 3216 | 10948 | 2.38 (2.10, 2.69) |
| **TOTAL** | | **2216** | **64362** | **257555** | **0.86 (0.82, 0.90)** |

Note: Only prostheses with over 400 procedures have been listed.

**Table KT31: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Cementless Fixation**

| Femoral Component | Tibial Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Active Knee | Active Knee | 1.1 (0.8, 1.5) | 3.1 (2.6, 3.8) | 4.3 (3.6, 5.1) | 5.9 (4.9, 7.0) | |
| Advance | Advance | 2.2 (1.1, 4.4) | 5.5 (3.5, 8.6) | 7.0 (4.6, 10.5) | 7.0 (4.6, 10.5) | |
| Advantim | Advantim | 0.4 (0.1, 1.2) | 1.4 (0.8, 2.7) | 1.8 (1.0, 3.2) | 1.8 (1.0, 3.2) | 1.8 (1.0, 3.2) |
| Duracon | Duracon | 1.1 (0.8, 1.5) | 2.7 (2.2, 3.3) | 3.4 (2.8, 4.1) | 3.9 (3.2, 4.7) | 4.2 (3.4, 5.0) |
| Gender Solutions | Natural Knee II | 0.8 (0.3, 2.5) | | | | |
| Genesis II | Genesis II | 1.6 (0.7, 3.5) | 8.0 (5.1, 12.5) | 9.5 (5.8, 15.4) | | |
| Genesis II | Mobile Bearing Knee | 1.5 (0.7, 3.1) | 1.9 (1.0, 3.6) | 2.8 (1.6, 4.7) | 3.3 (2.0, 5.4) | 5.0 (2.8, 9.0) |
| LCS | LCS | 1.5 (1.1, 2.1) | 3.4 (2.7, 4.2) | 4.3 (3.5, 5.2) | 4.9 (4.1, 5.9) | 6.3 (5.2, 7.5) |
| LCS | MBT | 1.2 (1.1, 1.4) | 3.5 (3.2, 3.8) | 4.6 (4.3, 5.1) | 5.4 (4.9, 5.9) | |
| Maxim | Maxim | 1.7 (0.9, 3.1) | 3.0 (1.9, 4.8) | 3.4 (2.2, 5.2) | 3.4 (2.2, 5.2) | |
| Natural Knee II | Natural Knee II | 1.0 (0.7, 1.5) | 2.5 (2.0, 3.2) | 3.8 (3.1, 4.7) | 5.5 (4.6, 6.7) | |
| Nexgen CR | Nexgen | 0.6 (0.4, 0.9) | 2.0 (1.5, 2.5) | 2.3 (1.9, 2.9) | 2.7 (2.2, 3.4) | 3.2 (2.5, 4.1) |
| Nexgen CR Flex | Nexgen | 0.7 (0.5, 0.9) | 1.6 (1.3, 2.0) | 2.3 (1.8, 2.9) | | |
| Nexgen LPS | Nexgen | 1.8 (1.0, 3.4) | 2.3 (1.3, 4.1) | 4.4 (2.4, 8.2) | | |
| PFC Sigma | AMK | 0.7 (0.4, 1.3) | 1.7 (1.1, 2.6) | 2.4 (1.6, 3.5) | 2.4 (1.6, 3.5) | |
| PFC Sigma | MBT | 2.2 (1.6, 2.9) | 4.8 (3.8, 5.9) | 5.5 (4.5, 6.8) | 6.3 (5.1, 7.9) | |
| Profix | Profix | 1.1 (0.7, 1.9) | 3.6 (2.6, 4.8) | 4.2 (3.2, 5.6) | 5.1 (3.8, 6.9) | |
| RBK | RBK | 1.3 (0.9, 1.7) | 3.1 (2.6, 3.9) | 4.2 (3.4, 5.1) | 5.0 (4.1, 6.1) | |
| Score | Score | 1.6 (0.7, 3.4) | | | | |
| Scorpio | Scorpio+ | 1.8 (1.0, 3.1) | 4.4 (3.1, 6.3) | 5.3 (3.8, 7.3) | 6.5 (4.7, 8.9) | |
| Scorpio | Series 7000 | 1.4 (1.0, 1.8) | 3.3 (2.7, 4.0) | 4.4 (3.7, 5.2) | 5.1 (4.3, 6.1) | |
| Scorpio NRG | Series 7000 | 1.2 (0.7, 2.0) | 2.9 (1.9, 4.5) | | | |
| Triathlon | Triathlon | 1.0 (0.8, 1.4) | 2.1 (1.6, 2.8) | | | |
| Vanguard | Maxim | 1.0 (0.4, 2.7) | 3.3 (1.8, 5.9) | | | |
| Other (48) | | 3.4 (2.8, 4.2) | 10.2 (9.0, 11.5) | 11.4 (10.1, 12.9) | 12.6 (11.1, 14.2) | |

Note: Only prostheses with over 400 procedures have been listed.

**Table KT32: Revision Rates of Primary Total Knee Replacement with Hybrid Fixation**

| Femoral Component | Tibial Component | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|---|
| AGC | AGC | 28 | 1308 | 7647 | 0.37 (0.24, 0.53) |
| Active Knee | Active Knee | 32 | 1088 | 4538 | 0.71 (0.48, 1.00) |
| Duracon | Duracon | 271 | 7630 | 45101 | 0.60 (0.53, 0.68) |
| Genesis II | Genesis II | 137 | 4512 | 19607 | 0.70 (0.59, 0.83) |
| LCS | LCS | 95 | 2173 | 15192 | 0.63 (0.51, 0.76) |
| LCS | MBT | 139 | 5204 | 17483 | 0.80 (0.67, 0.94) |
| Maxim | Maxim | 53 | 1347 | 7148 | 0.74 (0.56, 0.97) |
| Natural Knee II | Natural Knee II | 41 | 1594 | 8898 | 0.46 (0.33, 0.63) |
| Nexgen CR | Nexgen | 73 | 3220 | 19008 | 0.38 (0.30, 0.48) |
| Nexgen CR Flex | Nexgen | 64 | 5594 | 15505 | 0.41 (0.32, 0.53) |
| Nexgen LPS | Nexgen | 31 | 865 | 3741 | 0.83 (0.56, 1.18) |
| Nexgen LPS Flex | Nexgen | 10 | 593 | 1504 | 0.66 (0.32, 1.22) |
| PFC Sigma | MBT | 159 | 4055 | 14977 | 1.06 (0.90, 1.24) |
| PFC Sigma | PFC Sigma | 130 | 5934 | 23195 | 0.56 (0.47, 0.67) |
| Profix | Mobile Bearing Knee | 43 | 628 | 3712 | 1.16 (0.84, 1.56) |
| Profix | Profix | 33 | 781 | 4348 | 0.76 (0.52, 1.07) |
| RBK | RBK | 14 | 551 | 1820 | 0.77 (0.42, 1.29) |
| Scorpio | Scorpio+ | 97 | 2556 | 12602 | 0.77 (0.62, 0.94) |
| Scorpio | Series 7000 | 182 | 5285 | 26761 | 0.68 (0.58, 0.79) |
| Scorpio NRG | Series 7000 | 7 | 492 | 954 | 0.73 (0.29, 1.51) |
| Triathlon | Triathlon | 33 | 3320 | 5267 | 0.63 (0.43, 0.88) |
| Vanguard | Maxim | 34 | 1923 | 3356 | 1.01 (0.70, 1.42) |
| Vanguard | Vanguard | 2 | 648 | 847 | 0.24 (0.03, 0.85) |
| Other (80) | | 251 | 3915 | 17398 | 1.44 (1.27, 1.63) |
| **TOTAL** | | **1959** | **65216** | **280611** | **0.70 (0.67, 0.73)** |

Note: Only prostheses with over 400 procedures have been listed.

**Table KT33: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Hybrid Fixation**

| Femoral Component | Tibial Component | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| AGC | AGC | 0.7 (0.4, 1.3) | 1.6 (1.0, 2.4) | 2.1 (1.4, 3.1) | 2.7 (1.8, 3.9) | 2.7 (1.8, 3.9) |
| Active Knee | Active Knee | 0.8 (0.4, 1.5) | 2.6 (1.8, 3.9) | 3.3 (2.3, 4.8) | 4.3 (2.9, 6.4) | |
| Duracon | Duracon | 1.1 (0.9, 1.4) | 2.6 (2.2, 3.0) | 3.3 (2.9, 3.8) | 4.0 (3.5, 4.5) | 4.7 (4.0, 5.4) |
| Genesis II | Genesis II | 1.1 (0.8, 1.5) | 3.0 (2.5, 3.6) | 3.6 (3.0, 4.2) | 4.0 (3.4, 4.8) | 4.5 (3.6, 5.7) |
| LCS | LCS | 1.0 (0.6, 1.5) | 2.5 (1.9, 3.3) | 3.6 (2.8, 4.4) | 4.6 (3.8, 5.6) | 5.0 (4.1, 6.1) |
| LCS | MBT | 1.0 (0.7, 1.3) | 2.9 (2.4, 3.4) | 3.8 (3.2, 4.6) | 4.1 (3.4, 4.9) | |
| Maxim | Maxim | 0.7 (0.4, 1.4) | 2.5 (1.8, 3.5) | 3.8 (2.8, 5.0) | 4.8 (3.6, 6.4) | |
| Natural Knee II | Natural Knee II | 1.0 (0.6, 1.6) | 2.0 (1.4, 2.9) | 2.5 (1.8, 3.5) | 3.0 (2.1, 4.1) | |
| Nexgen CR | Nexgen | 0.4 (0.2, 0.7) | 1.6 (1.2, 2.2) | 2.3 (1.8, 2.9) | 2.5 (2.0, 3.2) | 3.0 (2.3, 3.9) |
| Nexgen CR Flex | Nexgen | 0.6 (0.4, 0.9) | 1.3 (1.0, 1.7) | 1.7 (1.3, 2.2) | | |
| Nexgen LPS | Nexgen | 0.5 (0.2, 1.3) | 2.7 (1.7, 4.2) | 4.8 (3.3, 6.9) | 5.5 (3.8, 8.0) | |
| Nexgen LPS Flex | Nexgen | 0.7 (0.3, 2.0) | 2.2 (1.2, 4.2) | | | |
| PFC Sigma | MBT | 1.5 (1.2, 2.0) | 3.8 (3.2, 4.5) | 5.1 (4.4, 6.1) | 5.8 (4.9, 6.9) | |
| PFC Sigma | PFC Sigma | 0.8 (0.6, 1.0) | 2.3 (1.9, 2.7) | 2.9 (2.4, 3.4) | 3.0 (2.5, 3.6) | 5.3 (3.5, 8.1) |
| Profix | Mobile Bearing Knee | 1.4 (0.8, 2.8) | 4.9 (3.4, 6.9) | 6.4 (4.7, 8.7) | 7.5 (5.6, 10.1) | |
| Profix | Profix | 1.3 (0.7, 2.4) | 3.3 (2.2, 4.8) | 4.2 (3.0, 6.0) | 4.9 (3.5, 6.9) | |
| RBK | RBK | 0.6 (0.2, 1.9) | 2.8 (1.5, 5.1) | 4.1 (2.4, 7.2) | 5.0 (2.8, 8.8) | |
| Scorpio | Scorpio+ | 1.0 (0.6, 1.4) | 2.7 (2.1, 3.4) | 3.8 (3.1, 4.7) | 5.1 (4.1, 6.3) | |
| Scorpio | Series 7000 | 0.8 (0.6, 1.1) | 2.6 (2.2, 3.1) | 3.6 (3.1, 4.2) | 4.4 (3.7, 5.1) | 5.4 (4.2, 7.0) |
| Scorpio NRG | Series 7000 | 0.7 (0.2, 2.2) | 1.9 (0.9, 3.9) | | | |
| Triathlon | Triathlon | 0.7 (0.4, 1.1) | 1.5 (1.1, 2.3) | | | |
| Vanguard | Maxim | 1.3 (0.9, 2.1) | 2.7 (1.9, 3.8) | | | |
| Vanguard | Vanguard | 0.2 (0.0, 1.1) | | | | |
| Other (80) | | 2.2 (1.7, 2.7) | 6.1 (5.3, 7.0) | 7.4 (6.5, 8.4) | 8.6 (7.6, 9.8) | 10.2 (8.9, 11.7) |

Note: Only prostheses with over 400 procedures have been listed.

# REVISION HIP AND KNEE REPLACEMENT

## Classes of Revision Procedures

The Registry defines revision of a joint replacement as any subsequent procedure that involves the insertion, removal and/or replacement of a prosthesis or implant.

Revisions are sub-categorised into three classes, major total, major partial and minor.

1. **Major total revision** is the insertion, removal and/or replacement of all major components.
2. **Major partial revision** is the insertion, removal and/or replacement of one major component.
3. **Minor revision** is the insertion removal and/or replacement of any other prostheses or implant including patellar prostheses in knee replacement.

Major components are prostheses that are fixed to bone. These are the femoral prosthesis and the acetabular shell or cup in hip replacement and the femoral and tibial prostheses in either partial or total knee replacement. Although a patellar prosthesis is fixed to bone it is not considered a major prosthesis.

Different types of major partial and minor revisions are identified based on the specific prostheses or implants used in the revision. These are listed in Tables R1 and R9.

If there is more than one revision then subsequent revisions are identified in sequential order i.e. 2$^{nd}$ 3$^{rd}$ 4$^{th}$ etc. The exception to this is a planned two-stage revision for infection, which is regarded as a single revision.

## Approach to Analysis

The purpose of this analysis is to provide information on the outcome of first revision procedures i.e. time from first to second revision (re-revision). To achieve this it is necessary to have a full chronological list of procedures including the primary procedure. This is important as the type of primary procedure as well as the timing and type of first revision are factors that potentially affect the outcome of that revision.

As the Registry has been collecting complete national data since 2003 the full history is not available for many of the revisions reported to the Registry. If the Registry does not have information on preceding procedures it is unable to establish if a reported revision is the first for that joint or a revision of a previous revision. It is also unable to determine the type of primary procedure that subsequently required revision.

To assist in analysis the Registry groups revision procedures into 'All Revisions' and 'Revisions of known Primary Procedures'.

The 'All Revisions' group includes all revision procedures reported to the Registry regardless of whether the Registry has a full chronological history including the primary procedure.

Analysis of this group provides information on the entire revision burden as well as demographic data, the reasons for revision and the types of revision undertaken.

The second group is a subset of the first and only includes the first revision of a Registry recorded primary procedure. This group is referred to as 'Revisions of known Primary Procedures'. The reason the Registry identifies this group is because this is the subset that can be used to determine the outcome of the first revision.

The number and proportion of revision procedures where the Registry has a record of the primary procedure continues to increase. The proportion of revisions being reported with a primary procedure recorded by the Registry will approach 100%.

There are important differences between the two groups.

The 'All Revisions' group covers the full spectrum of revisions including revisions on procedures undertaken prior to the implementation of the Registry i.e. early, mid and late revisions.

As the 'Revisions of known Primary Procedures' group are first revisions of primary procedures recorded by the Registry, they must have occurred a maximum of ten years or less after the primary. These are therefore largely early to mid term revisions.

First revisions for infection have been excluded from the analysis of the 'Revisions of known Primary Procedures' group. Determining the outcome of these revisions is more complex than revisions undertaken for other reasons. There are many additional factors to consider, e.g. antibiotic treatment, adequacy of debridement, infective organism(s) and revision strategy such as planned multi-staged procedures. The Registry does not have information on some of these factors and therefore meaningful interpretation of any analysis related to infection is difficult.

# Revision Hip

## Demographics of All Revision

This analysis is of all 35,380 hip revisions reported to the Registry with a procedure date up to and including 31 December 2010. This is an additional 4,045 procedures compared to the last report.

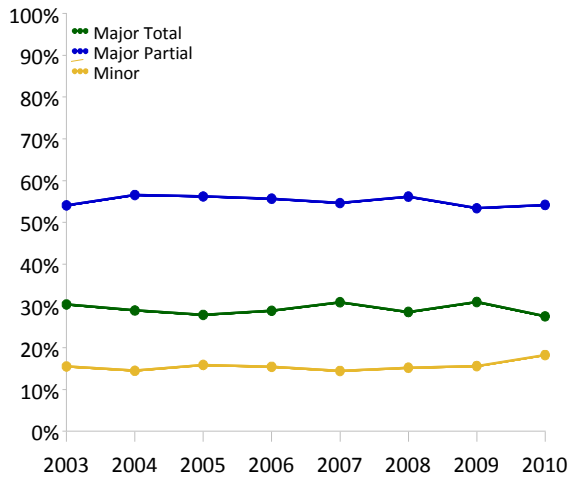
### Type of Revision

Most revisions recorded by the Registry are major revisions (84.7%). The most common types of revision are acetabular only (31.6%), THR (femoral/acetabular) (30.2%) and femoral only (17.9%) (Table R1).

Minor revisions account for 15.3% of all hip revisions. The most common is head and insert exchange. This type of revision accounts for 10.6% of all revisions (Table R1).

In 2010 there has been an increase in the proportion of revisions that are minor revisions (increased from 15.6% in 2009 to 18.3% in 2010). There has been a corresponding decrease in the proportion of major total revisions (decreased from 31.0% in 2009 to 27.5% in 2010) (Figure R1).

**Figure R1: Revision Hip Replacement by Class**



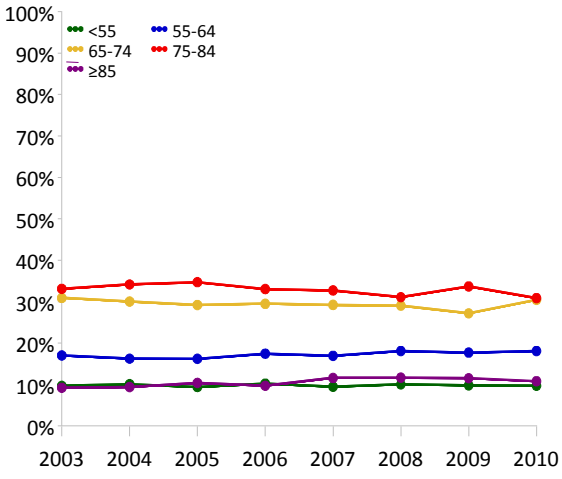

### Reason for Revision

The most common reasons for revision are loosening/lysis (54.1%), dislocation (14.5%), infection (12.2%) and fracture (9.1%) (Table R2).

### Age and Gender

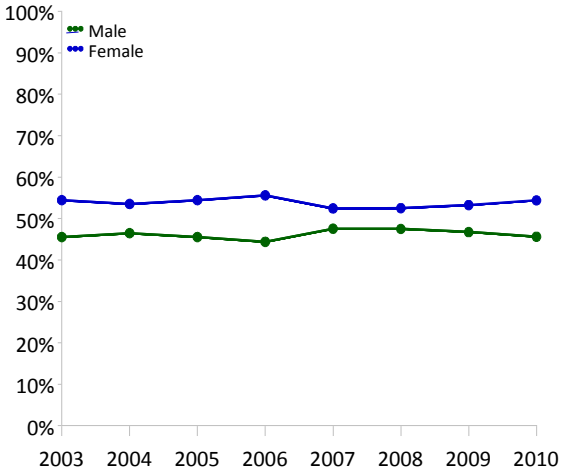
There has been little change in the age distribution of revision procedures since 2003 (Figure R2).

**Figure R2: Revision Hip Replacement by Age**




Revision hip replacement is more common in females. There has been little change in the proportion of females undergoing revisions (Figure R3).

**Figure R3: Revision Hip Replacement by Gender**




*Detailed information on the demographics of revision hip replacement is provided in the supplementary report 'Demographics of Hip Arthroplasty' which is available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

## Demographics of Revisions of Known Primary

This year the Registry is analysing 8,589 first revision procedures where the primary procedure has been recorded by the Registry. This is an additional 1,567 procedures compared to the last report.

### Type of Revision

There are differences in the types of revision between the 'Revisions of known Primary Procedures' group and the 'All Revisions' group.

The 'Revisions of known Primary Procedures' group has a smaller proportion of major revisions (78.6%) compared to the 'All Revisions' group (84.7%). There are also less acetabular only and THR (acetabular/femoral) revisions but more femoral only revisions (Table R1).

There is a higher proportion of minor revisions in the 'Revisions of known Primary Procedures' group (21.4% compared to 15.3%) (Table R1).

### Reason for Revision

There are also differences in the reason for revision. Loosening/lysis is still the most common reason but the proportion is less in the 'Revisions of known Primary Procedures' group (31.3% compared to 54.1%). Other diagnoses such as dislocation, infection, fracture and pain are more common in the 'Revisions of known Primary Procedures' group (Table R2).

**Table R1: Revision Hip Replacement by Type of Revision**

| Type of Revision | Revision of Known Primary | | All Revisions | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| **Major Revision** | | | | |
| Acetabular Component | 1999 | 23.3 | 11196 | 31.6 |
| THR (Femoral/Acetabular) | 1766 | 20.6 | 10675 | 30.2 |
| Femoral Component | 2351 | 27.4 | 6340 | 17.9 |
| Cement Spacer | 387 | 4.5 | 1083 | 3.1 |
| Removal of Prostheses | 92 | 1.1 | 320 | 0.9 |
| Bipolar Head and Femoral | 145 | 1.7 | 316 | 0.9 |
| Reinsertion of Components | 12 | 0.1 | 27 | 0.1 |
| Saddle | 2 | 0.0 | 4 | 0.0 |
| Thrust Plate | 1 | 0.0 | 2 | 0.0 |
| **N Major** | **6755** | **78.6** | **29963** | **84.7** |
| **Minor Revision** | | | | |
| Head/Insert | 1095 | 12.7 | 3757 | 10.6 |
| Head Only | 401 | 4.7 | 722 | 2.0 |
| Insert Only | 83 | 1.0 | 370 | 1.0 |
| Minor Components | 133 | 1.5 | 361 | 1.0 |
| Head/Neck | 43 | 0.5 | 74 | 0.2 |
| Bipolar Only | 35 | 0.4 | 66 | 0.2 |
| Head/Neck/Insert | 39 | 0.5 | 56 | 0.2 |
| Neck Only | 3 | 0.0 | 7 | 0.0 |
| Cement Only | 1 | 0.0 | 2 | 0.0 |
| Incomplete | 1 | 0.0 | 1 | 0.0 |
| Neck/Insert | | | 1 | 0.0 |
| **N Minor** | **1834** | **21.4** | **5417** | **15.3** |
| **TOTAL** | **8589** | **100.0** | **35380** | **100.0** |

**Table R2: Revision Hip Replacement by Reason for Revision**

| Reason for Revision | Revision of Known Primary | | All Revisions | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Loosening/Lysis | 2687 | 31.3 | 19150 | 54.1 |
| Prosthesis Dislocation | 1883 | 21.9 | 5124 | 14.5 |
| Infection | 1340 | 15.6 | 4333 | 12.2 |
| Fracture | 1435 | 16.7 | 3235 | 9.1 |
| Pain | 317 | 3.7 | 628 | 1.8 |
| Wear Hip Insert | 25 | 0.3 | 400 | 1.1 |
| Wear Acetabulum | 7 | 0.1 | 384 | 1.1 |
| Implant Breakage Acetabular | 61 | 0.7 | 382 | 1.1 |
| Implant Breakage Stem | 63 | 0.7 | 320 | 0.9 |
| Metal Sensitivity | 186 | 2.2 | 247 | 0.7 |
| Other | 585 | 6.8 | 1177 | 3.3 |
| **TOTAL** | **8589** | **100.0** | **35380** | **100.0** |

## Outcome of First Revision of Primary Total Conventional Hip Replacement

This analysis examines the rate of subsequent revision following the first revision of a known primary total conventional hip replacement.

There are 4,418 procedures available for analysis. These are obtained by including first revisions of primary total conventional hips undertaken for osteoarthritis and excluding all first revisions with a diagnosis of infection.

Minor revisions have an increased rate of re-revision compared to major partial and major total revisions. There is no difference in the rate of re-revision comparing major partial and major total revisions (Tables R3 and R4 and Figure R4).

The outcomes for the five most common types of first revision procedures are detailed in Tables R5 and R6 are Figure R5.

**Table R3: Re-revision Rates of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

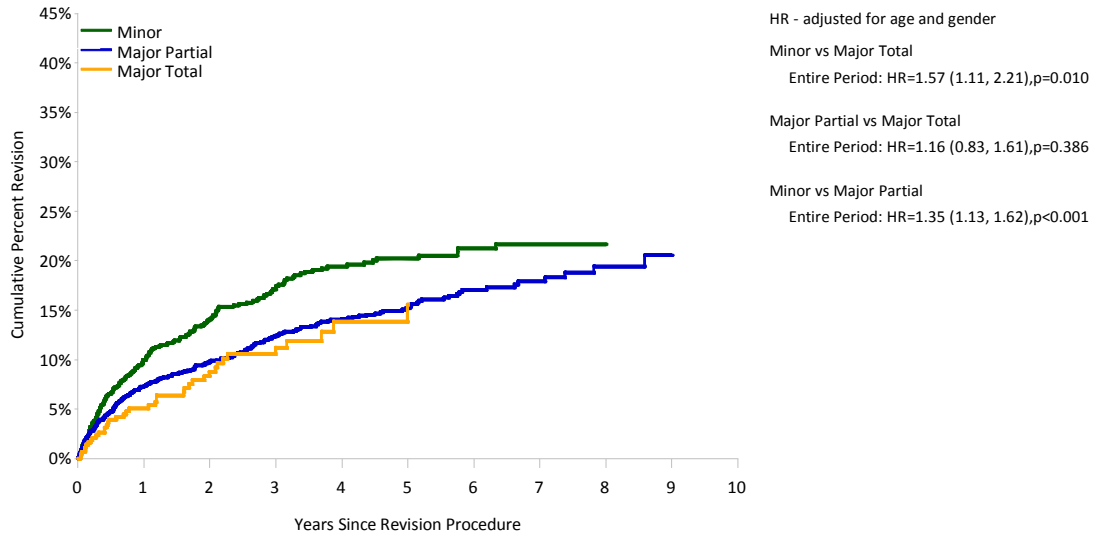
| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Minor | 188 | 1167 | 3768 | 4.99 (4.30, 5.76) |
| Major Partial | 323 | 2806 | 8292 | 3.90 (3.48, 4.34) |
| Major Total | 40 | 445 | 1052 | 3.80 (2.72, 5.18) |
| **All Revision** | **551** | **4418** | **13112** | **4.20 (3.86, 4.57)** |

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

**Table R4: Yearly Cumulative Percent Re-revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Minor | 10.0 (8.3, 11.9) | 17.4 (15.1, 20.0) | 20.3 (17.7, 23.2) | 21.7 (18.8, 24.9) | |
| Major Partial | 7.3 (6.4, 8.4) | 12.4 (11.1, 13.9) | 15.2 (13.6, 17.0) | 17.9 (15.8, 20.2) | |
| Major Total | 5.1 (3.3, 7.8) | 11.2 (8.0, 15.5) | 15.5 (10.8, 22.2) | | |
| **All Revision** | **7.8 (7.0, 8.7)** | **13.7 (12.5, 14.9)** | **16.6 (15.2, 18.0)** | **18.9 (17.2, 20.7)** | |

**Figure R4: Cumulative Percent Re-revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Minor | 1167 | 854 | 534 | 313 | 122 | 7 |
| Major Partial | 2806 | 2057 | 1171 | 589 | 213 | 9 |
| Major Total | 445 | 304 | 141 | 49 | 17 | 2 |

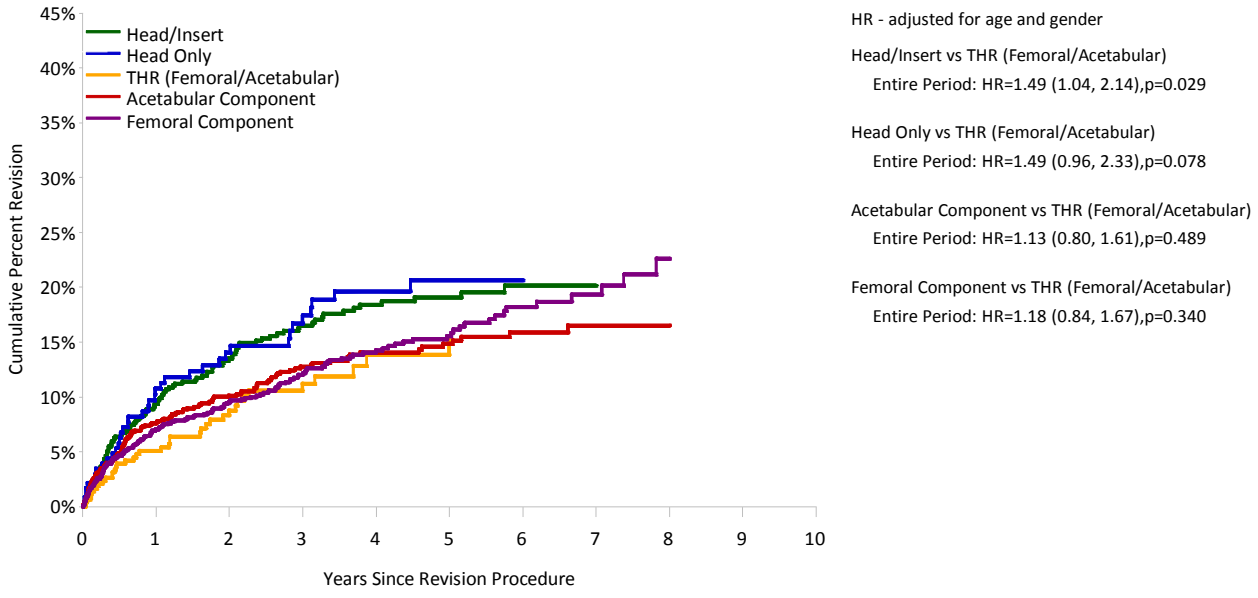
**Table R5: Re-revision Rates of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Head/Insert | 113 | 737 | 2362 | 4.78 (3.94, 5.75) |
| Head Only | 38 | 237 | 815 | 4.66 (3.30, 6.40) |
| THR (Femoral/Acetabular) | 40 | 445 | 1052 | 3.80 (2.72, 5.18) |
| Acetabular Component | 146 | 1312 | 3867 | 3.78 (3.19, 4.44) |
| Femoral Component | 177 | 1489 | 4396 | 4.03 (3.45, 4.66) |
| **TOTAL** | **514** | **4220** | **12492** | **4.11 (3.77, 4.49)** |

**Table R6: Yearly Cumulative Percent Re-revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Head/Insert | 9.4 (7.4, 11.8) | 16.5 (13.7, 19.8) | 19.1 (16.0, 22.7) | 20.1 (16.8, 24.0) | |
| Head Only | 10.8 (7.3, 15.8) | 17.4 (12.7, 23.7) | 20.6 (15.3, 27.5) | | |
| THR (Femoral/Acetabular) | 5.1 (3.3, 7.8) | 11.2 (8.0, 15.5) | 15.5 (10.8, 22.2) | | |
| Acetabular Component | 7.7 (6.3, 9.4) | 12.8 (10.8, 15.0) | 14.9 (12.6, 17.5) | 16.5 (13.8, 19.7) | |
| Femoral Component | 7.0 (5.8, 8.5) | 12.2 (10.4, 14.3) | 15.6 (13.3, 18.1) | 19.3 (16.3, 22.9) | |

**Figure R5: Cumulative Percent Re-revision of Known Primary Total Conventional Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Head/Insert | 737 | 550 | 338 | 192 | 73 | 2 |
| Head Only | 237 | 172 | 115 | 72 | 27 | 2 |
| THR (Femoral/Acetabular) | 445 | 304 | 141 | 49 | 17 | 2 |
| Acetabular Component | 1312 | 935 | 532 | 287 | 107 | 7 |
| Femoral Component | 1489 | 1117 | 635 | 299 | 103 | 2 |

## Outcome of First Revision of Primary Total Resurfacing Hip Replacement

There are 546 procedures available for analysis. These are obtained by only including first revisions of primary total resurfacing hip replacement undertaken for osteoarthritis and excluding all first revisions with a diagnosis of infection.

As most resurfacing prostheses are a combination of a solid metal acetabular component and a one-piece femoral component, the only possible revision is a major revision.

The most common type of major revision is a femoral only (52.6%) followed by femoral/acetabular (40.7%) and acetabular only revisions (6.8%).

There is no difference in the rate of re-revision when these three types of revision are compared (Tables R7 and R8 and Figure R6).

**Table R7: Re-revision Rates of Known Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

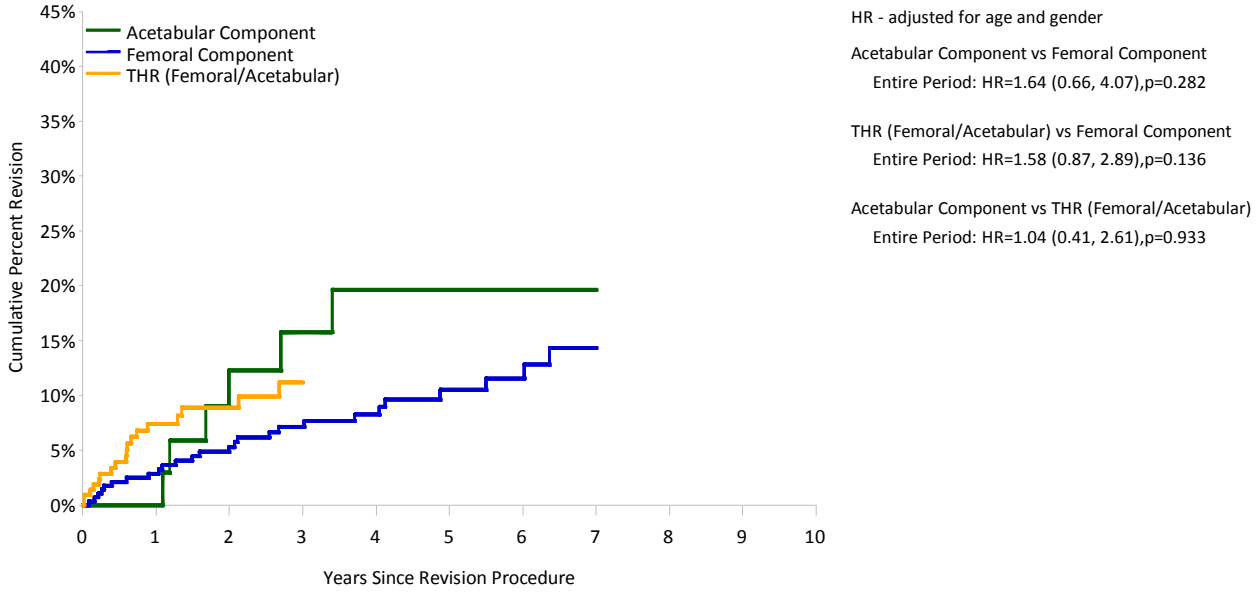
| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Acetabular Component | 6 | 37 | 160 | 3.75 (1.38, 8.16) |
| Femoral Component | 27 | 287 | 1150 | 2.35 (1.55, 3.42) |
| THR (Femoral/Acetabular) | 21 | 222 | 472 | 4.45 (2.76, 6.80) |
| **All Revision** | **54** | **546** | **1782** | **3.03 (2.28, 3.95)** |

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

**Table R8: Yearly Cumulative Percent Re-revision of Known Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Acetabular Component | 0.0 (0.0, 0.0) | 15.8 (6.9, 34.0) | 19.6 (9.2, 38.8) | 19.6 (9.2, 38.8) | |
| Femoral Component | 2.9 (1.4, 5.6) | 7.1 (4.5, 11.1) | 10.5 (7.0, 15.7) | 14.3 (9.4, 21.5) | |
| THR (Femoral/Acetabular) | 7.4 (4.4, 12.2) | 11.2 (7.0, 17.6) | | | |
| **All Revision** | **4.3 (2.9, 6.5)** | **9.4 (6.9, 12.6)** | **13.5 (10.2, 17.8)** | **16.3 (12.1, 21.9)** | |

**Figure R6: Cumulative Percent Re-revision of Known Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Acetabular Component | 37 | 35 | 23 | 16 | 8 | 0 |
| Femoral Component | 287 | 255 | 181 | 100 | 42 | 0 |
| THR (Femoral/Acetabular) | 222 | 147 | 64 | 21 | 3 | 0 |

# Revision Knee

## Demographics of All Revision

This analysis is of 27,823 knee revisions reported to the Registry with a procedure date up to and including 31 December 2010. This is an additional 3,661 procedures compared to the last report.

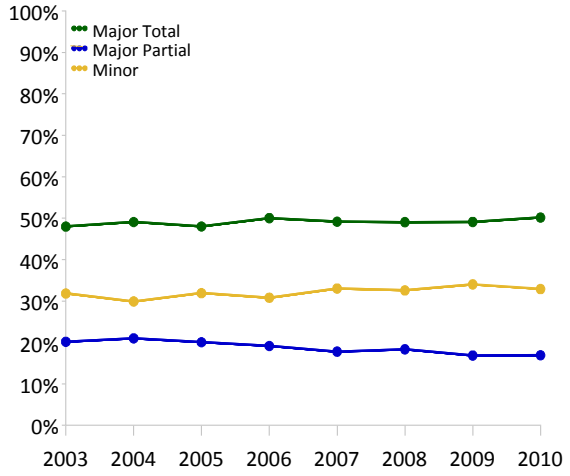
### Type of Revision

Most revisions recorded by the Registry are major revisions (67.4%). The most common major revisions are tibial/femoral (48.9%) and tibial only (8.0%) (Table R9).

Minor revisions account for 32.6% of all knee revisions. The most common are insert only (13.5%), patellar only (10.3%) and insert/patella (7.3%) (Table R9).

There has been little change in the proportion of major total, major partial and minor revisions since 2003 (Figure R7).

**Figure R7: Revision Knee Replacement by Class**



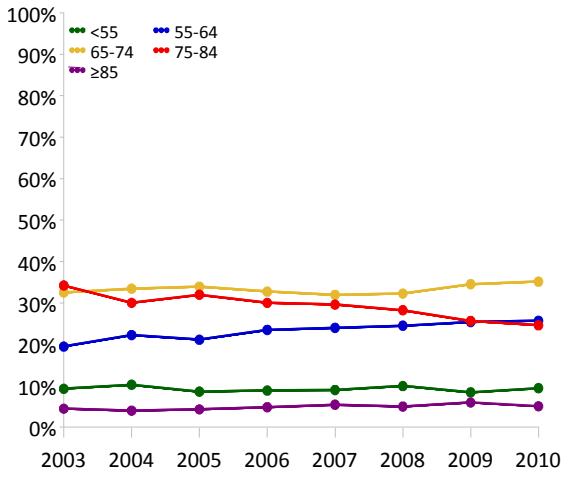

### Reason for Revision

The most common reasons for revision are loosening/lysis (41.5%), infection (18.6%) and pain (12.8%) (Table R10).

### Age and Gender

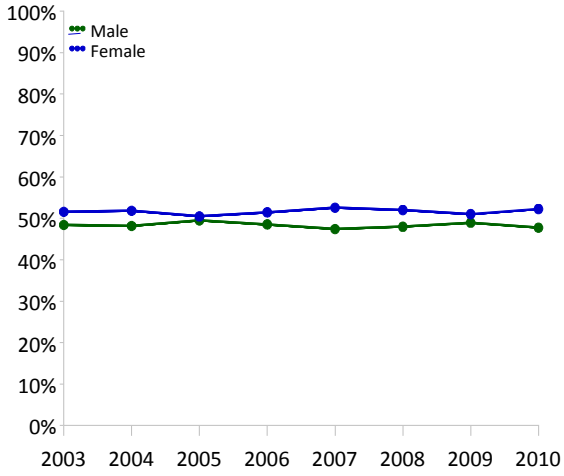
Most revisions occur in the 65-74 year age group. The proportion of revisions that are in the 75-84 year age group has been declining (Figure R8).

**Figure R8: Revision Knee Replacement by Age**




Revision knee replacement is more common in females. There has been little change in the gender proportion (Figure R9).

**Figure R9: Revision Knee Replacement by Gender**




*Detailed information on the demographics of revision knee replacement is provided in the supplementary report 'Demographics of Knee Arthroplasty' which is available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.*

## Demographics of Revisions of Known Primary

This year the Registry is analysing 11,335 first revision procedures where the primary procedure has been recorded by the Registry. This is an additional 2,047 procedures compared to the last report.

### Type of Revision

There are differences in the types of revision between the 'Revisions of known Primary Procedures' group and the 'All Revisions' group.

The 'Revisions of known Primary Procedures' group has a smaller proportion of major revisions (61.8%) compared to the 'All Revisions' group (67.4%), with less tibial/femoral revisions (40.7% compared to 48.9%) (Table R9).

There is a higher proportion of minor revisions (38.2% compared to 32.6%) (Table R9).

### Reason for Revision

There are differences in the reasons for revision. Loosening/lysis is still the most common reason but the proportion is less in the 'Revisions of known Primary Procedures' group (34.9% compared to 41.5%). Of the three most common reasons, pain is the only reason that has a higher proportion in the 'Revisions of known Primary Procedures' group (19.8% compared to 12.8%) (Table R10).

**Table R9: Revision Knee Replacement by Type of Revision**

| Type of Revision | Revision of Known Primary | | All Revisions | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| **Major Revision** | | | | |
| TKR (Tibial/Femoral) | 4613 | 40.7 | 13593 | 48.9 |
| Tibial Component | 927 | 8.2 | 2226 | 8.0 |
| Cement Spacer | 485 | 4.3 | 1261 | 4.5 |
| Femoral Component | 611 | 5.4 | 1075 | 3.9 |
| Uni Tibial Component | 147 | 1.3 | 187 | 0.7 |
| Removal of Prostheses | 61 | 0.5 | 148 | 0.5 |
| UKR (Uni Tibial/Uni Femoral) | 83 | 0.7 | 125 | 0.4 |
| Uni Femoral Component | 59 | 0.5 | 84 | 0.3 |
| Patella/Trochlear Resurfacing | 16 | 0.1 | 37 | 0.1 |
| Reinsertion of Components | 5 | 0.0 | 7 | 0.0 |
| **N Major** | **7007** | **61.8** | **18743** | **67.4** |
| **Minor Revision** | | | | |
| Insert Only | 1652 | 14.6 | 3756 | 13.5 |
| Patella Only | 1817 | 16.0 | 2879 | 10.3 |
| Insert/Patella | 649 | 5.7 | 2023 | 7.3 |
| Uni Insert Only | 174 | 1.5 | 271 | 1.0 |
| Minor Components | 20 | 0.2 | 117 | 0.4 |
| Cement Only | 8 | 0.1 | 17 | 0.1 |
| Removal of Patella | | | 8 | 0.0 |
| Partial Resurfacing | 3 | 0.0 | 4 | 0.0 |
| Unispacer | 4 | 0.0 | 4 | 0.0 |
| Uni Insert/Patella | 1 | 0.0 | 1 | 0.0 |
| **N Minor** | **4328** | **38.2** | **9080** | **32.6** |
| **TOTAL** | **11335** | **100.0** | **27823** | **100.0** |

**Table R10: Revision Knee Replacement by Reason for Revision**

| Reason for Revision | Revision of Known Primary | | All Revisions | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Loosening/Lysis | 3951 | 34.9 | 11543 | 41.5 |
| Infection | 1950 | 17.2 | 5175 | 18.6 |
| Pain | 1107 | 9.8 | 1846 | 6.6 |
| Patellofemoral Pain | 1139 | 10.0 | 1718 | 6.2 |
| Wear Tibial | 135 | 1.2 | 1504 | 5.4 |
| Progression Of Disease | 724 | 6.4 | 1187 | 4.3 |
| Instability | 505 | 4.5 | 934 | 3.4 |
| Fracture | 272 | 2.4 | 537 | 1.9 |
| Arthrofibrosis | 335 | 3.0 | 498 | 1.8 |
| Malalignment | 220 | 1.9 | 351 | 1.3 |
| Implant Breakage Knee Insert | 37 | 0.3 | 288 | 1.0 |
| Implant Breakage Tibial | 47 | 0.4 | 275 | 1.0 |
| Prosthesis Dislocation | 121 | 1.1 | 209 | 0.8 |
| Incorrect Sizing | 149 | 1.3 | 207 | 0.7 |
| Implant Breakage Patella | 38 | 0.3 | 193 | 0.7 |
| Wear Knee Insert | 39 | 0.3 | 188 | 0.7 |
| Patella Erosion | 141 | 1.2 | 185 | 0.7 |
| Wear Patella | 9 | 0.1 | 158 | 0.6 |
| Metal Sensitivity | 71 | 0.6 | 131 | 0.5 |
| Bearing Dislocation | 70 | 0.6 | 125 | 0.4 |
| Patella Maltracking | 64 | 0.6 | 120 | 0.4 |
| Implant Breakage Femoral | 21 | 0.2 | 110 | 0.4 |
| Synovitis | 45 | 0.4 | 80 | 0.3 |
| Osteonecrosis | 40 | 0.4 | 48 | 0.2 |
| Heterotopic Bone | 4 | 0.0 | 15 | 0.1 |
| Tumour | 5 | 0.0 | 14 | 0.1 |
| Wear Femoral | 1 | 0.0 | 9 | 0.0 |
| Patella Dislocation | 1 | 0.0 | 6 | 0.0 |
| Incorrect Side | 3 | 0.0 | 3 | 0.0 |
| Other | 91 | 0.8 | 166 | 0.6 |
| **TOTAL** | **11335** | **100.0** | **27823** | **100.0** |

## Outcome of First Revision of Primary Unicompartmental Knee Replacement

This analysis examines the rate of subsequent revision following the first revision of a known primary unicompartmental knee replacement.

There are 2,701 procedures available for analysis. These are obtained by only including first revisions of primary unicompartmental knees that were undertaken for osteoarthritis and excluding all first revisions with a diagnosis of infection.

The lowest rate of re-revision for a revised primary unicompartmental knee replacement is when it is revised to a total knee. Revision to another unicompartmental knee replacement has a cumulative percent re-revision of 35.4% at seven years. This compares to a re-revision of 15.8% if a unicompartmental knee is revised to a total knee replacement (Tables R11 and R12 and Figure R10).

Only 44 of the 2,701 unicompartmental knee revisions reported to the Registry were revisions that involved the removal of both tibial and femoral components and then subsequently replaced by another unicompartmental knee replacement. Most 'Uni to Uni' revisions are minor revisions where the insert is exchanged, or major partial revisions where either the tibial or femoral prostheses only is revised. There is no difference in the rate of re-revision between minor and major partial 'Uni to Uni' revisions (Tables R13 and R14 and Figure R11).

For the first time the Registry has identified a difference in the outcome of revising a unicompartmental knee replacement to a total knee replacement compared to revision of a total knee to a total knee replacement. The rate of re-revision of a 'Uni to Total" is less than a 'Total to Total" revision. (Tables R15 and R16 and Figure R12).

**Table R11: Re-revision Rates of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

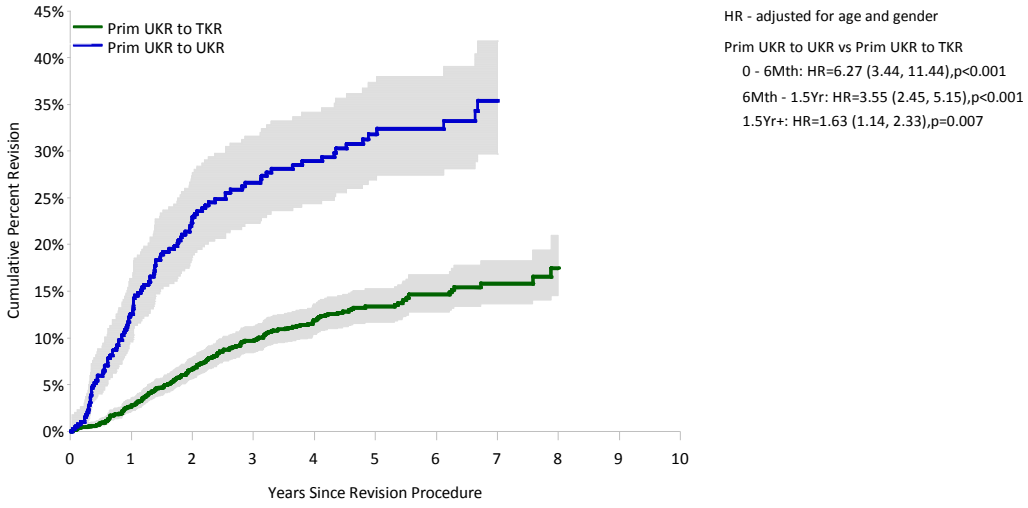
| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Prim UKR to TKR | 221 | 2300 | 7662 | 2.88 (2.52, 3.29) |
| Prim UKR to UKR | 110 | 401 | 1417 | 7.76 (6.38, 9.35) |
| **All Revision** | **331** | **2701** | **9079** | **3.65 (3.26, 4.06)** |

Note: Excluding Patella/Trochlear Resurfacing and revisions where no femoral and tibial components were inserted.

**Table R12: Yearly Cumulative Percent Re-revision of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Prim UKR to TKR | 2.8 (2.2, 3.6) | 9.7 (8.4, 11.2) | 13.3 (11.7, 15.3) | 15.8 (13.7, 18.3) | |
| Prim UKR to UKR | 12.5 (9.6, 16.3) | 26.6 (22.2, 31.6) | 31.8 (26.9, 37.3) | 35.4 (29.7, 41.8) | |
| **All Revision** | **4.2 (3.5, 5.1)** | **12.3 (11.0, 13.8)** | **16.3 (14.7, 18.2)** | **19.1 (17.0, 21.5)** | |

**Figure R10: Cumulative Percent Re-revision of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Prim UKR to TKR | 2300 | 1905 | 1130 | 570 | 184 | 1 |
| Prim UKR to UKR | 401 | 309 | 202 | 121 | 54 | 4 |

**Table R13: Re-revision Rates of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

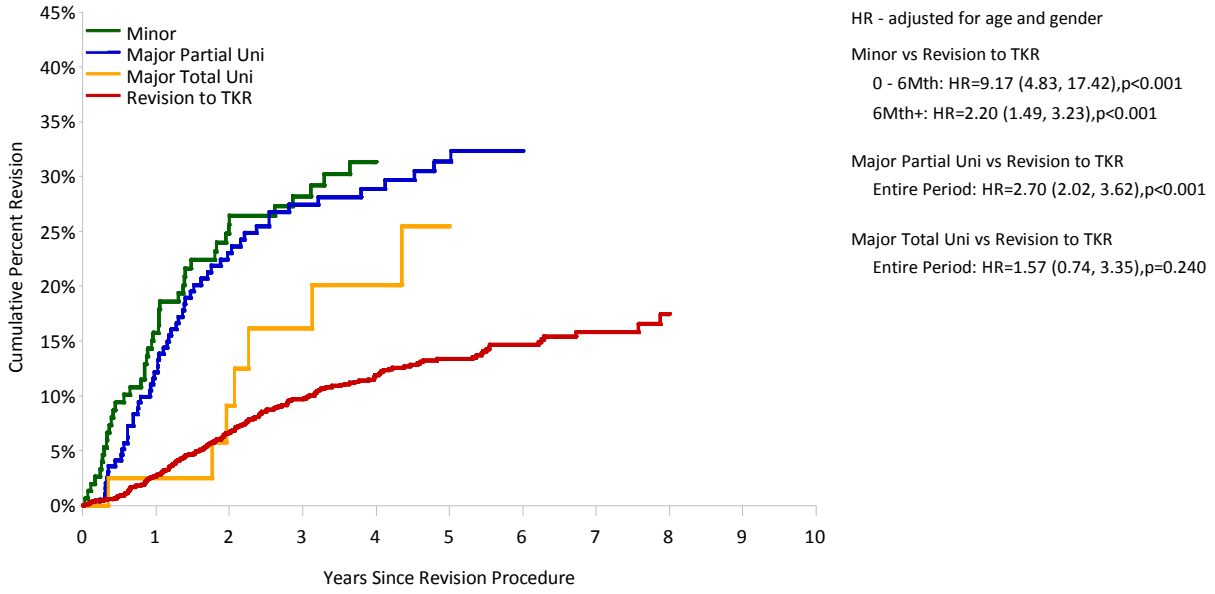
| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Minor | 44 | 155 | 518 | 8.50 (6.17, 11.41) |
| Major Partial Uni | 59 | 202 | 756 | 7.81 (5.94, 10.07) |
| Major Total Uni | 7 | 44 | 144 | 4.87 (1.96, 10.04) |
| Revision to TKR | 221 | 2300 | 7662 | 2.88 (2.52, 3.29) |
| **TOTAL** | **331** | **2701** | **9079** | **3.65 (3.26, 4.06)** |

Note: Excluding Patella/Trochlear Resurfacing and revisions where no femoral and tibial components were inserted.

**Table R14: Yearly Cumulative Percent Re-revision of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Minor | 15.7 (10.7, 22.7) | 28.2 (21.4, 36.6) | | | |
| Major Partial Uni | 12.2 (8.2, 17.7) | 27.4 (21.5, 34.7) | 31.4 (24.9, 39.1) | | |
| Major Total Uni | 2.5 (0.4, 16.5) | 16.1 (7.0, 34.8) | 25.4 (12.7, 47.1) | | |
| Revision to TKR | 2.8 (2.2, 3.6) | 9.7 (8.4, 11.2) | 13.3 (11.7, 15.3) | 15.8 (13.7, 18.3) | |

**Figure R11: Cumulative Percent Re-revision of Known Primary Unicompartmental Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Minor | 155 | 117 | 75 | 38 | 20 | 1 |
| Major Partial Uni | 202 | 158 | 106 | 73 | 30 | 1 |
| Major Total Uni | 44 | 34 | 21 | 10 | 4 | 2 |
| Revision to TKR | 2300 | 1905 | 1130 | 570 | 184 | 1 |

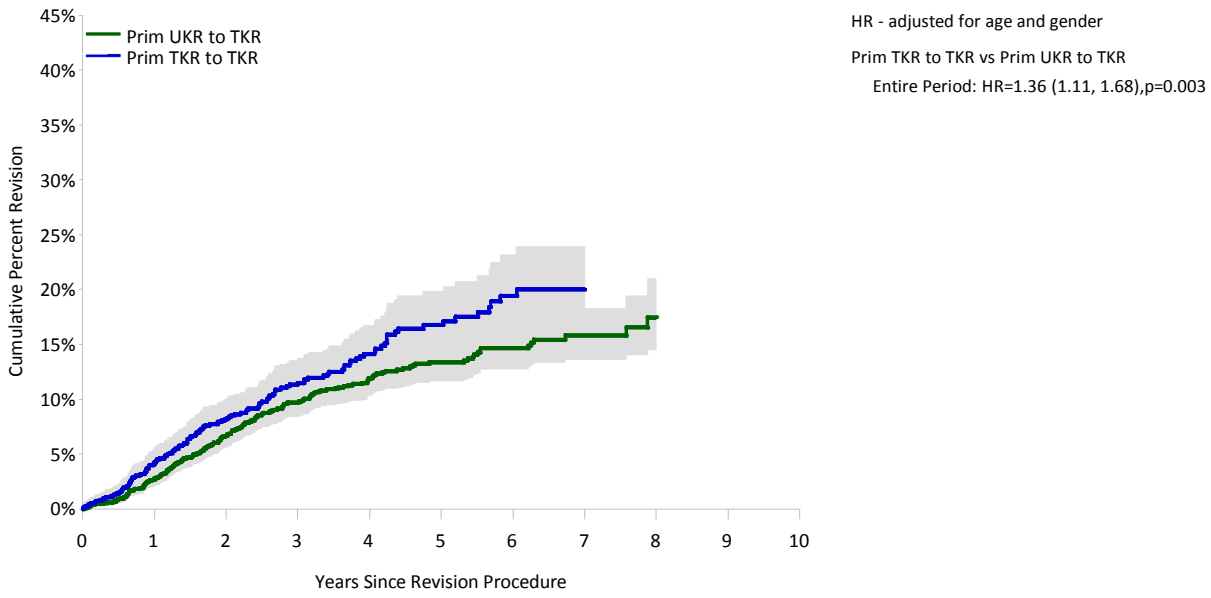
**Table R15: Re-revision Rates of Known Primary Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| Primary Revisions | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Prim UKR to TKR | 221 | 2300 | 7662 | 2.88 (2.52, 3.29) |
| Prim TKR to TKR | 150 | 1471 | 3975 | 3.77 (3.19, 4.43) |
| **TOTAL** | **371** | **3771** | **11637** | **3.19 (2.87, 3.53)** |

**Table R16: Yearly Cumulative Percent Re-revision of Known Primary Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Prim UKR to TKR | 2.8 (2.2, 3.6) | 9.7 (8.4, 11.2) | 13.3 (11.7, 15.3) | 15.8 (13.7, 18.3) | |
| Prim TKR to TKR | 4.2 (3.3, 5.5) | 11.5 (9.6, 13.7) | 16.7 (14.1, 19.8) | 20.0 (16.7, 23.9) | |

**Figure R12: Cumulative Percent Re-revision of Known Primary Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Prim UKR to TKR | 2300 | 1905 | 1130 | 570 | 184 | 1 |
| Prim TKR to TKR | 1471 | 1055 | 569 | 231 | 72 | 1 |

## Outcome of First Revision of Primary Total Knee Replacement

This analysis examines the rate of subsequent revision following the first revision of a known primary total knee replacement.

There are 6,111 procedures available for analysis. These are obtained by only including first revisions of primary total knee replacement that were undertaken for osteoarthritis and excluding all first revisions with a diagnosis of infection.

Major partial revisions have a significantly higher rate of revisions compared to both minor and major total revisions. There is no difference in the outcome of minor compared to major total revisions (Tables R17 and R18 and Figure R13).

Comparing the three types of major revision the only difference found is that femoral only revision has a higher rate of re-revision than tibial/femoral revision (Figure R14).

Revising the patella alone has the same rate of re-revision as revising the patella in combination with an insert exchange. Revising the insert alone has the highest rate of re-revision of the three types of minor revision, however this difference is only evident in the first 1.5 years (Tables R19 and R20 and Figure R15).

**Table R17: Revision Rates of Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

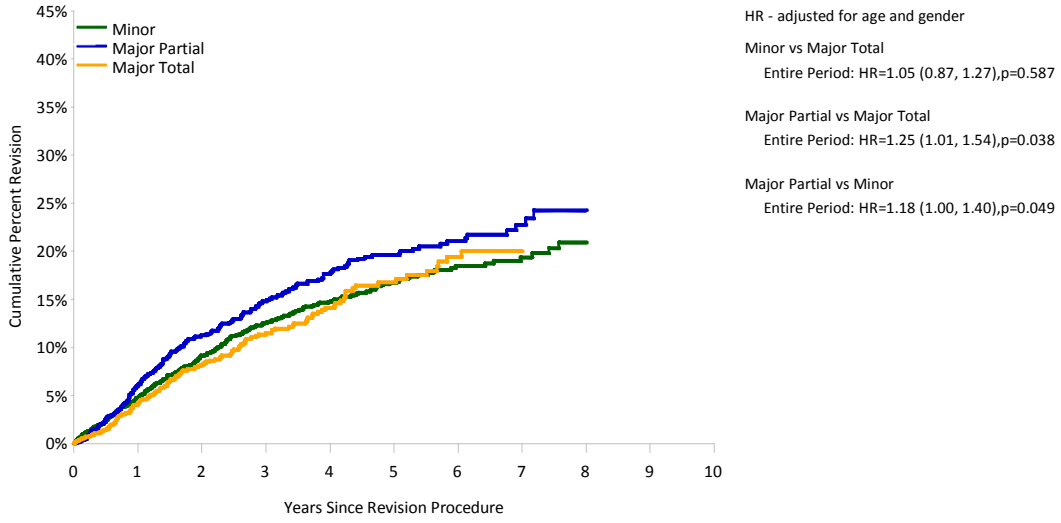
| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Minor | 375 | 3234 | 9686 | 3.87 (3.49, 4.28) |
| Major Partial | 214 | 1406 | 4795 | 4.46 (3.88, 5.10) |
| Major Total | 150 | 1471 | 3975 | 3.77 (3.19, 4.43) |
| **All Revision** | **739** | **6111** | **18457** | **4.00 (3.72, 4.30)** |

Note: Excluding revisions where no femoral and tibial components have been inserted.

**Table R18: Yearly Cumulative Percent Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Minor | 4.8 (4.1, 5.6) | 12.5 (11.3, 14.0) | 16.7 (15.1, 18.5) | 19.4 (17.3, 21.7) | |
| Major Partial | 6.1 (5.0, 7.6) | 14.8 (12.9, 17.1) | 19.6 (17.2, 22.3) | 22.7 (19.7, 26.1) | |
| Major Total | 4.2 (3.3, 5.5) | 11.5 (9.6, 13.7) | 16.7 (14.1, 19.8) | 20.0 (16.7, 23.9) | |
| **All Revision** | **5.0 (4.4, 5.6)** | **12.9 (11.9, 13.9)** | **17.4 (16.2, 18.7)** | **20.4 (18.8, 22.1)** | |

**Figure R13: Cumulative Percent Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Minor | 3234 | 2507 | 1372 | 652 | 205 | 6 |
| Major Partial | 1406 | 1129 | 713 | 390 | 122 | 1 |
| Major Total | 1471 | 1055 | 569 | 231 | 72 | 1 |

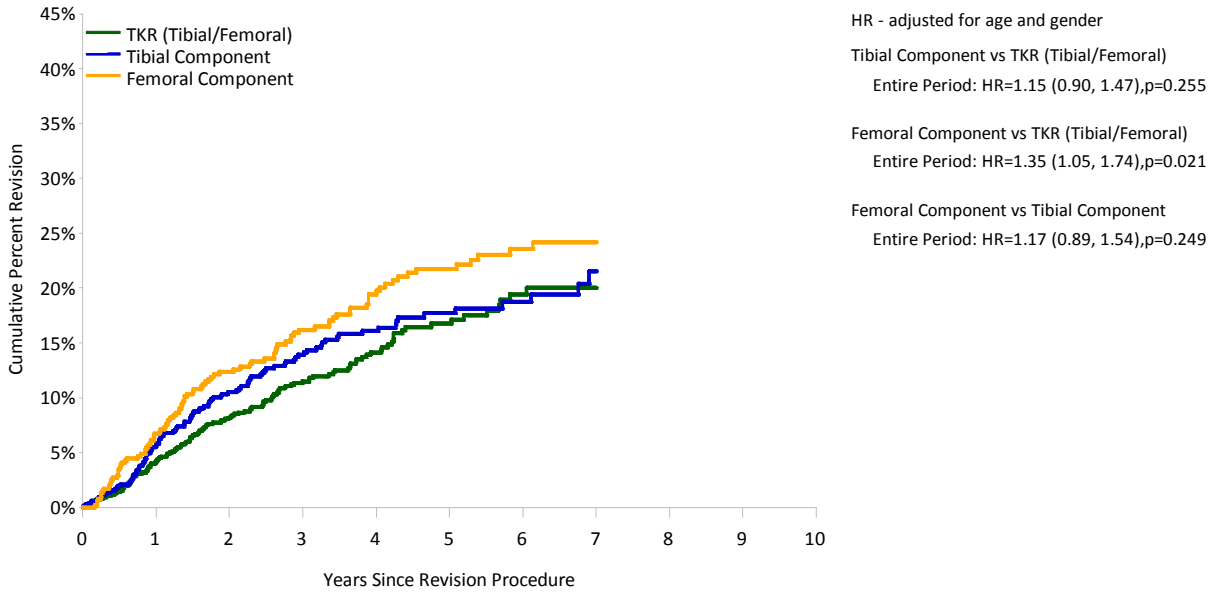
**Table R19: Re-revision Rates of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

| Revision of Primary | N Revised | N Total | Obs. Years | Revisions/100 Obs. Yrs (95% CI) |
|---|---|---|---|---|
| Insert/Patella | 62 | 620 | 1808 | 3.43 (2.63, 4.39) |
| Insert Only | 151 | 878 | 2523 | 5.98 (5.07, 7.02) |
| Patella Only | 160 | 1727 | 5320 | 3.01 (2.56, 3.51) |
| TKR (Tibial/Femoral) | 150 | 1471 | 3975 | 3.77 (3.19, 4.43) |
| Tibial Component | 114 | 862 | 2738 | 4.16 (3.43, 5.00) |
| Femoral Component | 99 | 542 | 2054 | 4.82 (3.92, 5.87) |
| **TOTAL** | **736** | **6100** | **18419** | **4.00 (3.71, 4.30)** |

**Table R20: Yearly Cumulative Percent Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**

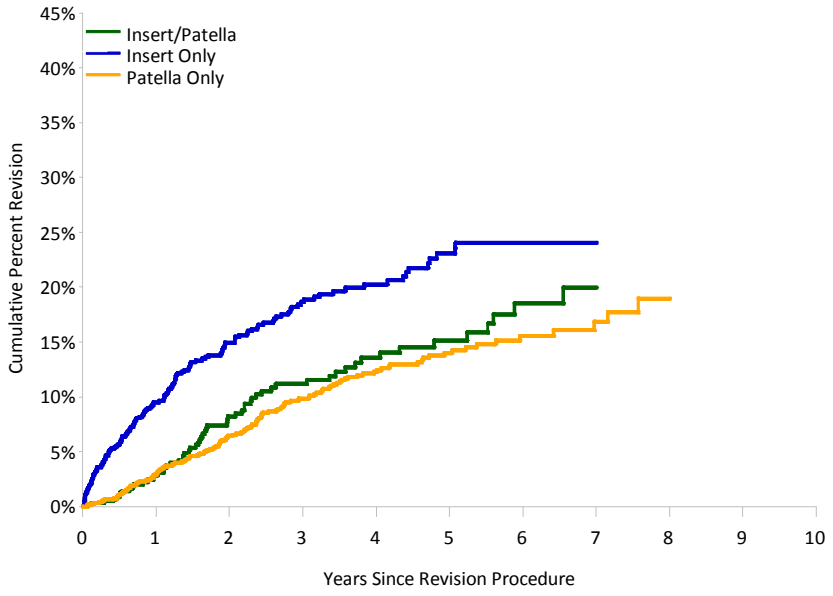
| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| Insert/Patella | 2.9 (1.7, 4.7) | 11.2 (8.5, 14.7) | 15.2 (11.7, 19.6) | 20.0 (15.0, 26.3) | |
| Insert Only | 9.5 (7.7, 11.7) | 18.6 (15.9, 21.8) | 23.1 (19.6, 27.0) | 24.1 (20.4, 28.2) | |
| Patella Only | 3.0 (2.2, 3.9) | 9.9 (8.3, 11.7) | 14.0 (11.9, 16.4) | 16.8 (14.0, 20.3) | |
| TKR (Tibial/Femoral) | 4.2 (3.3, 5.5) | 11.5 (9.6, 13.7) | 16.7 (14.1, 19.8) | 20.0 (16.7, 23.9) | |
| Tibial Component | 5.8 (4.4, 7.7) | 13.9 (11.5, 16.8) | 17.7 (14.7, 21.2) | 21.5 (17.3, 26.6) | |
| Femoral Component | 6.7 (4.8, 9.3) | 16.2 (13.1, 19.9) | 21.7 (18.0, 26.1) | 24.2 (20.0, 28.9) | |

**Figure R14: Cumulative Percent Major Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| TKR (Tibial/Femoral) | 1471 | 1055 | 569 | 231 | 72 | 1 |
| Tibial Component | 862 | 677 | 402 | 196 | 68 | 1 |
| Femoral Component | 542 | 451 | 310 | 194 | 54 | 0 |

**Figure R15: Cumulative Percent Minor Re-revision of Known Primary Total Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)**




HR - adjusted for age and gender

Insert/Patella vs Patella Only

Entire Period: HR=1.11 (0.82, 1.48),p=0.506

Insert Only vs Patella Only

0 - 3Mth: HR=9.99 (4.75, 20.98),p<0.001

3Mth - 1.5Yr: HR=2.30 (1.66, 3.19),p<0.001

1.5Yr+: HR=1.04 (0.74, 1.47),p=0.829

Insert Only vs Insert/Patella

0 - 3Mth: HR=9.04 (4.20, 19.43),p<0.001

3Mth - 1.5Yr: HR=2.08 (1.42, 3.04),p<0.001

1.5Yr+: HR=0.94 (0.63, 1.40),p=0.758

| Number at Risk | 0 Yr | 1 Yrs | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|---|
| Insert/Patella | 620 | 453 | 254 | 133 | 42 | 2 |
| Insert Only | 878 | 669 | 350 | 162 | 58 | 1 |
| Patella Only | 1727 | 1379 | 763 | 354 | 104 | 3 |

# PROSTHESES WITH HIGHER THAN ANTICIPATED RATES OF REVISION

## Introduction

A unique and important function of registries is that they are able to provide population based data on the comparative outcome of individual prostheses in a community. Outcomes data are necessary to enable an evidence-based approach to prostheses selection. For many prostheses the only source of outcomes data are registry reports.

It is evident from registry data that most prostheses have comparable outcomes. A number however have revision rates that are 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 revision rate. The comparator group includes all other prostheses within the same class regardless of their rate of revision. This is a more pragmatic approach than comparing to a select group of prostheses with the lowest revision rates.

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 prostheses in the same class. It is an automated analysis that identifies prostheses based on set criteria. These include:

(i) the revision rate (per 100 component years) exceeds twice that for the group, and
(ii) the Poisson probability of observing that number of revisions, given the rate of the group is significant ($p<0.05$), and

either

(iii) there are at least 10 primary procedures for that component,

or

(iv) the proportion revised is at least 75% and there have been at least two revisions.

Additionally, if a component represents more than 25% of the group, its revision rate is excluded from estimation of the group's overall rate.

The Registry has the capacity to assess the outcome of individual prostheses or the combination 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.

In Stage 2, the Director and Deputy Directors of the Registry in conjunction with DMAC staff, review the identified prostheses and undertake further investigation. This includes examining for 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 prostheses in the same class then the prosthesis or prostheses combination progress to Stage 3. The possible exception to this is the presence of confounding factors, such as use in complex primary procedures.

Stage 3 involves review by a panel of independent orthopaedic specialists from the Australian Orthopaedic Association Arthroplasty Society. The panel meets with Registry staff at a two-day workshop to review the Stage 2 analysis and determine which prostheses will be identified in the Annual Report.

Identified prostheses are listed in one of three groups. There are those that have a higher rate of revision but are no longer used in Australia. These are listed to provide ongoing information on the rate of revision. This also enables comparison of other prostheses to the discontinued group.

The second group is prostheses that are being re-identified but are still used. This listing identifies that the prosthesis continues to have a higher than anticipated rate of revision but it also provides information on its 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 the identification in the Annual Report.

The third group, 'Newly Identified' lists prostheses that are being used and 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. Registries monitor the continual real time performance of prostheses within a community and the Annual Report provides a snap shot 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 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.

This year, 15 independent arthroplasty specialists together with the Chairman of the NJRR Committee, the Director and the two Deputy Directors of the Registry attended the two day Surgeon Review Workshop.

Only prostheses identified for the first time or prostheses that are not re-identified are discussed in the following text.

*The full analysis for all prostheses identified as having a higher than anticipated rate of revision in the 2011 Annual Report are available on the Registry website, www.dmac.adelaide.edu.au/aoanjrr/publications.jsp*.

# Primary Partial Hip Replacement

## Unipolar Modular

There are no newly identified unipolar modular prostheses.

**Table IP1: Revision Rate of Individual Unipolar Modular Hip identified as having a Higher than Anticipated Revision Rate**

| Head/Femoral | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Re-Identified and still used** | | | | |
| **Taperloc | 120 | 334 | 2.39 | Entire Period: HR=2.15 (1.07, 4.34),p=0.031 |

Note: All Components have been compared to all other Unipolar Modular Hip components.
** Femoral Component

**Table IP2: Yearly Cumulative Percent Revision of Individual Unipolar Modular Hip identified as having a Higher than Anticipated Revision Rate**

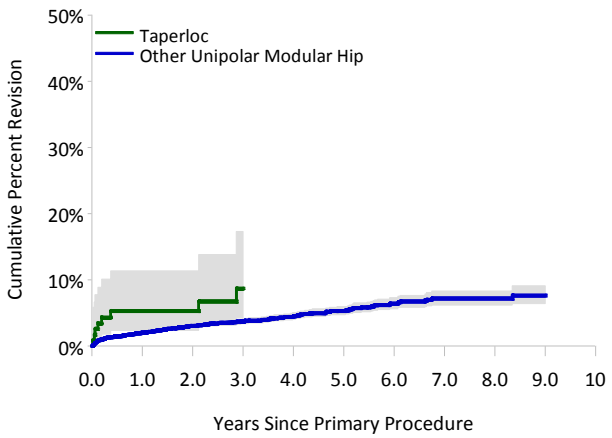
| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Re-Identified and still used** | | | | | |
| **Taperloc | 5.2 (2.4, 11.3) | 8.7 (4.2, 17.3) | | | |

**Table IP3: Yearly Usage of Individual Unipolar Modular Hip identified as having a Higher than Anticipated Revision Rate**

| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Re-Identified and still used** | | | | | | | | | | | | |
| **Taperloc | | | | | | 31 | 29 | 17 | 8 | 12 | 18 | 5 |

**Figure IP1: Cumulative Percent Revision of Individual Unipolar Modular Hip re- identified and still used**

**Re-identified and still used**



## Bipolar

There are no newly identified bipolar prostheses.

The Ringloc Bipolar hip prosthesis, which has been identified for a number of years, is no longer significantly different from other bipolar prostheses. It has been used in small numbers with 13 additional procedures in 2010. At three years the cumulative percent revision rate is 5.5% (adj HR=1.75; 95%CI (0.90, 3.39), p=0.098).

**Table IP4: Revision Rate of Individual Bipolar Hip identified as having a Higher than Anticipated Revision Rate**

| Bipolar Head/Femoral | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Re-Identified and still used** | | | | |
| Tandem/Spectron EF | 158 | 336 | 2.98 | 0 - 1.5Yr: HR=1.03 (0.38, 2.78),p=0.948<br>1.5Yr+: HR=7.43 (3.23, 17.09),p<0.001 |
| UHR/ABGII | 177 | 596 | 1.85 | Entire Period: HR=1.98 (1.08, 3.61),p=0.026 |
| UHR/Omnifit | 346 | 1483 | 1.42 | Entire Period: HR=1.74 (1.12, 2.71),p=0.014 |

Note All Components have been compared to all other Bipolar Hip components.

**Table IP5: Yearly Cumulative Percent Revision of Individual Bipolar Hip identified as having a Higher than Anticipated Revision Rate**

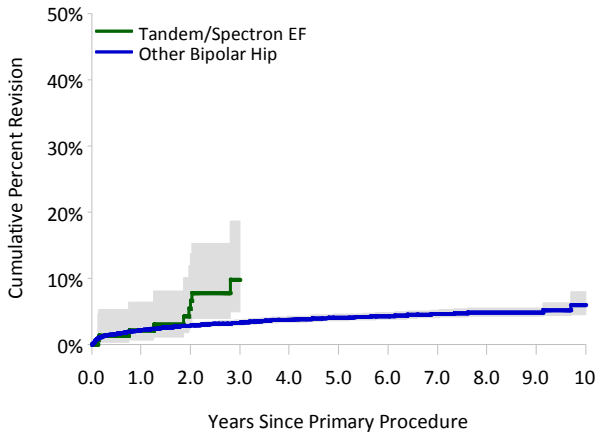
| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Re-Identified and still used** | | | | | |
| Tandem/Spectron EF | 2.1 (0.7, 6.4) | 9.8 (5.0, 18.6) | | | |
| UHR/ABGII | 4.4 (2.1, 9.1) | 5.3 (2.7, 10.4) | 8.9 (4.9, 15.9) | | |
| UHR/Omnifit | 5.3 (3.3, 8.4) | 5.7 (3.6, 8.9) | 6.1 (3.9, 9.5) | 7.8 (4.9, 12.1) | |

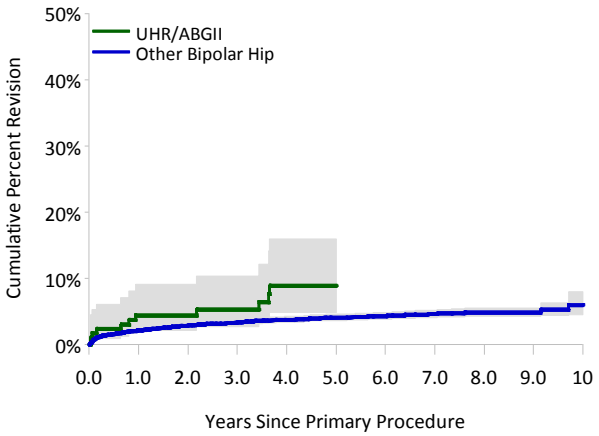
**Table IP6: Yearly Usage of Individual Bipolar Hip identified as having a Higher than Anticipated Revision Rate**

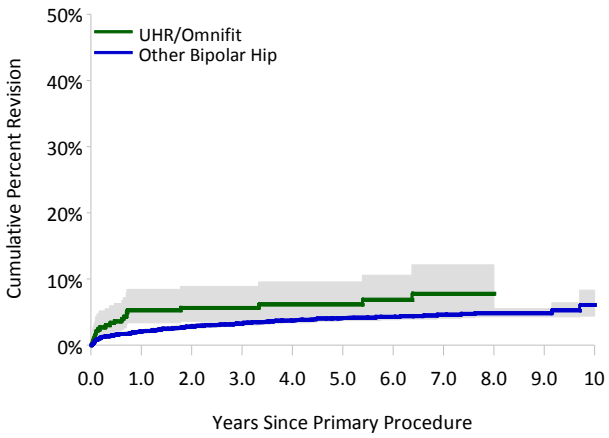
| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Re-Identified and still used** | | | | | | | | | | | | |
| Tandem/Spectron EF | | | | | | 3 | 21 | 24 | 30 | 34 | 26 | 20 |
| UHR/ABGII | | | 1 | 24 | 25 | 36 | 34 | 10 | 15 | 20 | 7 | 5 |
| UHR/Omnifit | 5 | 25 | 47 | 68 | 59 | 42 | 31 | 24 | 12 | 17 | 11 | 5 |

**Figure IP2: Cumulative Percent Revision of Individual Bipolar Hip re-identified and still used**

**Re-identified and still used**



# Primary Total Hip Replacement

## Total Conventional

There is a large number of femoral stem and acetabular component combinations available for comparative analysis. The Registry has information on 1,869 combinations used in primary total conventional hip replacement. This is 330 more than reported last year.

These combinations are the result of mixing and matching different femoral stem and acetabular components, which may be from the same or different companies.

There are 13 primary total hip prostheses and prostheses combinations being identified for the first time.

CPT/Low Profile Cup combination has been used in 61 procedures and has a five year cumulative percent revision rate of 11.1%. There have been five revisions, four of which were major. Three of the revisions were for dislocation (adj HR=3.23; 95%CI (1.35, 7.77), p=0.008).

The ML Taper Kinectiv/Continuum combination has been used in 399 procedures and has a one year cumulative percent revision of 3.3%. There have been 12 revisions, six major and six minor. Five of the revisions were for fracture and four for prosthesis dislocation (adj HR=2.52; 95%CI (1.43, 4.45), p=0.001).

Spectron EF/R3 combination has been used in 561 procedures and has a one year cumulative percent revision rate of 2.3%. There were 18 revisions, 10 of which were major. Five of the revisions were for dislocation and five for infection. These revisions were not related to small sizes of the Spectron EF stem (adj HR=1.99; 95%CI (1.25, 3.16), p=0.003).

Trabecular Metal/Trabecular Metal Shell combination has been used in 149 procedures and has a three year cumulative percent revision rate of 5.5%. There have been eight revisions, four major and four minor. Three have been revised for infection and two for dislocation (adj HR=2.39; 95%CI (1.20, 4.78), p=0.013).

Anca-fit femoral stem has been used in 206 procedures and has a three year cumulative percent revision rate of 5.1%. There have been 12 revisions, four for loosening/lysis and four for fracture (adj HR=1.96; 95%CI (1.11, 3.45), p=0.02).

Edinburgh femoral stem has been used in 137 procedures and has a three year cumulative percent revision rate of 9.6%. There have been 13 revisions, 11 of which were major. Seven of the revisions were for dislocation. Ten of the 13 revisions were with a metal on metal bearing surface. All revisions have been with the Fin II and Icon acetabular components, both of which have been identified as having a higher than anticipated rate of revision (adj HR=4.01; 95%CI (2.33, 6.91), p<0.001).

Mayo femoral stem has been used in 167 procedures and has a five year cumulative percent revision rate of 6.8%. There have been 11 revisions, all major. Five of the revisions were for loosening/lysis, three for dislocation and three for fracture (adj HR=2.11; 95%CI (1.17, 3.82), p=0.013).

Taper Fit femoral stem has a significantly higher revision rate after four years. It has been used in 303 procedures and has a seven year cumulative percent revision rate of 11.5%. There have been 23 revisions, all major. Six of the revisions were for loosening/lysis, six for infection and three for stem breakage. Of the 23 revisions, 16 were used with a metal on metal bearing surface (0-4Yr: adj HR=1.48; 95%CI (0.86, 2.55), p=0.159) (4Yr+: adj HR=5.26; 95%CI (2.83, 9.78), p<0.001).

The 2000 Plus acetabular component has been used in 133 procedures and has a three year cumulative percent revision of 7.5%. There have been eight revisions, all major. There were four revisions recorded for loosening/lysis and three for dislocation. All eight revisions occurred when this acetabular component was combined with the Adapter femoral stem, which has previously been identified as having a higher than anticipated rate of revision. However, four of these eight revisions involved acetabular components only (adj HR=2.44; 95%CI (1.22, 4.87), p=0.011).

Adept acetabular component has been used in 109 procedures and has a one year cumulative percent revision rate of 4.6%. There have been seven revisions, all were metal on metal bearing surface (adj HR=2.58; 95%CI (1.23, 5.42), p=0.012).

Fin II acetabular component has been used in 1,153 procedures and has a three year cumulative percent revision rate of 4.1%. There have been 39 revisions, 23 of the revisions were major. Fifteen of the revisions were for dislocation and nine for loosening/lysis (adj HR=1.56; 95%CI (1.14, 2.14), p=0.005).

Plasmacup acetabular component has been used in 159 procedures and has a one year cumulative percent revision rate of 6.4%. There have been nine revisions, seven of which were major revisions. Six revisions have occurred when a metal on ceramic bearing

surface was used (adj HR=2.93; 95%CI (1.52, 5.63), p=0.001).

Procotyl acetabular component has been used in 305 procedures and has a one year cumulative percent revision rate of 3.8%. There have been nine revisions, six of which were major revisions. There were five revisions for dislocation and three for fracture. This prosthesis has been used most often with the K2 stem which is a stem that has been identified as having a higher than anticipated rate of revision (adj HR=2.49; 95%CI (1.30, 4.79), p=0.006).

The Quadra H has been re-identified. In previous reports the Registry has highlighted that this prosthesis was associated with a higher rate of revision in the first two weeks and after this period there was no difference. This continues to be the situation. The hazard ratio however, has declined from adj HR=5.12; 95%CI (2.82, 9.29), p<0.001 in 2010 to adj HR=2.77; 95%CI (1.60, 4.81), p<0.001 in 2011.

Two acetabular components are no longer used have been identified for the first time. They are the Expansys (adj HR=2.46; 95%CI (1.11, 5.46), p=0.027) and Hedrocel (adj HR=3.16; 95%CI (1.51, 6.62), p=0.002). They are listed in the 'Identified and no longer used' group

**Table IP7: Revision Rate of Individual Total Conventional Hip identified as having a Higher than Anticipated Revision Rate**

| Femoral/Acetabular | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Identified and no longer used** | | | | |
| Charnley/Duraloc | 180 | 1274 | 1.81 | 0 - 3.5Yr: HR=1.15 (0.52, 2.57),p=0.726<br>3.5Yr - 4Yr: HR=12.37 (4.60, 33.29),p<0.001<br>4Yr+: HR=4.64 (2.69, 8.02),p<0.001 |
| Elite Plus/Apollo | 52 | 387 | 2.58 | Entire Period: HR=4.03 (2.17, 7.47),p<0.001 |
| Elite Plus/Charnley LPW | 89 | 597 | 2.01 | Entire Period: HR=2.94 (1.67, 5.19),p<0.001 |
| F2L/Delta | 110 | 512 | 2.54 | Entire Period: HR=3.38 (1.96, 5.81),p<0.001 |
| H Moos/Mueller | 19 | 108 | 7.41 | Entire Period: HR=10.55 (5.28, 21.07),p<0.001 |
| ML Taper/Fitmore | 115 | 316 | 2.85 | Entire Period: HR=3.09 (1.61, 5.94),p<0.001 |
| S-Rom/Duraloc | 166 | 1174 | 1.87 | Entire Period: HR=2.71 (1.78, 4.12),p<0.001 |
| Secur-Fit Plus/Secur-Fit | 197 | 1285 | 1.48 | Entire Period: HR=2.18 (1.39, 3.41),p<0.001 |
| *LYDERIC II | 163 | 860 | 1.40 | Entire Period: HR=2.03 (1.15, 3.57),p=0.014 |
| *Margron | 688 | 4137 | 2.08 | Entire Period: HR=2.97 (2.40, 3.68),p<0.001 |
| *Revitan (non mod) | 82 | 550 | 1.64 | Entire Period: HR=2.41 (1.26, 4.63),p=0.008 |
| **Artek | 178 | 1401 | 2.93 | 0 - 1.5Yr: HR=1.99 (0.95, 4.18),p=0.068<br>1.5Yr+: HR=5.54 (3.94, 7.78),p<0.001 |
| **ASR | 4410 | 14826 | 2.22 | 0 - 2Wk: HR=1.37 (0.84, 2.26),p=0.210<br>2Wk - 1Mth: HR=0.27 (0.10, 0.72),p=0.009<br>1Mth - 9Mth: HR=1.14 (0.83, 1.55),p=0.418<br>9Mth - 1.5Yr: HR=3.03 (2.36, 3.90),p<0.001<br>1.5Yr+: HR=4.92 (4.25, 5.70),p<0.001 |
| **ExpanSys | 71 | 324 | 1.85 | Entire Period: HR=2.46 (1.11, 5.46),p=0.027 |
| **Hedrocel | 46 | 330 | 2.12 | Entire Period: HR=3.16 (1.51, 6.62),p=0.002 |
| **Inter-Op | 33 | 248 | 3.63 | Entire Period: HR=5.50 (2.86, 10.58),p<0.001 |
| **MBA | 124 | 698 | 2.01 | Entire Period: HR=2.99 (1.77, 5.05),p<0.001 |
| **SPH-Blind | 951 | 6295 | 1.33 | Entire Period: HR=1.97 (1.59, 2.45),p<0.001 |
| **Re-Identified and still used** | | | | |
| Alloclassic/Durom | 622 | 2372 | 1.56 | 0 - 1.5Yr: HR=0.90 (0.50, 1.62),p=0.722<br>1.5Yr+: HR=3.37 (2.29, 4.96),p<0.001 |
| Esop/Atlas | 176 | 773 | 1.42 | Entire Period: HR=1.87 (1.04, 3.39),p=0.037 |
| *Adapter (cemented) | 148 | 442 | 3.85 | 0 - 6Mth: HR=2.36 (0.89, 6.29),p=0.085<br>6Mth+: HR=6.07 (3.52, 10.47),p<0.001 |
| *Adapter (cementless) | 680 | 1668 | 2.34 | Entire Period: HR=2.42 (1.76, 3.31),p<0.001 |
| *CBH Stem | 169 | 398 | 2.51 | Entire Period: HR=2.58 (1.39, 4.80),p=0.002 |
| *K2 | 470 | 585 | 4.61 | Entire Period: HR=3.41 (2.34, 4.97),p<0.001 |
| *Profemur Z | 186 | 861 | 2.44 | Entire Period: HR=3.27 (2.13, 5.02),p<0.001 |
| *Quadra-H | 1808 | 1944 | 1.85 | 0 - 2Wk: HR=2.77 (1.60, 4.81),p<0.001<br>2Wk+: HR=0.98 (0.65, 1.47),p=0.911 |
| *UniSyn | 325 | 1137 | 1.93 | 0 - 1Mth: HR=4.69 (2.44, 9.03),p<0.001<br>1Mth+: HR=1.69 (0.98, 2.91),p=0.059 |
| **Bionik | 603 | 1627 | 2.77 | Entire Period: HR=2.97 (2.22, 3.99),p<0.001 |
| **Icon | 387 | 1080 | 2.69 | Entire Period: HR=2.85 (1.97, 4.10),p<0.001 |

| Femoral/Acetabular | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Newly Identified** | | | | |
| CPT/Low Profile Cup | 61 | 192 | 2.60 | Entire Period: HR=3.23 (1.35, 7.77),p=0.008 |
| ML Taper Kinectiv/Continuum | 399 | 215 | 5.58 | Entire Period: HR=2.52 (1.43, 4.45),p=0.001 |
| Spectron EF/R3 | 561 | 678 | 2.65 | Entire Period: HR=1.99 (1.25, 3.16),p=0.003 |
| Trabecular Metal/Trabecular Metal Shell | 149 | 325 | 2.46 | Entire Period: HR=2.39 (1.20, 4.78),p=0.013 |
| *Anca_Fit | 206 | 709 | 1.69 | Entire Period: HR=1.96 (1.11, 3.45),p=0.020 |
| *Edinburgh | 137 | 381 | 3.42 | Entire Period: HR=4.01 (2.33, 6.91),p<0.001 |
| *Mayo | 167 | 647 | 1.70 | Entire Period: HR=2.11 (1.17, 3.82),p=0.013 |
| *Taper Fit | 303 | 1472 | 1.56 | 0 - 4Yr: HR=1.48 (0.86, 2.55),p=0.159<br>4Yr+: HR=5.26 (2.83, 9.78),p<0.001 |
| **2000 Plus | 133 | 356 | 2.25 | Entire Period: HR=2.44 (1.22, 4.87),p=0.011 |
| **Adept | 109 | 260 | 2.69 | Entire Period: HR=2.58 (1.23, 5.42),p=0.012 |
| **Fin II | 1153 | 2423 | 1.61 | Entire Period: HR=1.56 (1.14, 2.14),p=0.005 |
| **Plasmacup | 159 | 271 | 3.33 | Entire Period: HR=2.93 (1.52, 5.63),p=0.001 |
| **Procotyl | 305 | 174 | 5.18 | Entire Period: HR=2.49 (1.30, 4.79),p=0.006 |

Note: All Components have been compared to all other Total Conventional Hip components.
** Acetabular Component
* Femoral Component

**Table IP8: Yearly Cumulative Percent Revision of Individual Total Conventional Hip identified as having a Higher than Anticipated Revision Rate**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | |
| Charnley/Duraloc | 0.6 (0.1, 3.9) | 2.9 (1.2, 6.7) | 9.4 (5.9, 14.9) | 13.1 (8.7, 19.4) | |
| Elite Plus/Apollo | 2.0 (0.3, 13.4) | 4.0 (1.0, 15.1) | 12.1 (5.6, 25.0) | 18.4 (10.0, 32.5) | |
| Elite Plus/Charnley LPW | 1.2 (0.2, 8.2) | 6.1 (2.6, 14.1) | 11.3 (6.1, 20.7) | 12.8 (7.1, 22.6) | 25.4 (12.4, 47.8) |
| F2L/Delta | 5.5 (2.5, 11.8) | 10.1 (5.7, 17.5) | 12.2 (7.3, 20.2) | | |
| H Moos/Mueller | 5.6 (0.8, 33.4) | 33.3 (16.6, 59.6) | 38.9 (20.8, 64.7) | 38.9 (20.8, 64.7) | |
| ML Taper/Fitmore | 5.2 (2.4, 11.3) | | | | |
| S-Rom/Duraloc | 3.1 (1.3, 7.2) | 5.0 (2.6, 9.9) | 5.7 (3.0, 10.8) | 7.3 (4.1, 12.9) | |
| Secur-Fit Plus/Secur-Fit | 3.1 (1.4, 6.7) | 7.3 (4.4, 11.9) | 7.8 (4.8, 12.6) | 9.9 (6.3, 15.4) | |
| *LYDERIC II | 3.1 (1.3, 7.3) | 5.7 (3.0, 10.7) | 7.4 (4.1, 13.0) | | |
| *Margron | 5.8 (4.3, 7.9) | 8.4 (6.5, 10.8) | 10.4 (8.3, 13.0) | 13.7 (11.1, 16.8) | |
| *Revitan (non mod) | 2.4 (0.6, 9.4) | 6.1 (2.6, 14.0) | 8.6 (4.2, 17.1) | 11.2 (6.0, 20.4) | |
| **Artek | 2.8 (1.2, 6.7) | 8.0 (4.8, 13.1) | 15.7 (11.0, 22.0) | 21.1 (15.7, 28.1) | |
| **ASR | 1.8 (1.5, 2.3) | 6.5 (5.8, 7.3) | 10.2 (9.1, 11.6) | | |
| **ExpanSys | 2.8 (0.7, 10.8) | 4.2 (1.4, 12.6) | 10.5 (4.7, 22.4) | | |
| **Hedrocel | 4.3 (1.1, 16.3) | 6.6 (2.2, 19.2) | 6.6 (2.2, 19.2) | 9.2 (3.5, 22.8) | |
| **Inter-Op | 12.1 (4.7, 29.1) | 15.2 (6.6, 32.6) | 21.4 (10.8, 39.8) | 24.9 (13.3, 43.7) | 28.3 (15.8, 47.4) |
| **MBA | 4.0 (1.7, 9.4) | 8.2 (4.5, 14.8) | 10.3 (6.0, 17.6) | 12.1 (7.0, 20.4) | |
| **SPH-Blind | 3.8 (2.8, 5.2) | 5.8 (4.5, 7.5) | 7.3 (5.8, 9.2) | 8.9 (7.2, 11.0) | |
| **Identified and still used** | | | | | |
| Alloclassic/Durom | 1.3 (0.7, 2.6) | 5.0 (3.5, 7.2) | 6.8 (4.8, 9.5) | | |
| Esop/Atlas | 2.8 (1.2, 6.7) | 4.1 (2.0, 8.5) | 6.0 (3.1, 11.5) | | |
| *Adapter (cemented) | 4.1 (1.9, 9.0) | 9.9 (5.8, 16.5) | | | |
| *Adapter (cementless) | 3.1 (2.0, 4.7) | 5.7 (4.0, 8.1) | | | |
| *CBH Stem | 3.8 (1.7, 8.3) | 6.8 (3.5, 12.9) | | | |
| *K2 | 5.2 (3.4, 7.9) | | | | |
| *Profemur Z | 6.0 (3.4, 10.5) | 10.5 (6.8, 15.9) | 11.0 (7.3, 16.6) | | |
| *Quadra-H | 1.9 (1.4, 2.7) | 3.4 (2.1, 5.4) | | | |
| *UniSyn | 3.7 (2.1, 6.5) | 6.0 (3.8, 9.4) | 8.7 (5.6, 13.2) | | |
| **Bionik | 3.6 (2.3, 5.4) | 6.7 (4.8, 9.4) | | | |
| **Icon | 3.2 (1.8, 5.5) | 7.7 (5.2, 11.4) | | | |
| **Newly Identified** | | | | | |
| CPT/Low Profile Cup | 5.2 (1.7, 15.2) | 7.9 (3.0, 20.2) | 11.1 (4.6, 25.5) | | |
| ML Taper Kinectiv/Continuum | 3.3 (1.9, 5.8) | | | | |
| Spectron EF/R3 | 2.3 (1.3, 4.1) | | | | |
| Trabecular Metal/Trabecular Metal Shell | 4.8 (2.3, 9.8) | 5.5 (2.8, 10.8) | | | |
| *Anca_Fit | 2.9 (1.3, 6.4) | 5.1 (2.8, 9.3) | | | |
| *Edinburgh | 6.2 (3.1, 12.0) | 9.6 (5.3, 16.9) | | | |
| *Mayo | 3.0 (1.3, 7.1) | 6.8 (3.7, 12.3) | 6.8 (3.7, 12.3) | | |
| *Taper Fit | 1.3 (0.5, 3.5) | 3.1 (1.6, 5.9) | 8.0 (5.1, 12.3) | 11.5 (7.5, 17.4) | |
| **2000 Plus | 3.1 (1.2, 8.2) | 7.5 (3.8, 14.6) | | | |
| **Adept | 4.6 (1.9, 10.7) | | | | |
| **Fin II | 2.8 (2.0, 4.0) | 4.1 (3.0, 5.7) | | | |
| **Plasmacup | 6.4 (3.4, 12.0) | | | | |
| **Procotyl | 3.8 (1.9, 7.4) | | | | |

Note: ** Acetabular Component
* Femoral Component

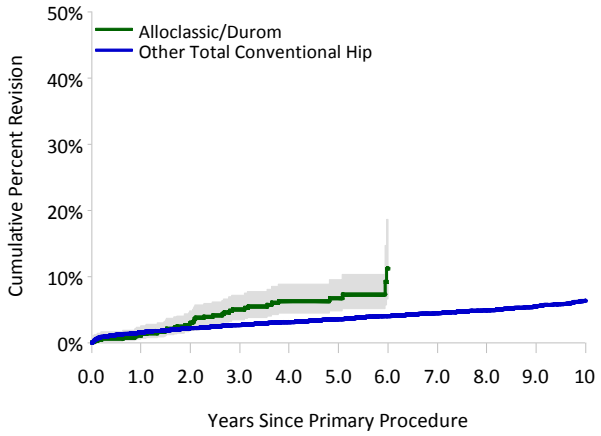
**Table IP9: Yearly Usage of Individual Total Conventional Hip identified as having a Higher than Anticipated Revision Rate**

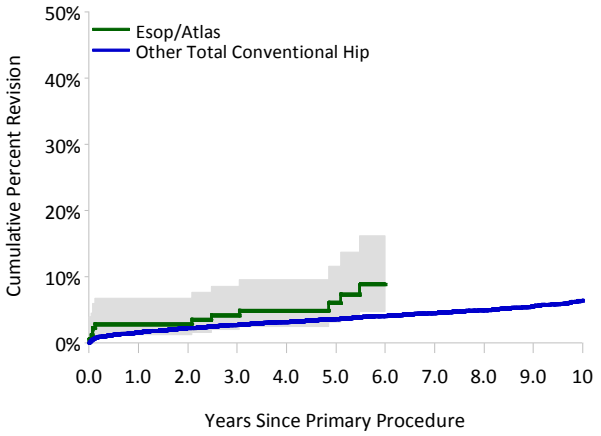
| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | | | | | | | | |
| Charnley/Duraloc | | 6 | 60 | 41 | 33 | 19 | 20 | 1 | | | | |
| Elite Plus/Apollo | | 9 | 16 | 17 | 10 | | | | | | | |
| Elite Plus/Charnley LPW | 3 | 19 | 23 | 29 | 15 | | | | | | | |
| F2L/Delta | | | | | | 10 | 62 | 28 | 10 | | | |
| H Moos/Mueller | | 5 | 9 | 5 | | | | | | | | |
| ML Taper/Fitmore | | | | | | | 7 | 11 | 24 | 70 | 3 | |
| S-Rom/Duraloc | 12 | 28 | 14 | 39 | 31 | 28 | 3 | 3 | 1 | 4 | 3 | |
| Secur-Fit Plus/Secur-Fit | | 1 | 40 | 60 | 27 | 21 | 26 | 22 | | | | |
| *LYDERIC II | | | 5 | 27 | 16 | 64 | 23 | 12 | 8 | 8 | | |
| *Margron | | 28 | 56 | 130 | 123 | 140 | 96 | 85 | 28 | 2 | | |
| *Revitan (non mod) | | | | 6 | 53 | 23 | | | | | | |
| **Artek | 12 | 33 | 111 | 22 | | | | | | | | |
| **ASR | | | | | | 84 | 583 | 958 | 1185 | 1173 | 427 | |
| **ExpanSys | | | | | 1 | 7 | 24 | 30 | 8 | 1 | | |
| **Hedrocel | | 2 | 9 | 26 | 9 | | | | | | | |
| **Inter-Op | | 9 | 24 | | | | | | | | | |
| **MBA | | | 8 | 41 | 29 | 19 | 11 | 9 | 5 | 2 | | |
| **SPH-Blind | | 32 | 116 | 228 | 262 | 204 | 41 | 49 | 19 | | | |
| **Re-Identified and still used** | | | | | | | | | | | | |
| Alloclassic/Durom | | | | | 3 | 51 | 151 | 139 | 113 | 112 | 46 | 7 |
| Esop/Atlas | | | | | 8 | 51 | 24 | 39 | 20 | 16 | 12 | 6 |
| *Adapter (cemented) | | | | | | | 7 | 41 | 52 | 33 | 8 | 7 |
| *Adapter (cementless) | | | | | | | 19 | 140 | 131 | 121 | 156 | 113 |
| *CBH Stem | | | | | | 12 | 7 | 14 | 37 | 28 | 27 | 44 |
| *K2 | | | | | | | | 1 | 22 | 80 | 169 | 198 |
| *Profemur Z | | | | | | 41 | 79 | 56 | 6 | 1 | 2 | 1 |
| *Quadra-H | | | | | | | | | 65 | 242 | 531 | 970 |
| *UniSyn | | | | 1 | 15 | 40 | 75 | 32 | 36 | 45 | 46 | 35 |
| **Bionik | | | | | | | 11 | 147 | 136 | 137 | 134 | 38 |
| **Icon | | | | | | 3 | 40 | 79 | 83 | 68 | 77 | 37 |
| **Newly Identified** | | | | | | | | | | | | |
| CPT/Low Profile Cup | | | | | | 15 | 9 | 8 | 7 | 7 | 6 | 9 |
| ML Taper Kinectiv/Continuum | | | | | | | | | | | 40 | 359 |
| Spectron EF/R3 | | | | | | | | | | 113 | 224 | 224 |
| Trabecular Metal/Trabecular Metal Shell | | | | | | | | 4 | 48 | 37 | 56 | 4 |
| *Anca_Fit | | | | | | 9 | 21 | 52 | 67 | 31 | 16 | 10 |
| *Edinburgh | | | | | | | 20 | 37 | 29 | 18 | 23 | 10 |
| *Mayo | | 1 | | 9 | 11 | 14 | 23 | 24 | 25 | 29 | 29 | 2 |
| *Taper Fit | | | 14 | 16 | 34 | 65 | 50 | 66 | 26 | 18 | 6 | 8 |
| **2000 Plus | | | | | | | 11 | 23 | 42 | 14 | 18 | 25 |
| **Adept | | | | | | | | 19 | 20 | 29 | 30 | 11 |
| **Fin II | | | | | | | 39 | 127 | 175 | 250 | 261 | 301 |
| **Plasmacup | | | | | | | 10 | 16 | 13 | 7 | 53 | 60 |
| **Procotyl | | | | | | | | | | 8 | 32 | 265 |

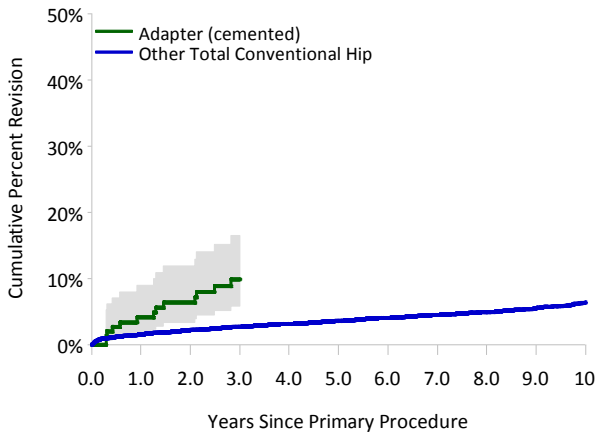
Note: ** Acetabular Component
* Femoral Component

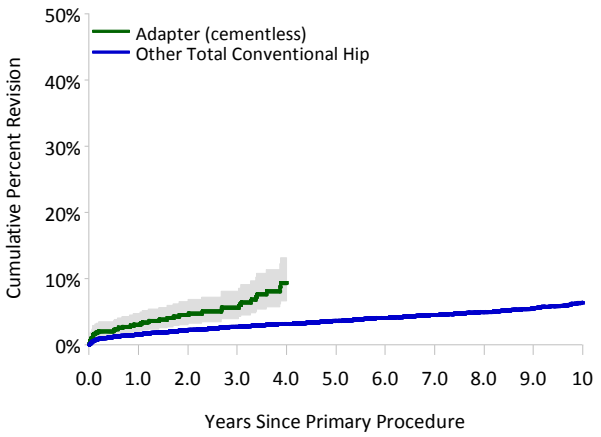
**Figure IP3: Cumulative Percent Revision of Individual Total Conventional Hip re-identified and still used**

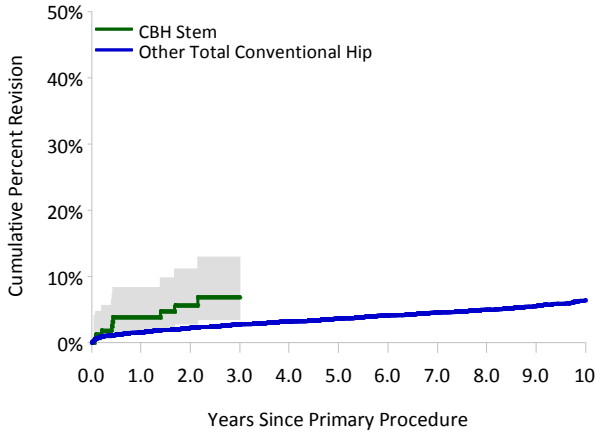
**Re-identified and still used**

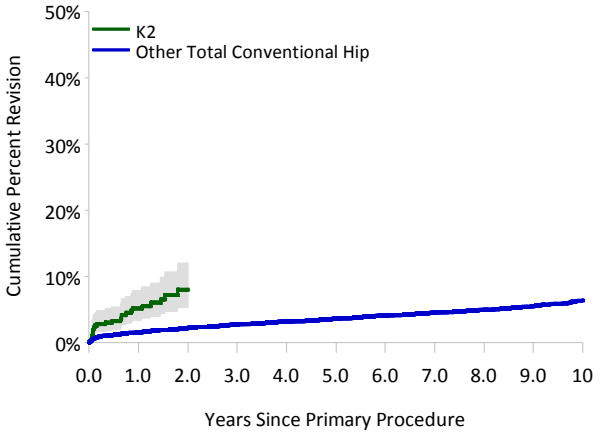


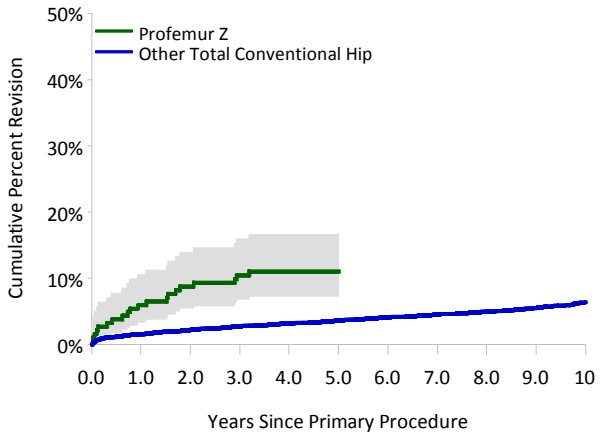



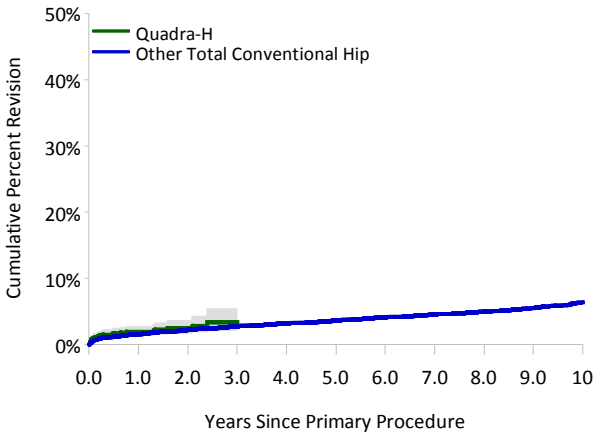



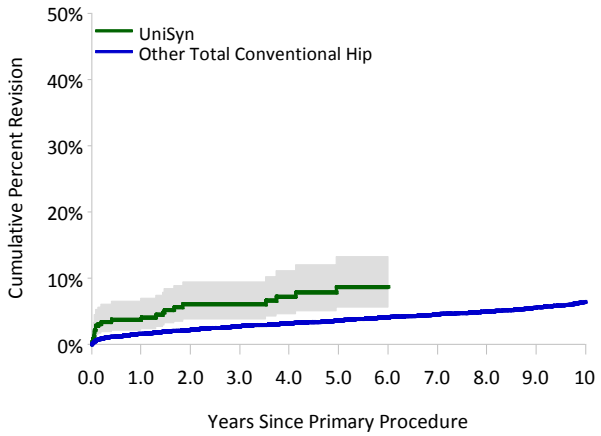



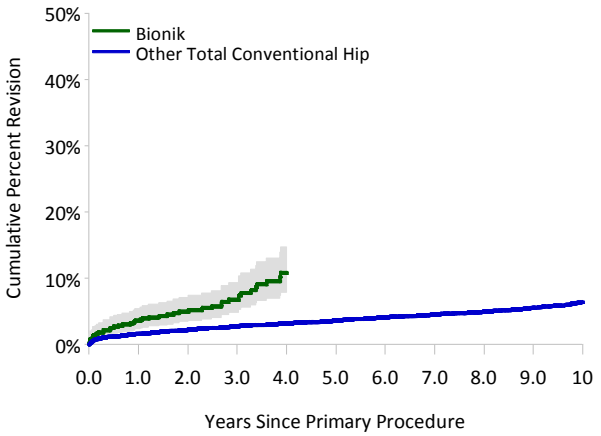




Profemur Z
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


Quadra-H
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


UniSyn
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


Bionik
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure

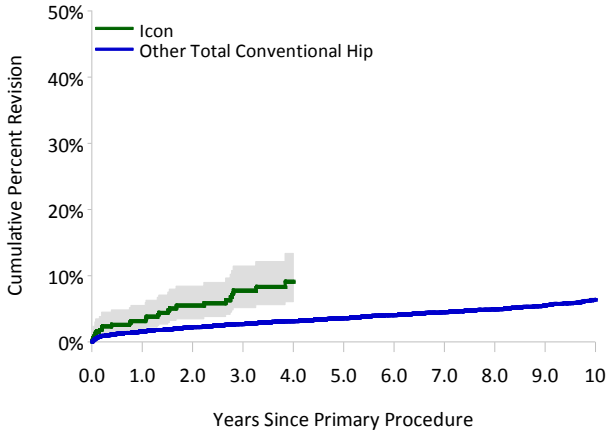
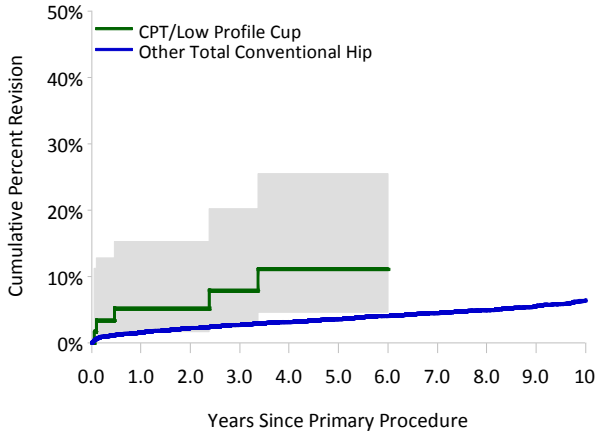
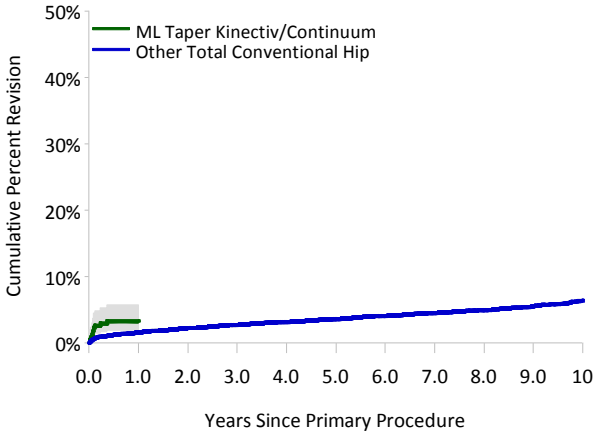
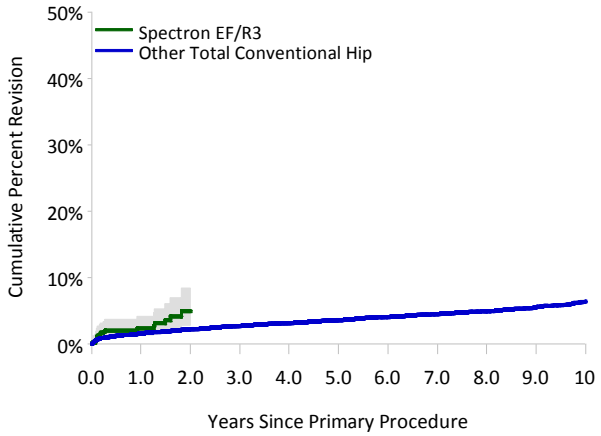

Icon
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure

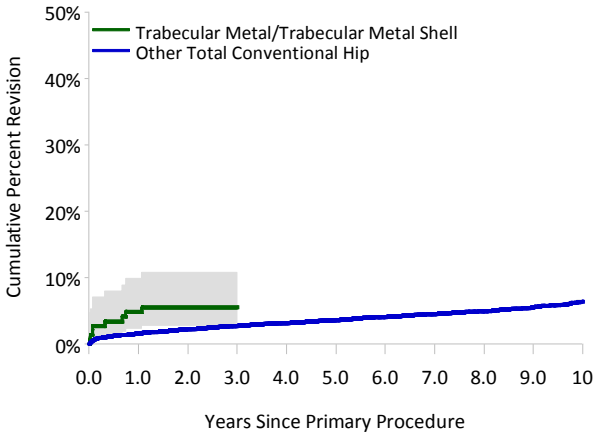
**Figure IP4: Cumulative Percent Revision of Individual Total Conventional Hip newly identified**

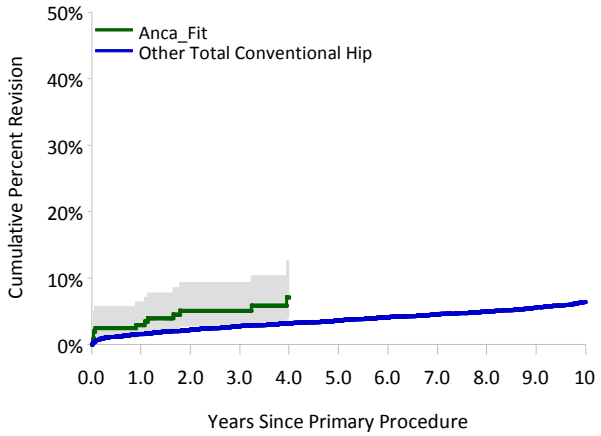
**Newly Identified**

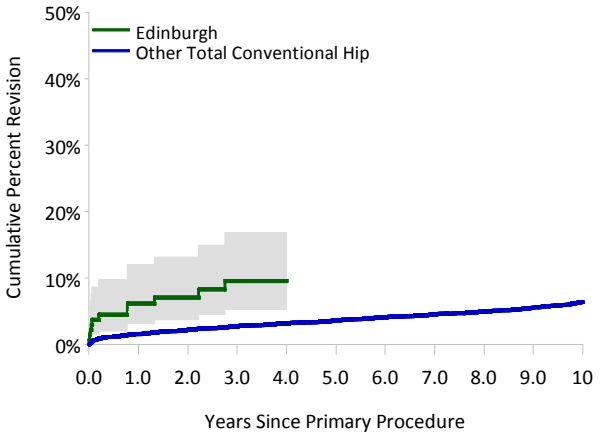


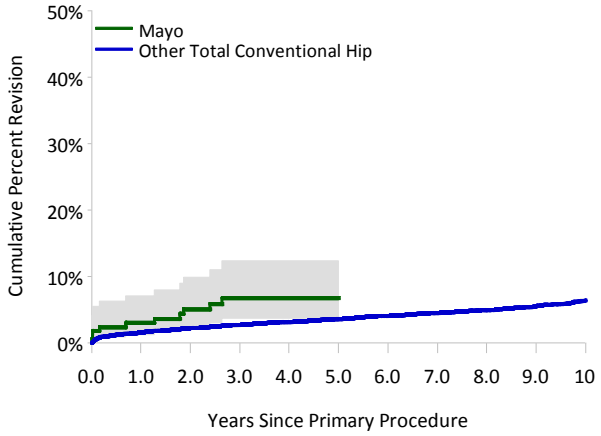



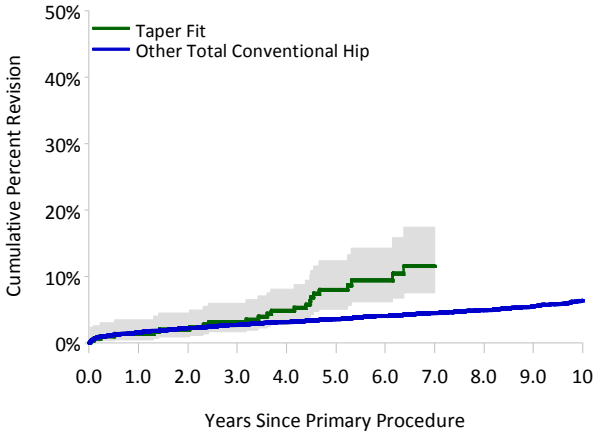



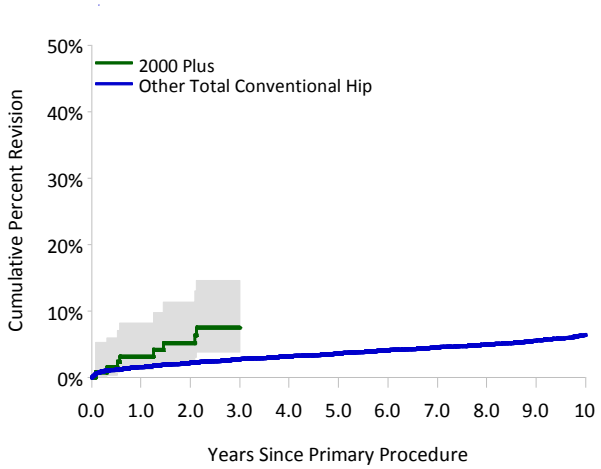



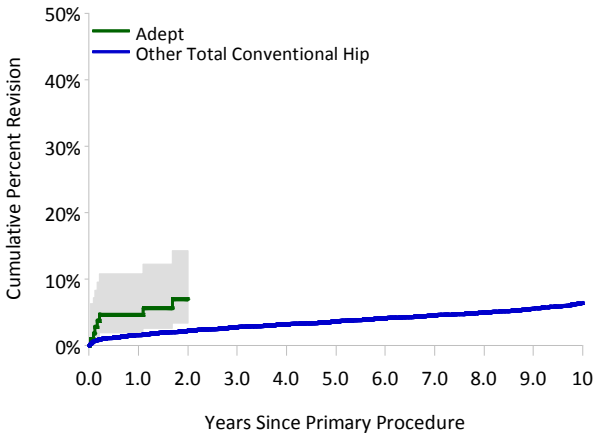



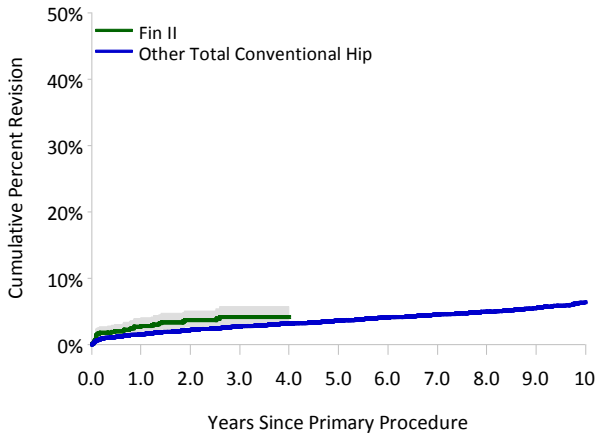



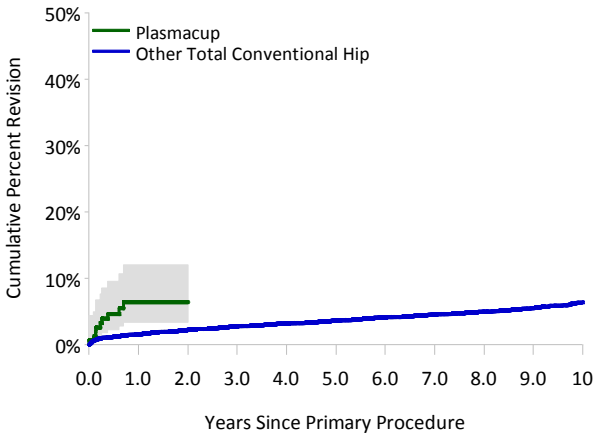

Mayo
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure

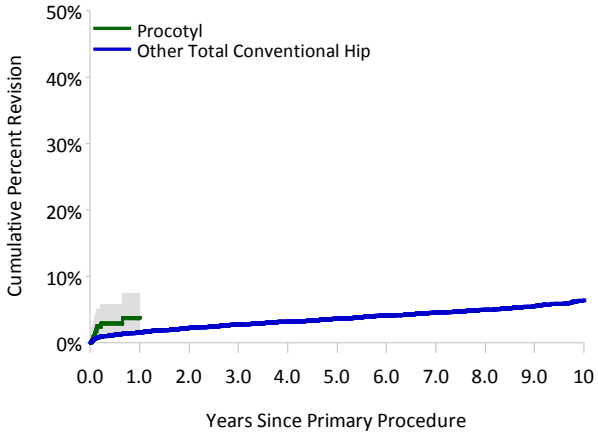

Taper Fit
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


2000 Plus
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


Adept
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


Fin II
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


Plasmacup
Other Total Conventional Hip
Cumulative Percent Revision
50%
40%
30%
20%
10%
0%
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10
Years Since Primary Procedure


50%
40%
30%
20%
10%
0%
Cumulative Percent Revision
Procotyl
Other Total Conventional Hip
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10
Years Since Primary Procedure

## Total Resurfacing

The Recap resurfacing hip prosthesis has been newly identified this year. Although it was identified prior to 2010 it is regarded as a newly identified prostheses because it was not identified last year. This year, the three year cumulative percent revision is 6.0% (adj HR=2.17; 95%CI (1.25, 3.76), p=0.005).

Four resurfacing devices have previously been identified as having a higher than anticipated rate of revision. Two of these are still available on the market. They are the Durom and the Bionik resurfacing hip prostheses. Both continue to have a higher than anticipated rate of revision.

**Table IP10: Revision Rate of Individual Total Resurfacing Hip identified as having a Higher than Anticipated Revision Rate**

| Resurfacing Head/Acetabular | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Identified and no longer used** | | | | |
| ASR/ASR | 1167 | 4932 | 2.09 | Entire Period: HR=2.24 (1.81, 2.77),p<0.001 |
| *Cormet 2000 HAP | 95 | 627 | 2.07 | Entire Period: HR=2.47 (1.43, 4.28),p=0.001 |
| **Re-Identified and still used** | | | | |
| Bionik/Bionik | 192 | 495 | 3.64 | Entire Period: HR=3.48 (2.17, 5.57),p<0.001 |
| Durom/Durom | 837 | 3723 | 1.56 | Entire Period: HR=1.74 (1.32, 2.28),p<0.001 |
| **Newly Identified** | | | | |
| Recap/Recap | 192 | 577 | 2.25 | Entire Period: HR=2.17 (1.25, 3.76),p=0.005 |

Note: All Components have been compared to all other Total Resurfacing Hip components.
* Resurfacing Head Component

**Table IP11: Yearly Cumulative Percent Revision of Individual Total Resurfacing Hip identified as having a Higher than Anticipated Revision Rate**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | |
| ASR/ASR | 3.3 (2.5, 4.5) | 5.9 (4.7, 7.5) | 10.5 (8.6, 12.7) | 13.0 (9.3, 17.9) | |
| *Cormet 2000 HAP | 6.3 (2.9, 13.5) | 8.4 (4.3, 16.1) | 9.5 (5.0, 17.4) | 12.6 (7.4, 21.2) | |
| **Re-Identified and still used** | | | | | |
| Bionik/Bionik | 3.8 (1.8, 7.7) | 10.0 (6.1, 16.4) | | | |
| Durom/Durom | 3.1 (2.2, 4.6) | 5.4 (4.0, 7.2) | 7.3 (5.6, 9.5) | 9.6 (6.7, 13.7) | |
| **Newly Identified** | | | | | |
| Recap/Recap | 4.3 (2.2, 8.4) | 6.0 (3.4, 10.7) | | | |

**Table IP12: Yearly Usage of Individual Total Resurfacing Hip identified as having a Higher than Anticipated Revision Rate**

| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | | | | | | | | |
| ASR/ASR | | | | | 43 | 165 | 302 | 257 | 176 | 133 | 91 | |
| *Cormet 2000 HAP | | | 1 | 17 | 38 | 39 | | | | | | |
| **Re-Identified and still used** | | | | | | | | | | | | |
| Bionik/Bionik | | | | | | | 12 | 33 | 33 | 45 | 54 | 15 |
| Durom/Durom | | | | | 58 | 166 | 207 | 143 | 105 | 88 | 46 | 24 |
| **Newly Identified** | | | | | | | | | | | | |
| Recap/Recap | | | | | | 27 | 14 | 9 | 42 | 46 | 38 | 16 |

**Figure IP5: Cumulative Percent Revision of Individual Total Resurfacing Hip re-identified and still used**

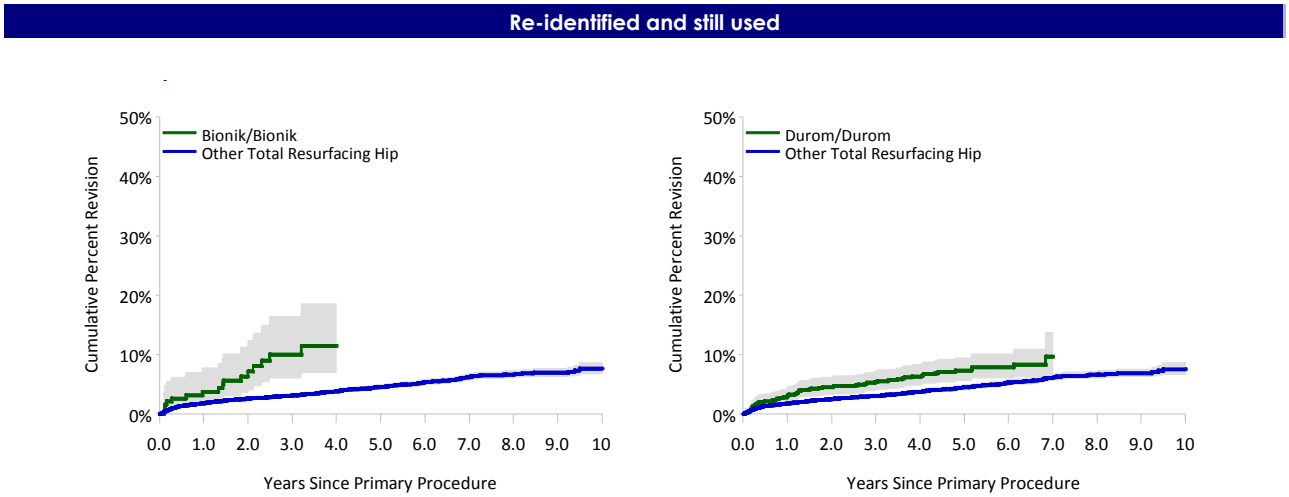
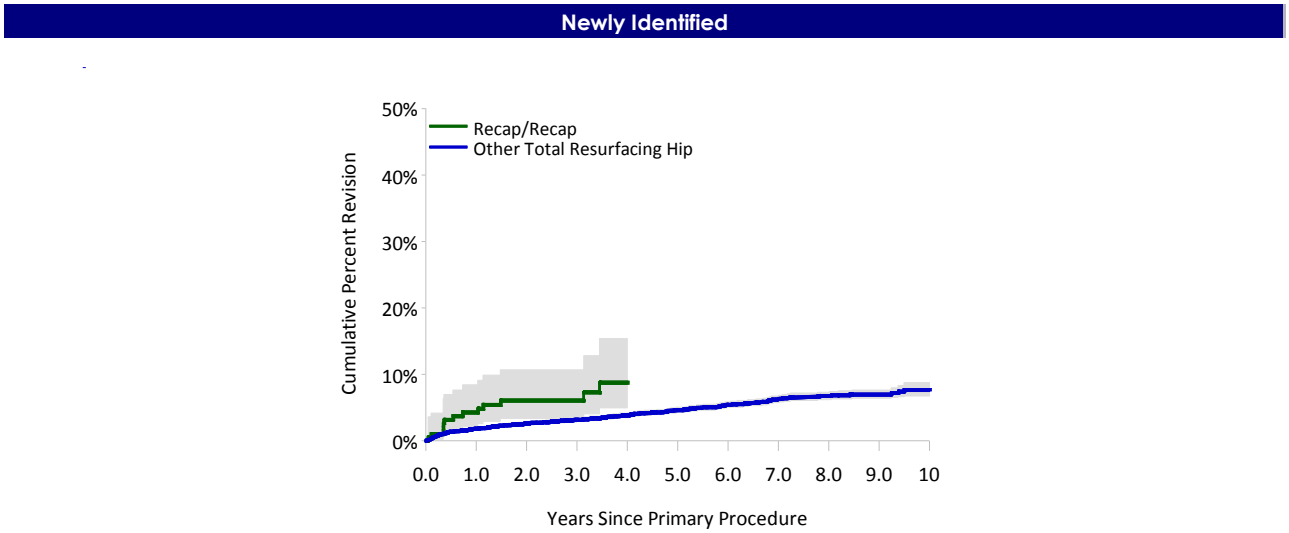



**Figure IP6: Cumulative Percent Revision of Individual Total Resurfacing Hip newly identified**



# Primary Partial Knee Replacement

## Patella/Trochlear

There is one patella/trochlear prosthesis, the PFC Sigma/Sigma HP combination, that is being identified for the first time as having a higher than anticipated rate of revision compared to all other patella/trochlear prostheses. At three years it has a cumulative percent revision rate of 25.5% (adj HR=3.58; 95%CI (1.58, 8.15), p=0.002)

**Table IP13: Revision Rate of Individual Patella/Trochlear Knee identified as having a Higher than Anticipated Revision Rate**

| Patella/Trochlear | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Identified and no longer used** | | | | |
| **LCS | 413 | 1762 | 5.28 | Entire Period: HR=1.88 (1.44, 2.45),p<0.001 |
| **Newly Identified** | | | | |
| PFC Sigma/Sigma HP | 41 | 64 | 9.42 | Entire Period: HR=3.58 (1.58, 8.15),p=0.002 |

Note: All Components have been compared to all other Patella/Trochlear Knee components.
** Trochlear Component

**Table IP14: Yearly Cumulative Percent Revision of Individual Patella/Trochlear Knee identified as having a Higher than Anticipated Revision Rate**

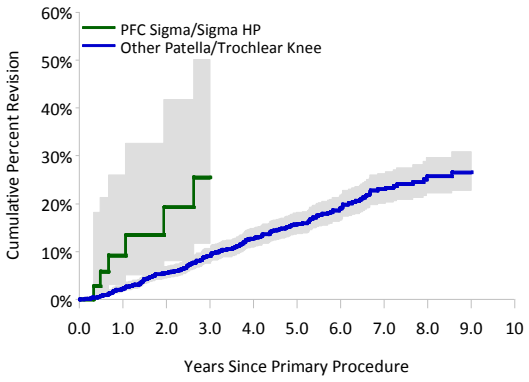
| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | |
| **LCS | 3.9 (2.4, 6.2) | 12.2 (9.3, 15.9) | 21.8 (17.6, 26.9) | 34.9 (28.5, 42.2) | |
| **Newly Identified** | | | | | |
| PFC Sigma/Sigma HP | 9.2 (3.0, 25.9) | 25.5 (11.7, 50.1) | | | |

**Table IP15: Yearly Usage of Individual Patella/Trochlear Knee identified as having a Higher than Anticipated Revision Rate**

| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | | | | | | | | |
| **LCS | | | | 26 | 56 | 68 | 47 | 65 | 64 | 60 | 27 | |
| **Newly Identified** | | | | | | | | | | | | |
| PFC Sigma/Sigma HP | | | | | | | | | 14 | 6 | 5 | 16 |

**Figure IP7: Cumulative Percent Revision of Individual Patella/Trochlear Knee newly identified**

**Newly Identified**



## Unicompartmental

The GMK-UNI prosthesis combination is newly identified. It has only been used in a small number of procedures (16) however it has a cumulative percent revision at one year of 20.7%. One of the four revisions was due to femoral prosthesis breakage (adj HR=8.41; 95%CI (3.15, 22.44), p<0.001).

**Table IP16: Revision Rate of Individual Unicompartmental Knee identified as having a Higher than Anticipated Revision Rate**

| Femoral/Tibial | N Total | Obs. Years | Revisions/100 Obs. Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Identified and no longer used** | | | | |
| Advance/Advance | 37 | 168 | 7.16 | Entire Period: HR=4.34 (2.46, 7.65),p<0.001 |
| **Preservation Mobile | 400 | 2453 | 3.51 | 0 - 1.5Yr: HR=2.22 (1.59, 3.11),p<0.001<br>1.5Yr - 3Yr: HR=2.55 (1.73, 3.74),p<0.001<br>3Yr+: HR=1.13 (0.75, 1.70),p=0.553 |
| **Re-Identified and still used** | | | | |
| AMC/AMC | 643 | 2505 | 2.91 | Entire Period: HR=1.50 (1.19, 1.89),p<0.001 |
| BalanSys Uni/BalanSys Uni Mobile | 199 | 832 | 3.48 | 0 - 6Mth: HR=5.02 (2.49, 10.12),p<0.001<br>6Mth+: HR=1.46 (0.95, 2.25),p=0.083 |
| Eius/Eius | 141 | 680 | 3.82 | Entire Period: HR=1.73 (1.17, 2.55),p=0.005 |
| **Newly Identified** | | | | |
| GMK-UNI/GMK-UNI | 16 | 23 | 17.18 | Entire Period: HR=8.41 (3.15, 22.44),p<0.001 |

Note: All Components have been compared to all other Unicompartmental Knee components.
** Unicompartmental Tibial Component

**Table IP17: Yearly Cumulative Percent Revision of Individual Unicompartmental Knee identified as having a Higher than Anticipated Revision Rate**

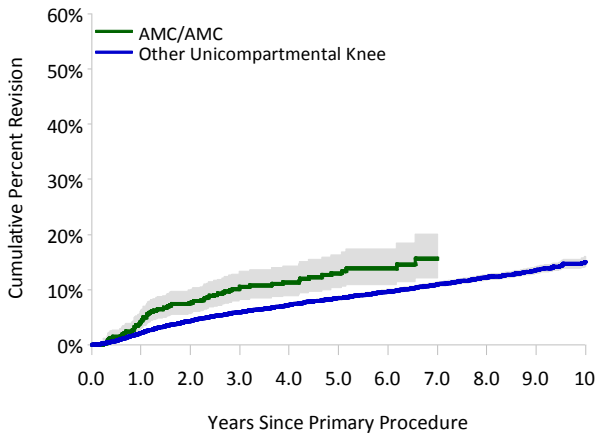
| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | |
| Advance/Advance | 10.8 (4.2, 26.3) | 27.1 (15.6, 44.6) | 30.6 (18.2, 48.6) | 34.3 (20.9, 52.7) | |
| **Preservation Mobile | 5.3 (3.5, 7.9) | 15.5 (12.3, 19.5) | 19.0 (15.5, 23.2) | 21.7 (17.9, 26.2) | |
| **Re-Identified and still used** | | | | | |
| AMC/AMC | 4.2 (2.9, 6.1) | 10.5 (8.3, 13.4) | 13.0 (10.3, 16.3) | 15.6 (12.1, 20.1) | |
| BalanSys Uni/BalanSys Uni Mobile | 7.1 (4.3, 11.7) | 13.4 (9.3, 19.0) | 15.4 (10.9, 21.5) | | |
| Eius/Eius | 5.0 (2.4, 10.2) | 12.6 (8.0, 19.4) | 18.6 (12.8, 26.6) | | |
| **Newly Identified** | | | | | |
| GMK-UNI/GMK-UNI | 20.7 (7.1, 51.5) | | | | |

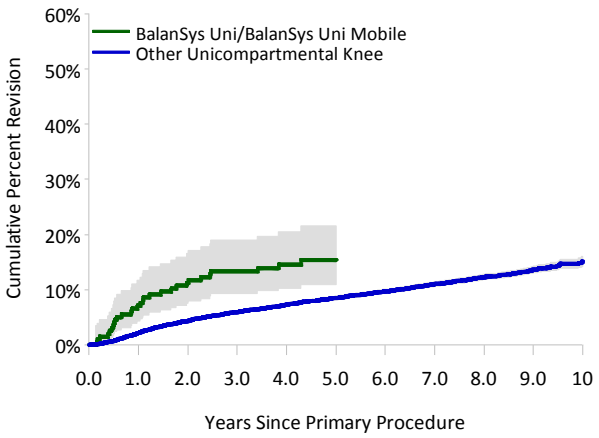
**Table IP18: Yearly Usage of Individual Unicompartmental Knee identified as having a Higher than Anticipated Revision Rate**

| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | | | | | | | | |
| Advance/Advance | | | | | 13 | 11 | 7 | 2 | 3 | 1 | | |
| **Preservation Mobile | | | 15 | 149 | 121 | 59 | 26 | 17 | 13 | | | |
| **Re-Identified and still used** | | | | | | | | | | | | |
| AMC/AMC | | | | | 80 | 66 | 123 | 84 | 107 | 93 | 61 | 29 |
| BalanSys Uni/BalanSys Uni Mobile | | | | | | 37 | 51 | 63 | 33 | 9 | 2 | 4 |
| Eius/Eius | | | | 10 | 21 | 27 | 37 | 21 | 8 | 8 | 7 | 2 |
| **Newly Identified** | | | | | | | | | | | | |
| GMK-UNI/GMK-UNI | | | | | | | | | | 5 | 9 | 2 |

**Figure IP8: Cumulative Percent Revision of Individual Unicompartmental Knee re-identified and still used**

**Re-identified and still used**



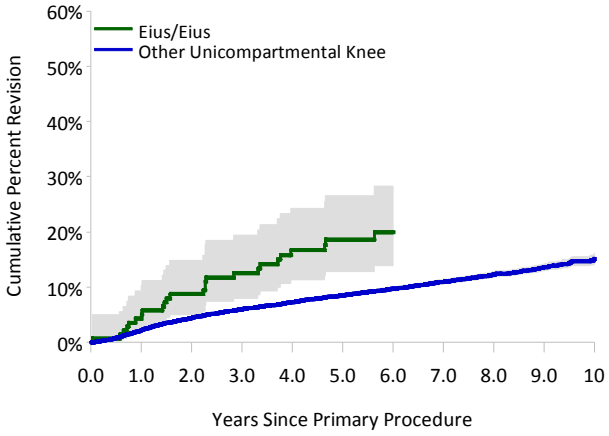
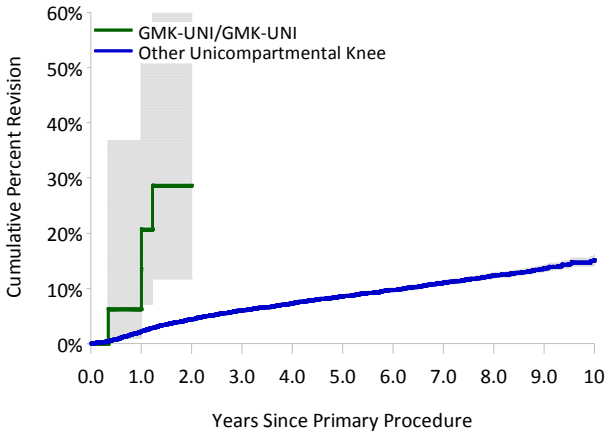




**Figure IP9: Cumulative Percent Revision of Individual Unicompartmental Knee newly identified**

**Newly Identified**



## Primary Total Knee Replacement

Buechel Pappas and HLS Noetos are newly identified.

Buechel Pappas has been used in 418 procedures and has a three year cumulative percent revision of 6.3%. Of the 16 revisions, four were for loosening/lysis, four for instability and two for pain. (adj HR=2.02; 95%CI (1.24, 3.30) p=0.004).

HLS Noetos has been used in 244 procedures and has a three year cumulative percent revision of 6.5%. Of the 12 revisions, ten were patella only revisions (adj HR=2.18; 95%CI (1.24, 3.83), p=0.007).

All primary total knee replacement prostheses previously identified as having a higher than anticipated rate of revision have been re-identified again this year.

**Table IP19: Revision Rate of Individual Total Knee identified as having a Higher than Anticipated Revision Rate**

| Femoral/Tibial | N Total | Obs. Years | Revisions/ 100 Obs.Yrs | Hazard Ratio, P Value |
|---|---|---|---|---|
| **Identified and no longer used** | | | | |
| AMK/AMK | 424 | 3302 | 1.00 | Entire Period: HR=1.63 (1.15, 2.29),p=0.005 |
| Eska RP/Eska RP | 40 | 147 | 4.76 | Entire Period: HR=6.17 (2.95, 12.93),p<0.001 |
| Gemini MK II/Gemini MK II | 21 | 139 | 3.61 | Entire Period: HR=5.19 (2.16, 12.47),p<0.001 |
| Genesis (cemented)/Genesis (cemented) | 62 | 439 | 2.05 | Entire Period: HR=3.50 (1.82, 6.72),p<0.001 |
| Genesis II Oxinium (cementless)/Genesis II | 110 | 546 | 7.88 | Entire Period: HR=9.96 (7.38, 13.44),p<0.001 |
| Genesis II Oxinium (cementless)/MBK | 88 | 347 | 14.99 | Entire Period: HR=17.76 (13.52, 23.34),p<0.001 |
| Genesis II Oxinium PS (cemented)/Genesis II (Keel) | 269 | 996 | 4.42 | Entire Period: HR=4.88 (3.63, 6.57),p<0.001 |
| IB II/IB II | 199 | 1608 | 1.74 | 0 - 2Yr: HR=0.77 (0.25, 2.37),p=0.642<br>2Yr - 2.5Yr: HR=4.58 (1.48, 14.24),p=0.008<br>2.5Yr+: HR=5.00 (3.29, 7.62),p<0.001 |
| Interax/Interax | 58 | 441 | 2.04 | Entire Period: HR=3.62 (1.88, 6.95),p<0.001 |
| Optetrak-PS/Optetrak-PS | 55 | 236 | 5.08 | Entire Period: HR=7.09 (4.02, 12.49),p<0.001 |
| Profix Oxinium (cementless)/MBK | 158 | 784 | 8.54 | Entire Period: HR=11.44 (8.99, 14.55),p<0.001 |
| Profix Oxinium (cementless)/Profix | 75 | 386 | 7.52 | Entire Period: HR=9.36 (6.50, 13.47),p<0.001 |
| Rotaglide Plus/Rotaglide Plus | 631 | 3842 | 1.20 | 0 - 1.5Yr: HR=1.14 (0.65, 2.01),p=0.655<br>1.5Yr+: HR=2.15 (1.53, 3.01),p<0.001 |
| Trac/Trac | 138 | 1086 | 1.66 | Entire Period: HR=2.55 (1.61, 4.06),p<0.001 |
| *Renasys | 121 | 529 | 1.70 | Entire Period: HR=2.14 (1.12, 4.12),p=0.022 |
| **Re-Identified and still used** | | | | |
| Columbus/Columbus | 668 | 1579 | 1.96 | Entire Period: HR=2.14 (1.51, 3.05),p<0.001 |
| Genesis II CR (cementless)/Genesis II (cementless) | 193 | 553 | 1.99 | Entire Period: HR=2.04 (1.13, 3.68),p=0.017 |
| Journey/Journey | 2122 | 4181 | 1.79 | 0 - 3Mth: HR=0.16 (0.02, 1.13),p=0.065<br>3Mth - 9Mth: HR=1.49 (0.88, 2.52),p=0.138<br>9Mth+: HR=2.18 (1.69, 2.81),p<0.001 |
| Optetrak-CR/Optetrak | 391 | 2067 | 1.11 | Entire Period: HR=1.62 (1.08, 2.44),p=0.021 |
| Optetrak-PS/Optetrak | 1695 | 6541 | 1.50 | Entire Period: HR=1.91 (1.57, 2.33),p<0.001 |
| Optetrak-PS/Optetrak RBK | 621 | 1537 | 2.47 | Entire Period: HR=2.64 (1.92, 3.63),p<0.001 |
| Profix/Mobile Bearing Knee | 1233 | 7209 | 1.50 | Entire Period: HR=2.08 (1.72, 2.51),p<0.001 |
| TC-Plus/TC-Plus | 132 | 395 | 1.77 | Entire Period: HR=2.11 (1.01, 4.42),p=0.048 |
| **Newly Identified** | | | | |
| Buechel-Pappas/Buechel-Pappas | 418 | 738 | 2.17 | Entire Period: HR=2.02 (1.24, 3.30),p=0.004 |
| HLS Noetos/HLS Noetos | 244 | 577 | 2.08 | Entire Period: HR=2.18 (1.24, 3.83),p=0.007 |

Note: All Components have been compared to all other Total Knee components.
* Femoral Component

**Table IP20: Yearly Cumulative Percent Revision of Individual Total Knee identified as having a Higher than Anticipated Revision Rate**

| CPR | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs |
|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | |
| AMK/AMK | 1.4 (0.7, 3.2) | 4.6 (3.0, 7.1) | 5.6 (3.8, 8.3) | 6.7 (4.6, 9.6) | 9.0 (6.4, 12.5) |
| Eska RP/Eska RP | 7.5 (2.5, 21.5) | 12.9 (5.6, 28.3) | 18.7 (9.3, 35.4) | | |
| 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 (cemented)/Genesis (cemented) | 0.0 (0.0, 0.0) | 6.7 (2.6, 16.8) | 10.0 (4.6, 20.9) | 13.5 (7.0, 25.3) | |
| Genesis II Oxinium (cementless)/Genesis II | 11.0 (6.4, 18.6) | 38.3 (29.8, 48.2) | 39.3 (30.7, 49.2) | 39.3 (30.7, 49.2) | |
| Genesis II Oxinium (cementless)/MBK | 24.0 (16.3, 34.4) | 52.8 (42.8, 63.5) | 57.4 (47.4, 67.9) | 58.6 (48.5, 69.0) | |
| Genesis II Oxinium PS (cemented)/Genesis II (Keel) | 4.5 (2.6, 7.7) | 14.5 (10.8, 19.3) | | | |
| IB II/IB II | 0.0 (0.0, 0.0) | 3.6 (1.7, 7.3) | 7.8 (4.8, 12.7) | 11.8 (7.9, 17.3) | |
| Interax/Interax | 0.0 (0.0, 0.0) | 5.4 (1.8, 15.7) | 11.1 (5.1, 23.0) | 15.4 (8.0, 28.6) | 15.4 (8.0, 28.6) |
| Optetrak-PS/Optetrak-PS | 1.8 (0.3, 12.2) | 16.4 (8.9, 29.1) | 22.7 (12.9, 38.3) | | |
| Profix Oxinium (cementless)/MBK | 9.0 (5.4, 14.6) | 40.2 (32.9, 48.3) | 41.5 (34.2, 49.7) | 43.6 (36.2, 51.8) | |
| Profix Oxinium (cementless)/Profix | 13.3 (7.4, 23.4) | 36.1 (26.4, 48.1) | 37.5 (27.6, 49.5) | 37.5 (27.6, 49.5) | |
| Rotaglide Plus/Rotaglide Plus | 0.8 (0.3, 1.9) | 4.1 (2.8, 6.0) | 5.9 (4.3, 8.1) | 8.0 (6.0, 10.6) | |
| Trac/Trac | 2.2 (0.7, 6.6) | 5.9 (3.0, 11.4) | 9.0 (5.2, 15.2) | 9.8 (5.8, 16.2) | |
| *Renasys | 2.5 (0.8, 7.5) | 4.2 (1.8, 9.8) | 8.2 (4.3, 15.2) | | |
| **Re-Identified and still used** | | | | | |
| Columbus/Columbus | 2.5 (1.5, 4.1) | 5.7 (3.9, 8.3) | 6.8 (4.6, 9.9) | | |
| Genesis II CR (cementless)/Genesis II (cementless) | 1.3 (0.3, 4.9) | 8.6 (4.6, 15.6) | | | |
| Journey/Journey | 1.6 (1.1, 2.3) | 5.3 (4.1, 6.7) | | | |
| Optetrak-CR/Optetrak | 1.3 (0.5, 3.1) | 4.4 (2.7, 7.0) | 5.5 (3.5, 8.6) | 7.7 (5.1, 11.6) | |
| Optetrak-PS/Optetrak | 1.6 (1.1, 2.3) | 5.4 (4.3, 6.7) | 7.0 (5.7, 8.6) | 9.3 (7.4, 11.7) | |
| Optetrak-PS/Optetrak RBK | 2.7 (1.7, 4.4) | 7.9 (5.6, 11.0) | | | |
| Profix/Mobile Bearing Knee | 2.2 (1.5, 3.2) | 6.4 (5.1, 7.9) | 8.4 (7.0, 10.2) | 9.5 (7.9, 11.4) | |
| TC-Plus/TC-Plus | 1.9 (0.5, 7.5) | 7.8 (3.5, 16.8) | 7.8 (3.5, 16.8) | | |
| **Newly Identified** | | | | | |
| Buechel-Pappas/Buechel-Pappas | 2.2 (1.1, 4.6) | 6.3 (3.8, 10.2) | | | |
| HLS Noetos/HLS Noetos | 3.3 (1.6, 6.8) | 6.5 (3.7, 11.4) | | | |

Note: * Femoral Component

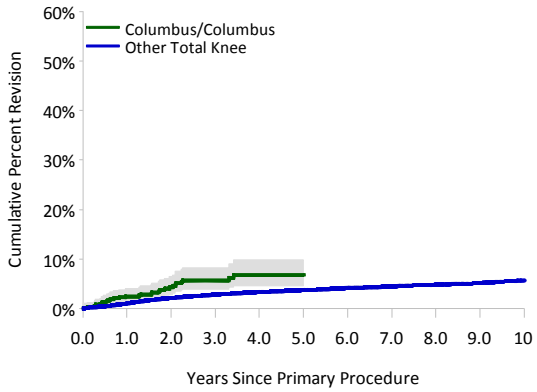
**Table IP21: Yearly Usage of Individual Total Knee identified as having a Higher than Anticipated Revision Rate**

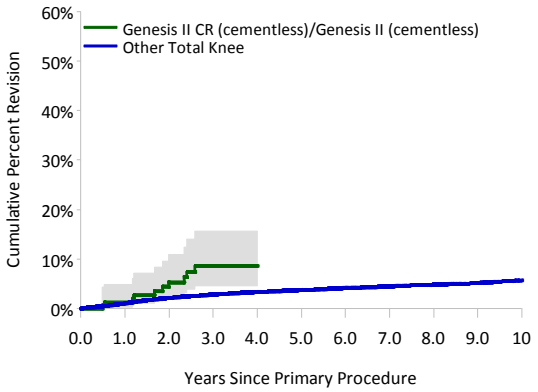
| Year of Implant | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Identified and no longer used** | | | | | | | | | | | | |
| AMK/AMK | 41 | 108 | 134 | 53 | 51 | 37 | | | | | | |
| Eska RP/Eska RP | | | | | | | 9 | 24 | 5 | 0 | 2 | |
| Gemini MK II/Gemini MK II | | | 4 | 10 | 7 | | | | | | | |
| Genesis (cemented)/Genesis (cemented) | | 18 | 19 | 8 | 6 | 3 | 8 | | | | | |
| Genesis II Oxinium (cementless)/Genesis II | | | | 4 | 106 | | | | | | | |
| Genesis II Oxinium (cementless)/MBK | | | | 22 | 66 | | | | | | | |
| Genesis II Oxinium PS (cemented)/Genesis II (Keel) | | | | | | | 18 | 124 | 127 | | | |
| IB II/IB II | | 64 | 90 | 33 | 12 | | | | | | | |
| Interax/Interax | 10 | 30 | 18 | | | | | | | | | |
| Optetrak-PS/Optetrak-PS | | | | | | 8 | 14 | 18 | 15 | | | |
| Profix Oxinium (cementless)/MBK | | | | 63 | 95 | | | | | | | |
| Profix Oxinium (cementless)/Profix | | | | 10 | 65 | | | | | | | |
| Rotaglide Plus/Rotaglide Plus | | | 56 | 125 | 151 | 110 | 101 | 43 | 30 | 15 | | |
| Trac/Trac | 7 | 36 | 52 | 33 | 9 | 1 | | | | | | |
| *Renasys | | | | | | | 51 | 53 | 3 | 14 | | |
| **Re-Identified and still used** | | | | | | | | | | | | |
| Columbus/Columbus | | | | | | | 49 | 92 | 89 | 148 | 156 | 134 |
| Genesis II CR (cementless)/Genesis II (cementless) | | 3 | 8 | 9 | 11 | 3 | 0 | 16 | 29 | 34 | 28 | 52 |
| Journey/Journey | | | | | | | | 134 | 337 | 592 | 596 | 463 |
| Optetrak-CR/Optetrak | | | 19 | 88 | 66 | 44 | 24 | 37 | 37 | 43 | 28 | 5 |
| Optetrak-PS/Optetrak | | 14 | 22 | 90 | 130 | 155 | 252 | 253 | 216 | 167 | 200 | 196 |
| Optetrak-PS/Optetrak RBK | | | | | | | 1 | 81 | 173 | 166 | 118 | 82 |
| Profix/Mobile Bearing Knee | | | 55 | 214 | 204 | 349 | 269 | 54 | 60 | 12 | 14 | 2 |
| TC-Plus/TC-Plus | | | | | 1 | 27 | 27 | 6 | 6 | 9 | 18 | 38 |
| **Newly Identified** | | | | | | | | | | | | |
| Buechel-Pappas/Buechel-Pappas | | | | | | | 1 | 39 | 51 | 84 | 100 | 143 |
| HLS Noetos/HLS Noetos | | | | | | 2 | 2 | 47 | 45 | 45 | 55 | 48 |

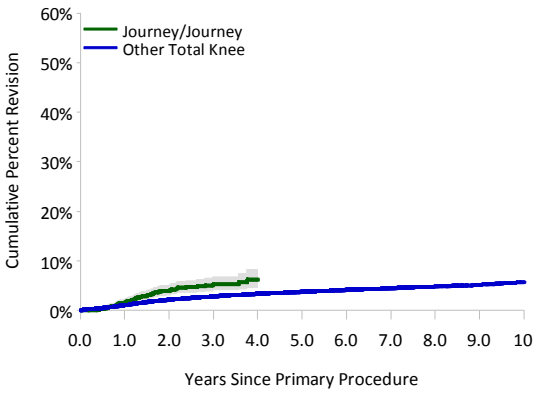
Note: * Femoral Component

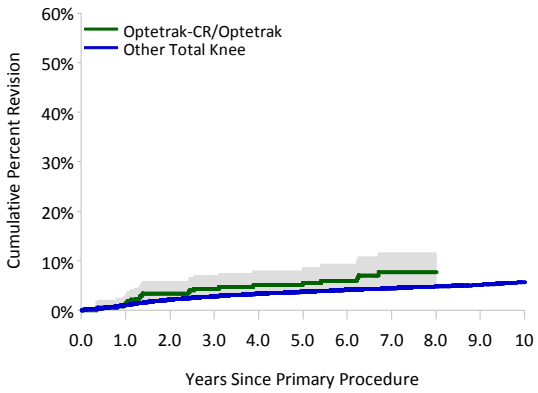
## Figure IP10: Cumulative Percent Revision of Individual Total Knee re-identified and still used

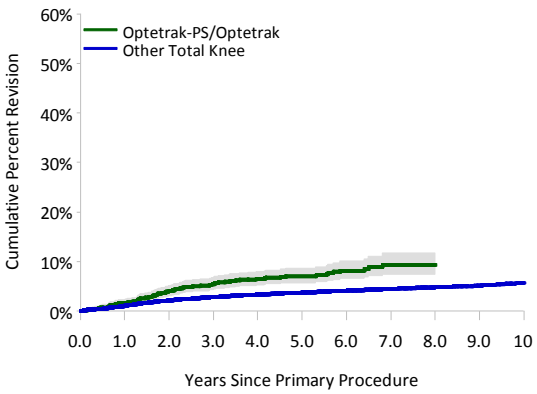
**Re-identified and still used**

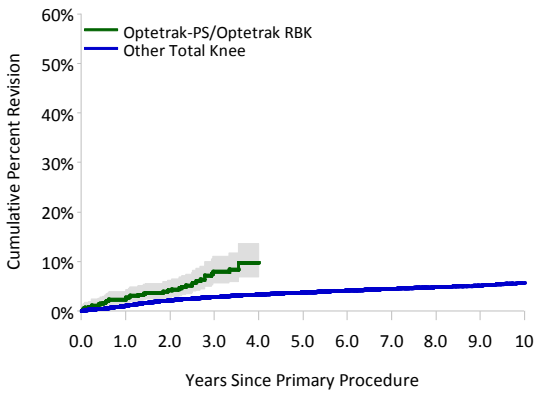


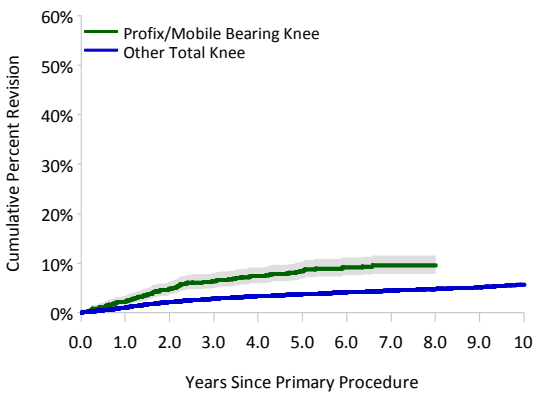



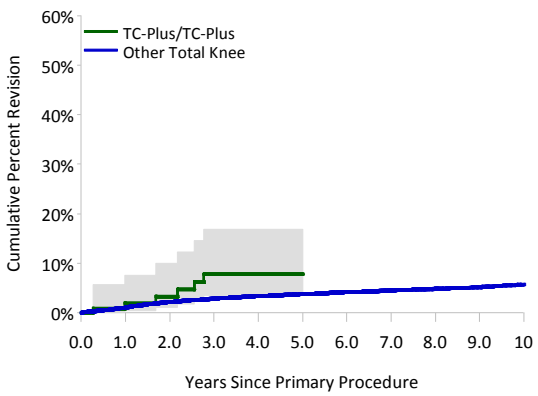
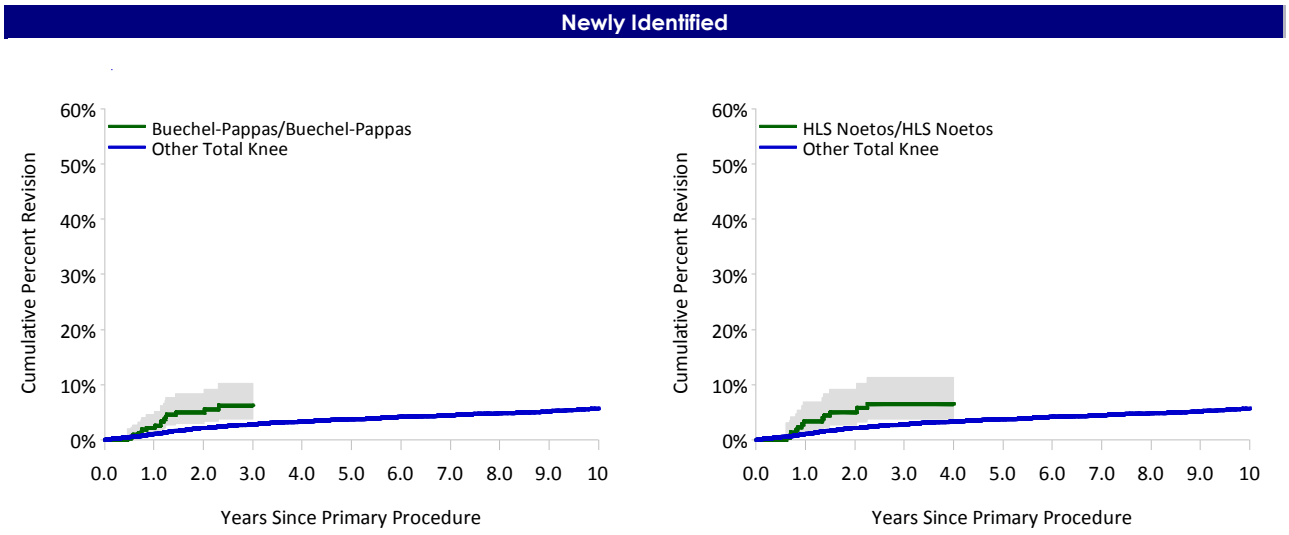



**Figure IP11: Cumulative Percent Revision of Individual Total Knee newly identified**



# APPENDICES

## APPENDIX 1

### Participating Hospitals & Coordinators

#### NEW SOUTH WALES

#### PUBLIC HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Albury Base Hospital | Elwyn Black | Nurse Manager Theatre |
| Armidale Hospital | Debbie Spokes/Cheryl Fardon | NUM Theatre/Theatre Clerk |
| Bankstown/Lidcombe Hospital | John Mati/Aron Priscion | CNS/RN Orthopaedic Theatre |
| Bathurst Base Hospital | Kylie Peers | NUM Theatre |
| Bega District Hospital | Melanie Rossi | RN Theatre |
| Blacktown Hospital | Diane Barben/Sergio Jumanong | NUM Theatre/A/Nurse Educator |
| Bowral and District Hospital | Barbara Wise | NUM Theatre |
| Broken Hill Health Service | Sue Beahl/Helen Gentle | NUM/RN Theatre |
| Campbelltown Hospital | Amanda Young | Theatre Reception |
| Canterbury Hospital | Jenny Cubit | NUM Theatre |
| Coffs Harbour Health Campus | Eric Dorman | NUM Theatre |
| Concord Repatriation Hospital | Monique Prowse | NUM Theatre |
| Dubbo Base Hospital | Cathy Chapman, Celia Taylor | Theatre Clerks |
| Fairfield Hospital | Cathy Jiear | Peri operative Services Manager |
| Gosford Hospital | Kirsty Brown | Set up Coordinator Theatre |
| Goulburn Base Hospital | Marta Daniel/Karen Goode | NUM Theatre/Theatre Admin Clerk |
| Hornsby & Ku-Ring-Gai Hospital | Bessie Chu | CNS Theatre |
| Institute of Rheumatology & Orthopaedic Surgery | Maria Hatziandreou | NUM Theatre |
| John Hunter Hospital | Felicia Bristow/Ken Schilling | Equipment Officer/Admin Equip Officer |
| Lismore Base Hospital | Glen Nettle | CNS Orthopaedic Theatre |
| Liverpool Health Service | John Murphy | NUM Orthopaedic Theatre |
| Maitland Hospital | Karen Cheers | NUM Theatre |
| Manly District Hospital | Heather Liddle/Maryanne Howell | NUM Theatre/RN Theatre |
| Manning Rural Referral Hospital | Grahame Cooke | RN Theatre |
| Mona Vale Hospital | Estelle vont Takach | CN Orthopaedic Theatre |
| Mt Druitt Hospital | Rhonda Sneddon | NUM Anaesthetics & Recovery |
| Murwillumbah District Hospital | Lynne Penglase | NUM Theatre |
| Nepean Hospital | Debbie Dobbs | RN Operating Theatres |
| Orange Health Service | Teresa Luczak | Senior Nurse Manager Theatre |
| Port Macquarie Base Hospital | Pam Campbell/Joanne Atkins | NUM Theatre/Theatre Clerk |
| Royal Newcastle Centre | Rosalee MacLeod | NUM Theatre |
| Royal North Shore Hospital | Eileen Cole | Research Physiotherapist/Dept Ortho |
| Royal Prince Alfred Hospital | Lisa Hatton | NUM Theatre |
| Ryde Hospital | Karen Jones/Maria Manna | NUM Theatre |
| Shoalhaven Group Hospital | Leanne McTavish | NUM Orthopaedic |
| St George Hospital | Simon Cheng | A/NUM Orthopaedic Theatre |
| St Vincent's Public Hospital | Mary Therese Butler/Lee Black | NUM Peri operative Services/Acting NUM |
| Sutherland Hospital | Sara Apolloni | CNS Theatre |
| Tamworth Base Hospital | Kevin Attard | RN Theatre |
| The Prince of Wales Hospital | Anne-Marie Daly | NUM Orthopaedics |
| The Tweed Hospital | Amanda Budd/Neroli Prestage | CNS Theatre/ANUM |
| Wagga Wagga Base Hospital | Alison Giese/Melissa Chapman | CNS Orthopaedic Theatre |
| Westmead Hospital | Elizabeth Stefidas | NUM Theatre |
| Wollongong Hospital | Carol Jackson | CNS Orthopaedics |
| Wyong Hospital | Marilyn Randall/Janice Marks | CNS Logistics/ANUM Theatre |

## NEW SOUTH WALES

### PRIVATE HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Albury Wodonga Private Hospital | Beverly Francis | CNS Orthopaedic Theatre |
| Armidale Private Hospital | Cheryl Constance | NUM Theatre |
| Baringa Private Hospital | Marilyn Chauncy | Orthopaedic Resource Manager |
| Bathurst Private Hospital | Diane Carter | RN Operating Theatres |
| Berkeley Vale Private Hospital | Michelle Turner | QA/Education Coordinator |
| Brisbane Waters Private Hospital | Toni Hoad | CNS Coord Orthopaedic Theatre |
| Calvary Health Care Riverina | Annette Somerville | Manager, Health Information Services |
| Campbelltown Private Hospital | Yvonne Quinn | CNC Orthopaedics |
| Dalcross Private Hospital | Anne Carroll/Kerrie Legg | Deputy CEO_DON/NUM |
| Delmar Private Hospital | Ros Berrymen/Cathy Byrne | NUM Theatre/Medical Records |
| Dubbo Private Hospital | Sally Cross | RN Theatre |
| Dudley Private Hospital | James Bird/Louise Johnson | NUM Theatre/CNS Theatre |
| Figtree Private Hospital | Jan Goldrick | Theatre |
| Forster Private Hospital | Deb Conway | NUM Theatre |
| Hawkesbury Health Service | Megan McVIcar | CNS Theatre |
| Holroyd Private Hospital | Sid Turingan | NUM Theatre |
| Hunters Hill Private Hospital | Jenny May | NUM Orthopaedic Theatre |
| Hunter Valley Private | Margaret Water/Joanne Lalic | NUM Theatre/2IC Theatre |
| Hurstville Community Pte Hospital | Kathryn Boyce | Orthopaedic Case Manager |
| Kareena Private Hospital | Deirdre Baulch | NUM/CNS Orthopaedics |
| Lake Macquarie Private Hospital | Robert Reddie | Theatre |
| Lingard Private Hospital | Greg Hewitt/Leah Gardem | NUM Theatre/Theatre Clerk |
| Maitland Private Hospital | Leyanne Beavis | NUM Theatre |
| Macquarie University Hospital | Simmy Masuku | NUM Orthopaedic Theatre |
| Mayo Private Hospital | Suzanna Cini | NUM Theatre |
| National Day Surgery Sydney | Elizabeth Carroll/Louise Jones | Director of Nursing/Floor Manager |
| Nepean Private Hospital | Jan Wernert | NUM Theatre |
| Newcastle Private Hospital | Fiona MacDonald | CNS Theatre |
| North Gosford Private Hospital | Claire Monger | RN Orthopaedic Theatre |
| North Shore Private Hospital | Eileen Cole | Research Physiotherapist, Dept Ortho |
| Norwest Private Hospital | Lucy Richardson | NUM Orthopaedic Theatre |
| Nowra Private Hospital | Linda Wright | NUM Theatre |
| Port Macquarie Private Hospital | Tresna Bell | CNS Orthopaedic Theatre |
| Shellharbour Private Hospital | Liz Quennel | Medical Records |
| Southern Highlands Hospital | Lynne Byrne | Theatre Clerk |
| St George Private Hospital and Medical Centre | Michele McKenna | NUM Orthopaedics |
| St Luke's Care | Helen Ashley/Sue Bevan | Theatre Manager/CNS Theatre |
| St Vincent's Private Hospital Darlinghurst | F Crawford/R Liston/V Law | CNS Theatre/CNS Ortho/ROI Coordinator |
| St Vincent's Private Hospital Lismore | Janelle Hospers | CNS, Orthopaedic Care Coord |
| Strathfield Private Hospital | Donna Reichel | Perioperative Manager |
| Sydney Adventist Hospital | Jill Parker/Melissa Ng | CNS Orthopaedic Theatre/RN |
| Sydney Private Hospital | Fiona Wallace | NUM Operating Theatres |
| Sydney South West Private | Angela Wilbow/Harold Faustino | Nurse Manager/CNC Orthopaedics |
| Tamara Private Hospital | Kris Wall | NUM Operating Theatre |
| The Mater Hospital | Toni Cummins | CNS Theatre |
| The Prince of Wales Private Hospital | Ellaine Lamasan | Orthopaedic NUM |
| The Surgery Centre, Hurstville | Alfred Lombardi | Manager, Surgical Services |
| Toronto Private Hospital | Scott Neesom | Theatre Clerk/Purchasing Officer |
| Warners Bay Private Hospital | Annette Harrison | CNS Theatre |
| Westmead Private Hospital | Karen O'Shaughnessy | CNS Orthopaedic Theatre |

# VICTORIA

## PUBLIC HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Austin Health | Ross Kentish/Kath Morris | ANUM Orthopaedic Theatre |
| Ballarat Health Services | Amanda Bell/Kellie Livingston | Equipment ANUM |
| Bass Coast Regional Health/Wonthaggi Hospital | Barbara Harrison/Anne Kerr | Peri operative Services Mgr/Acting NUM |
| Bendigo Health Care Group | Dot Smith | ANUM Orthopaedic Theatre |
| Box Hill Hospital | Helga Ploschke | Quality Coord Orthopaedic Services |
| Cohuna District Hospital | Jenny Brereton | NUM Theatre |
| Colac Area Health | Amanda Tout | NUM Theatre |
| Dandenong Hospital | Karen Ferguson/Carolyn Bourke | ANUM Orthopaedics |
| Djerriwarrh Health Services, Bacchus Marsh Campus | Linda Aykens/Judy Dehnert | NUM Theatre/ACN |
| East Grampians Health Service | Brian Lomax | Manager – Peri operative Service |
| Echuca Regional Health | Anne Dick | Associate Charge Nurse Theatre |
| Goulburn Valley Health | Fiona Moncriess/Carmen Feehan | RN Theatre/CNS Orthopaedic Theatre |
| Kerang District Health | Margie Christian | NUM Operating Theatre |
| Kyabram & District Health Services | Kristen Elliott | NUM Theatre |
| Latrobe Regional Hospital | Simone Lovison | Clinical Nurse Specialist |
| Maroondah Hospital | Brooke Retallack | CNS Orthopaedic Theatre |
| Mildura Base Hospital | Gwenda Smith | NUM Theatre |
| Monash Medical Centre, Clayton Campus | Candice Brown | Orthopaedic ANUM |
| Monash Medical Centre, Moorabbin Campus | Sushila Tomlinson | ANUM Theatre |
| Northeast Health Service Wangaratta | Lynn Reid/Larissa Laverty | ACN Theatre/Theatre Reception Clerk |
| Peninsula Health Service, Frankston Hospital | Donna Anderson | ANUM Theatre |
| Portland District Health | Angela Hand | NUM Theatre |
| Sandringham & District Memorial Hospital | Tamara Losinsky | ACN Orthopaedics |
| Seymour District Memorial Hospital | Elizabeth McKeown | Peri-operative Services Unit Manager |
| South West Healthcare Warrnambool Campus | Tony Kelly | Peri operative Services Manager |
| St Vincent's Public Hospital | Shazeli Osman | NUM |
| Stawell Regional Health | Chris Gillmartin/Barb Savage | NUM Theatre/Theatre Nurse |
| Sunshine Hospital | Joy Curley | RN Theatre |
| Swan Hill District Hospital | Helen Wilkins | NUM Theatre |
| The Alfred | Caroline McMurray | Coordinator Orthopaedic Dept |
| The Geelong Hospital, Barwon Health | Lee Rendle | ANUM Theatre |
| The Northern Hospital | Siew Perry | ANUM Theatre |
| The Royal Children's Hospital | Sonia Lauletta | Acting AUM Orthopaedics |
| The Royal Melbourne Hospital | Michelle Killick/Kerrie Crosato | RN Operating Theatre |
| West Gippsland Healthcare Group | Christine Evans/Bernie Notman | ACN Theatre/CNS |
| West Wimmera Health Service | Lisa Newcombe/Christine Dufty | NUM OR/CSSD ICP |
| Western District Health Service | Jane Sanders | ANUM Theatre |
| Western Hospital | Vicki Mahaljcek/Cassandra Mules | RN Theatre/Purchasing Officer Theatres |
| Williamstown Hospital | Maureen Clark | ANUM Theatre |
| Wimmera Health Care Group | Maree Markby/Catherine Jensen | NUM Theatre/ANUM Theatre |

## VICTORIA

## PRIVATE HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Beleura Private Hospital | Jean Leyland | AUM Theatre |
| Bellbird Private Hospital | Bronwyn Gilmore | Theatre Manager |
| Cabrini Private Hospital, Brighton | Brooke Mackay | Admin Assistant |
| Cabrini Private Hospital, Malvern | Brooke Mackay | Admin Assistant |
| Como Private Hospital | Gillian Wilson | NUM Theatre |
| Cotham Private Hospital | Justine Grover | RN Orthopaedic Theatre |
| Epworth Hospital | T Weerakkody/F Bartholomew | ANUM Ortho Theatre/Clinical Care Coord |
| Epworth Eastern Hospital | Erin Seal | RN Orthopaedic Department |
| Epworth Freemason Hospital | Claudia Nozzolillo | ANUM Orthopaedic Theatre |
| Essendon Private Hospital | Chan Leong | NUM Theatre |
| Geelong Private Hospital | Wilna Steyn/Robyn Pugh | Orthopaedic Services Mgr/Assistant |
| Glenferrie Private Hospital | Samantha Jervois | Theatre Manager |
| John Fawkner Hospital | Vera Shaw | AUM Orthopaedic Theatre |
| Knox Private Hospital | Janet Smith | Billings Officer Theatre |
| Latrobe Private Hospital | Jenny Telfer | NUM Theatre |
| Linacre Private Hospital | Melissa Dillon | NUM Orthopaedic Theatre |
| Maryvale Private Hospital | Glenda Chambers | ANUM Orthopaedic Theatre |
| Masada Private Hospital | Lisa McBain | Theatre Manager |
| Melbourne Private Hospital | Karen Grant | Theatre Manager |
| Mildura Private Hospital | Elizabeth Collihole | ACN Theatre |
| Mitcham Private Hospital | Julie Nankivell/Judith Bond | RN/RN Theatre |
| Mountain District Hospital | Rosslyn Martin | NUM Theatre |
| Northpark Private Hospital | Suzanne Farrelly | NUM Theatre |
| Peninsula Private Hospital | Ruth Honan | ANUM Orthopaedic Theatre |
| Ringwood Private Hospital | Carol Burns | ANUM Theatre |
| Shepparton Private Hospital | Niki Miller | CNS Orthopaedic Theatre |
| South Eastern Private Hospital | Nicole O'Brien | NUM Theatre |
| St John of God Health Care, Ballarat | Kylie Cross | CN Orthopaedics |
| St John of God Health Care, Bendigo | Jenny Dillon | AUM Theatre |
| St John of God Health Care, Geelong | Angie Patterson | CNS Orthopaedic Theatre |
| St John of God Health Care, Warrnambool | Leanne McPherson/Gill Wheaton | DON/Perioperative Services Manager |
| St John of God Hospital, Berwick | Belinda Smith | NUM Theatres |
| St Vincent's & Mercy Private Hospital, Mercy Campus | Sue Zidziunas/ Jessica O'Dey | CNS Orthopaedics/Ward Clark |
| St Vincent's & Mercy Private Hospital, St Vincent's | Julie Keyte/Deanna Delle-virgini | ANUM/RN Orthopaedic Theatre |
| The Avenue Hospital | Annellen Watson | ANUM Orthopaedics |
| The Valley Private Hospital | Anne Diamond | NUM Perioperative Services |
| Vimy Private Hospital | Joy Miller | ANUM Theatre |
| Wangaratta Private Hospital | Janet McKie | ANUM Theatre |
| Warringal Hospital | Kylie Leys | RN Operating Theatre |
| Waverley Private Hospital | Rebecca Juzva | Orthopaedic AUM |
| Western Private Hospital | Rachel Cassar | NUM Theatre |

# QUEENSLAND

## PUBLIC HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Bundaberg Base Hospital | Gail Doherty | CNC Theatre |
| Cairns Base Hospital | Rebecca Rowley | Orthopaedic Bookings Officer |
| Caloundra Health Service | Raylee Callaghan | NUM Theatre |
| Gold Coast Hospital | Meredith Bird | Loan Set Coordinator |
| Gold Coast Hospital, Robina Campus | Annemarie Brooks/Helen McGuire | CN/RN Theatre |
| Hervey Bay Hospital | Michelle Alcorn | Clinical Nurse Orthopaedics |
| Ipswich Hospital | Regina Harrison | Acting NUM Theatre |
| Logan Hospital | Denise Maher | Director Support Orthopaedics |
| Mackay Base Hospital | Renee Hutchinson/Casey Rideout | NUM Pre-admission/RN Theatre |
| Maryborough Hospital | Heather Zillman | RN Theatre |
| Mater Misericordiae Public Adult's Hospital | Christine Thompson | Clinical Nurse |
| Mater Misericordiae Public Children's Hospital | Vicki Livett | NUM Theatre |
| Nambour General Hospital | Kay Friend | Nurse Mgr, Logistics & Procurement |
| The Prince Charles Hospital | Sue Grice/Louise Tuppin | Clinical Nurse/Clinical Data Mgr |
| Princess Alexandra Hospital | Jo-Anne de Plater/Gail Brodrick | CN Orthopaedics/RN Ortho Theatres |
| Queen Elizabeth II Jubilee Hospital | Donna Cal | EN Theatre |
| Redcliffe Hospital | R Thursfield/G van Fleet/K Williamson | Program Coord/Snr Health Info Mgr |
| Redland Public Hospital | Trish O'Farrell | RN Theatre |
| Rockhampton Base Hospital | C Harrison/S Stoddart | CN Orthopaedics/RN Ortho Theatre |
| Royal Brisbane & Women's Hospital | Annette Flynn | Nurse Researcher |
| Toowoomba Hospital | Amanda Lostroh/Simon Bowly | RN Theatre |
| Townsville Hospital | Sharon Cooke/Natasha Johnston | RN Orthopaedic Theatre |

## PRIVATE HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Allamanda Private Hospital | Margaret Law | NUM Theatre |
| Brisbane Private Hospital | Liz Drabble | Theatre Logistics Coordinator |
| Cairns Private Hospital | Wendy Gould | RN Theatre |
| Caloundra Private Hospital | Christine Wells/Todd Mimnaw | CN Theatre |
| Friendly Society's Hospital | Jo Peterson | Perioperative Services Manager |
| Greenslopes Private Hospital | Kelly Williams | CN Orthopaedic Theatre |
| Hervey Bay Surgical Centre | Natalie Short | RN Theatre |
| Hillcrest Rockhampton Private Hospital | Lyn Martin | NUM Theatre |
| Holy Spirit Northside Hospital | Leanne Brace | Senior Level 1, Orthopaedic Theatre |
| John Flynn Hospital | Paula Archer | RN Orthopaedics |
| Mater Health Services North Queensland | Anna Grimley/Jo Humphreys | CN Orthopaedic Theatre |
| Mater Misericordiae Hospital Bundaberg | James Turner/Karen Smith | ANUM/CN Orthopaedic Theatre |
| Mater Misericordiae Hospital Gladstone | Alison Drinkwater | NUM Orthopaedic Theatre |
| Mater Misericordiae Hospital Mackay | Danell Curtis | Nurse Coordinator |
| Mater Misericordiae Hospital Rockhampton | Lynda Hossack | RN Orthopaedics |
| Mater Misericordiae Private Hospital | Melissa Gordon | Acting CNC Theatre |
| Mater Private Hospital Redland | Erina Harris | RN Theatre |
| Nambour Selangor Private Hospital | Karen Hicks | RN Theatre |
| Noosa Hospital | Janet McMeekin | CN Theatre |
| North West Private Hospital | Elizabeth Hill | Peri Operative Clinical Nurse |
| Peninsula Private Hospital | Joan Fellowes | NUM Theatre |
| Pindara Private Hospital | Carli Nicolaou | CN Orthopaedic Theatre |
| St Andrew's Private Hospital | Mel Grant | CSSD Theatre |
| St Andrew's Hospital, Toowoomba | Jeff van Leeuwen | Manager Peri-operative Services |
| St Andrew's War Memorial Hospital | Tracey Liesch | Clinical Manager Peri Operative |
| St Stephen's Private Hospital | Sheila Jensen | RN Theatre |
| St Vincent's Hospital, Toowoomba | Judy Plotecki | RN Peri-operative Services |
| Sunnybank Private Hospital | Judy Aslette | 2IC Orthopaedics |
| The Sunshine Coast Hospital | Phil Hall | RN Theatre |
| Wesley Hospital | Debra Tyszkiewicz | CNM Ward 1M |

# SOUTH AUSTRALIA

## PUBLIC HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Clare Hospital and Health Services | Libby Hoffmann | NUM Theatre |
| Flinders Medical Centre | Jo Drabsch/Lyndal Klei | CN Theatre/ACN Ortho Trauma Theatre |
| Gawler Health Service | Sharon Soones | RN Theatre |
| Lyell McEwin Hospital | Fiona Brinkies | CN Theatre |
| Modbury Public Hospital | Lisa Pearson | RN Orthopaedic Theatre |
| Mt Barker District Solders Memorial Hospital | Emma Crowder | RN Theatre |
| Mt Gambier Regional Hospital | Kylie Duncan | Assoc Clinical Services Coord |
| Murray Bridge Soldiers Memorial Hospital | Chris Jarvis | CN Theatre |
| Naracoorte Health Service | Margie Sinclair | CN Theatre |
| Noarlunga Hospital | Carol Dawson | RN Theatre |
| Port Augusta | Leann Cutler | NUM Theatre |
| Port Lincoln Hospital | Christine Weber | NUM Theatre |
| Port Pirie Hospital | Sue Wilkinson | NUM Theatre |
| Queen Elizabeth Hospital | Carol Saniotis | Nursing Management Facilitator |
| Repatriation General Hospital | Joy Telfer | Clinical Nurse |
| Riverland Regional Hospital | Viv Turner/Leanne Zerna | RN Theatre |
| Royal Adelaide Hospital | Lisa Lewington/Sue Pannach | CN Orthopaedics/Clinical Outcomes Coord |
| South Coast District Hospital | Jill Cooper/Judy Anderson | EO DON/CN Theatre |
| Whyalla Health Service | Carol McSorley | CN Theatre |
| Women's and Children's Hospital | Margaret Betterman | CN Theatre |

## PRIVATE HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Ashford Community Hospital | Lisa Kowalik | A/CN Theatre |
| Burnside War Memorial Hospital | Meriel Wilson | Manager Medical Records |
| Calvary Central Districts Hospital | Jeremy Gredig | Clinical Nurse |
| Calvary Health Care Adelaide | Maria Young | CN Theatre |
| Calvary Wakefield Hospital | Evelyn Carroll | CN Orthopaedic Theatre |
| Flinders Private Hospital | Marcus Ender | CN Orthopaedics |
| Glenelg Community Hospital | Jan Lewandowski | CN Orthopaedic Theatre |
| North Eastern Community Hospital | Anne Sciacca | Theatre Manager |
| Parkwynd Private Hospital | Helen Madigan | CN Orthopaedic Theatre |
| Sportsmed SA | Nic Shute | Clinical Coder Medical Records |
| St Andrew's Private Hospital | H Crosby/L White | RN Orthopaedic Theatre |
| Stirling & District Hospital | Nick Clarke/Tanya Hanlon | CN Manager/CNC Theatre |
| The Memorial Hospital | Katrina Smith | CN Orthopaedic Liaison |
| Western Hospital | Margaret Witts | RN Theatre |

## WESTERN AUSTRALIA

### PUBLIC HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Albany Regional Hospital | Heather Watson | RN Theatre |
| Armadale Health Service | Eleri Griffiths/Deb Carkeek | Mgr Surgical Services/Ortho Tech |
| Bunbury Regional Hospital | Anthea Amonini | Orthopaedic Technician Theatre |
| Freemantle Hospital | Steven Johnson | Orthopaedic Technician Theatre |
| Geraldton Hospital | Vicki Richards | CN Theatre |
| Kaleeya Hospital | Letchumy Krishnasamy | CN Orthopaedic Theatre |
| Kalgoorlie Regional Hospital | Nicole Hintz | Clinical Manager Theatre |
| Osborne Park Hospital | Jenny Misiewicz/Anita Maxwell | CN Theatre |
| Rockingham General Hospital | Carol Beaney | CN Theatre |
| Royal Perth Hospital, Shenton Park | Christopher Sheen | Orthopaedic Coordinator |
| Royal Perth Hospital, Wellington St | Carmel McCormack | NUM Theatre |
| Sir Charles Gairdner Hospital | Sandra Miller | Director ,Safety, Quality and Performance |

### PRIVATE HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Bethesda Hospital | Kristina Markusic/Tanja Radick | CN Orthopaedics/Theatre Co-ordinator |
| Hollywood Private Hospital | Judith Corbett | CN Theatre |
| Joondalup Health Campus | J Hughes/D Crowley/J Larkan | HIM/CN Ortho/Deputy HIM |
| Mercy Hospital Mt Lawley | Ty Masi/Greg Cox/Stuart Meek | Orthopaedic Technicians |
| Mount Hospital | Jacqui McDonald | Orthopaedic Coordinator |
| Peel Health Campus | Jan Birmingham | CN Orthopaedic Theatre |
| South Perth Hospital | Carrol Colquhun | Acting CNM Theatre |
| St John of God Health Care Bunbury | Alison Hawkes | Theatre Manager |
| St John of God Health Care Geraldton | Lee McDonald | EN Theatre |
| St John of God Health Care Murdoch | Samantha Hunter | Orthopaedic Coordinator |
| St John of God Health Care Subiaco | Andrew Grimm | Orthopaedic Coordinator |

## TASMANIA

### PUBLIC HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Launceston General Hospital | P van Nynanten/Madeleine Smith | CN Orthopaedic Theatre |
| North West Regional Hospital, Burnie Campus | B Kerr/ R Dicker/T McCaskill | Peri Op CN/RN/RN |
| Royal Hobart Hospital | Carolyn Douglas | RN Theatre |

### PRIVATE HOSPITALS

| Name of Hospital | Registry Coordinator | |
|---|---|---|
| Calvary Health Care Tasmania, St John's Campus | Cate Farrell | RN Orthopaedic Theatre |
| Calvary Health Care Tasmania, St Luke's Campus | Anne Boot/Toni Morice | CNC Theatre/ Theatre Clerk |
| Calvary Hospital | M Newman/A Copping/B DiMartino | CNS Ortho/CNS Neuro/Theatre Clerk |
| Hobart Private Hospital | Sarah Bird/Janine Dohnt | Peri Op Services Manager/Ortho RN |
| North-West Private Hospital | Roz Watkins/Annette Russell | NUM Theatre/Admin Theatre |

## AUSTRALIAN CAPITAL TERRITORY

### PUBLIC HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| The Canberra Hospital | Helen Boyd/Milton Jamieson | CNS Orthopaedic Theatre/RN |
| Calvary Health Care | Belinda Carruthers | RN Orthopaedic Theatre |

### PRIVATE HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Calvary John James Hospital | Phillippa Parkins | RN2 Orthopaedics |
| The National Capital Private Hospital | Mary-Jane Leibhardt | NUM Orthopaedic Theatre |
| Calvary Health Care | Belinda Carruthers | RN Orthopaedic Theatre |
| Canberra Specialist Surgical Centre | Fiona Grant | Director of Nursing |

## NORTHERN TERRITORY

### PUBLIC HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Alice Springs Hospital | Maria Berridge/Ndina Chaita | CNM Theatre/RN3 Ortho |
| Royal Darwin Hospital | Tanya Anderson | NUM Theatre |

### PRIVATE HOSPITALS

| Name of Hospital | | Registry Coordinator |
|---|---|---|
| Darwin Private Hospital | Deb Belben/Chris Brennan | NUM Theatre/ANUM |

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## FORMERLY PARTICIPATING HOSPITALS – NOW CEASED JOINT REPLACEMENT

### NEW SOUTH WALES

Auburn Health Service
Blue Mountains District ANZAC Memorial Hospital
Canada Bay Private Hospital
MacArthur Private Hospital
Mosman Private Hospital
St Vincent's Private Hospital, Bathurst
Sydney Hospital & Sydney Eye Hospital

### VICTORIA

Hartwell Private Hospital
Repatriation Hospital, Heidelberg
Vaucluse Hospital

### TASMANIA

Calvary Health Care Tasmania St Vincent's Campus
Mersey Community Hospital

### QUEENSLAND

Caboolture Private Hospital
Gladstone Hospital
Logan Private Hospital
Mater Women's & Children's Hospital Hyde Park
Pioneer Valley Hospital
Riverview Private Hospital

### SOUTH AUSTRALIA

Abergeldie Hospital
Blackwood Hospital
Northern Yorke Peninsula Hospital

### WESTERN AUSTRALIA

Galliers Private Hospital
Waikiki Private Hospital

# APPENDIX 2

## Glossary of 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 Test ($\chi 2$) 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.

**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 set of values for a summary measure, such as a rate or rate ratio, constructed so the set has a specified probability of including the true value of the measure. The specified probability is called the confidence interval, the end points are called lower and upper confidence limits; 95% confidence intervals are most common.

**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, say, two 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 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 death, at a point in time, *t*. This is sometimes called the 'force of mortality'. 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 (AVN), Developmental Dysplasia of the Hip (DDH) and Osteoarthritis (OA):

1. 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.

2. 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, an IRR of 1 results.

**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, its 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 (31/12/2010) 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

1. A primary total hip procedure performed on 1/1/2010 was revised on 1/7/2010. 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.
2. A patient with a primary procedure on 1/1/2010 died without being revised on 1/4/2010. This procedure contributes 0.25 component years.
3. A primary procedure occurs on 1/1/2010 and has not been revised. This procedure contributes 1 component year (as observation time is censored at 31/12/2010).

**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 the cumulative percent revision (CPR). The Kaplan-Meier method is biased 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 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 Sensitivity | *Reaction to prosthesis* |
| 7 | Loosening/Lysis | |
| 8 | Wear Hip Insert | *Wear and implant breakage* |
| 9 | Wear Acetabular Cup/Shell | |
| 10 | Wear Head | |
| 11 | Implant Breakage Head | |
| 12 | Implant Breakage Stem | |
| 13 | Implant Breakage Hip Insert | |
| 14 | Implant Breakage Acetabular Cup/Shell | |
| 15 | Prosthesis Dislocation | *Stability of prosthesis* |
| 16 | Instability | |
| 17 | Fracture (Femur/Acetabular/Neck/Periprosthetic) | *Fracture of bone* |
| 18 | Chondrolysis/Acetabular Erosion | *Progression of disease on non-operated part of joint* |
| 19 | Progression of Disease | |
| 20 | Synovitis | *New diseases occurring in association with joint replacement* |
| 21 | Osteonecrosis/AVN | |
| 22 | Heterotopic Bone | |
| 23 | Pain | *Pain* |
| 24 | Other | *Remaining diagnoses* |

## 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 Sensitivity | *Reaction to prosthesis* |
| 7 | Loosening/Lysis | |
| 8 | Wear Knee Insert | *Wear and implant breakage* |
| 9 | Wear Tibial Tray | |
| 10 | Wear Femoral | |
| 11 | Wear Patella | |
| 12 | Implant Breakage Femoral | |
| 13 | Implant Breakage Knee Insert | |
| 14 | Implant Breakage Tibial Tray | |
| 15 | Implant Breakage Patella | |
| 16 | Bearing Dislocation | *Stability of prosthesis/knee* |
| 17 | Patella Dislocation | |
| 18 | Prosthesis Dislocation | |
| 19 | Instability | |
| 20 | Patella Maltracking | |
| 21 | Fracture (Femur/Tibia/Patella/Periprosthetic) | *Fracture of bone* |
| 22 | Progression of Disease | *Progression of disease on non-operated part of joint* |
| 23 | Patellar Erosion | |
| 24 | Synovitis | *New diseases occurring in association with joint replacement* |
| 25 | Arthrofibrosis | |
| 26 | Osteonecrosis/AVN | |
| 27 | Heterotopic Bone | |
| 28 | Patellofemoral Pain | *Pain* |
| 29 | Pain | |
| 30 | Other | *Remaining diagnoses* |

# 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 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 clearly 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 wish to opt off, have enquires or wish to 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 will be 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 & CONFIDENTIALITY

The Data Management & Analysis Centre (DMAC), University of Adelaide undertakes data entry, validation and analysis and provides secure data storage. DMAC was established in 1993. Professor Philip Ryan, Professor in Public Health, heads DMAC. The centre staff include data managers, database programmers, statisticians and data assistants. It is engaged in an increasing variety of work, including clinical trials, pharmacoepidemiological studies, consultations and cohort studies.

The list of personnel with access to identified Registry information is as follows:

Director, Professor Stephen Graves
Deputy Director, Mr David Davidson
Deputy Director, Mr Richard de Steiger
Coordinator, Ms Ann Tomkins
DMAC staff including data manager and data assistants, statisticians and programmers.

Declaration of the project as a Quality Assurance Activity ensures that Registry and DMAC staff are bound to maintain confidentiality. Confidentiality not only applies to individual patients but also includes surgeons and hospitals.

DMAC has security systems to restrict access to DMAC 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 DMAC. After a period of time the forms are scanned and electronically stored. As with all data these are securely stored. All data are 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. In addition to this, the AOANJRR Committee made a decision in October 1999 to remove surgeon name from Registry forms. The Board of the AOA ratified this decision and consequently Registry staff blackout surgeon name, whether it is hand written or printed on the hospital patient identification, on all forms received by the Registry.

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 internet 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 and is permanently removed from Registry forms.

**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 November 2001 and again for a further five years in November 2006. 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 and Ageing 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

**INTRODUCTION - *about the Registry***

You are about to have a joint replacement. Joint replacement is very successful and most people do not require any further surgery following this procedure. However, a number of people who have a joint replacement may at some time in the future require another operation on that joint. This may occur due to a variety of reasons; the most common being that the joint replacement has worn out. Furthermore, differences between the many types of artificial joints available may affect the time at which they wear out and require replacing. In order to improve the success of this surgery, the Australian Orthopaedic Association has set up a National Joint Replacement Registry so that joint replacement and prostheses can be monitored.

The purpose of the Registry is to assess the performance of all joint replacement. If a joint replacement is identified as having a problem, the Registry can assist hospitals to locate those people who may be affected. To do this it is important to record information on every person having a joint replacement. More than 70,000 people have joint replacement surgery each year in Australia. It is also important to record details on any subsequent operations and the reason the surgery was performed. By analysing this information it will be possible to identify the cause of any problems as well as determine which types of joint replacement have the best results. To be successful, the Registry needs to gather information on as many people having joint replacement surgery as possible. 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. This information is necessary to accurately link you to the artificial joint 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 artificial joint used. No other personal information is recorded. Hospitals and Government will from time to time provide information that enables the Registry to check the accuracy of its data.

**INFORMATION - *how we will keep your information confidential***

Your personal information is confidential and cannot be used outside the Registry. Procedures are in place to protect your information and to keep it confidential. When your details have been entered into the Registry your record will be given a specific Registry number. In addition you cannot be identified in any reports produced by the Registry.

**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 Registry database.

**RISKS AND BENEFITS - *to you***

There are no risks to you by having your details in the Registry. Your information is protected and we are not allowed to identify you by law. The Registry will produce general reports on a variety of factors that influence the success of joint replacement surgery. This will improve the quality of future joint replacement surgery.

**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 Ann Tomkins, Registry Coordinator on 1800 068 419 *(freecall)*. 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 Coordinator.

*Concerns or complaints related to the data collection process may be directed to the Registry on 1800 068 419 (freecall) or alternatively the Australian Government, Office of the Privacy Commissioner on 1300 363 992*

# APPENDIX 6

## Implementation of National Joint Replacement Registry

The Registry was implemented in a staged manner on a state-by-state basis. The table below shows the commencement date for each state. Implementation was completed nationally by mid 2002; therefore 2003 was the first year of complete national data.

| 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

## HIP REPLACEMENT

### PARTIAL HIP REPLACEMENT

49315-00 Partial arthroplasty (excludes Austin Moore)
47522-00 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 of hip 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 & femur
49346-00 Revision of partial arthroplasty hip replacement

## KNEE REPLACEMENT

### 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