Hip and Knee Arthroplasty

ANNUAL REPORT 2009

AUSTRALIAN ORTHOPAEDIC ASSOCIATION

National Joint Replacement Registry

AUSTRALIAN ORTHOPAEDIC ASSOCIATION
NATIONAL JOINT REPLACEMENT REGISTRY

ANNUAL REPORT

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INTRODUCTION

This is the tenth Hip and Knee Arthroplasty Annual Report of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). This Report is based on the analysis of 472,966 primary and revision hip and knee procedures recorded by the Registry with a procedure date up to and including 31st December 2008. This is an increase of 71,977 procedures compared to the 2008 Annual Report.

In addition, there are four supplementary reports that complete the AOANJRR Annual Report for 2009. These include:-

1. Demographics of Hip and Knee Arthroplasty
2. Demographics of Shoulder, Elbow, Wrist, Ankle and Spinal Disc Arthroplasty
3. Lay Summary 2009
4. Analysis of State and Territory Health Data – All Arthroplasty

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 297 participating hospitals however this may vary from time to time due to hospital closures, new hospitals, or changes to services within hospitals.

BACKGROUND TO THE REGISTRY

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 2008 the number of hip replacement procedures increased by 5.8% compared to the year prior and the number of knees by 8.5%. Since 2003, the first year of complete national data collection by the Registry, the number of hip procedures has increased by 21.1% and the number of knee procedures by 37.6%.

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 a supplementary web report entitled 'Analysis of State and Territory Health Data – All Arthroplasty'.

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 the 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 recognised the need to establish a National Joint Replacement Registry in 1993. At that time, the outcome of this surgery 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 agreed to fund the Australian Orthopaedic Association to establish the Registry.

The Registry began data collection on 1st September 1999. Implementation was undertaken in a staged manner in each of the Australian states and territories becoming fully 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. It 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 risk of revision.

The information obtained by analysis of Registry data is used to inform surgeons, health care

professionals, government, orthopaedic companies and the community.

Although the Registry has only been fully national since 2003, the continual monitoring process by the Registry has established that information provided by the Registry has already influenced joint replacement in a beneficial manner. The value of the Registry will continue to increase as time progresses.

Aims of the Registry

- Establish demographic data related to joint replacement surgery in Australia.
- Provide accurate information on the usage 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.

Registry Management

The National Joint Replacement Registry is an initiative of the Australian Orthopaedic Association (AOA). At the time it was established, the Federal Board of the AOA nominated a Registry Committee to develop and manage Registry policies. The Committee reports to the Board. Members of the Committee include the Chairman, NJRR Director, two NJRR Deputy Directors, an orthopaedic surgeon from each state and territory 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 of the Registry are appointed by the Board and are responsible for the day-to-day management. In addition, the AOA employs a Registry 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 2006, a Registry Advisory Committee was established to provide information and advice to the Registry Working Group. The Registry Advisory Committee is an external committee with representation from a variety of stakeholders.

These include: -

- Chairman, Orthopaedic Surgeon (AOA)
- Director, NJRR
- Department of Health and Ageing
- Therapeutic Goods Administration
- Prostheses Devices Committee
- Australian Health Industries Association
- Medical Technology Association of Australia
- Consumer's Health Forum.

The committee is chaired by an independent orthopaedic surgeon and meets four times a year.

Data Collection Method

Hospitals provide data on specific Registry forms, examples of forms are available on the website www.dmac.adelaide.edu.au/aoanjrr/documentation.jsp. Forms are completed in theatre at the time of surgery and submitted to the Registry each month. While initial discussions indicated that most hospitals would prefer to send the information electronically, a review of the information collected and the systems used demonstrated that a paper-based system would be more appropriate. The Registry continues to use a paper-based system but has established mechanisms to collect data electronically when this becomes feasible for contributing hospitals. As yet no hospital has requested to provide data electronically.

Data Validation

The Registry validates data collected from 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 these health departments' 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.

The initial validation is performed using hospital and patient identity number with subsequent 'matching' undertaken on relevant procedure codes and appropriate admission time 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' matching 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 the treating hospital for clarification of primary or revision codes or admission period.

Individual level patient/procedure validation is performed on Registry data for public and private hospitals in South Australia, Western Australia, Tasmania, Victoria, Queensland, The Australian Capital Territory and the Northern Territory (public hospital data only). New South Wales supply aggregate data and negotiations are ongoing to obtain data at patient unit record level.

In the 2007/08 financial year period the Registry received notification of approximately 1,500 more procedures than were provided in the various health departments' unit record data. The Registry accepts that these additional notifications are valid.

Importantly the validation process identifies procedures that have not been submitted to the Registry. In the period 2007/08 the Registry has identified 1,116 procedures in health department files which were not submitted to the Registry (73% of these were procedures with an ICD10 code for hemiarthroplasty of the femur). Sufficient information is supplied in the state unit record data (patient unit record number, admission period and procedure type) to enable the Registry to request procedure details from individual hospitals for these 'missing' data.

For the 2007/08 Registry data, the initial validation resulted in almost 92% 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 set of data relating to hip and knee joint replacement in Australia.

Assessing Prosthesis Performance

An important Registry focus has been the continued development of a standardised algorithm to identify any prosthesis or combination of prostheses not performing to the level of others in its class. This work is not readily apparent in the Report but is critical to its function. A pragmatic three-stage approach has been developed.

As currently implemented, the first stage is an automated system that selects for further attention any component where:

(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 less than 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 purpose of this stage is to bring to early attention any prosthesis with a performance discrepancy.

In the second stage, the Director and Deputy Directors of the Registry in conjunction with DMAC staff review the findings and decide if identification of a component is possibly warranted.

The third stage involves further review of those components identified in the second stage. A panel of orthopaedic surgeons, who are members of the Arthroplasty Society, attend the Surgeon Review Workshop to undertake this review. This workshop is open to all members of the Society. Participants are given the opportunity to request additional analyses as required. This year ten orthopaedic surgeons together with the Chairman of the NJRR Committee, the Director and the two Deputy Directors of the Registry attended the workshop.

Many factors are considered when making the decision to identify components as having a higher than anticipated rate of revision, including the statistical significance of the higher revision rate and the presence or absence of any confounding factors. It is known that many different factors may affect the outcome and careful consideration must be given before any particular prosthesis is identified. Only a small number of prostheses selected by the algorithm in the first stage are subsequently identified in the annual report. The major reasons for not including the majority of identified prostheses are the inadequate number of procedures or the inability to exclude other confounding factors. The algorithm and processes undertaken to determine if particular components should be identified are subject to change as the process is reviewed and further data are collected.

Survival Analysis

The Registry describes the time to first revision of a prosthesis using the Kaplan-Meier estimates of survivorship (Appendix 2). The estimates are displayed on the graph until the number at risk for the category reaches 40, unless the initial number at risk for the category is less than 100 in which case we extend the graph until 10% of the initial number at risk remain. This avoids uninformative, imprecise estimates at the right tails of the distribution where the number of primary prostheses at risk is low. However, analytical comparisons of prostheses survival using the proportional hazards model are based on all available data (ref 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).

Confidence intervals for the Kaplan-Meier estimates are point-wise Greenwood estimates and should not be used to infer whether overall differences in survival between comparison groups are significant. Rather, hazard ratios reported with each curve should be used when judging statistical significance.

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, generically a 'cumulative failure rate', accounts for right censoring due to death and 'closure' of the database at the time of analysis.

Report Review Prior to Publication

As previously mentioned, members of the Arthroplasty Society were invited to attend a two day workshop to review, comment and provide advice and feedback on all sections of the report. This report was finalised and approved at that meeting. Prior to publication the report was also provided to the Board of the AOA for consideration and approval.

Acknowledgements

The Registry continues to receive support and invaluable assistance from the Federal 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 continued 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 continued support of all hospitals both public and private that undertake arthroplasty surgery nationally. The support provided by each of the hospitals through their nominated coordinator(s) is appreciated. A complete list of participating hospitals and coordinators is available in Appendix 1.

EXECUTIVE SUMMARY

This executive summary is specific to the Hip and Knee Arthroplasty Annual Report 2009. It summarises new approaches to analysis and highlights major findings. The information presented in this report has been reviewed prior to its release. Members of the Australian Orthopaedic Association (AOA) Arthroplasty Society attended a two day workshop held on 1st and 2nd August 2009. The surgeons reviewed the data and provided feedback, comment and advice on the information presented.

The major purpose of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) Annual Report is to provide the most up to date information on the outcome of joint replacement surgery in Australia. Each year as the number of procedures and the length of follow up increases the Registry's capacity to provide quality information is enhanced.

The Registry is continually reviewing its approach to data analysis and as a consequence this year there are two changes to be highlighted.

The first relates to the way the Registry reports hazard ratios. The Registry uses hazard ratios as a method to quantify comparative risk of revision. Previously hazard ratios have been calculated based on the entire time of observation.

As the length of follow up and the number of procedures increases the Registry has been able to demonstrate that in some instances hazard ratios are not constant over the entire time of observation. This year the Registry is reporting hazard ratios for specific time periods during which the hazard ratio is constant. This enables more specific and valid comparisons of the risk of revision over time.

Using this approach the Registry has been able to identify situations where an increased risk of revision between two comparison groups does not become evident until many years after the initial surgery and others where the risk of revision is higher initially but decreases with time. These two scenarios clearly have different implications with respect to the likely cause(s) for the observed differences in the revision rates. Identifying how the risk of revision varies over time will assist in interpreting and understanding the implications of these differences.

The other area of analysis that has changed is the way the Registry reports revision diagnoses. In previous years the Registry reported all revision diagnoses listed by surgeons. Surgeons have the option of listing more than one diagnosis e.g. for an infected procedure the surgeon may list infection, loosening and lysis. The Registry encourages surgeons to continue to identify as many diagnoses as they feel appropriate, however, it now reports on the principal revision diagnosis, which is determined by a Registry established diagnostic hierarchy. In the example above the principal diagnosis would be infection. The diagnostic hierarchy for revision hip and knee replacement is detailed in Appendix 3.

With respect to the information in this report it is evident that the number of hip and knee replacements undertaken each year continues to increase. Overall there has been an increase of 7.3% in hip and knee replacements in 2008 compared to 2007 (5.8% for hips and 8.5% for knees). Most procedures are undertaken in the private sector (57.5% for hips and 66.9% for knees).

The changing use of different categories of partial hip replacement reported previously by the Registry has continued in 2008. In particular the use of unipolar monoblock prostheses, especially the Austin Moore type prostheses, has continued to decline. The use of bipolar prostheses has also continued to decline while the use of unipolar modular prostheses has increased.

The Registry has previously identified that revision rates of primary partial hip replacement are affected by a number of factors. These include the category of prosthesis, age at time of surgery, method of fixation and the prosthesis used. Updated data on these factors are presented. The use of unipolar modular and bipolar procedures continues to be associated with fewer revision procedures compared to unipolar monoblock prostheses. Bipolar prostheses are revised less frequently than unipolar modular prostheses when individuals are less than 85 years of age. The use of cement fixation reduces the risk of revision by approximately half regardless of the category of partial hip replacement used.

Most primary partial hip prostheses used in unipolar modular and bipolar partial hip replacement perform equally satisfactorily however there are a small number of prostheses or prostheses combinations that have previously been identified as having a higher than anticipated rate of revision. Most of these have been re-identified again this year.

Primary total hip replacement involves replacement of both the femoral and acetabular joint surfaces. The two main types of primary total hip replacement reported by the Registry are total resurfacing and conventional total hip replacement. There is a third type of primary total hip replacement known as a thrust plate procedure. This has very limited use

compared to the other types of primary total hip replacement. The majority of primary total hip procedures are used to treat end stage arthritis, most commonly osteoarthritis.

Primary conventional total hip is undertaken more often than primary total resurfacing hip replacement (92.3% compared to 7.6% of all primary total hip replacements). The use of primary conventional total hip replacement continues to increase, not only in absolute numbers but also as a proportion of all primary total hip procedures. This increase is not only in the younger age group but is evident in all age groups.

There are many factors known to influence the outcome of hip replacement surgery, one is primary diagnosis. The 2008 Annual Report detailed for the first time the outcome of primary conventional total hip replacement related to primary diagnosis. This is presented again this year. The primary diagnosis of osteoarthritis is associated with the lowest risk of revision and fractured neck of femur the highest. Other diagnoses, including avascular necrosis, rheumatoid arthritis and developmental dysplasia of the hip, also have a higher risk of revision when compared to osteoarthritis. However, the increased risk of revision for developmental dysplasia is only evident for the first three months following surgery.

The approach to fixation continues to change. Cementless fixation has increased from 54.3% to 61.9% between 2004 and 2008. Hybrid and cement fixation has continued to decline and in 2008 accounted for 31.1% and 7.1% of all primary conventional total hip replacements respectively.

As reported previously there are differences in outcome depending on the type of fixation, and these differences are related to age. In the older age group (≥75 years) the significantly higher revision rate of cementless fixation compared to cemented and hybrid fixation is more apparent. When comparing different categories of hip replacement based on fixation it is important to understand that in each of the fixation categories there are a large number of prostheses combinations some of which have an excellent outcome. Revision rates for different combinations of prostheses by method of fixation have been provided for prostheses combinations with over 350 procedures recorded by the Registry.

For the second year the Registry is reporting outcomes related to different bearing surfaces used in primary conventional total hip replacement. There is a complex interaction of factors impacting on the outcome of this analysis so it should be interpreted with caution. One of these factors is head size. Metal on polyethylene bearing surface is revised less frequently than other bearing surfaces regardless of the size of the femoral head. Metal on metal bearing surfaces are revised more often than other bearing surfaces when larger head sizes are used.

New prostheses have continued to come onto the market in 2008. The number of new femoral and acetabular prostheses combinations used in primary conventional total hip replacement reported to the Registry increased, with a further 136 combinations recorded.

The number of primary conventional total hip prostheses and prostheses combinations identified as having a higher than anticipated rate of revision has increased in 2008. There are nine new prostheses and prostheses combinations that have been identified in this report. Some, although not used in 2008, are being identified for the first time. The extent of use varies from small to quite large numbers. Details specific to each of these prostheses and prostheses combinations can be found at the end of the chapter on primary total hip replacement.

The use of primary total resurfacing hip replacement has declined for the third year in a row. Analysis on a variety of factors affecting outcome has again been presented. These include primary diagnosis, type of prosthesis, gender and age. Patients having a total resurfacing for osteoarthritis are revised less frequently than patients with developmental dysplasia of the hip. Females have a significantly higher rate of revision compared to males and the risk of revision increases with age. Males have an age related risk of revision which is significantly higher after the age of 65 years.

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 risk of revision and size of the femoral head component. Increased revision with increasing age and the relationship to femoral component head size indicate that both bone volume and quality are factors that may impact on the outcome of this procedure.

As with primary conventional total hip replacement outcome is also determined by the prosthesis used. The ASR and Durom, reported last year as having a higher than anticipated rate of revision, continue to demonstrate more than twice the risk of revision compared to other resurfacing prostheses. In addition, the Recap resurfacing prosthesis has been identified this year as having more than twice the rate of revision compared to other resurfacing prostheses. It is not uncommon for orthopaedic manufacturers to attribute these differences to surgeon learning curve. This approach however does not explain why most new prostheses are not identified as having a higher than anticipated rate of revision.

The Registry has again presented data on the outcome of revision hip replacement. The Registry defines revisions as major or minor revision. This is a reference to the extent of surgery and not the relative risk. A major revision involves the removal and/or replacement of one or more components that are fixed to bone either by cement or bone ingrowth. Minor revisions are all other revision procedures which involve removal and/or exchange of one or more of the components used in the primary procedure or is a subsequent procedure that involves the addition of another component. The outcome of revision of primary conventional total hip is dependent on the type of revision procedure undertaken. Minor revisions have a higher risk of subsequent revision.

All revisions of a primary total resurfacing hip replacement that involve removal or exchange of a component are major revisions. The outcome varies depending on the components revised. The most common type of revision is a femoral component only revision and is most often undertaken for femoral neck fracture, 7% of these have been re-revised within five years.

There are four chapters on knee replacement surgery; general introduction, partial, total and revision knee replacement.

The Registry identifies five types of partial knee replacement, they are partial resurfacing, unispacer, patella/trochlear, unicompartmental and bicompartmental knee replacement. Two of these (partial resurfacing and bicompartmental) are relatively recent technologies introduced to the Australian market and reported for the first time last year. Early outcomes for both of these new single product procedures had a higher rate of revision than other knee replacement with the exception of the unispacer. This situation remains unchanged in 2008.

Patella/trochlear procedures continue to be undertaken in small numbers (231 in 2008). The cumulative percent revision at eight years for patella/trochlear replacement is 24.3%.

The use of unicompartmental knee replacement continues to decline. There were 18% less unicompartmental knee replacements undertaken in 2008 compared to 2005. Age at the time of surgery is a major factor affecting the outcome, the younger the patient the greater the risk of revision.

As with other classes of joint replacement the outcome of unicompartmental knee replacement varies depending on the type of prosthesis used. Four unicompartmental knee prostheses have been identified as having a higher than anticipated rate of revision compared to other unicompartmental prostheses.

As reported previously the outcome of primary total knee replacement is related to age as well as a number of other factors including gender, the bearing mobility and stability of the prosthesis and whether the patella was resurfaced at the time of the primary procedure. Unlike primary conventional total hip replacement the method of fixation does not appear to affect the outcome of primary total knee replacement.

Nineteen different primary total knee prostheses are identified as having a higher than anticipated rate of revision in this report. Four of these are identified for the first time this year.

The outcome of revising a unicompartmental knee replacement depends on the type of revision undertaken. The best outcome is achieved if it is converted to a total knee replacement. The risk of subsequent re-revision is similar to the outcome of a total knee revision of a primary total knee replacement.

After six months, the outcome of a revision of a primary total knee replacement does not vary regardless of whether it was a major or minor revision. The outcome, however, does vary depending on the type of minor revision. Patellar resurfacing and patellar resurfacing plus insert have a five year cumulative percent re-revision of 12.7% and 16.5% respectively. If the insert only is revised the five year cumulative percent re-revision is 26.3%.

The five year cumulative percent re-revision for major partial and major total knee revision is 18.1% and 17.5% respectively.

The report also provides information on the outcome of primary hip and knee replacement in relation to the use of antibiotic or non antibiotic cement.

The use of antibiotic cement compared to non-antibiotic cement significantly reduces the risk of revision in primary total knee replacement. This relationship is not as evident in primary total hip replacement. A reduced risk of revision when antibiotic cement is used is only evident between six and eighteen months following surgery.

As in previous years the final section is an analysis of mortality following joint replacement surgery. Survivorship data in relation to mortality are presented for hip and knee replacement where data are sufficient.

HIP REPLACEMENT

GENERAL INTRODUCTION

This report is based on the analysis of 224,390 primary and revision hip replacements received by the Registry with a procedure date up to and including 31st December 2008. This is an additional 32,717 hip procedures compared to the Annual Report released in 2008.

CATEGORIES OF HIP REPLACEMENT

The Registry categorises hip replacement as either primary or revision procedures. Primary hip procedures are further categorised as partial or total hip replacement. Partial hips are further sub-categorised depending on the type of prostheses used; partial resurfacing, monoblock, unipolar modular and bipolar procedures.

Primary total hip replacement is categorised as either conventional total, total resurfacing or thrust plate procedures.

Hip revisions are re-operations of hip replacements. They may be re-operations of primary partial, primary total or previous revision procedures. Hip revisions are categorised as either major or minor.

A major revision involves the removal and/or replacement of a major component, which is defined as a component that interfaces with bone i.e. either the femoral stem or acetabular cup or shell.

A minor revision is a revision where a major component has not been removed or replaced. Examples include exchange of the femoral head, exchangeable femoral neck component and/or acetabular insert.

A re-operation that does not involve removal, replacement or addition of a prosthesis or cable is not regarded as a revision procedure and therefore is not included in the analysis.

A complete breakdown of age, gender, primary diagnosis and revision diagnosis for each category of hip replacement is provided in a supplementary report entitled 'Demographics of Hip and Knee Arthroplasty' available on the Registry website www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.

GENDER

Hip replacement is performed more frequently in females (56.6%) than males. There are also variations in gender depending on the category of hip replacement. Primary partial hip replacement (73.5%) and primary conventional total hip replacement (55.4%) are undertaken more frequently in females. Total resurfacing and thrust plate procedures are undertaken more frequently in males (73.6% and 70.7% respectively). More females have revision procedures (53.9%) (Table HG1).

Since 2003 (the first year of full national coverage by the Registry) there has been little change in the proportion of females having primary conventional total hip replacement. There has however been a decline in females undergoing partial hip replacement (75.3% in 2003 to 72.0% in 2008) and total resurfacing procedures (28.8% in 2003 to 20.4% in 2008) (Figure HG1).

AGE

The mean age for all hip replacement is 69.9 years with females having a higher mean age compared to males (71.8 and 67.4 years respectively). Primary partial hips are generally used in individuals older than those receiving primary total hip replacement (mean age 81.7 years for partial and 67.0 years for total). Females have a higher mean age for both of these procedures (82.1 compared to 80.7 years for males having primary partial, and 68.6 compared to 65.2 years for males having primary total hip replacement).

Total resurfacing and thrust plate procedures are generally undertaken in people younger than those having primary conventional total hip replacement (total resurfacing 53.4 years, thrust plate 57.1 years and conventional total 68.1 years). The mean age for revision procedures is 70.8 years (female 71.4 and male 70.1 years).

Primary partial hip replacement is rarely undertaken on individuals younger than 65 years of age (4.5%) with the exception of partial resurfacing where all individuals were less than 55 years of age (Table HG2). There has been little change in the proportion of individuals younger than 65 years undergoing primary hip replacement since full national data was collected in 2003 (Figure HG2).

Most primary conventional total hip replacement is undertaken on individuals 65 years or older but the proportion of patients younger than 65 years (34.4%) is much higher than for partial hip replacement. Most individuals having total resurfacing and thrust plate replacement are younger than 65 years (90.6% and 78.0% respectively). Over one quarter of revision procedures are undertaken on individuals less than 65 years of age (26.7%) (Table HG2).

DIAGNOSIS

The diagnosis for almost all primary partial hips is fractured neck of femur (93.9%). Osteoarthritis is

the major reason for primary conventional total and total resurfacing hip replacement (88.3% and 94.2% respectively).

The principal cause for revision hip replacement is aseptic loosening/lysis (56.4%). The revision diagnosis of primary procedures differs from the revision diagnosis of all revisions recorded by the Registry. This is because subsequent revisions of primary procedures recorded by the Registry are early to mid term revisions. All revisions include these primaries as well as revisions of primary procedures undertaken prior to the Registry. In addition this 'all revision' group includes revisions of previous revisions.

There are also differences when comparing the reason for revision for each different class of prostheses. In previous years dislocation has been the most common reason for revision of known primary conventional total hip replacement. This year for the first time, the Registry recorded loosening/lysis as the major reason for revision of primary conventional total hip replacement. This is a reflection of the increased follow up time of primary procedures recorded by the Registry. Fractured neck of femur (39.4%) remains the most common reason for revision of total resurfacing hip replacement.

Usage of Hip Replacement

The most common hip procedure is a primary total hip (71.2% of all hip replacement). Primary partial hip replacement accounts for 16.6% and revisions 12.3% of all hip replacement (Table HG1).

During the last five years, the proportion of primary total hip replacement has increased from 70.5% (2004) to 73.2% (2008). The proportion of primary partial hip replacement has declined from 17.1% (2004) to 15.4% (2008). Revision procedures have also declined as a proportion of all hip replacement from 12.4% (2004) to 11.4% (2008) (Figure HG3). It is important to appreciate that the change in the proportion of revision procedures is not necessarily indicative of a reduction in the rate of revision. It is a measure of the number of revision procedures as a percentage of all hip replacement and therefore is affected by the number of other types of hip replacements undertaken.

State and Territory

There are some minor variations in the proportion of primary partial, primary total and revision hip replacement undertaken in the different states and territories. South Australia has consistently had a higher percentage of partial hip replacement (18.6% in 2008) compared to the other states and territories with Tasmania and ACT/NT having the lowest (12.1% and 12.3% respectively). In 2008 Tasmania had the highest percentage of primary total hip replacement (78.4%) with the other states and territories varying between 71.0% and 74.3% (Figure HG3).

The percentage of revision procedures also varies. In 2008 Tasmania had the lowest percentage of revision (9.4%). However due to the smaller number of procedures undertaken in Tasmania compared to other states there is a large year by year variation in this figure. South Australia has consistently had a smaller percentage of revision procedures than other states and territories (10.4% in 2008). Other states and territories varied between 11.2% and 13.4% (Figure HG3).

Public and Private Sector

More hip replacements are undertaken in the private sector. The total number of hip replacements in all hospitals has increased by 21.1% since 2003, 5.8% in the last year. Hip replacement in the private sector has increased by 24.1% since 2003 compared to 17.2% in the public sector. In the last year hip replacement increased by 6.5% in the private sector compared to 4.9% in the public sector (Figure HG4).

Bilateral Primary Hip Replacement

For the purpose of this report, the definition of a bilateral primary procedure is when an individual has undergone hip replacement of both hips regardless of the type of primary hip replacement and the timing of the second primary hip procedure. Primary bilateral hip replacement recorded by the Registry accounts for 11.9% of all patients undergoing primary hip replacement.

The Registry has recorded 20,916 individuals having undergone bilateral primary hip replacement. The most common type of bilateral primary hip replacement is bilateral primary conventional total hip (83.3% of all bilateral procedures) followed by bilateral primary total resurfacing hip replacement (7.7%) (Table HG3).

Same day bilateral procedures are much less common in hip replacement compared to knee replacement and account for 5.0% of all bilateral hip procedures recorded by the Registry. Of those individuals who have had bilateral primary conventional total hip replacement, 4.4% were undertaken on the same day. Same day bilateral total resurfacing procedures account for 16.3% of all bilateral total resurfacings (Table HG3).

Outcomes of Primary Hip Replacement

The main outcome measured by the Registry is the time to first revision of a primary joint replacement. The outcomes of procedures are measured in two ways; using the number of revisions per 100 observed component years and the cumulative percent revision over time (refer Appendix 2 'Glossary of Statistical Terms' for full definitions).

Primary conventional total hip replacement has the lowest revisions per 100 observed component years compared to total resurfacing and partial hip replacement (0.8, 1.0 and 1.4 respectively) (Table HG4). This difference is also evident when comparing the eight year cumulative percent revision for each of these procedures (4.9%, 6.1% and 6.1% respectively) (Table HG5).

Thrust plate procedures, because they are quite different in design from the other types of primary hip replacement, are considered separately. Only a small number (191) of these procedures have been recorded by the Registry. The number of revisions per 100 observed component years for this procedure is 0.5 and the cumulative percent revision at five years is 2.6%. Although the cumulative percent revision is smaller than other primary hip replacements, the width of the confidence interval is large and thus is not significantly different compared to other hip replacements (Tables HG4 and HG5).

Outcome by Primary Diagnosis

Outcomes stratified by primary diagnosis are presented for primary conventional total and total resurfacing hip replacement as it is only in these classes that there are sufficient procedures with different diagnoses to enable comparative data to be analysed. Although large numbers of primary partial hips have been recorded these procedures have not been included because almost all have been undertaken for fractured neck of femur.

The Registry has classified 11 different primary diagnoses for primary conventional total hip replacement. The outcomes of the five most common diagnoses were compared using osteoarthritis (OA) as the comparator diagnosis. Fractured neck of femur, avascular necrosis (AVN) and rheumatoid arthritis all have a significantly higher risk of revision compared to those undertaken for OA. In the 2008 Annual Report there was no significant difference between OA and developmental dysplasia of the hip (DDH) for primary conventional total hip replacement. This year DDH has a significantly higher risk of revision in the first three months following surgery compared to OA but there is no difference after this period (Tables HG6 and HG7 and Figure HG5).

Three different diagnoses were compared for primary total resurfacing hip replacement. DDH had a significantly higher risk of revision compared to resurfacing procedures undertaken for OA. There was no difference in the risk of revision between AVN and OA (Tables HG8 and HG9 and Figure HG6).

The five year cumulative percent revision for DDH is almost three times less when a conventional total hip replacement is used compared to a total resurfacing procedure (4.2% compared to 12.0%) (Tables HG7 and HG9).

HIP REPLACEMENT
1/9/1999 - 31/12/2008

Primary Partial Hip Replacement

Partial Resurfacing	▪ Partial articular surface replacement
Unipolar Monoblock	▪ Fixed femoral component and large head
Unipolar Modular	▪ Femoral component and exchangeable head
Bipolar	▪ Femoral component and standard head combined with a mobile exchangeable polyethylene insert in a metal shell

Primary Total Hip Replacement

Conventional	▪ Femoral component for resected femoral head and acetabular component
Total Resurfacing	▪ Femoral component for non resected femoral head and acetabular component
Thrust Plate	▪ Femoral component for resected femoral head with lateral fixation plate and acetabular component

Revision Hip Replacement

- Exchange or removal of one or more components

Table HG1: Number of Hip Replacements by Gender

Type of Hip Replacement	Female		Male		TOTAL	
	N	%	N	%	N	%
Partial Resurfacing	2	20.0	8	80.0	10	0.0
Monoblock	13487	74.2	4698	25.8	18185	48.9
Unipolar Modular	7223	72.7	2718	27.3	9941	26.7
Bipolar	6607	73.1	2426	26.9	9033	24.3
Primary Partial	**27319**	**73.5**	**9850**	**26.5**	**37169**	**100.0**
Total Resurfacing	3197	26.4	8896	73.6	12093	7.6
Conventional Total	81696	55.4	65726	44.6	147422	92.3
Thrust Plate	56	29.3	135	70.7	191	0.1
Primary Total	**84949**	**53.2**	**74757**	**46.8**	**159706**	**100.0**
Revision	**14825**	**53.9**	**12690**	**46.1**	**27515**	**100.0**
TOTAL	**127093**	**56.6**	**97297**	**43.4**	**224390**	**100.0**

Figure HG1: Percentage of Females by Type of Hip Replacement and Year

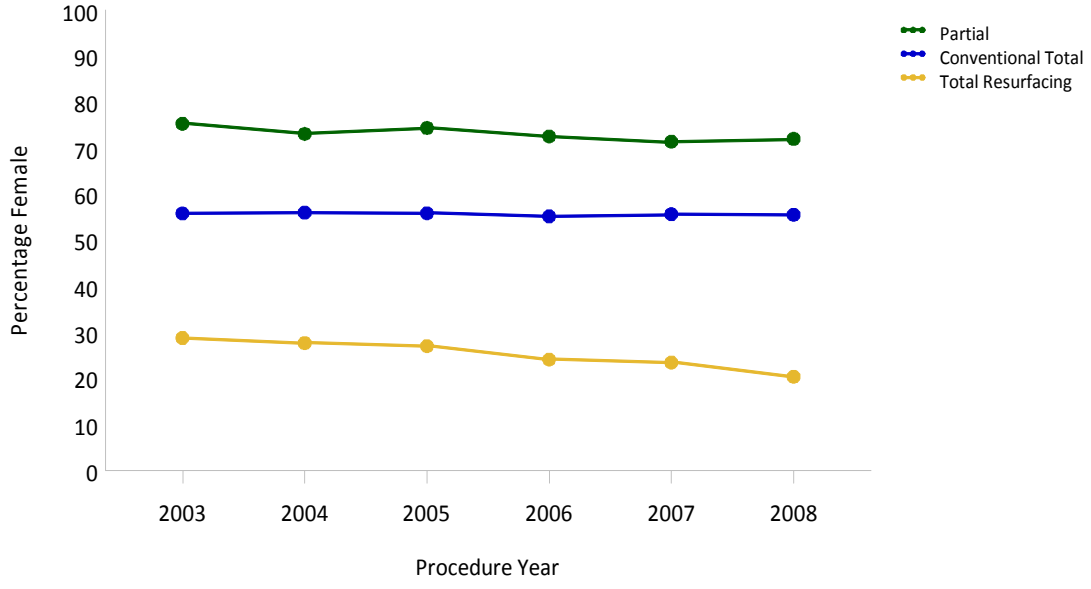


Table HG2: Number of Hip Replacements by Age

Type of Hip Replacement	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
Partial Resurfacing	10	100.0	0	0.0	0	0.0	0	0.0	0	0.0	10	0.0
Monoblock	42	0.2	212	1.2	1441	7.9	7407	40.7	9083	49.9	18185	48.9
Unipolar Modular	155	1.6	444	4.5	1545	15.5	4292	43.2	3505	35.3	9941	26.7
Bipolar	254	2.8	562	6.2	1575	17.4	3981	44.1	2661	29.5	9033	24.3
Primary Partial	**461**	**1.2**	**1218**	**3.3**	**4561**	**12.3**	**15680**	**42.2**	**15249**	**41.0**	**37169**	**100.0**
Total Resurfacing	6258	51.7	4700	38.9	1069	8.8	65	0.5	1	0.0	12093	7.6
Conventional Total	17419	11.8	33368	22.6	49958	33.9	39350	26.7	7327	5.0	147422	92.3
Thrust Plate	67	35.1	82	42.9	40	20.9	2	1.0	0	0.0	191	0.1
Primary Total	**23744**	**14.9**	**38150**	**23.9**	**51067**	**32.0**	**39417**	**24.7**	**7328**	**4.6**	**159706**	**100.0**
Revision	**2790**	**10.1**	**4564**	**16.6**	**8222**	**29.9**	**9115**	**33.1**	**2824**	**10.3**	**27515**	**100.0**
TOTAL	**26995**	**12.0**	**43932**	**19.6**	**63850**	**28.5**	**64212**	**28.6**	**25401**	**11.3**	**224390**	**100.0**

Figure HG2: Percentage of Patients Aged < 65 by Type of Hip Replacement and Year

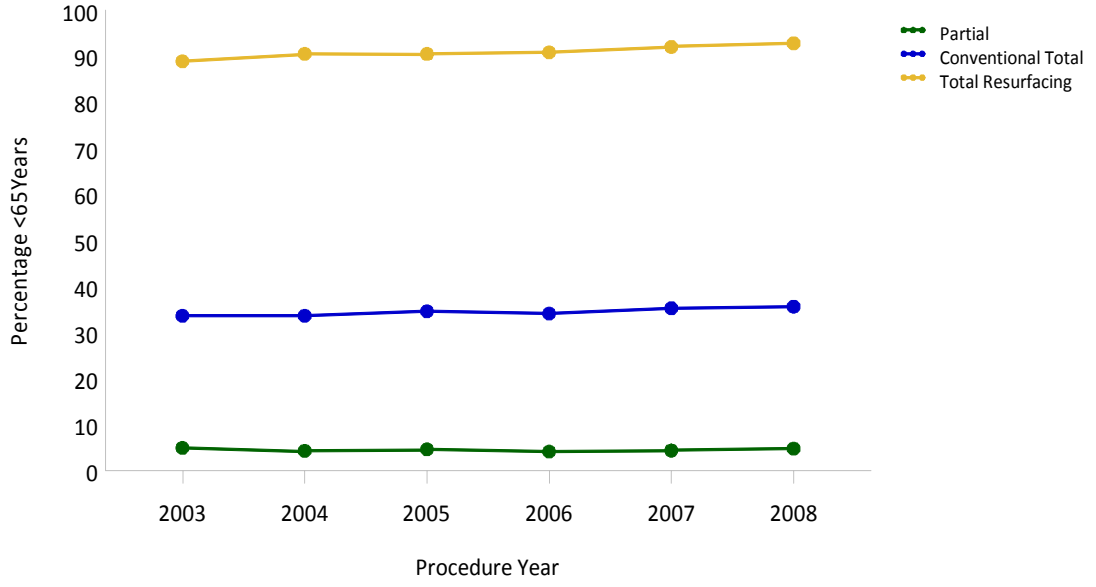


Figure HG3: Trends in Usage of Hip Replacement by State/Territory and Year

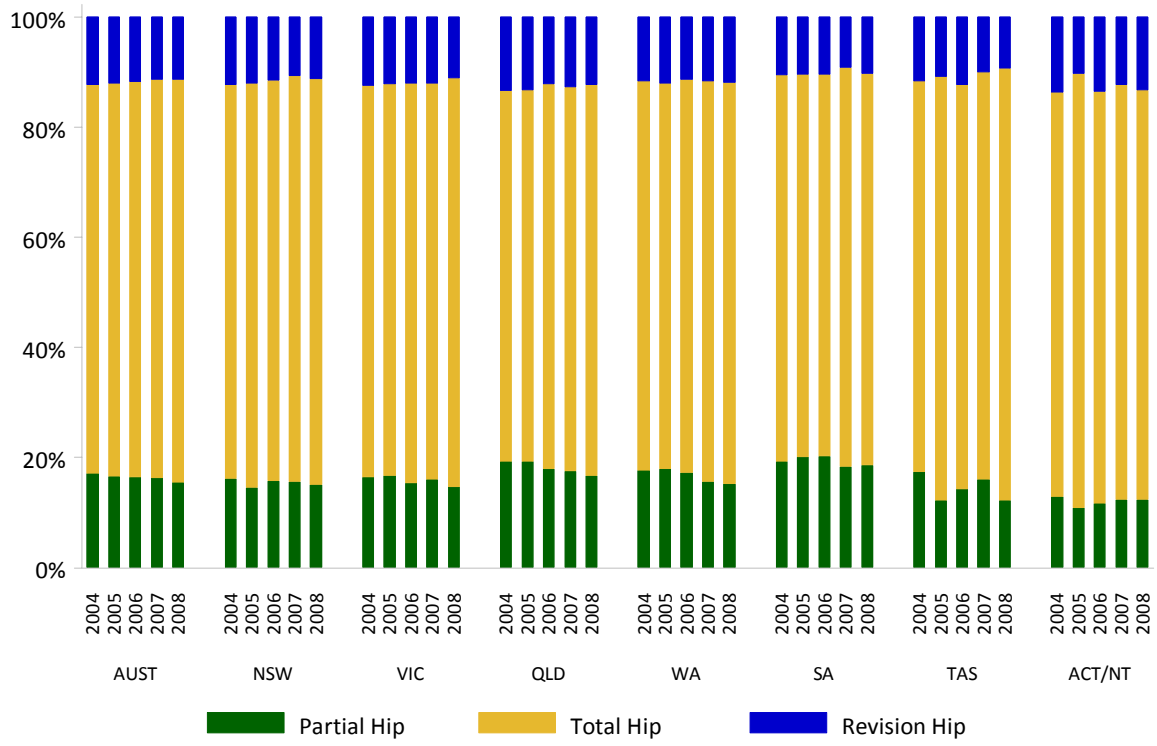


Figure HG4: Number of Hip Replacements by Public/Private Sector and Year

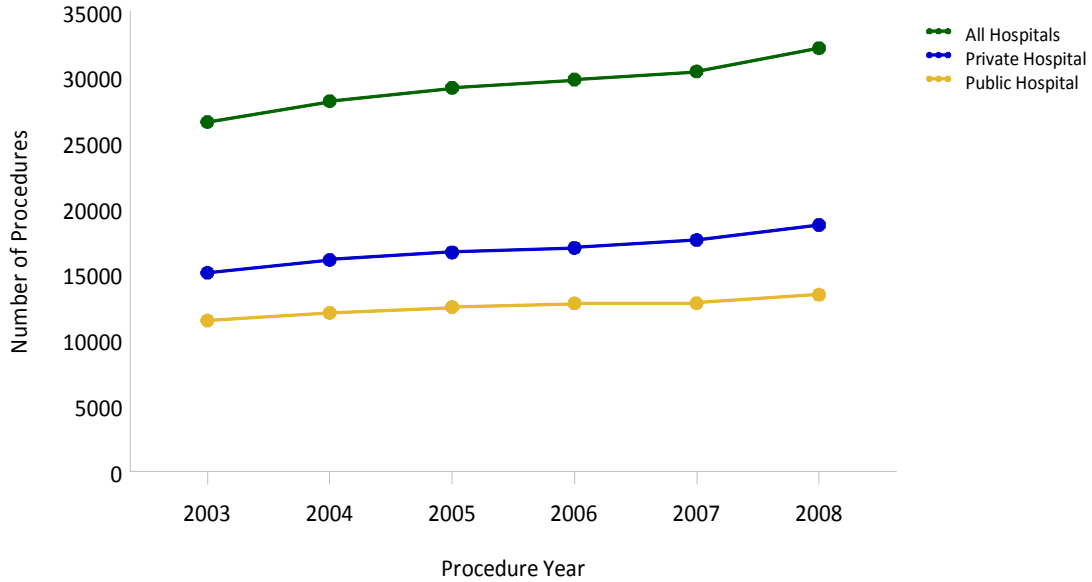


Table HG3: Time between Procedures for Bilateral Primary Hip Replacement

Bilateral Procedures	Same Day		1day-6months		≥6months		TOTAL	
	N	%	N	%	N	%	N	%
Both Conventional Total	759	3.6	4128	19.7	12539	59.9	17426	83.3
Both Total Resurfacing	262	1.3	337	1.6	1005	4.8	1604	7.7
Both Partial	14	0.1	336	1.6	743	3.6	1093	5.2
Conventional Total/Other Total	11	0.1	23	0.1	350	1.7	384	1.8
Conventional Total/Partial	2	0.0	56	0.3	322	1.5	380	1.8
Both Thrust Plate	1	0.0	8	0.0	20	0.1	29	0.1
TOTAL	**1049**	**5.0**	**4888**	**23.4**	**14979**	**71.6**	**20916**	**100.0**

Note: 'Other Total' includes total resurfacing and thrust plate hip replacement.
Partial' includes partial resurfacing, unipolar modular, unipolar monoblock and bipolar.
Total' includes conventional total and total resurfacing.

Table HG4: Revision Rates of Primary Hip Replacement

Type of Hip Replacement	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Primary Partial	**1196**	**37169**	**82725**	**1.4**	**(1.36, 1.53)**
Partial Resurfacing	2	10	21	9.6	(1.17, 34.78)
Monoblock	660	18185	38658	1.7	(1.58, 1.84)
Unipolar Modular	269	9941	18463	1.5	(1.29, 1.64)
Bipolar	265	9033	25584	1.0	(0.91, 1.17)
Conventional Total	**4095**	**147422**	**511244**	**0.8**	**(0.78, 0.83)**
Cemented	487	17471	70977	0.7	(0.63, 0.75)
Cementless	2366	80540	264203	0.9	(0.86, 0.93)
Hybrid	1242	49411	176065	0.7	(0.67, 0.75)
Thrust Plate	**4**	**191**	**847**	**0.5**	**(0.13, 1.21)**
Total Resurfacing	**437**	**12093**	**43347**	**1.0**	**(0.92, 1.11)**
TOTAL	**5732**	**196875**	**638164**	**0.9**	**(0.88, 0.92)**

Table HG5: Yearly Cumulative Percent Revision of Primary Hip Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Primary Partial	**2.4 (2.3, 2.6)**	**4.0 (3.8, 4.3)**	**5.0 (4.7, 5.3)**	**5.7 (5.2, 6.2)**	**6.1 (5.4, 6.9)**
Partial Resurfacing	0.0 (0.0, 0.0)	16.7 (2.5, 72.7)			
Monoblock	3.0 (2.7, 3.3)	5.1 (4.7, 5.5)	6.2 (5.7, 6.8)	6.8 (6.2, 7.5)	7.7 (6.3, 9.2)
Unipolar Modular	2.0 (1.7, 2.3)	3.9 (3.4, 4.4)	5.5 (4.7, 6.5)	7.2 (5.8, 8.9)	7.2 (5.8, 8.9)
Bipolar	2.2 (1.9, 2.5)	3.3 (2.9, 3.8)	4.1 (3.6, 4.6)	4.5 (3.9, 5.3)	4.9 (4.0, 6.1)
Conventional Total	**1.5 (1.5, 1.6)**	**2.6 (2.6, 2.7)**	**3.5 (3.4, 3.6)**	**4.4 (4.2, 4.6)**	**4.9 (4.7, 5.2)**
Cemented	1.2 (1.0, 1.3)	2.3 (2.0, 2.5)	3.3 (3.0, 3.6)	4.2 (3.8, 4.7)	5.0 (4.4, 5.7)
Cementless	1.7 (1.6, 1.8)	2.9 (2.8, 3.1)	3.8 (3.6, 3.9)	4.6 (4.4, 4.9)	5.1 (4.8, 5.5)
Hybrid	1.4 (1.3, 1.5)	2.3 (2.1, 2.4)	3.1 (2.9, 3.3)	4.0 (3.7, 4.3)	4.4 (4.1, 4.8)
Thrust Plate	**1.1 (0.3, 4.2)**	**1.7 (0.6, 5.3)**	**2.6 (1.0, 6.9)**		
Total Resurfacing	**1.9 (1.7, 2.2)**	**3.2 (2.9, 3.6)**	**4.4 (4.0, 4.9)**	**5.9 (5.2, 6.7)**	**6.1 (5.3, 6.9)**

Table HG6: Revision Rates of Primary Conventional Total Hip Replacement by Primary Diagnosis

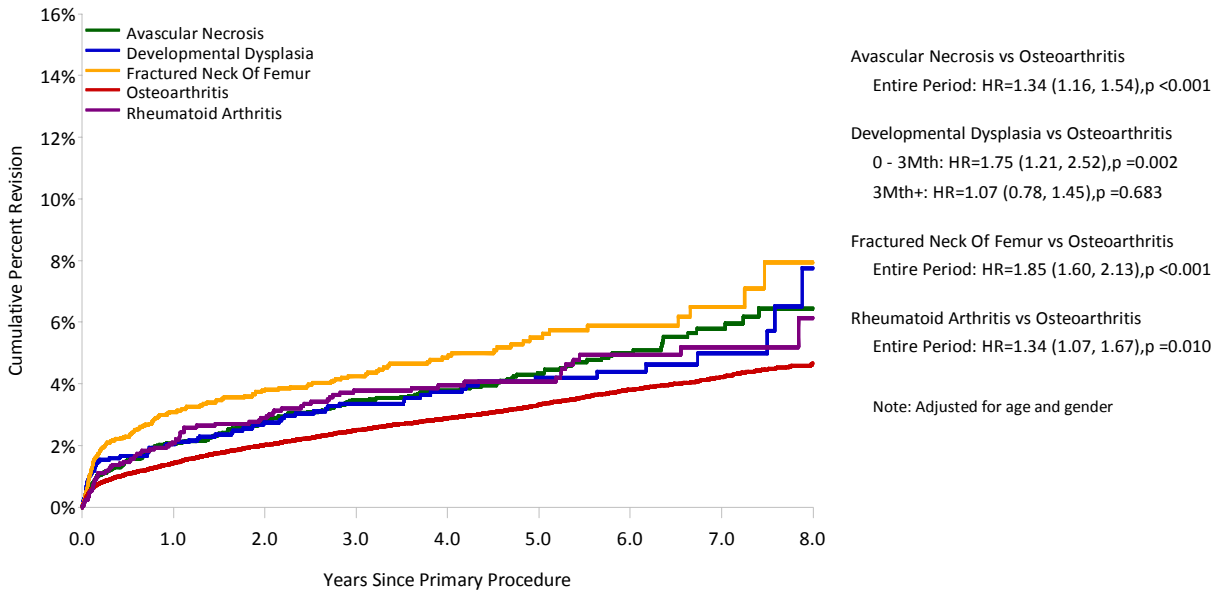
Primary Diagnosis	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Avascular Necrosis	207	5618	20329	1.0	(0.88, 1.17)
Developmental Dysplasia	72	1957	7500	1.0	(0.75, 1.21)
Fractured Neck Of Femur	202	5159	13320	1.5	(1.31, 1.74)
Osteoarthritis	3449	130147	455035	0.8	(0.73, 0.78)
Rheumatoid Arthritis	80	2081	8164	1.0	(0.78, 1.22)
Other (6)	85	2460	6897	1.2	(0.98, 1.52)
TOTAL	**4095**	**147422**	**511244**	**0.8**	**(0.78, 0.83)**

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

Table HG7: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Primary Diagnosis

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	2.1 (1.7, 2.5)	3.5 (3.0, 4.0)	4.3 (3.7, 5.0)	5.8 (4.9, 6.8)	6.4 (5.3, 7.8)
Developmental Dysplasia	2.1 (1.5, 2.8)	3.3 (2.6, 4.3)	4.2 (3.3, 5.4)	5.0 (3.8, 6.6)	7.8 (4.9, 12.1)
Fractured Neck Of Femur	3.1 (2.6, 3.6)	4.3 (3.7, 4.9)	5.5 (4.7, 6.4)	6.5 (5.3, 7.9)	7.9 (5.9, 10.7)
Osteoarthritis	1.4 (1.4, 1.5)	2.5 (2.4, 2.6)	3.3 (3.2, 3.4)	4.2 (4.0, 4.4)	4.7 (4.4, 4.9)
Rheumatoid Arthritis	2.1 (1.6, 2.8)	3.8 (3.0, 4.8)	4.1 (3.2, 5.1)	5.2 (4.1, 6.6)	6.1 (4.3, 8.8)
Other (6)	2.5 (1.9, 3.2)	3.8 (3.0, 4.8)	4.7 (3.8, 6.0)	5.2 (4.1, 6.6)	5.8 (4.3, 7.8)

Figure HG5: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	5618	4674	3854	3149	2412	1747	1105	545	147
Developmental Dysplasia	1957	1670	1425	1166	927	668	436	221	58
Fractured Neck Of Femur	5159	3616	2629	1890	1287	829	476	211	47
Osteoarthritis	130147	107622	88090	69765	52694	37040	23036	10769	2730
Rheumatoid Arthritis	2081	1800	1544	1263	980	749	491	254	83

Table HG8: Revision Rates of Primary Total Resurfacing Hip Replacement by Primary Diagnosis

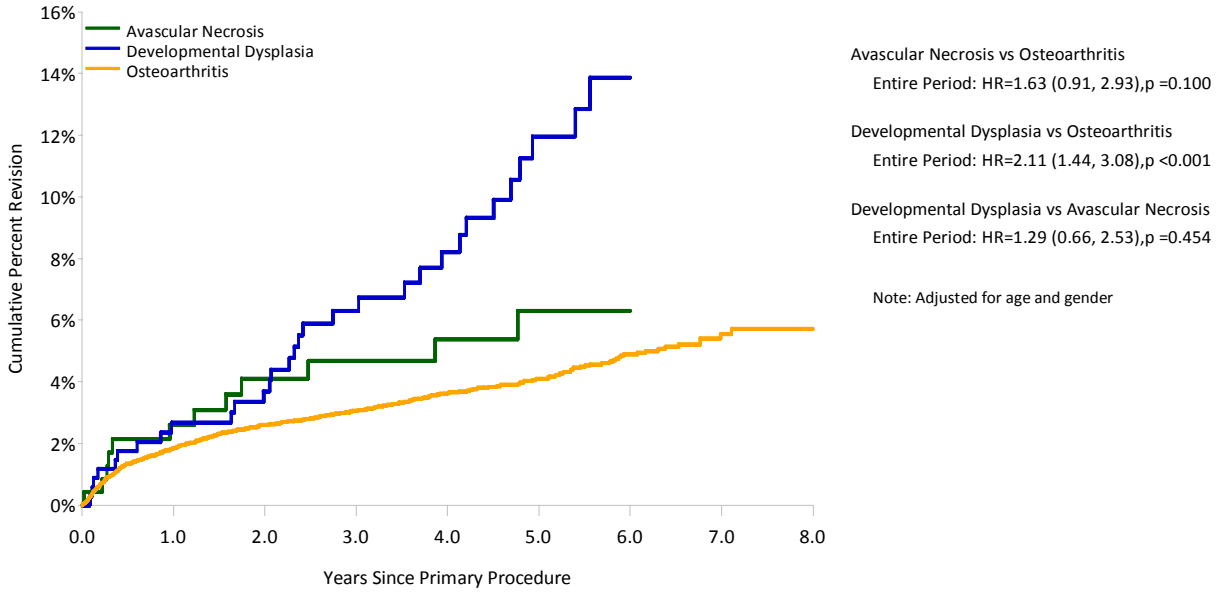
Primary Diagnosis	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Avascular Necrosis	12	238	967	1.2	(0.64, 2.17)
Developmental Dysplasia	31	343	1359	2.3	(1.55, 3.24)
Osteoarthritis	387	11396	40569	1.0	(0.86, 1.05)
Other (8)	7	116	452	1.5	(0.62, 3.19)
TOTAL	**437**	**12093**	**43347**	**1.0**	**(0.92, 1.11)**

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

Table HG9: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	2.6 (1.2, 5.7)	4.7 (2.5, 8.5)	6.3 (3.5, 11.1)		
Developmental Dysplasia	2.7 (1.4, 5.1)	6.3 (4.0, 9.7)	12.0 (8.3, 17.1)		
Osteoarthritis	1.9 (1.6, 2.1)	3.1 (2.7, 3.4)	4.1 (3.7, 4.6)	5.6 (4.9, 6.3)	5.7 (5.0, 6.6)
Other (8)	2.6 (0.9, 8.0)	3.7 (1.4, 9.5)	6.9 (3.1, 15.3)		

Figure HG6: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	238	205	181	163	131	95	55	17	2
Developmental Dysplasia	343	313	276	215	176	118	68	18	4
Osteoarthritis	11396	9795	8171	6508	4773	3251	1873	671	82

PRIMARY PARTIAL HIP REPLACEMENT

The analysis for this report is based on 37,169 primary partial hip replacements recorded by the Registry up to and including 31st December 2008. This section includes the analysis of 18,185 unipolar monoblock replacements, 9,941 unipolar modular replacements and 9,033 bipolar replacements. The Registry has also recorded ten primary partial resurfacing hip replacements since 2004 (Table HG1).

USAGE OF PARTIAL HIP REPLACEMENT

The vast majority of primary partial hip replacement is used for treating fractures of the femoral neck (93.9%). The proportion of all hip replacement that is primary partial hip replacement has decreased in the last year from 16.2% in 2007 to 15.4% in 2008 (Figure HG3).

With respect to primary partial hip replacement, the use of unipolar modular continues to increase proportionally and in total number whereas use of both unipolar monoblock and bipolar hip replacement continues to decrease. Of all primary partial hip replacement performed in 2008, 49.9% were unipolar modular, an increase of 5.0% from 2007.

There continues to be state and territory variation in the type of primary partial hip replacement used. In 2008 Western Australia had the smallest proportion of unipolar monoblock replacement (2.9%) and the largest proportion of unipolar modular replacement (89.4%). Bipolar replacement remains the most common partial hip replacement in the ACT/NT in 2008, however there has been an Australia-wide decline in the use of this type of hip replacement (Figure HP1).

UNIPOLAR MONOBLOCK

There are three different prosthesis types in the unipolar monoblock category, Austin Moore type, Thompson type and Exeter Trauma System (ETS). There was a further reduction in the use of these prostheses in 2008 with a total of 1,655 implanted compared to 2,646 in 2004 (Table HP2). The use of Austin Moore type and Thompson type prostheses continues to decline with a small increase in the use of the ETS (Figure HP2).

UNIPOLAR MODULAR

In 2008, 20 different unipolar modular heads were implanted and 37 different femoral stems, which is a decrease compared to the preceding two years. Overall there have been 123 different unipolar modular head and stem combinations recorded by the Registry (Tables HP3 and HP4)

In 2008 the Unipolar Head (S&N) has overtaken the Unitrax as the most frequently used unipolar modular head and accounts for 31.4% of all unipolar heads. The ten most used unipolar modular heads account for 98.4% of all primary unipolar modular replacement (Table HP3 and Figure HP3).

The Exeter V40 remains the most frequently used femoral stem in 2008, followed by the Spectron EF. The ten most used stems account for 93.2% of all stems used in 2008 (Table HP4 and Figure HP4).

BIPOLAR

There was a reduction in the number of bipolar heads used in 2008 (8) compared to 2006 (16). The five most used bipolar heads remain unchanged from 2007 with the UHR being the most used (55.4% of all procedures) (Table HP5 and Figure HP5).

The Exeter stem remains the most common stem used in primary bipolar hip replacement (Table HP6 and Figure HP6). In 2008 six femoral stems are common to both the ten most used femoral stems used in primary unipolar modular and primary bipolar hip replacement.

AGE AND GENDER

Females continue to be more likely to undergo partial hip replacement, 72.0% females compared to 28.0% males in 2008. The proportion of females to males is similar for primary unipolar monoblock, unipolar modular and bipolar hip replacement (Tables HP7-HP10).

Most patients undergoing primary partial hip replacement are 75 years or older, in 2008 this group accounted for 83.8% of primary partial hip replacement. Of patients undergoing primary partial hip replacement the greatest increase over the last five years has been in patients aged 85 years or older, 40.1% in 2004 to 44.6% in 2008 (Table HP11).

In 2008 primary unipolar monoblock replacement was used most often for patients 75 years or older (91.3%) with 55.2% of patients 85 years or older. The use of monoblock replacement in patients 85 years or older has declined by 29.5% since 2004 (913 procedures in 2008 compared to 1,295 in 2004). Unipolar modular hip replacement is the most common procedure used in patients 75 years or older (Table HP12-HP14).

FIXATION

The mode of fixation for partial hip replacement refers to fixation of the femoral stem. For primary partial hip replacement 54.1% of procedures were cemented, however fixation varies by the type of partial hip replacement. In 2008, cement fixation was used in 39.3% of monoblock, 75.1% of unipolar

modular and 77.8% of bipolar hip replacement (Table HP15 and Figures HP7-HP9).

There continues to be state and territory variation in the use of fixation. The majority of unipolar monoblock procedures in Queensland have been cemented over the last five years. Up until 2008 the majority of monoblock procedures in Western Australia were cemented, however in 2008 the number of monoblock procedures declined to 14 and all but one were cementless. Other states and territories have mainly used cementless fixation for monoblock procedures. South Australia has the highest use of cementless fixation in bipolar hip replacement and Tasmania has the highest for unipolar modular replacement (Figures HP7-HP9).

Outcomes of Primary Partial Hip Replacement

Of the 37,169 primary partial hip replacements recorded by the Registry there have been 1,196 revisions. This equates to 1.4 revisions per 100 observed component years and an eight year cumulative percent revision of 6.1% (Tables HG4 and HG5). The following analyses only include procedures with a primary diagnosis of fractured neck of femur and exclude revision for infection.

Age and Gender

Age continues to have a significant effect on the revision rate of partial hip replacement. A complete breakdown of the risk of revision over time by age is presented in Figures HP10, HP11 and HP12.

The effect of age is most evident for primary unipolar monoblock replacement with patients less than 85 years having a significantly higher risk of revision compared to patients 85 years or older. The seven year cumulative percent revision for patients less than 75 years is 14.7%, 6.8% for patients 75 to 84 and 3.3% for patients 85 years or older (Tables HP16 and HP17 and Figure HP10). The risk of revision after two years is almost ten times the risk for individuals less than 75 years of age compared to those aged 85 years or older (Adj HR = 9.91; 95%CI (5.39, 18.20) p<0.001) (Figure HP10).

Unipolar modular patients 84 years and younger also have a significantly higher risk of revision compared to patients 85 years or older from three months onwards. The seven year cumulative percent revision for patients less than 75 years is 11.3% and patients 75 to 84 years is 5.3% while the five year cumulative percent revision for patients 85 or older is 1.4% (Tables HP18 and HP19 and Figure HP11).

This age effect is not as pronounced for primary bipolar hip replacement. There is a significantly higher risk of revision for patients less than 75 years compared to 85 years or older. However there is no difference between 85 years or older when compared to patients 75 to 84 years. At eight years the cumulative percent revision for patients less than 75 years is 6.4% and between 75 and 84 years is 2.7%. The bipolar prosthesis has a lower risk of revision compared to unipolar modular in individuals aged less than 85 years (Tables HP20 and HP21 and Figure HP12).

The decreasing rate of revision with increasing age is evident with all partial hip procedures for both males and females (Tables HP22-HP27).

Fixation

Cement fixation of the femoral stem continues to have a significantly reduced risk of revision for all categories of partial hip replacement.

Unipolar Monoblock

Cementless unipolar monoblock replacements have twice the risk of revision compared to cemented (Adj HR = 2.12; 95%CI (1.70, 2.65) p<0.001). It is important to note the mortality rate following cementless monoblock procedures is significantly higher than cemented monoblock procedures. Consequently the higher risk of revision and mortality in the first eight years is a major consideration in determining the appropriate prosthesis selection and fixation for the management of fractured neck of femur.

Unipolar Modular

Similarly with unipolar modular replacements cementless fixation has twice the risk of revision compared to cemented (Adj HR=2.03; 95%CI (1.53, 2.70) p<0.001). The follow up period for cementless procedures is shorter than for cemented as the use of cementless fixation of unipolar prostheses has only been undertaken in substantial numbers over the last five years. The five year cumulative percent revision for cementless replacement is 7.0% and 4.3% for cemented (Tables HP30 and HP31 and Figure HP14).

Bipolar

Bipolar hip replacement also has a significantly higher risk of revision when used with cementless stems compared to cemented, however this is only seen in the first three months following surgery (Adj HR=2.86; 95%CI (1.72, 4.73) p<0.001). There is no difference in the risk of revision after three months (p=0.222). At five years the cumulative percent revision is 4.6% for cementless fixation compared to 2.8% for cemented (Tables HP32 and HP33 and Figure HP15).

Prostheses Specific Outcomes

Unipolar Monoblock

There are a variety of different manufacturers of the Austin Moore type and Thompson type prostheses however the Registry does not distinguish between

manufacturer specific prostheses. Tables HP34 and HP35 provide the revision rate and the cumulative percent revision of the three prostheses by fixation. Cementless Thompson type prostheses (380) have a 13.2% cumulative percent revision compared to 6.5% for cementless Austin Moore type (12,565) at five years. The ETS cemented stem has a similar cumulative percent revision compared to Austin Moore type cemented and Thompson type cemented at three years (Table HP35).

Unipolar Modular

The revision rates and cumulative percent revision of stem/unipolar modular head combinations with 50 procedures or more are outlined in Tables HP36 and HP37.

Bipolar

The revision rates and cumulative percent revision of stem/bipolar head combinations with 50 procedures or more are presented in Tables HP38 and HP39.

Partial Hip Prostheses with a Higher than Anticipated Revision Rate

Unipolar Modular

The Registry has previously identified the Modular Carthcart/Corail and the Endo II/Taperloc combinations as having a higher than anticipated rate of revision. The Modular Carthcart/Corail combination has been re-identified this year. This combination has a significantly higher risk of revision compared to other unipolar modular hip replacement (Adj HR=2.09; 95%CI (1.22, 3.60) p=0.007). The principal reason for revision is femoral fracture (Tables HP40-HP42 and Figure HP17). The use of this combination increased in 2008.

Only 12 additional procedures using the Endo II/Taperloc combination were recorded by the Registry in 2008. There were no new revisions recorded and as a consequence this prosthesis combination no longer has a significantly higher risk of revision compared to other unipolar modular procedures and therefore is not identified this year.

Bipolar

The Registry has re-identified the Bipolar Head (Biomet), and the UHR/ABG II and UHR/Omnifit combinations as having a higher than anticipated rate of revision. The Bipolar Head (Biomet), UHR/ABG II and UHR/Omnifit have a three year cumulative percent revision of 6.6%, 5.2% and 5.4% respectively. All of these prostheses are still being used in small numbers (Tables HP43-45 and Figures HP18-HP20).

The principal reason for revision of the UHR/ABG II is femoral fracture and for the UHR/Omnifit is loosening. The Omnifit stem may be cemented or cementless. The increased risk of revision for the UHR/Omnifit combination is associated with the use of the cementless Omnifit stem. The three year cumulative percent revision for the cementless stem is 15.7% (data not shown).

PRIMARY PARTIAL HIP REPLACEMENT
1/9/1999 - 31/12/2008

Table HP1: Revision Rates of Primary Partial Resurfacing Hip Replacement

Partial Resurfacing	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Partial Resurfacing	2	10	21	9.6	(1.17, 34.78)
TOTAL	**2**	**10**	**21**	**9.6**	**(1.17, 34.78)**

Note: All partial resurfacing hip replacements have been implanted on the femoral side.

Figure HP1: Trends in Usage of Primary Partial Hip Replacement by State/Territory and Year

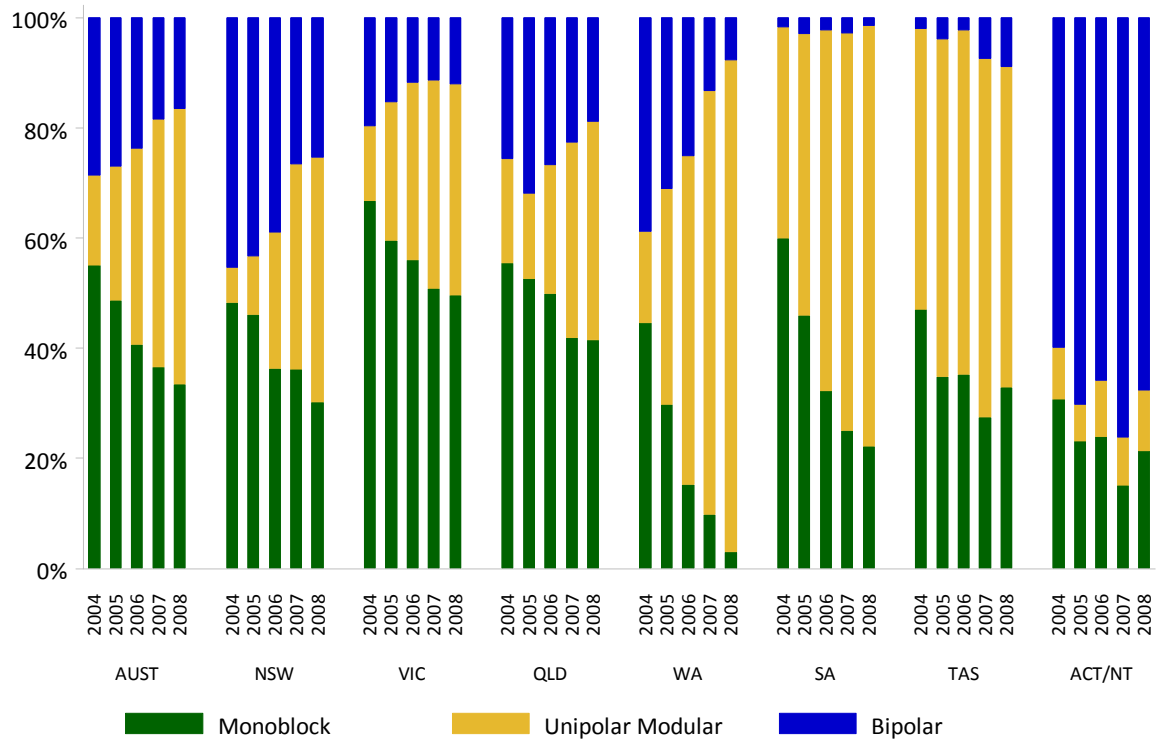


Table HP2: 3 Most Common Unipolar Monoblock Prostheses used in Primary Unipolar Monoblock Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Austin-Moore Type	Austin-Moore Type	Austin-Moore Type	Austin-Moore Type	Austin-Moore Type
	1969	1588	1209	1114	1026
2	Thompson Type	Thompson Type	Thompson Type	Thompson Type	Thompson Type
	636	628	576	452	386
3	ETS	ETS	ETS	ETS	ETS
	41	119	196	233	243
Top 3 Usage	100%	100%	100%	100%	100%
Total Procedures	2646	2335	1981	1799	1655
N Prosthesis Types	3	3	3	3	3

Figure HP2: 3 Most Common Unipolar Monoblock Prostheses used in Primary Unipolar Monoblock Hip Replacement

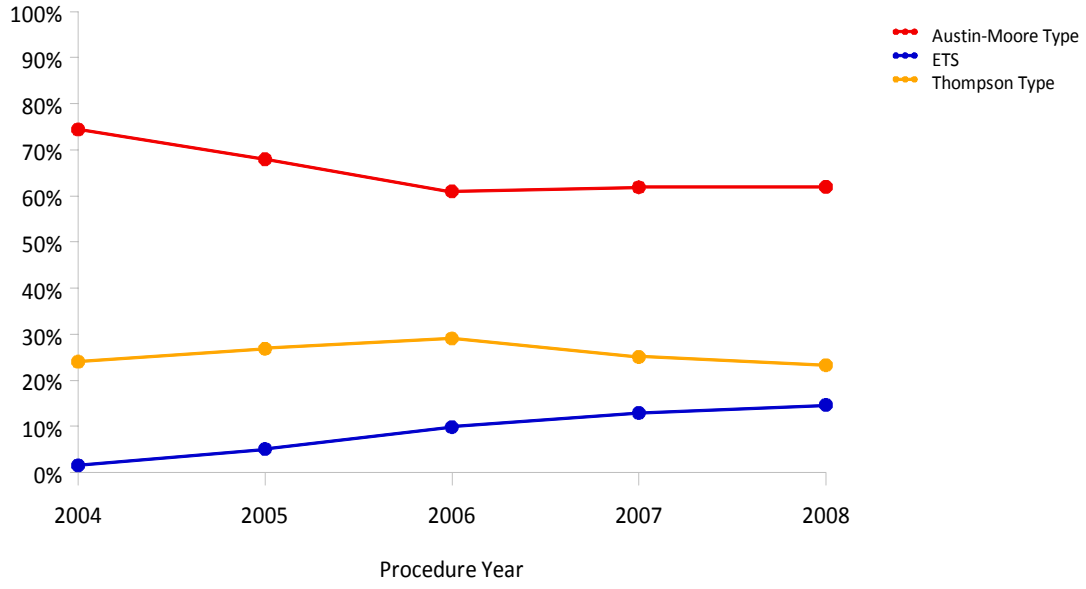


Table HP3: 10 Most Common Unipolar Modular Heads used in Primary Unipolar Modular Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Unitrax 197	Unitrax 333	Unitrax 502	Unitrax 648	Unipolar (S&N) 775
2	Unipolar (S&N) 148	Unipolar (S&N) 254	Unipolar (S&N) 400	Unipolar (S&N) 603	Unitrax 739
3	Hemi (Mathys) 110	VerSys Endo 159	VerSys Endo 191	VerSys Endo 327	VerSys Endo 340
4	Unipolar (Sulzer) 102	Hemi (Mathys) 119	Unipolar (Corin) 184	Modular Cathcart 140	Modular Cathcart 180
5	VerSys Endo 88	Unipolar (Zimmer) 102	Unipolar (Zimmer) 151	Unipolar (Corin) 139	Unipolar (Corin) 143
6	Unipolar (Plus) 66	Unipolar (Plus) 67	Modular Cathcart 84	Unipolar (Zimmer) 134	Unipolar (Zimmer) 113
7	Endo II 22	Endo II 42	Hemi (Mathys) 64	Unipolar (Plus) 89	Unipolar (Plus) 83
8	Modular Endo 14	Unipolar (Corin) 28	Unipolar (Plus) 63	Hemi (Mathys) 40	Metasul 27
9	Hemi (Depuy) 12	Unipolar (Sulzer) 21	Endo II 37	Metasul 28	Hemi (Mathys) 18
10	Unipolar (Zimmer) 12	Modular Cathcart 20	Hemi (Depuy) 15	Pharo 13	Femoral (JRI) 14
Top 10 Usage	97.8%	97.7%	97.4%	97.7%	98.4%
Total Procedures	788	1172	1736	2211	2471
N Prosthesis Types	15	17	23	22	20

Figure HP3: 5 Most Common Unipolar Modular Heads used in Primary Unipolar Modular Hip Replacement

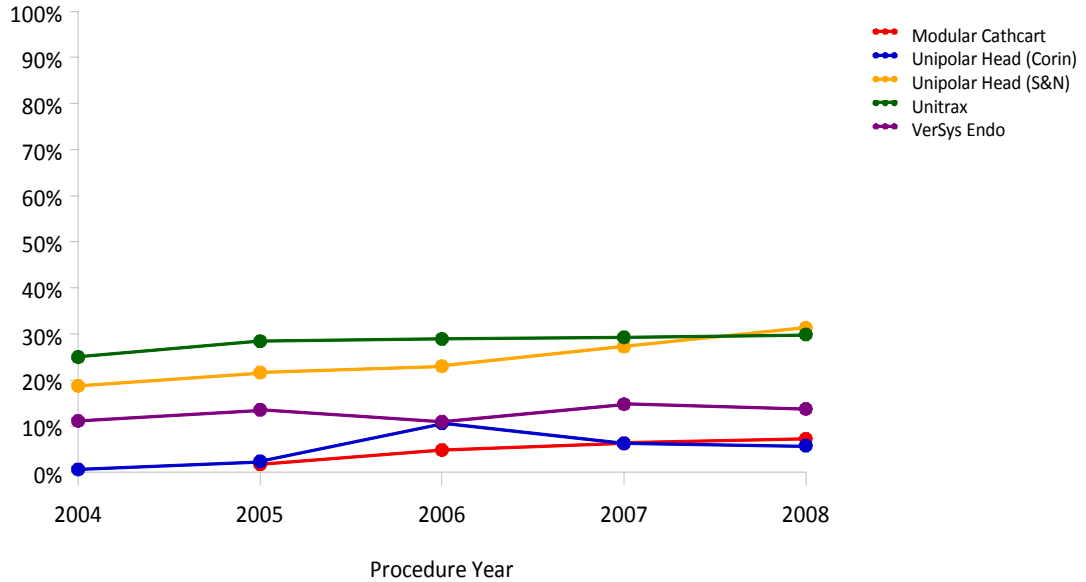


Table HP4: 10 Most Common Femoral Stems used in Primary Unipolar Modular Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Exeter V40	Exeter V40	Exeter V40	Exeter V40	Exeter V40
	179	315	479	615	708
2	Spectron EF	Spectron EF	Spectron EF	CPT	Spectron EF
	127	162	201	305	352
3	Alloclassic	CPT	CPT	Spectron EF	CPCS
	112	133	174	277	344
4	CPT	Alloclassic	CPCS	CPCS	CPT
	73	102	169	274	312
5	Fullfix Stem	CPCS	Alloclassic	Alloclassic	Corail
	68	92	132	157	175
6	SL-Plus	CCA	Trifit	Corail	Alloclassic
	65	78	124	140	146
7	CCA	SL-Plus	Corail	SL-Plus	SL-Plus
	37	67	82	89	88
8	Taperloc	Fullfix Stem	SL-Plus	Trifit	Taper Fit
	31	36	61	76	71
9	CPCS	Corail	Taper Fit	Taper Fit	Trifit
	17	29	61	59	66
10	VerSys	Taperloc	CCA	Platform	Platform
	15	29	40	30	40
Top 10 Usage	91.9%	89%	87.7%	91.5%	93.2%
Total Procedures	788	1172	1736	2211	2471
N Prosthesis Types	33	34	40	40	37

Figure HP4: 5 Most Common Femoral Stems used in Primary Unipolar Modular Hip Replacement

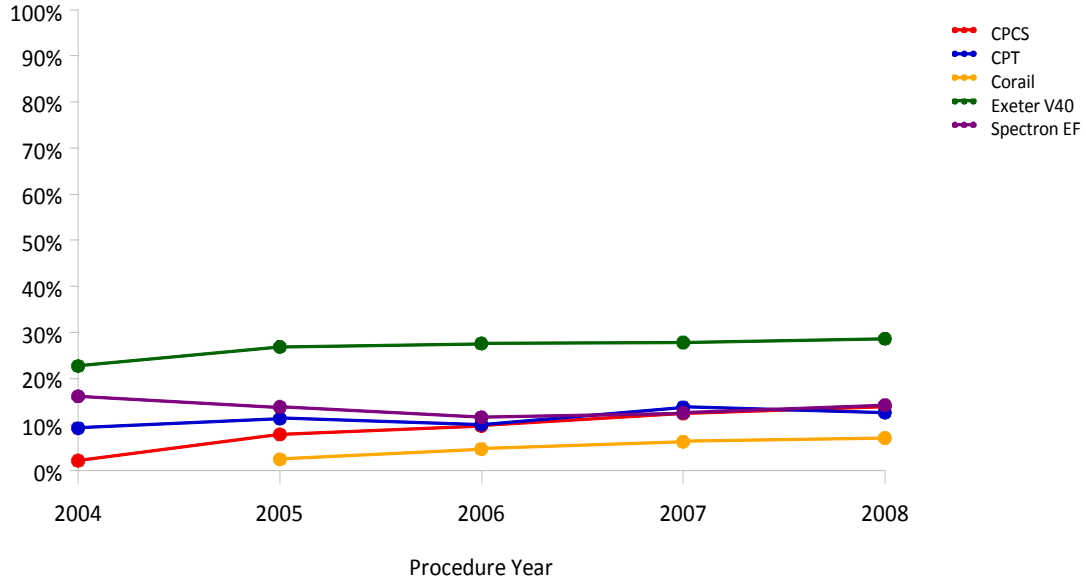


Table HP5: 10 Most Common Bipolar Heads used in Primary Bipolar Hip Replacement

Rank	2004	2005	2006	2007	2008
1	UHR 656	UHR 619	UHR 555	UHR 443	UHR 458
2	Convene 194	Tandem 133	Tandem 220	Tandem 173	Tandem 124
3	Hastings 138	Convene 110	Multipolar Bipolar 101	Multipolar Bipolar 144	Multipolar Bipolar 113
4	Self-Centering 116	Multipolar Bipolar 102	Self-Centering 70	Hastings 64	Hastings 70
5	Bipolar (Sulzer) 101	Hastings 96	Hastings 58	Self-Centering 52	Self-Centering 36
6	Multipolar Bipolar 91	Self-Centering 93	Convene 41	Bipolar (Biomet) 18	Bipolar (Biomet) 16
7	Bipolar (Mathys) 21	Bipolar (Sulzer) 80	Bipolar (Zimmer) 38	UHL 6	UHL 8
8	Bipolar (Biomet) 20	Bipolar (Mathys) 24	Bipolar (Sulzer) 32	Bipolar (Eska) 5	Bipolar (Lima) 1
9	UHL 11	Bipolar (Biomet) 16	Bipolar (Biomet) 19	Bipolar (Lima) 3	
10	Bipolar (Lima) 10	Bipolar (Zimmer) 14	Bipolar (Mathys) 7	Bipolar (Plus) 2	
Top 10 Usage	98.2%	98.6%	98%	99.9%	100%
Total Procedures	1383	1305	1164	911	826
N Prosthesis Types	16	15	16	11	8

Figure HP5: 5 Most Common Bipolar Heads used in Primary Bipolar Hip Replacement

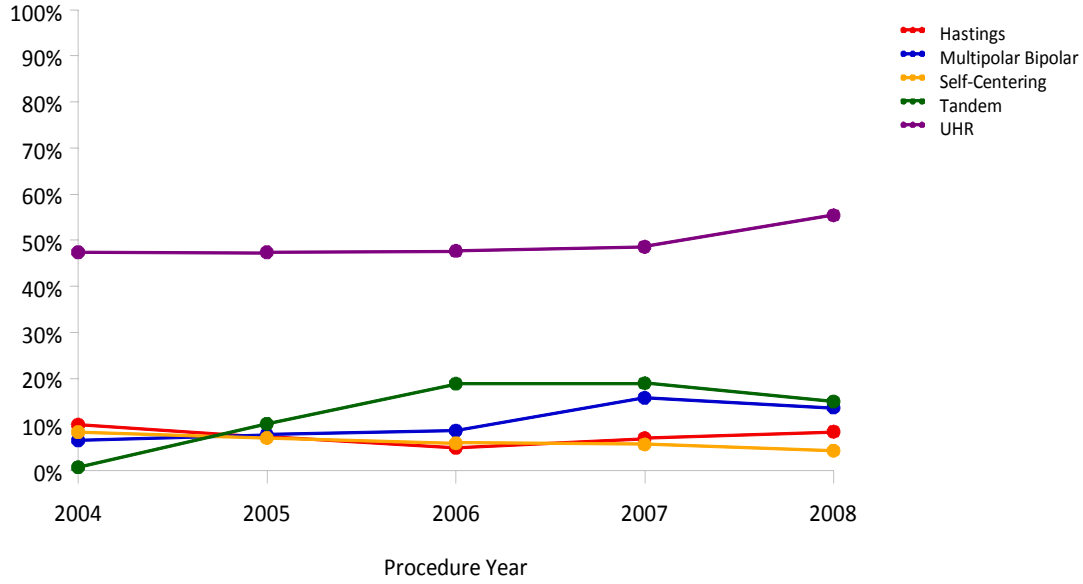


Table HP6: 10 Most Common Femoral Stems used in Primary Bipolar Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Exeter V40	Exeter V40	Exeter V40	Exeter V40	Exeter V40
	559	546	485	371	368
2	CPCS	CPCS	CPCS	CPCS	CPCS
	151	176	222	133	75
3	Elite Plus	Alloclassic	Alloclassic	Corail	VerSys
	100	85	78	62	63
4	Alloclassic	Elite Plus	Corail	CPT	Corail
	96	77	58	57	52
5	C-Stem	VerSys	VerSys	VerSys	Accolade
	61	73	57	46	35
6	VerSys	Corail	CPT	Alloclassic	Spectron EF
	56	52	29	32	32
7	Omnifit	ABGII	Spectron EF	Spectron EF	CPT
	43	34	28	31	30
8	ABGII	Omnifit	Accolade	Accolade	ABGII
	36	31	24	30	20
9	Corail	Spectron EF	Omnifit	C-Stem	Alloclassic
	31	31	24	19	17
10	CPT	C-Stem	Elite Plus	ABGII	C-Stem
	28	19	20	15	17
Top 10 Usage	83.9%	86.1%	88.1%	87.4%	85.8%
Total Procedures	1383	1305	1164	911	826
N Prosthesis Types	54	43	47	36	34

Figure HP6: 5 Most Common Femoral Stems used in Primary Bipolar Hip Replacement

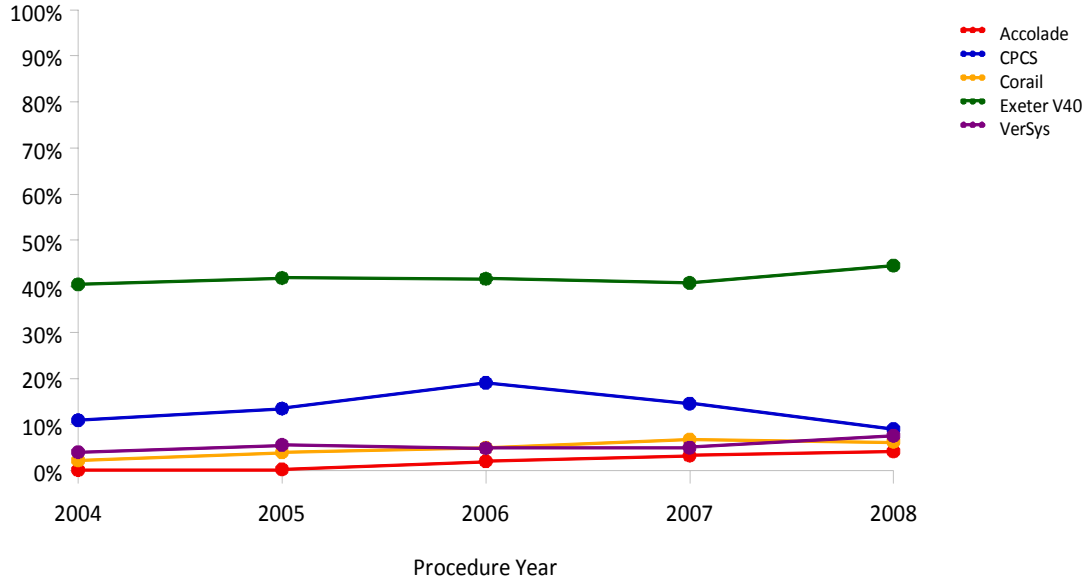


Table HP7: Primary Partial Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	3522	73.1	1295	26.9	4817	100.0
2005	3581	74.4	1231	25.6	4812	100.0
2006	3542	72.6	1339	27.4	4881	100.0
2007	3516	71.4	1405	28.6	4921	100.0
2008	3565	72.0	1387	28.0	4952	100.0

Table HP8: Primary Unipolar Monoblock Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	1937	73.2	709	26.8	2646	100.0
2005	1752	75.0	583	25.0	2335	100.0
2006	1407	71.0	574	29.0	1981	100.0
2007	1293	71.9	506	28.1	1799	100.0
2008	1218	73.6	437	26.4	1655	100.0

Table HP9: Primary Unipolar Modular Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	587	74.5	201	25.5	788	100.0
2005	882	75.3	290	24.7	1172	100.0
2006	1266	72.9	470	27.1	1736	100.0
2007	1571	71.1	640	28.9	2211	100.0
2008	1752	70.9	719	29.1	2471	100.0

Table HP10: Primary Bipolar Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	998	72.2	385	27.8	1383	100.0
2005	947	72.6	358	27.4	1305	100.0
2006	869	74.7	295	25.3	1164	100.0
2007	652	71.6	259	28.4	911	100.0
2008	595	72.0	231	28.0	826	100.0

Table HP11: Primary Partial Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	53	1.1	153	3.2	618	12.8	2062	42.8	1931	40.1	4817	100.0
2005	57	1.2	163	3.4	612	12.7	2072	43.1	1908	39.7	4812	100.0
2006	50	1.0	151	3.1	549	11.2	2095	42.9	2036	41.7	4881	100.0
2007	54	1.1	159	3.2	584	11.9	2000	40.6	2124	43.2	4921	100.0
2008	67	1.4	167	3.4	568	11.5	1939	39.2	2211	44.6	4952	100.0

Table HP12: Primary Unipolar Monoblock Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	6	0.2	24	0.9	215	8.1	1106	41.8	1295	48.9	2646	100.0
2005	8	0.3	28	1.2	180	7.7	960	41.1	1159	49.6	2335	100.0
2006	0	0.0	27	1.4	139	7.0	810	40.9	1005	50.7	1981	100.0
2007	4	0.2	12	0.7	135	7.5	676	37.6	972	54.0	1799	100.0
2008	4	0.2	19	1.1	121	7.3	598	36.1	913	55.2	1655	100.0

Table HP13: Primary Unipolar Modular Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	15	1.9	44	5.6	141	17.9	346	43.9	242	30.7	788	100.0
2005	18	1.5	61	5.2	223	19.0	522	44.5	348	29.7	1172	100.0
2006	27	1.6	72	4.1	261	15.0	767	44.2	609	35.1	1736	100.0
2007	26	1.2	98	4.4	316	14.3	941	42.6	830	37.5	2211	100.0
2008	34	1.4	97	3.9	328	13.3	1016	41.1	996	40.3	2471	100.0

Table HP14: Primary Bipolar Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	32	2.3	85	6.1	262	18.9	610	44.1	394	28.5	1383	100.0
2005	31	2.4	74	5.7	209	16.0	590	45.2	401	30.7	1305	100.0
2006	23	2.0	52	4.5	149	12.8	518	44.5	422	36.3	1164	100.0
2007	24	2.6	49	5.4	133	14.6	383	42.0	322	35.3	911	100.0
2008	29	3.5	51	6.2	119	14.4	325	39.3	302	36.6	826	100.0

Table HP15: Primary Partial Hip Replacement by Fixation

Fixation	Monoblock		Unipolar Modular		Bipolar		TOTAL	
	N	%	N	%	N	%	N	%
Cemented	5240	14.1	7472	20.1	7377	19.9	20089	54.1
Cementless	12945	34.8	2469	6.6	1656	4.5	17070	45.9
TOTAL	**18185**	**48.9**	**9941**	**26.8**	**9033**	**24.3**	**37159**	**100.0**

Figure HP7: Trends in Usage of Unipolar Monoblock Hip Replacement by State/Territory and Year

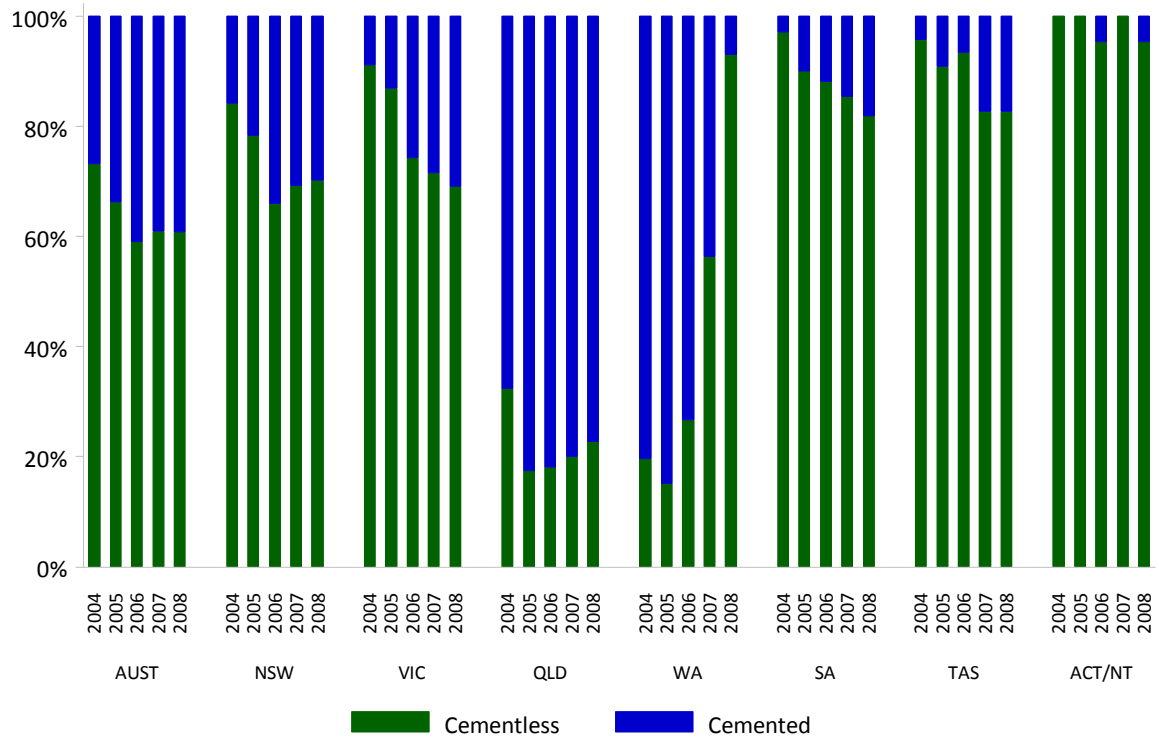


Figure HP8: Trends in Usage of Unipolar Modular Hip Replacement by State/Territory and Year

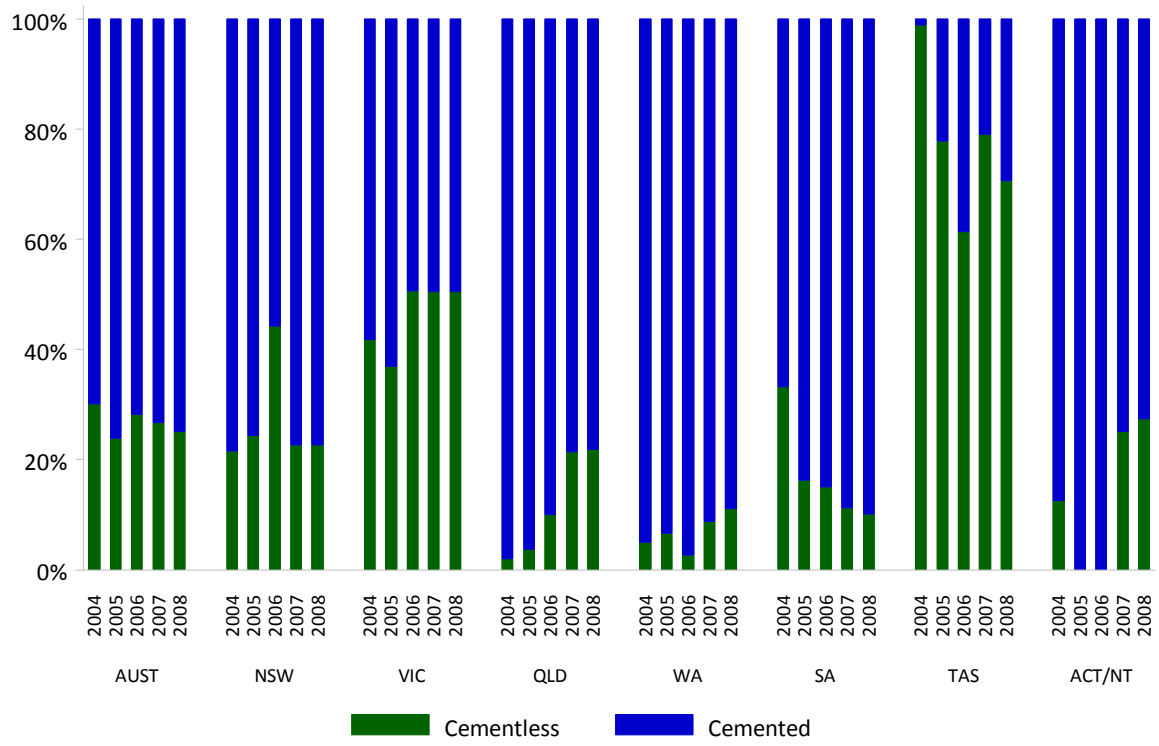


Figure HP9: Trends in Usage of Bipolar Hip Replacement by State/Territory and Year

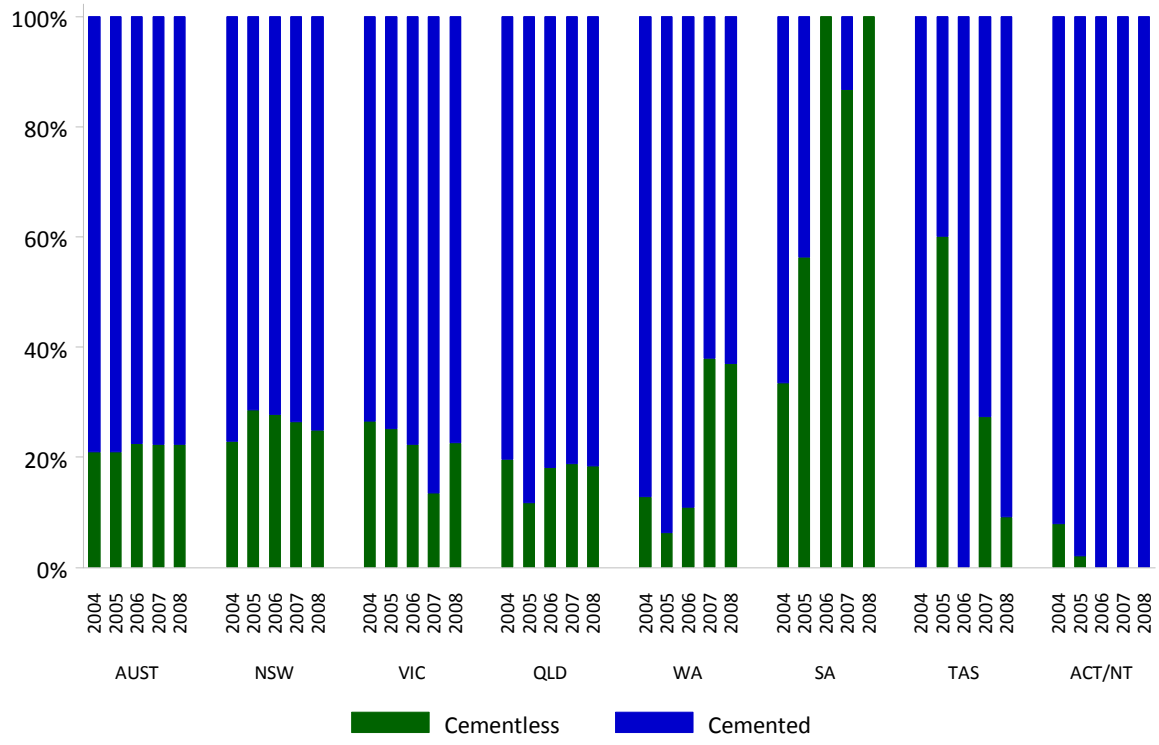


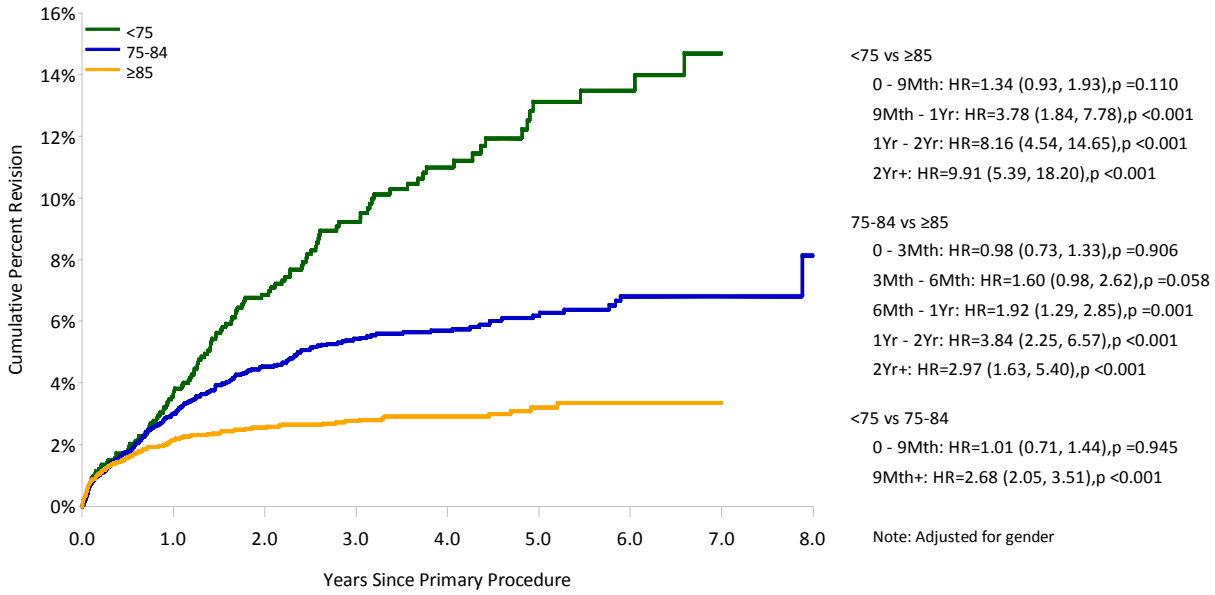
Table HP16: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<75	122	1624	4253	2.9	(2.38, 3.43)
75-84	282	7181	16829	1.7	(1.49, 1.88)
≥85	180	8837	16629	1.1	(0.93, 1.25)
TOTAL	**584**	**17642**	**37711**	**1.5**	**(1.43, 1.68)**

Table HP17: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<75	3.6 (2.8, 4.8)	9.2 (7.6, 11.2)	13.1 (10.9, 15.8)	14.7 (11.9, 18.0)	
75-84	3.0 (2.6, 3.5)	5.4 (4.8, 6.1)	6.2 (5.4, 7.0)	6.8 (5.9, 7.8)	8.1 (5.8, 11.3)
≥85	2.2 (1.8, 2.5)	2.8 (2.4, 3.2)	3.2 (2.7, 3.8)	3.3 (2.8, 4.0)	

Figure HP10: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<75	1624	1082	824	625	431	282	179	90	30
75-84	7181	4509	3328	2401	1633	1022	586	261	60
≥85	8837	4825	3310	2239	1396	795	389	163	30

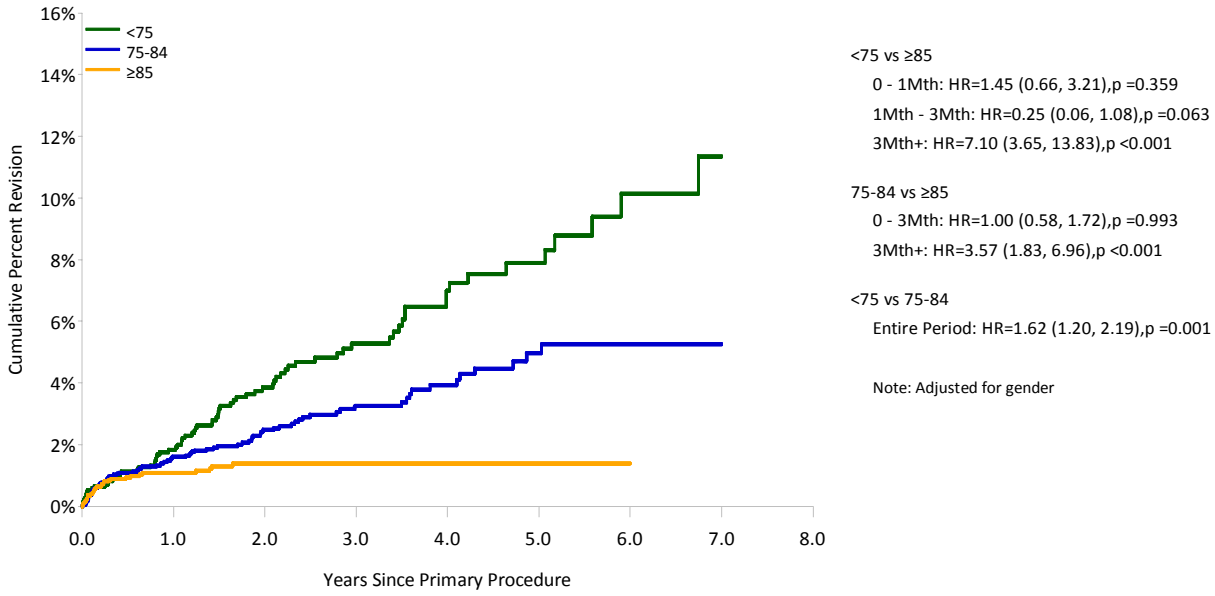
Table HP18: Revision Rates of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<75	80	1902	4413	1.8	(1.44, 2.26)
75-84	91	3969	7985	1.1	(0.92, 1.40)
≥85	33	3239	4743	0.7	(0.48, 0.98)
TOTAL	**204**	**9110**	**17140**	**1.2**	**(1.03, 1.37)**

Table HP19: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<75	1.8 (1.3, 2.6)	5.3 (4.1, 6.8)	7.9 (6.1, 10.2)	11.3 (8.1, 15.8)	
75-84	1.6 (1.2, 2.1)	3.2 (2.6, 4.1)	5.0 (3.8, 6.5)	5.3 (4.0, 6.9)	
≥85	1.1 (0.8, 1.6)	1.4 (1.0, 2.0)	1.4 (1.0, 2.0)		

Figure HP11: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<75	1902	1302	876	586	359	223	121	61	21
75-84	3969	2452	1600	979	576	342	171	80	16
≥85	3239	1641	903	472	240	116	48	17	4

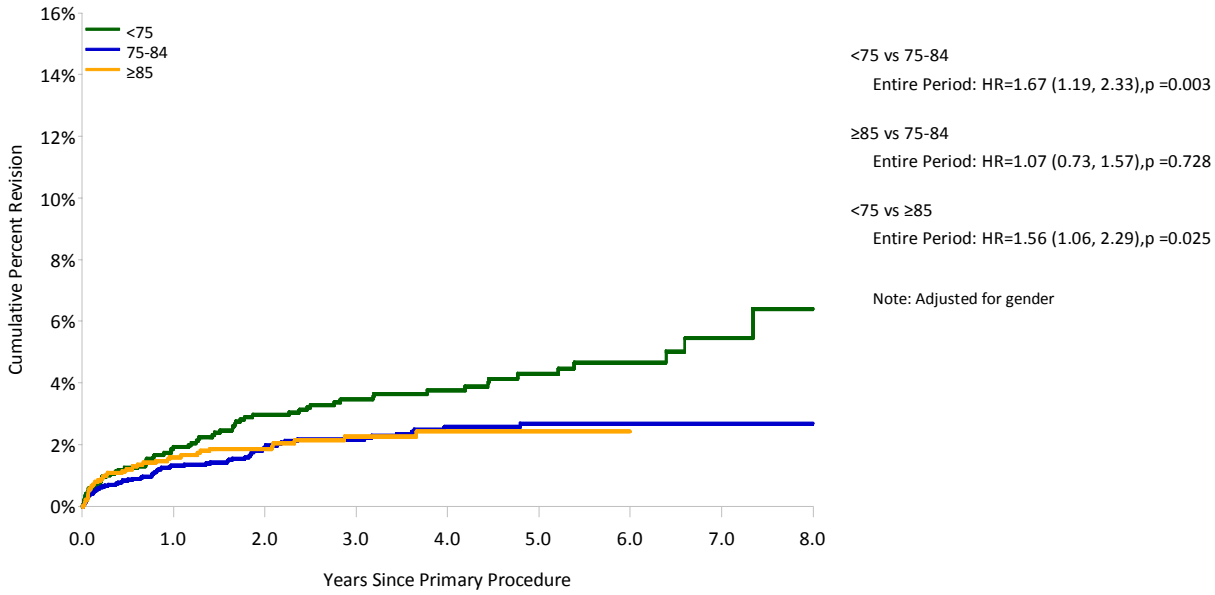
Table HP20: Revision Rates of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<75	67	1955	6763	1.0	(0.77, 1.26)
75-84	69	3603	10971	0.6	(0.49, 0.80)
≥85	42	2447	5469	0.8	(0.55, 1.04)
TOTAL	**178**	**8005**	**23203**	**0.8**	**(0.66, 0.89)**

Table HP21: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<75	1.9 (1.4, 2.7)	3.5 (2.7, 4.5)	4.3 (3.3, 5.5)	5.4 (4.0, 7.3)	6.4 (4.3, 9.4)
75-84	1.3 (1.0, 1.8)	2.2 (1.7, 2.8)	2.7 (2.1, 3.4)	2.7 (2.1, 3.4)	2.7 (2.1, 3.4)
≥85	1.6 (1.1, 2.2)	2.3 (1.6, 3.1)	2.4 (1.8, 3.3)		

Figure HP12: Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<75	1955	1546	1286	1064	844	582	351	146	42
75-84	3603	2772	2234	1721	1218	779	432	161	46
≥85	2447	1576	1140	785	492	274	122	28	9

Table HP22: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<75	26	541	1128	2.3	(1.51, 3.38)
	75-84	63	1944	3202	2.0	(1.51, 2.52)
	≥85	50	2062	2602	1.9	(1.43, 2.53)
Female	<75	96	1083	3125	3.1	(2.49, 3.75)
	75-84	219	5237	13627	1.6	(1.40, 1.83)
	≥85	130	6775	14027	0.9	(0.77, 1.10)
TOTAL		**584**	**17642**	**37711**	**1.5**	**(1.43, 1.68)**

Table HP23: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<75	3.4 (2.0, 5.8)	6.9 (4.5, 10.5)	10.5 (6.7, 16.0)		
	75-84	3.5 (2.6, 4.6)	5.7 (4.4, 7.3)	5.7 (4.4, 7.3)		
	≥85	3.2 (2.4, 4.3)	3.8 (2.8, 5.2)	5.3 (3.3, 8.3)		
Female	<75	3.8 (2.7, 5.2)	10.1 (8.1, 12.5)	14.1 (11.4, 17.3)	16.0 (12.7, 20.0)	
	75-84	2.9 (2.4, 3.4)	5.3 (4.6, 6.1)	6.2 (5.4, 7.2)	6.8 (5.8, 7.9)	8.3 (5.7, 12.1)
	≥85	1.9 (1.6, 2.3)	2.5 (2.1, 3.0)	2.8 (2.3, 3.4)	3.0 (2.4, 3.7)	

Table HP24: Revision Rates of Primary Unipolar Modular Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<75	22	599	1186	1.9	(1.16, 2.81)
	75-84	29	1070	1735	1.7	(1.12, 2.40)
	≥85	10	807	894	1.1	(0.54, 2.06)
Female	<75	58	1303	3227	1.8	(1.36, 2.32)
	75-84	62	2899	6250	1.0	(0.76, 1.27)
	≥85	23	2432	3849	0.6	(0.38, 0.90)
TOTAL		**204**	**9110**	**17140**	**1.2**	**(1.03, 1.37)**

Table HP25: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<75	2.4 (1.4, 4.2)	6.0 (3.7, 9.5)	6.0 (3.7, 9.5)		
	75-84	2.4 (1.5, 3.7)	4.0 (2.7, 6.0)	5.7 (3.5, 9.2)		
	≥85	1.2 (0.6, 2.4)	2.1 (1.0, 4.2)			
Female	<75	1.6 (1.0, 2.5)	5.0 (3.7, 6.8)	8.4 (6.2, 11.2)	12.4 (8.4, 18.1)	
	75-84	1.3 (0.9, 1.9)	3.0 (2.2, 3.9)	4.7 (3.4, 6.4)	5.0 (3.6, 7.0)	
	≥85	1.0 (0.7, 1.6)	1.2 (0.8, 1.9)	1.2 (0.8, 1.9)		

Table HP26: Revision Rates of Primary Bipolar Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<75	19	547	1677	1.1	(0.68, 1.77)
	75-84	24	908	2302	1.0	(0.67, 1.55)
	≥85	10	639	1097	0.9	(0.44, 1.68)
Female	<75	48	1408	5085	0.9	(0.70, 1.25)
	75-84	45	2695	8669	0.5	(0.38, 0.69)
	≥85	32	1808	4372	0.7	(0.50, 1.03)
TOTAL		**178**	**8005**	**23203**	**0.8**	**(0.66, 0.89)**

Table HP27: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<75	2.1 (1.1, 3.8)	4.1 (2.6, 6.7)	5.3 (3.3, 8.6)		
	75-84	1.6 (0.9, 2.8)	3.3 (2.2, 5.1)	4.5 (2.9, 6.9)		
	≥85	2.0 (1.1, 3.8)	2.0 (1.1, 3.8)	2.0 (1.1, 3.8)		
Female	<75	1.9 (1.3, 2.8)	3.2 (2.3, 4.4)	3.9 (2.9, 5.3)	5.4 (3.8, 7.6)	
	75-84	1.2 (0.9, 1.8)	1.8 (1.3, 2.5)	2.2 (1.6, 3.0)	2.2 (1.6, 3.0)	
	≥85	1.5 (1.0, 2.2)	2.3 (1.6, 3.3)	2.5 (1.7, 3.6)		

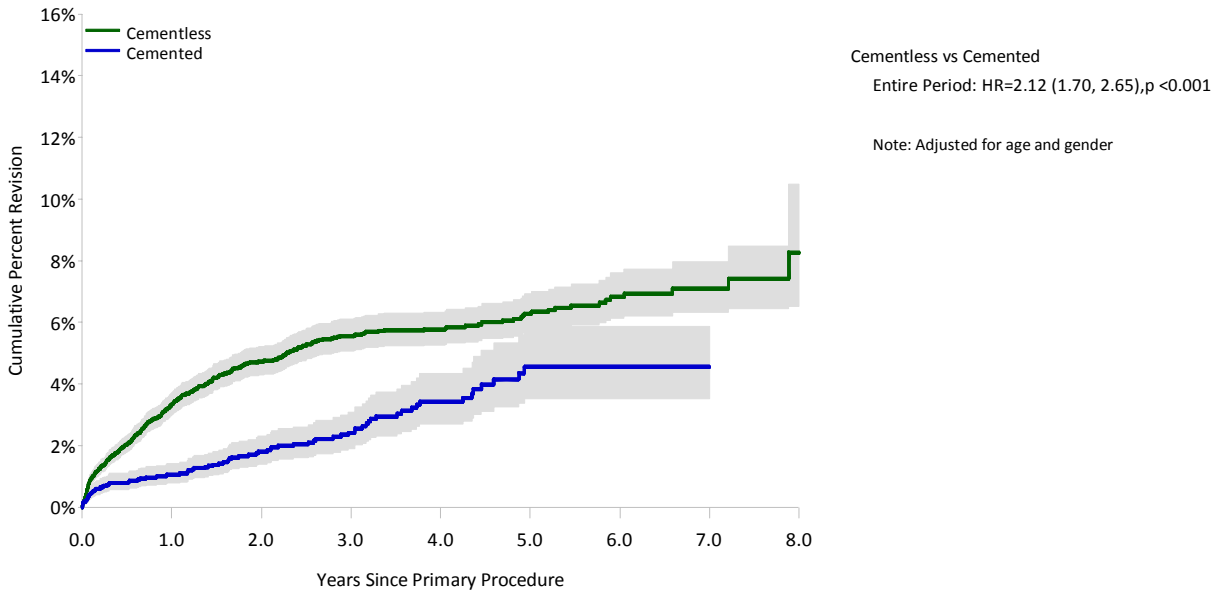
Table HP28: Revision Rates of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Cement	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Cementless	490	12572	27328	1.8	(1.64, 1.96)
Cemented	94	5070	10383	0.9	(0.73, 1.11)
TOTAL	**584**	**17642**	**37711**	**1.5**	**(1.43, 1.68)**

Table HP29: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Cementless	3.3 (3.0, 3.7)	5.6 (5.1, 6.1)	6.3 (5.7, 6.9)	7.1 (6.3, 8.0)	8.3 (6.5, 10.5)
Cemented	1.1 (0.8, 1.4)	2.4 (1.9, 3.1)	4.6 (3.5, 5.9)	4.6 (3.5, 5.9)	

Figure HP13: Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cementless	12572	7341	5329	3873	2622	1638	893	388	91
Cemented	5070	3075	2133	1392	838	461	261	126	29

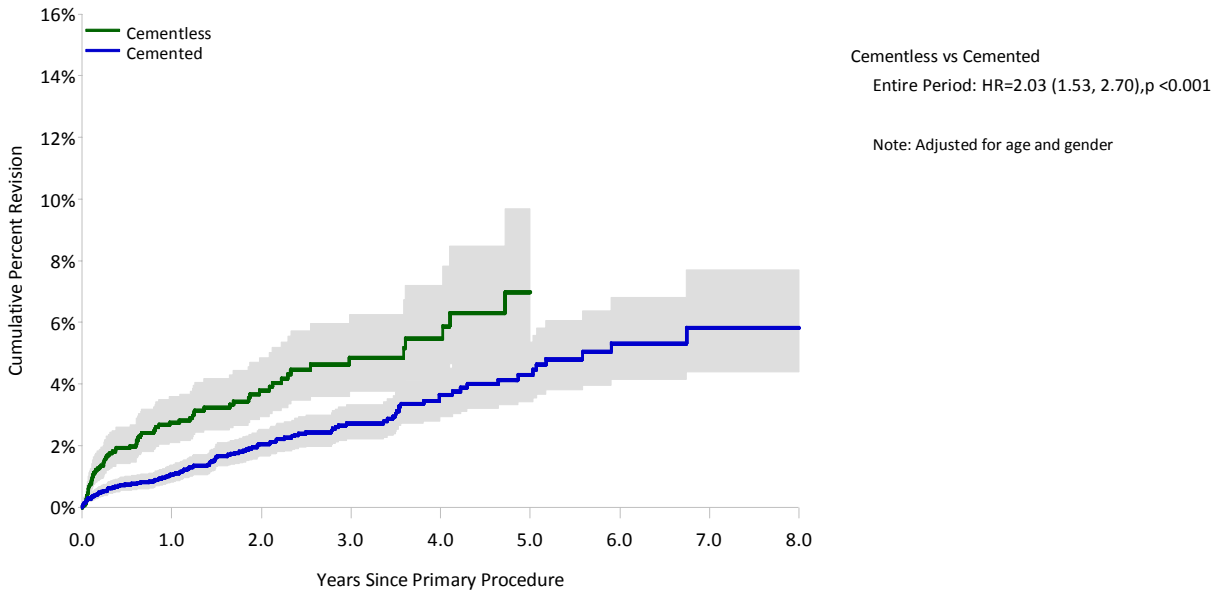
Table HP30: Revision Rates of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Cement	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Cementless	76	2314	3924	1.9	(1.53, 2.42)
Cemented	128	6796	13217	1.0	(0.81, 1.15)
TOTAL	**204**	**9110**	**17140**	**1.2**	**(1.03, 1.37)**

Table HP31: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Cementless	2.7 (2.1, 3.6)	4.8 (3.8, 6.3)	7.0 (5.0, 9.7)		
Cemented	1.1 (0.8, 1.4)	2.7 (2.2, 3.3)	4.3 (3.4, 5.4)	5.8 (4.4, 7.7)	5.8 (4.4, 7.7)

Figure HP14: Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cementless	2314	1347	796	432	238	93	23	4	0
Cemented	6796	4048	2583	1605	937	588	317	154	41

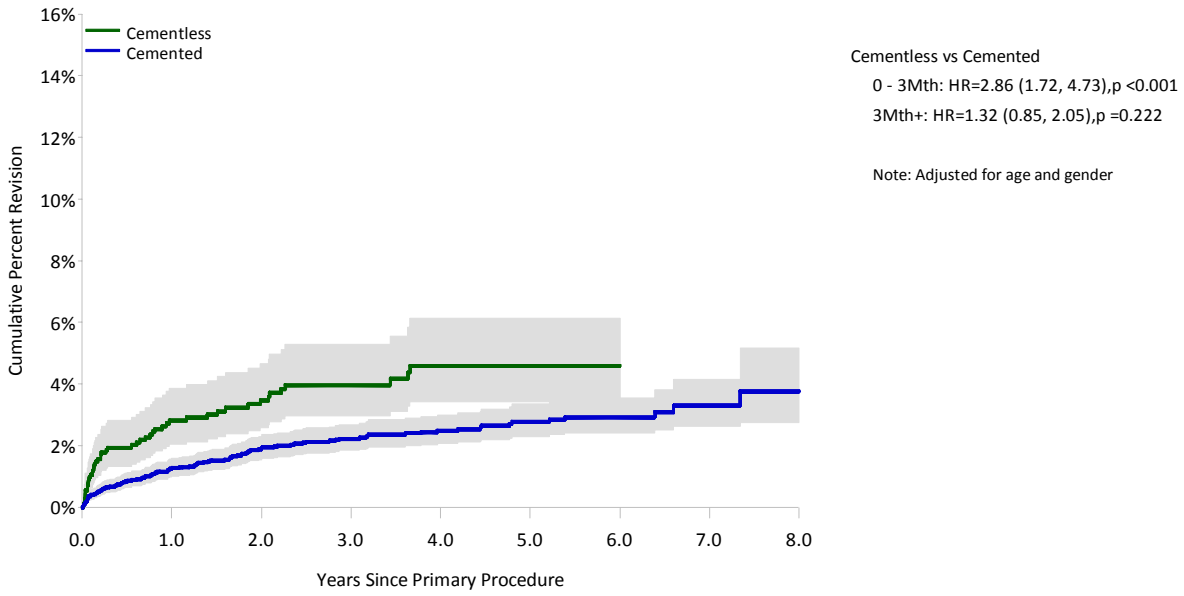
Table HP32: Revision Rates of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Cement	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Cementless	50	1478	3835	1.3	(0.97, 1.72)
Cemented	128	6527	19368	0.7	(0.55, 0.79)
TOTAL	**178**	**8005**	**23203**	**0.8**	**(0.66, 0.89)**

Table HP33: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Cementless	2.8 (2.0, 3.9)	4.0 (3.0, 5.3)	4.6 (3.4, 6.1)		
Cemented	1.3 (1.0, 1.6)	2.2 (1.8, 2.7)	2.8 (2.3, 3.3)	3.3 (2.6, 4.1)	3.8 (2.7, 5.2)

Figure HP15: Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cementless	1478	1052	797	586	392	208	100	29	12
Cemented	6527	4842	3863	2984	2162	1427	805	306	85

Prostheses Specific Outcomes

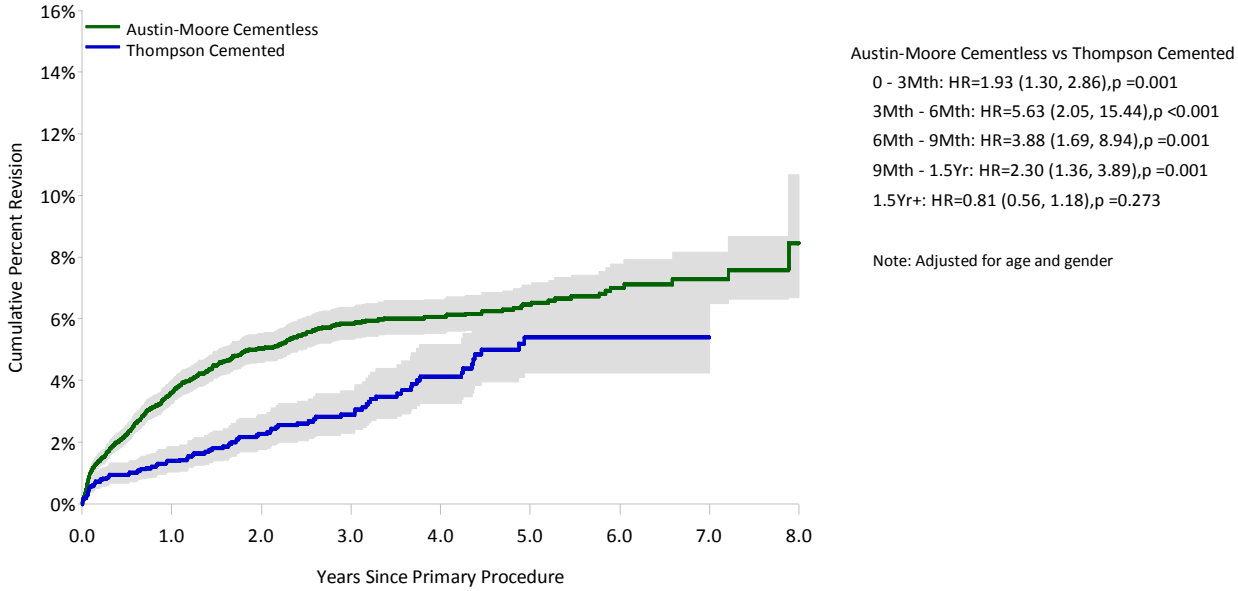
Table HP34: Revision Rates of Primary Unipolar Monoblock Hip Replacement

Unipolar Monoblock	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Austin-Moore Type Cemented	8	457	770	1.0	(0.45, 2.05)
Austin-Moore Type Cementless	516	12565	27133	1.9	(1.74, 2.07)
ETS Cemented	14	832	1146	1.2	(0.67, 2.05)
Thompson Type Cemented	95	3951	8753	1.1	(0.88, 1.33)
Thompson Type Cementless	27	380	857	3.2	(2.08, 4.59)
TOTAL	**660**	**18185**	**38658**	**1.7**	**(1.58, 1.84)**

Table HP35: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Austin-Moore Type Cemented	1.1 (0.4, 3.1)	3.2 (1.4, 7.1)			
Austin-Moore Type Cementless	3.6 (3.3, 4.0)	5.8 (5.3, 6.4)	6.5 (5.9, 7.1)	7.3 (6.5, 8.2)	8.5 (6.7, 10.7)
ETS Cemented	1.5 (0.8, 2.7)	3.2 (1.6, 6.3)			
Thompson Type Cemented	1.4 (1.0, 1.9)	2.9 (2.3, 3.7)	5.4 (4.2, 6.8)	5.4 (4.2, 6.8)	
Thompson Type Cementless	6.0 (3.8, 9.4)	9.8 (6.5, 14.5)	13.2 (8.7, 19.7)		

Figure HP16: Cumulative Percent Revision of Cementless Austin Moore Type and Cemented Thompson Type Hip Prostheses



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Austin-Moore Type Cementless	12565	7304	5286	3835	2594	1619	885	389	90
Thompson Type Cemented	3951	2489	1792	1218	774	449	257	123	28

Table HP36: Revision Rates of Primary Unipolar Modular Hip Replacement

Unipolar Head	Femoral Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Endo II	Taperloc	4	74	155	2.6	(0.71, 6.63)
Hemi Head (Depuy)	C-Stem	4	56	223	1.8	(0.49, 4.59)
Hemi Head (Depuy)	Elite Plus	2	76	217	0.9	(0.11, 3.33)
Hemi Head (Mathys)	CCA	7	357	1095	0.6	(0.26, 1.32)
Hemi Head (Mathys)	Fullfix Stem	5	226	608	0.8	(0.27, 1.92)
Metasul	Alloclassic	1	59	61	1.6	(0.04, 9.11)
Modular Cathcart	Corail	14	400	410	3.4	(1.87, 5.72)
Ultima	Thompson Modular	1	132	502	0.2	(0.01, 1.11)
Unipolar Head (Corin)	Taper Fit	4	210	260	1.5	(0.42, 3.94)
Unipolar Head (Corin)	Trifit	6	279	374	1.6	(0.59, 3.49)
Unipolar Head (Plus)	SL-Plus	14	402	797	1.8	(0.96, 2.95)
Unipolar Head (S&N)	CPCS	16	896	1036	1.5	(0.88, 2.51)
Unipolar Head (S&N)	Platform	3	83	65	4.6	(0.96, 13.56)
Unipolar Head (S&N)	Spectron EF	29	1325	2563	1.1	(0.76, 1.62)
Unipolar Head (Sulzer)	Alloclassic	14	309	981	1.4	(0.78, 2.39)
Unipolar Head (Zimmer)	Alloclassic	10	445	681	1.5	(0.70, 2.70)
Unipolar Head (Zimmer)	CPT	7	149	714	1.0	(0.39, 2.02)
Unipolar Head (Zimmer)	MS 30	0	56	124	0.0	(0.00, 2.97)
Unitrax	Accolade	5	76	132	3.8	(1.23, 8.82)
Unitrax	Exeter V40	69	2628	4666	1.5	(1.15, 1.87)
Unitrax	Omnifit	3	62	164	1.8	(0.38, 5.34)
VerSys Endo	CPT	22	1050	1670	1.3	(0.83, 2.00)
VerSys Endo	VerSys	5	114	191	2.6	(0.85, 6.11)
Other (100)		24	477	772	3.1	(1.99, 4.63)
TOTAL		**269**	**9941**	**18463**	**1.5**	**(1.29, 1.64)**

Note: Only prostheses with over 50 procedures have been listed.

Table HP37: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement

Unipolar Head	Femoral Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Endo II	Taperloc	6.1 (2.3, 15.6)	6.1 (2.3, 15.6)			
Hemi Head (Depuy)	C-Stem	1.9 (0.3, 12.9)	1.9 (0.3, 12.9)	4.7 (1.2, 18.0)		
Hemi Head (Depuy)	Elite Plus	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.6 (0.5, 22.8)		
Hemi Head (Mathys)	CCA	1.0 (0.3, 3.0)	2.7 (1.3, 5.6)	2.7 (1.3, 5.6)	2.7 (1.3, 5.6)	2.7 (1.3, 5.6)
Hemi Head (Mathys)	Fullfix Stem	1.5 (0.5, 4.7)	2.8 (1.2, 6.7)	2.8 (1.2, 6.7)		
Metasul	Alloclassic	1.9 (0.3, 12.4)				
Modular Cathcart	Corail	3.8 (2.2, 6.7)	7.4 (3.6, 15.0)			
Ultima	Thompson Modular	0.8 (0.1, 5.5)	0.8 (0.1, 5.5)	0.8 (0.1, 5.5)	0.8 (0.1, 5.5)	
Unipolar Head (Corin)	Taper Fit	1.1 (0.3, 4.4)	5.0 (1.5, 16.3)			
Unipolar Head (Corin)	Trifit	1.6 (0.6, 4.3)				
Unipolar Head (Plus)	SL-Plus	2.1 (1.1, 4.1)	5.2 (2.8, 9.4)	7.7 (3.6, 15.9)		
Unipolar Head (S&N)	CPCS	1.5 (0.9, 2.7)	2.8 (1.6, 4.9)			
Unipolar Head (S&N)	Platform	4.6 (1.5, 13.7)				
Unipolar Head (S&N)	Spectron EF	1.6 (1.0, 2.6)	3.5 (2.3, 5.3)	4.4 (2.8, 6.8)	5.3 (3.2, 8.6)	5.3 (3.2, 8.6)
Unipolar Head (Sulzer)	Alloclassic	3.4 (1.8, 6.4)	4.3 (2.4, 7.6)	6.2 (3.7, 10.5)		
Unipolar Head (Zimmer)	Alloclassic	2.5 (1.3, 4.8)	2.9 (1.6, 5.5)			
Unipolar Head (Zimmer)	CPT	0.7 (0.1, 5.2)	3.2 (1.2, 8.2)	5.2 (2.4, 11.3)	7.9 (3.4, 17.8)	7.9 (3.4, 17.8)
Unipolar Head (Zimmer)	MS 30	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
Unitrax	Accolade	1.4 (0.2, 9.3)	11.9 (4.9, 27.0)			
Unitrax	Exeter V40	1.6 (1.1, 2.2)	3.7 (2.8, 5.0)	7.1 (5.1, 9.7)	7.7 (5.5, 10.7)	
Unitrax	Omnifit	6.2 (2.0, 18.8)	6.2 (2.0, 18.8)	6.2 (2.0, 18.8)		
VerSys Endo	CPT	1.6 (0.9, 2.6)	3.4 (2.1, 5.6)	3.4 (2.1, 5.6)		
VerSys Endo	VerSys	4.7 (1.8, 12.3)	4.7 (1.8, 12.3)			
Other (100)		4.6 (2.9, 7.3)	7.7 (4.8, 12.1)	9.5 (5.6, 15.8)		

Note: Only prostheses with over 50 procedures have been listed.

Table HP38: Revision Rates of Primary Bipolar Hip Replacement

Bipolar Head	Femoral Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Bipolar Ballhead (Sulzer)	Alloclassic	8	308	1072	0.7	(0.32, 1.47)
Bipolar Ballhead (Sulzer)	MS 30	1	58	247	0.4	(0.01, 2.26)
Bipolar Head (Mathys)	CCA	2	87	311	0.6	(0.08, 2.33)
Bipolar Head (Zimmer)	Alloclassic	0	50	106	0.0	(0.00, 3.49)
Centrax	Exeter	6	202	990	0.6	(0.22, 1.32)
Centrax	Exeter V40	0	64	307	0.0	(0.00, 1.20)
Convene	CPCS	13	345	1060	1.2	(0.65, 2.10)
Convene	Spectron EF	7	165	600	1.2	(0.47, 2.40)
Hastings	C-Stem	7	158	556	1.3	(0.51, 2.59)
Hastings	Charnley	4	92	233	1.7	(0.47, 4.39)
Hastings	Corail	5	176	363	1.4	(0.45, 3.21)
Hastings	Elite Plus	13	298	1128	1.2	(0.61, 1.97)
Hastings	Summit	1	57	107	0.9	(0.02, 5.19)
Multipolar Bipolar	Alloclassic	1	72	112	0.9	(0.02, 4.98)
Multipolar Bipolar	CPT	7	167	276	2.5	(1.02, 5.22)
Multipolar Bipolar	VerSys	3	342	665	0.5	(0.09, 1.32)
Self-Centering	C-Stem	1	109	338	0.3	(0.01, 1.65)
Self-Centering	Corail	4	110	202	2.0	(0.54, 5.07)
Self-Centering	Elite Plus	3	238	845	0.4	(0.07, 1.04)
Tandem	CPCS	11	490	760	1.4	(0.72, 2.59)
Tandem	Spectron EF	5	110	158	3.2	(1.03, 7.37)
UHR	ABGII	10	165	431	2.3	(1.11, 4.26)
UHR	Accolade	4	98	122	3.3	(0.90, 8.42)
UHR	Exeter	8	207	962	0.8	(0.36, 1.64)
UHR	Exeter V40	76	3413	9104	0.8	(0.66, 1.04)
UHR	Global MRS	1	55	90	1.1	(0.03, 6.20)
UHR	Omnifit	18	330	1197	1.5	(0.89, 2.38)
Other (147)		46	1067	3241	1.4	(1.04, 1.89)
TOTAL		**265**	**9033**	**25584**	**1.0**	**(0.91, 1.17)**

Note: Only prostheses with over 50 procedures have been listed.

Table HP39: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement

Bipolar Head	Femoral Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Bipolar Ballhead (Sulzer)	Alloclassic	1.1 (0.3, 3.3)	2.7 (1.3, 5.6)	3.5 (1.7, 7.0)	3.5 (1.7, 7.0)	
Bipolar Ballhead (Sulzer)	MS 30	1.9 (0.3, 12.4)	1.9 (0.3, 12.4)	1.9 (0.3, 12.4)		
Bipolar Head (Mathys)	CCA	1.2 (0.2, 8.5)	2.7 (0.7, 10.3)	2.7 (0.7, 10.3)		
Bipolar Head (Zimmer)	Alloclassic	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
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)	4.2 (1.7, 10.0)
Centrax	Exeter V40	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
Convene	CPCS	2.2 (1.1, 4.6)	3.3 (1.8, 6.1)	5.0 (2.9, 8.7)		
Convene	Spectron EF	2.0 (0.6, 6.0)	3.8 (1.6, 9.0)	6.2 (2.9, 12.9)	6.2 (2.9, 12.9)	
Hastings	C-Stem	2.7 (1.0, 7.0)	5.6 (2.7, 11.6)	5.6 (2.7, 11.6)	5.6 (2.7, 11.6)	
Hastings	Charnley	0.0 (0.0, 0.0)	4.2 (1.1, 15.8)	10.1 (3.8, 25.1)		
Hastings	Corail	3.1 (1.3, 7.3)	3.1 (1.3, 7.3)	3.1 (1.3, 7.3)		
Hastings	Elite Plus	1.9 (0.8, 4.6)	4.3 (2.3, 7.9)	5.0 (2.8, 9.0)	7.4 (4.0, 13.3)	7.4 (4.0, 13.3)
Hastings	Summit	2.6 (0.4, 17.2)	2.6 (0.4, 17.2)			
Multipolar Bipolar	Alloclassic	1.6 (0.2, 10.6)	1.6 (0.2, 10.6)			
Multipolar Bipolar	CPT	4.1 (1.8, 8.9)	5.6 (2.6, 12.1)	5.6 (2.6, 12.1)		
Multipolar Bipolar	VerSys	0.3 (0.0, 2.2)	1.5 (0.5, 4.7)	1.5 (0.5, 4.7)		
Self-Centering	C-Stem	0.0 (0.0, 0.0)	1.2 (0.2, 8.2)	1.2 (0.2, 8.2)		
Self-Centering	Corail	3.8 (1.4, 9.7)	3.8 (1.4, 9.7)	3.8 (1.4, 9.7)		
Self-Centering	Elite Plus	0.0 (0.0, 0.0)	0.6 (0.1, 3.9)	1.7 (0.4, 7.2)		
Tandem	CPCS	2.4 (1.2, 4.5)	3.8 (1.9, 7.8)			
Tandem	Spectron EF	2.0 (0.5, 7.7)	10.3 (4.1, 24.7)			
UHR	ABGII	4.1 (1.9, 9.1)	5.2 (2.5, 10.9)	9.9 (5.2, 18.4)		
UHR	Accolade	4.3 (1.3, 13.6)				
UHR	Exeter	1.6 (0.5, 4.9)	3.5 (1.6, 7.6)	5.0 (2.5, 9.8)	5.0 (2.5, 9.8)	5.0 (2.5, 9.8)
UHR	Exeter V40	1.8 (1.4, 2.4)	2.5 (2.0, 3.2)	3.1 (2.4, 3.9)	3.3 (2.5, 4.3)	
UHR	Global MRS	2.5 (0.4, 16.5)	2.5 (0.4, 16.5)			
UHR	Omnifit	5.0 (3.0, 8.1)	5.4 (3.3, 8.6)	5.9 (3.7, 9.4)	6.9 (4.2, 11.3)	6.9 (4.2, 11.3)
Other (147)		3.6 (2.6, 5.0)	5.2 (3.9, 6.9)	5.4 (4.0, 7.2)	5.4 (4.0, 7.2)	5.4 (4.0, 7.2)

Note: Only prostheses with over 50 procedures have been listed.

Primary Unipolar Modular Hip Prostheses with a higher than anticipated Revision Rate

Table HP40: Revision Rate of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

Unipolar Head/ Femoral Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and still used				
Modular Cathcart/Corail	400	410	3.4	Entire Period: HR=2.09 (1.22, 3.60), p=0.007

Note: All Components have been compared to all other Unipolar Modular Hip components.

Table HP41: Yearly Cumulative Percent Revision of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

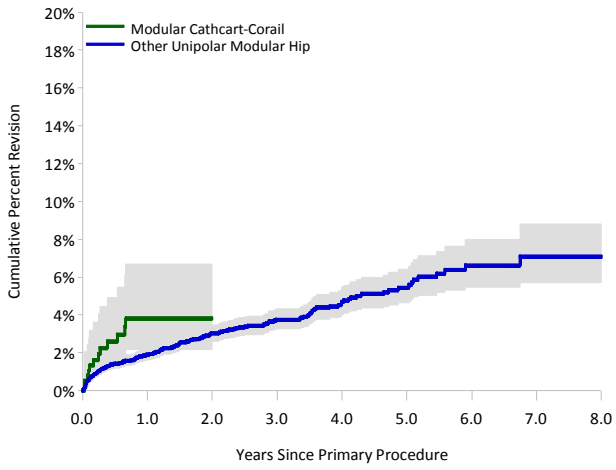
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and still used					
Modular Cathcart/Corail	3.8 (2.2, 6.7)				

Table HP42: Yearly Usage of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and still used										
Modular Cathcart/Corail							20	79	133	168

Figure HP17: Cumulative Percent Revision of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used



Primary Bipolar Hip Prostheses with a higher than anticipated Revision Rate

Table HP43: Revision Rate of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

Bipolar Head/ Femoral Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and still used				
*Bipolar Head (Biomet)	134	344	2.3	0 - 2Wk: HR=10.04 (2.97, 33.93), p<0.001 2Wk+: HR=1.39 (0.57, 3.37), p=0.469
UHR/ABGII	165	431	2.3	Entire Period: HR=2.22 (1.18, 4.18), p=0.013
UHR/Omnifit	330	1197	1.5	Entire Period: HR=1.73 (1.07, 2.80), p=0.024

Note: All Components have been compared to all other Bipolar Hip components.
*Bipolar Head Component

Table HP44: Yearly Cumulative Percent Revision of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

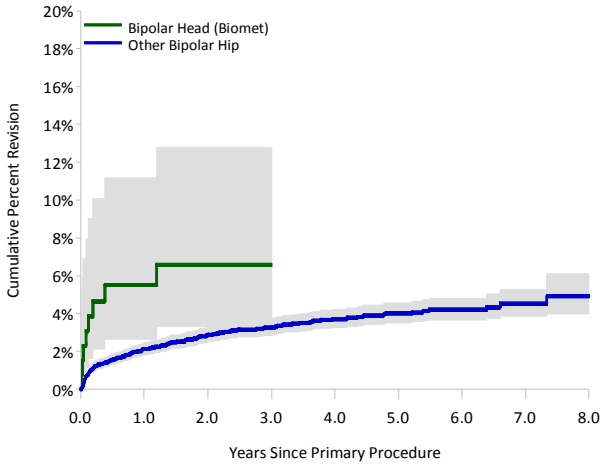
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and still used					
*Bipolar Head (Biomet)	5.5 (2.7, 11.2)	6.6 (3.3, 12.8)			
UHR/ABGII	4.1 (1.9, 9.1)	5.2 (2.5, 10.9)			
UHR/Omnifit	5.0 (3.0, 8.1)	5.4 (3.3, 8.6)	5.9 (3.7, 9.4)		

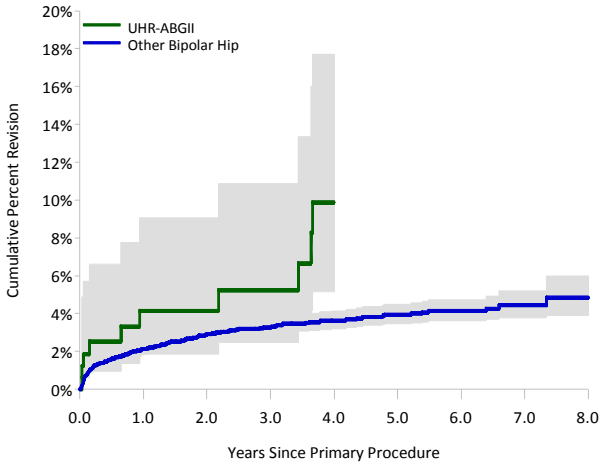
Table HP45: Yearly Usage of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

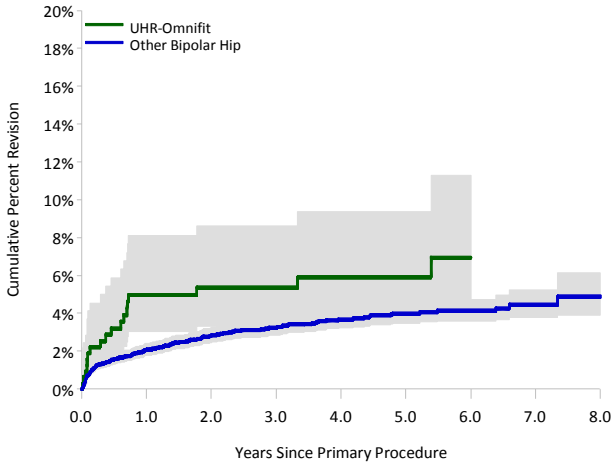
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and still used										
*Bipolar Head (Biomet)	1	3	6	16	19	20	16	19	18	16
UHR/ABGII			1	24	25	36	34	10	15	20
UHR/Omnifit	5	25	47	68	59	42	31	24	12	17

Figures HP18-20: Cumulative Percent Revision of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used







PRIMARY TOTAL HIP REPLACEMENT

The analysis for this report is based on 159,706 primary total hip replacements reported to the Registry up to and including 31st December 2008. This is an increase of 23,907 primary total hip procedures compared to the 2008 Annual Report. Primary total hip replacements include 147,422 conventional total, 12,093 total resurfacing and 191 thrust plate hip procedures.

A complete breakdown of the demographics of primary total hip replacement including age, gender, primary diagnosis and revision diagnosis for each category of hip replacement is available in a supplementary report on the Registry website www.dmac.adelaide.edu.au/aoanjrr/publications.jsp.

DIAGNOSIS

Osteoarthritis remains the most common diagnosis associated with primary total hip replacement and accounts for 88.7% of all procedures (88.3% of conventional total, 94.2% of total resurfacing and 94.8% of thrust plate procedures). Other common diagnoses include avascular necrosis (3.7%), fractured neck of femur (3.2%), developmental dysplasia (1.4%) and rheumatoid arthritis (1.3%).

Since 2003 there has been a reduction in the use of total resurfacing for the diagnosis of avascular necrosis (AVN) and developmental dysplasia of the hip (DDH). AVN has reduced from 3% in 2003 to 1.8% in 2008 and DDH from 3.3% to 1.5%.

USAGE OF TOTAL HIP REPLACEMENT

Conventional total hip replacement remains by far the most common type of primary total hip replacement and accounts for 92.3% of all primary total hip replacements recorded by the Registry. Total resurfacing accounts for 7.6% and thrust plate for 0.1% of total hip replacement (Table HT1).

Total resurfacing continues to decline and in 2008 accounted for 6.1% of all primary total hip replacement, a reduction from 8.8% in 2005. Western Australia has the lowest rate of total resurfacing accounting for less than 1.5% of primary total hip replacement with little variation over the last five years. All other states and territories have shown a decrease in total resurfacing hip replacement (Figure HT1).

The number of thrust plate hip procedures remains small with an additional 19 reported to the Registry in 2008.

AGE AND GENDER

Overall 53.2% of people undergoing primary hip replacement are female. Whilst the percentage of conventional total hip replacement is unchanged with respect to gender and age (Table HT2) there has been a reduction in the number of females undergoing total resurfacing from 27.7% in 2004 to 20.4% in 2008 (Table HT3). Primary total resurfacing hip replacement also continues to decline in patients older than 55 years of age, 49.2% in 2004 to 45.4% in 2008 (Table HT5).

FIXATION

There continues to be variation in the use of cementless, hybrid and cemented conventional total hip replacement by state and territory. The use of cementless prostheses has increased from 54.3% in 2004 to 61.9% in 2008, however cemented and hybrid prostheses have declined by 5.1% and 2.5% respectively (Figure HT2). Almost all total resurfacing hip replacement use hybrid fixation, however there has been a small increase in cementless fixation, largely in South Australia (Figure HT3).

CONVENTIONAL TOTAL HIP REPLACEMENT

The Exeter V40 stem remains the most used femoral stem for conventional total hip replacement in Australia (Table HT6 and Figure HT4). While there is no change in the five most frequently used femoral stems there has been an increase in the use of the Corail stem and a reduction in the use of the Accolade stem. The use of the Synergy and Alloclassic stems has remained constant. The percentage of procedures using the ten most frequently used femoral stems has continued to increase from 62.9% in 2004 to 68.6% in 2008. The number of different femoral stems recorded by the Registry in 2008 was 106. The ten most used cemented and cementless femoral stems are listed separately in Tables HT7 and HT8.

The Trident acetabular component remains the most frequently used acetabular prosthesis though there was a slight reduction in its use compared to 2007 (Table HT9 and Figure HT7). The R3 acetabular shell is the third most used acetabular component with 1,875 procedures recorded in 2008, and only six procedures in 2007. There has been a slight decrease in the use of the ASR and BHR acetabular components in primary conventional total hip replacement compared to previous years. The ten most frequently used acetabular prostheses were implanted in 79.9% of all conventional total hip replacements in 2008. There has been a slight reduction in the number of different types of acetabular prostheses used in 2008 compared to the preceding three years. The ten most used cemented and cementless acetabular prostheses are listed separately in Tables HT10 and HT11.

TOTAL RESURFACING HIP REPLACEMENT

The number of total resurfacing hip procedures has continued to decline as a proportion of all hip

procedures and also in terms of absolute numbers. The BHR remains the most used prosthesis accounting for 50.9% of all total resurfacings in 2008. The Mitch TRH was the second most used prosthesis and showed a small increase in 2008. The ASR and Durom showed a small decline in use and the Cormet HAP BiCoat showed an increase in usage from 71 in 2007 to 84 in 2008. The ten most frequently used total resurfacing prostheses accounted for 99.9% of all procedures implanted in 2008 (Table HT12 and Figure HT10).

Outcome of Primary Total Hip Replacement

Conventional total hip replacement continues to have a significantly lower revision rate compared to total resurfacing, with an eight year cumulative percent revision of 4.0% compared to 5.3% (Adj HR=1.37; 95%CI (1.22, 1.55) p<0.001) (Tables HT13 and HT14 and Figure HT11).

Outcome of Conventional Total Hip Replacement

Age and Gender

Previously the Registry reported no difference in the revision rate of primary conventional total hip replacement with respect to age. This year there is a significant difference in outcome between individuals aged less than 65 years compared to 65 years and older (Tables HT15 and HT16 and Figure HT12).

There is no significant difference in the risk of revision for primary conventional total hip replacement with respect to gender. The eight year cumulative percent revision for females is 3.8% and for males is 4.3% (Tables HT17 and HT18 and Figure HT13).

As reported in 2008 there continues to be a difference in the risk of revision between age within gender. For females the risk of revision decreases with increasing age. Females under 55 have the highest risk of revision at eight years (5.9%). Females under the age of 75 years have a significantly higher revision rate compared to those over 75 years (Tables HT19 and HT20 and Figure HT14).

The relationship between risk of revision and age is not apparent for males, with males 65 to 74 years having the lowest cumulative percent revision at eight years (3.8%). Males 75 years or older have a significantly higher rate of revision than those aged less than 55 years (Tables HT19 and HT20 and Figure HT15).

Fixation

At eight years the cumulative percent revision of hybrid fixation is 3.4%, cement 3.9% and cementless 4.4%. In the first two years following surgery, cement fixation has a significantly lower risk of revision compared to cementless fixation, with no difference in the risk of revision after two years. In the first month cement fixation has a significantly lower risk of revision compared to hybrid fixation and a significantly higher risk of revision between nine months and a 3.5 years. After 3.5 years there is no difference between cement and hybrid fixation (Tables HT21 and HT22 and Figure HT16).

The difference in the risk of revision between methods of fixation is associated with the age of the patient. For those individuals less than 55 years cementless fixation has a slightly higher risk of revision compared to hybrid fixation. Cement fixation has no significant difference in the risk of revision compared to cementless or hybrid fixation (Tables HT23 and HT24 and Figure HT17).

As reported previously the difference between cementless and cemented or hybrid fixation is most apparent in those 75 years or older. The risk of revision for cementless fixation is significantly higher than both hybrid and cemented fixation (Figure HT20). A statistical comparison of fixation by age is presented in Figures HT17-HT20.

Bearing Surface

Last year the Registry reported for the first time the effect of bearing surface on the early to mid term outcome of primary conventional total hip replacement. As advised last year caution should be taken when interpreting these analyses. The relationship between bearing surface and other factors known to be important to the outcome of joint replacement is complex and the current follow up period is relatively short. This is particularly so for larger head sizes with ceramic on polyethylene and metal on metal bearing surfaces.

The Registry has classified bearing surface into six categories: Ceramic on Polyethylene, Ceramic on Ceramic, Metal on Polyethylene, Metal on Metal, Ceramic on Metal and a sixth category relating to a small number of procedures where the bearing surface is yet to be classified by the Registry.

Without taking head size into consideration, metal on metal bearing surface has a higher revision rate than other bearing surfaces. Metal on polyethylene has a significantly lower risk of revision compared to all other bearing surfaces however when compared to ceramic on ceramic it is only significant for the first one and a half years following the initial surgery (Tables HT25 and HT26 and Figure HT21).

The risk of revision however does vary depending on head size. When the head size is 28mm or less, metal on polyethylene has the lowest risk of revision. This is significantly lower than ceramic on ceramic for the first one and a half years after the

initial surgery and ceramic on polyethylene for the first six months. It is not significantly different however from metal on metal for the head size of 28mm or less (Tables HT27 and HT28 and Figure HT22).

When the head size is greater than 28mm, metal on metal has the highest risk of revision and metal on polyethylene the lowest. The five year cumulative percent revision when metal on metal is used is 4.0% and metal on polyethylene 1.7%. Ceramic on ceramic and ceramic on polyethylene have five year cumulative percent revision of 2.7% and 2.1% respectively (Tables HT27 and HT28 and Figure HT23).

For each of the bearing surfaces larger head size (with the exception of metal on metal) is associated with a lower risk of revision than the smaller head size for that bearing surface. With metal on metal larger head size is associated with a higher risk of revision (Tables HT27 and HT28 and Figures HT24-HT27).

Prosthesis Specific Outcomes

The outcomes of the most used stem and acetabular combinations for primary conventional total hip replacements are listed in Tables HT29-HT34. The tables are grouped into combinations of cemented, cementless and hybrid (femoral cemented) prostheses with over 350 procedures recorded by the Registry. The first table provides information on the number of procedures and revisions and the revisions per 100 observed component years and the second table provides the yearly cumulative percent revision. There are 1,385 combinations for primary conventional total hip replacement recorded by the Registry (136 more combinations than last year), of these 72 combinations have over 350 procedures. Although the listed combinations are only a small proportion of the possible combinations, they represent 78% of all primary conventional total hip replacement.

These tables allow a comparison of outcomes for the most used combinations. The group 'Other' is the combined outcome of all prostheses combinations with less than 350 procedures. This group has a total of 1,313 stem and acetabular combinations, making up only 22% of all primary conventional total hip replacement.

There are 11 conventional total stem and acetabular combinations with more than 350 procedures using cement fixation. All have over 1,000 observed component years and the number of revisions per 100 observed component years varies from 0.2 to 0.9. Of those with an eight year cumulative percent revision, the least revised combinations are the MS 30/Low Profile Cup (1.0%) and the Exeter/Exeter (3.2%) (Tables HT29 and HT30).

There are 42 cementless conventional total stem and acetabular combinations listed with 35 having over 1,000 observed component years. The number of revisions per 100 observed component years varies from 0.5 to 2.8 revisions, which is a wider range than for both cemented and hybrid combinations. Three cementless combinations have 0.5 revisions per 100 observed component years and are unchanged from the 2008 Annual Report. These are the Natural Hip/Fitmore, Secur-Fit Plus/Trident and the Summit/Pinnacle. Of the six combinations reported with an eight year cumulative percent revision the Secur-Fit Plus /Trident combination is the lowest (2.8%) (Tables HT31 and HT32).

There are 19 combinations of conventional total hip replacement with hybrid fixation. All but one listed combination has over 1,000 observed component years and the rate of revision per 100 observed component years varies from 0.2 to 1.1. The Definition/Vitalock has the lowest cumulative percent revision at eight years (1.5%) (Tables HT33 and HT34).

Outcome of Total Resurfacing Hip Replacement

Age and Gender

Age has a significant effect on the risk of revision for primary total resurfacing and the risk of revision increases with increasing age (Tables HT35 and HT36 and Figure HT28). At seven years the cumulative percent revision for patients aged less than 55 years is 4.7%, 55-64 and 65-74 are both 5.6%.

At seven years females have more than twice the cumulative percent revision than males, 8.7% compared to 3.8% (Tables HT37 and HT38 and Figure HT29).

The effect of increasing age on the risk of revision is evident for both males and females (Tables HT39 and HT40 and Figures HT30 and HT31).

Fixation

Almost all total resurfacing procedures utilise hybrid fixation with a cemented femoral component and cementless acetabular component. There has been an increase in cementless total resurfacing procedures (i.e. cementless femoral component) in 2008. No comparative outcome data by fixation are presented. The principal cementless femoral components are the Biomet, Cormet 2000 HAP and Cormet HAP BiCoat. The outcome for these prostheses is shown in Tables HT45 and HT46.

Femoral Component Head Size

As reported for the first time last year there is a relationship between femoral component head size and the risk of revision for total resurfacing hip replacement. Further data confirms an inverse

relationship between the femoral component head size and the risk of revision. At seven years patients with a femoral head size component 44mm or less have over four times the risk of revision of patients with a component head size 55mm or more, with a five year cumulative percent revision of 9.2% and 2.3% respectively (Adj HR=4.30; 95%CI (2.21, 8.37) p<0.001) (Tables HT41 and HT42 and Figure HT32).

The effect of femoral component head size is evident in both males and females. Gender difference in outcome for total resurfacing procedures is largely due to differences in femoral head size. There is no significant difference between gender in the risk of revision after adjusting for femoral component head size. Males and females with femoral component head size less than 50mm have a similar cumulative percent revision at seven years (8.4% and 9.5% respectively) and males and females with head sizes 50mm or greater also have a similar five year cumulative percent revision (2.3% and 2.0% respectively) (Tables HT43 and HT44 and Figure HT33).

PROSTHESIS SPECIFIC OUTCOMES

The outcomes of total resurfacing systems recorded in the Registry are listed in Tables HT45 and HT46. The three combinations with over 1,000 observed component years are the BHR, ASR and Durom. The eight year cumulative percent revision of the BHR is 5.0%. The five year cumulative percent revision for the ASR is 8.7% and Durom 6.7%, both higher than the BHR at eight years. Six prostheses combinations have a cumulative percent revision up to three years. These vary from 1.9% for the Adept to 7.6% for the Recap, excluding the Conserve/Conserve Plus which has only recorded 10 procedures and no revisions (Tables HT45 and HT46).

TOTAL HIP PROSTHESES WITH A HIGHER THAN ANTICIPATED REVISION RATE

The approach the Registry uses to identify individual femoral, acetabular or combinations of these components as having a higher than anticipated rate of revision is detailed in the Introduction (Page 1).

In brief the Registry uses a standard algorithm to screen prostheses in the same class identifying those that have more than twice the rate of revision compared to all others within that class. These prostheses or prostheses combinations are individually reviewed following more extensive analysis, particularly examining for the effect of a range of confounding factors.

These data are then reviewed by a panel of orthopaedic surgeons who determine which components should be identified. Only a small number of the prostheses or prostheses combinations originally identified by the algorithm are subsequently identified in the report.

CONVENTIONAL TOTAL HIP REPLACEMENT

As previously mentioned there is a large number of different femoral stem and acetabular component combinations available for comparative analysis in the conventional total hip category (1,385 combinations). These combinations are the result of mixing and matching different femoral stem and acetabular components, often from different companies. This practice is largely specific to primary conventional total hip replacement.

The Registry is able to report the outcome of combinations and/or individual stems and acetabular components. It is apparent from previous reports that femoral stems and acetabular components that perform well individually may not perform satisfactorily in a surgeon or company selected combination (i.e. a good outcome may not be achieved by combining two good components). This finding implies that the outcome of a primary conventional total hip replacement is in part dependent on the interaction between the different components used. This year the Registry recorded 136 more combinations that had previously been documented.

Individual femoral stems and acetabular components are analysed by combining all possible combinations for an overall analysis of the femoral stem or acetabular component and then reviewed to determine if a higher revision rate is identified with a single combination, multiple combinations or uniformly with all combinations.

Combinations and individual femoral and acetabular prostheses identified as having a higher than anticipated rate of revision in this report are listed in Table HT47. These are grouped into three categories; Re-identified and no longer used, Re-identified and still used and Newly Identified. The revisions per 100 observed component years, age and gender adjusted hazard ratio, confidence interval and p-value, cumulative percent revision and usage per year are listed in Tables HT47, HT48 and HT49. Survivorship curves for prostheses that are still being used are also provided in Figures HT34-HT49.

In the re-identified and no longer used group, the same seven components as last year are included along with the addition of the F2LMultineck/Delta and the SPH Blind acetabular component. These two components were not used in 2008.

In the re-identified and still used category there are five femoral stems [Adapter (cemented), Anca_Fit, Consensus (includes Hayes Consensus reported last year), Lyderic II, Profemur Z] and two cups (Bionik, MBA) which are identified.

There are nine newly identified primary conventional total hip prostheses and prostheses combinations identified as having a higher than anticipated rate of revision. Each will be considered separately.

This year the ASR has been identified in its own right and not in combination with other femoral stems. When used in total resurfacing hip replacement the ASR has also been identified as having a higher than anticipated risk of revision. There have been 3,971 reported to the Registry with 126 revised, 1.8 revisions per 100 observed component years. The cumulative percent revision is 5.4% at three years. The hazard ratio for ASR compared to all other conventional total hip replacement varies over time (Table HT47) but from one month onwards is significantly higher. The hazard ratio from one month to two years is 1.81, from two to three years 5.41 and from three years onwards 3.87. Fifty of the 126 revisions have been acetabular only and 18 are a combination of femoral and acetabular.

The Alloclassic/Durom combination has a cumulative percent revision at three years of 5.4%. When compared to all other primary conventional total hip replacement there is only a significant difference in the risk of revision after two years (Adj HR = 5.38; 95%CI (2.88, 10.05) p<0.001).

The Charnley/Duraloc combination has a cumulative percent revision at seven years of 12.3%. The Registry has recorded only 180 procedures and no procedures using this combination have been reported since 2006. When compared to all other primary conventional total hip replacement there is only a significant difference in the risk of revision after 3.5 years (AdJ HR=6.05; 95%CI (3.34, 10.98) p<0.001).

The CLS/Trilogy combination has been used in relatively small numbers over the last four years but has 2.3 revisions per 100 observed component years with 5.8% cumulative percent revision at three years (Adj HR = 2.32; 95%CI (1.16, 4.63) p=0.017).

The Edinburgh/Icon combination has only been used in small numbers (46 procedures) but has 8.9 revisions per 100 observed component years with 9.4% cumulative percent revision at one year (Adj HR = 7.23; 95%CI (3.01, 17.38) p<0.001).

In the 2006 Annual Report the Esop/Atlas combination was identified as having a higher than anticipated rate of revision. This was based on only a small number of procedures. Since that time this prosthesis combination was not significantly different compared to other primary conventional total hips until this year. There have been eight revisions from 156 procedures, 1.7 revisions per 100 observed component years and a cumulative percent revision of 4.2% at three years (Adj HR = 2.02; 95%CI (1.01, 4.03) p=0.047).

The M/L Taper/Fitmore combination has been used in small numbers. There has however been 4.5 revisions per 100 observed component years and a cumulative percent revision of 4.5% at one year (Adj HR = 3.10; 95%CI (1.29, 7.46) p=0.011).

The Secur-Fit Plus/Secur-Fit combination has been used over a number of years but not since 2006. There have been 1.6 revisions per 100 observed component years and the five year cumulative percent revision is 8.0% (Adj HR=2.31; 95%CI (1.42, 3.77) p<0.001).

The Quadra-H/Versafit combination has only been recorded by the Registry since 2007. Most of the 245 procedures were undertaken in 2008. There have been 6.7 revisions per 100 observed component years and the cumulative percent revision at one year is 4.9%. This prosthesis is significantly different from other primary conventional total hips because of a high risk of revision in the first two weeks after the procedure (Adj HR=11.30; 95%CI (5.35, 23.86) p<0.001).

TOTAL RESURFACING HIP REPLACEMENT

The same three prostheses previously identified by the Registry have again been identified as having a higher than anticipated rate of revision. These are the Cormet 2000 HAP which is no longer used and has a 9.5% cumulative percent revision at five years. Both the ASR/ASR and Durom/Durom are still used and have a five year cumulative percent revision of 8.7% and 6.7% respectively (Tables HT50 and HT51). The yearly usage of the identified resurfacing prostheses is presented in Table HT52 and the cumulative percent revision is presented graphically in Figures HT50-52.

Newly identified this year is the Recap/Recap, of which there have been 137 implanted. The one year cumulative percent revision is 5.0% and this combination has over two and half times the risk of revision compared to all other total resurfacing procedures (Adj HR=2.59; 95%CI (1.29, 5.22) p=0.007).

PRIMARY TOTAL HIP REPLACEMENT
1/9/1999 - 31/12/2008

Table HT1: Primary Total Hip Replacement by State/Territory

State/Territory	Cemented		Cementless		Hybrid		Total Resurfacing		Thrust Plate		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
NSW	2022	4.3	27862	59.3	13461	28.6	3653	7.8	11	0.0	47009	100.0
VIC	5152	11.6	21110	47.7	13570	30.7	4406	10.0	1	0.0	44239	100.0
QLD	6246	24.4	8165	31.9	9152	35.8	1993	7.8	0	0.0	25556	100.0
WA	1021	6.0	10470	61.3	5081	29.8	328	1.9	169	1.0	17069	100.0
SA	2482	15.0	6416	38.7	6523	39.4	1139	6.9	0	0.0	16560	100.0
TAS	464	8.5	4400	80.6	504	9.2	83	1.5	10	0.2	5461	100.0
ACT/NT	84	2.2	2117	55.5	1120	29.4	491	12.9	0	0.0	3812	100.0
AUST	**17471**	**10.9**	**80540**	**50.4**	**49411**	**30.9**	**12093**	**7.6**	**191**	**0.1**	**159706**	**100.0**

Figure HT1: Trends in Usage of Total Hip Replacement by State/Territory and Year

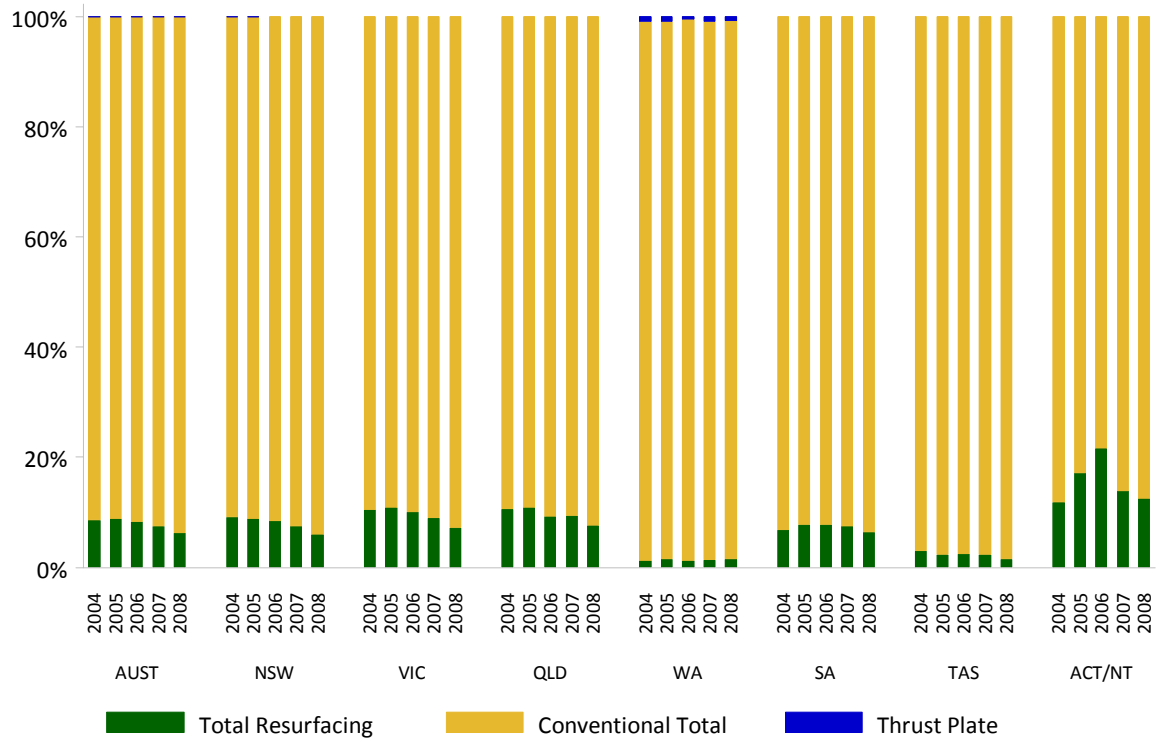


Table HT2: Primary Conventional Total Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	10167	56.0	7986	44.0	18153	100.0
2005	10603	55.9	8366	44.1	18969	100.0
2006	10831	55.2	8791	44.8	19622	100.0
2007	11322	55.6	9030	44.4	20352	100.0
2008	12284	55.6	9825	44.4	22109	100.0

Table HT3: Primary Total Resurfacing Hip Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	468	27.7	1220	72.3	1688	100.0
2005	496	27.1	1336	72.9	1832	100.0
2006	427	24.2	1341	75.8	1768	100.0
2007	386	23.5	1257	76.5	1643	100.0
2008	294	20.4	1148	79.6	1442	100.0

Table HT4: Primary Conventional Total Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	1988	11.0	4113	22.7	6191	34.1	4989	27.5	872	4.8	18153	100.0
2005	2211	11.7	4351	22.9	6413	33.8	5099	26.9	895	4.7	18969	100.0
2006	2310	11.8	4383	22.3	6583	33.5	5322	27.1	1024	5.2	19622	100.0
2007	2405	11.8	4774	23.5	6679	32.8	5467	26.9	1027	5.0	20352	100.0
2008	2597	11.7	5279	23.9	7343	33.2	5672	25.7	1218	5.5	22109	100.0

Table HT5: Primary Total Resurfacing Hip Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	858	50.8	669	39.6	151	8.9	10	0.6	0	0.0	1688	100.0
2005	899	49.1	758	41.4	169	9.2	6	0.3	0	0.0	1832	100.0
2006	926	52.4	679	38.4	159	9.0	3	0.2	1	0.1	1768	100.0
2007	837	50.9	675	41.1	124	7.5	7	0.4	0	0.0	1643	100.0
2008	788	54.6	550	38.1	97	6.7	7	0.5	0	0.0	1442	100.0

Figure HT2: Trends in Usage of Fixation in Conventional Total Hip Replacement by State/Territory and Year

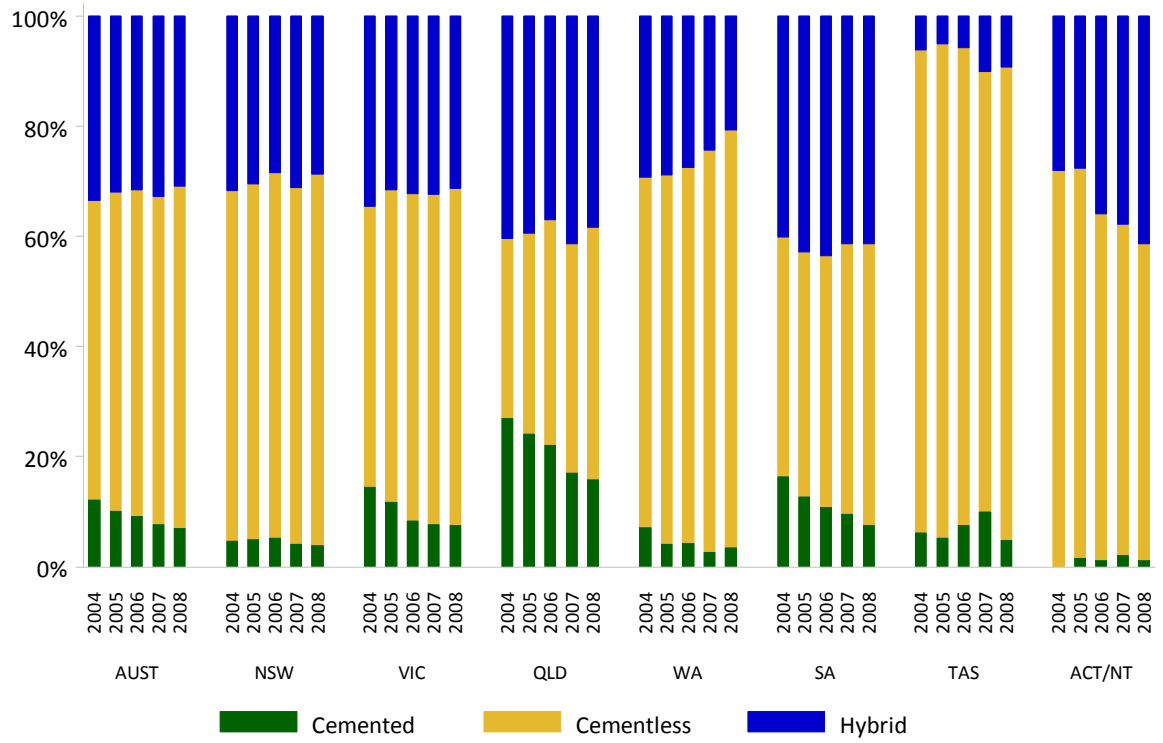


Figure HT3: Trends in Usage of Fixation in Total Resurfacing Hip Replacement by State/Territory and Year

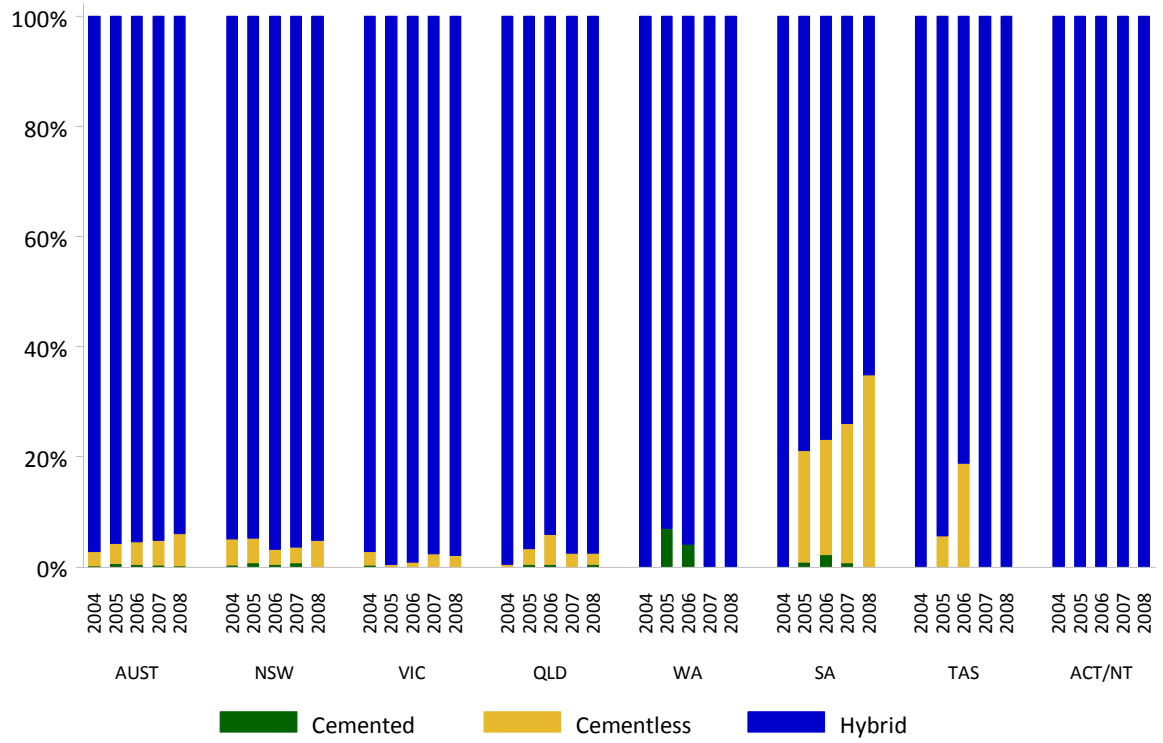


Table HT6: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Exeter V40 4216	Exeter V40 4431	Exeter V40 4476	Exeter V40 4703	Exeter V40 4797
2	Synergy 1371	Synergy 1261	Corail 1431	Corail 2048	Corail 3128
3	Alloclassic 997	Alloclassic 1222	Synergy 1404	Accolade 1564	Accolade 1158
4	ABGII 907	Accolade 947	Accolade 1350	Synergy 1107	Synergy 1096
5	Spectron EF 810	Corail 940	Alloclassic 1059	Alloclassic 1075	Alloclassic 1067
6	Secur-Fit Plus 764	ABGII 764	Spectron EF 817	Spectron EF 826	CPT 1049
7	VerSys 692	Spectron EF 727	Summit 622	CPT 737	Secur-Fit 831
8	Accolade 579	VerSys 680	VerSys 591	SL-Plus 563	Anthology 704
9	CPT 553	Secur-Fit Plus 665	CPT 555	Summit 562	Spectron EF 682
10	Omnifit 521	Summit 550	ABGII 518	VerSys 522	SL-Plus 659
Top 10 Usage	62.9%	64.2%	65.4%	67.3%	68.6%
Total Procedures	18153	18969	19622	20352	22109
N Prosthesis Types	81	97	98	107	106

Figure HT4: 5 Most Common Femoral Components used in Primary Conventional Total Hip Replacement

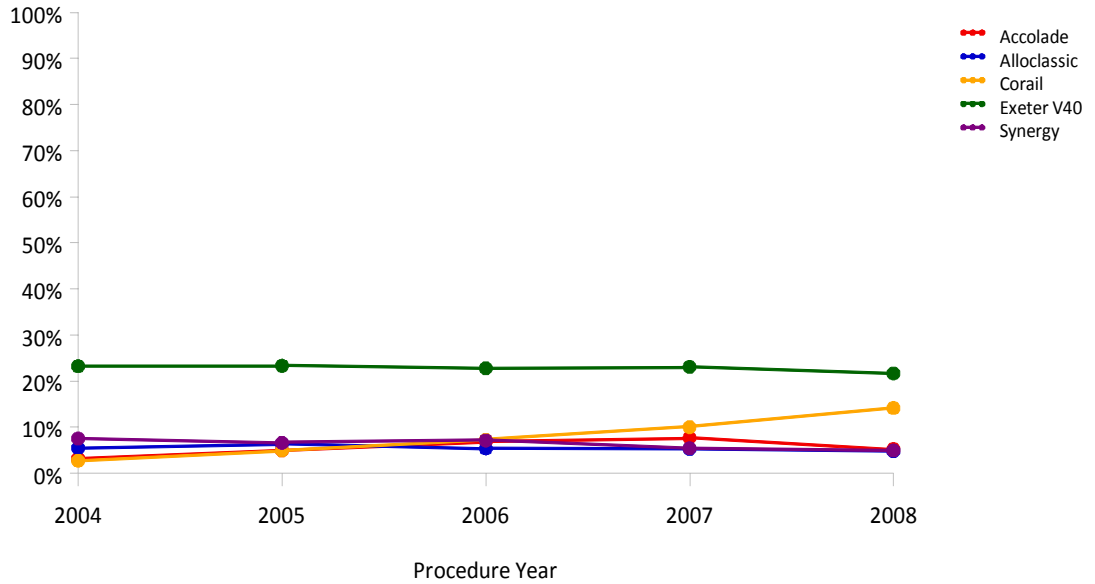


Table HT7: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cement Fixation

Rank	2004	2005	2006	2007	2008
1	Exeter V40	Exeter V40	Exeter V40	Exeter V40	Exeter V40
	4215	4429	4473	4702	4797
2	Spectron EF	Spectron EF	Spectron EF	Spectron EF	CPT
	810	726	817	826	1049
3	CPT	CPT	CPT	CPT	Spectron EF
	553	505	555	737	681
4	C-Stem	C-Stem	CPCS	CPCS	CPCS
	456	379	515	493	628
5	CPCS	CPCS	C-Stem	C-Stem	C-Stem
	377	365	351	382	241
6	Elite Plus	MS 30	MS 30	MS 30	MS 30
	352	297	262	193	215
7	Omnifit	Elite Plus	Omnifit	Omnifit	Omnifit
	285	248	164	164	179
8	MS 30	Omnifit	Charnley	VerSys	Charnley
	276	225	148	129	161
9	Charnley	Charnley	Elite Plus	Charnley	R120
	202	218	112	108	52
10	VerSys	VerSys	VerSys	Adapter	Adapter
	115	119	111	53	38
Top 10 Usage	92.8%	94.4%	94.9%	95.1%	96.1%
Total Procedures	8232	7953	7914	8184	8369
N Prosthesis Types	38	40	42	37	45

Figure HT5: 5 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cement Fixation

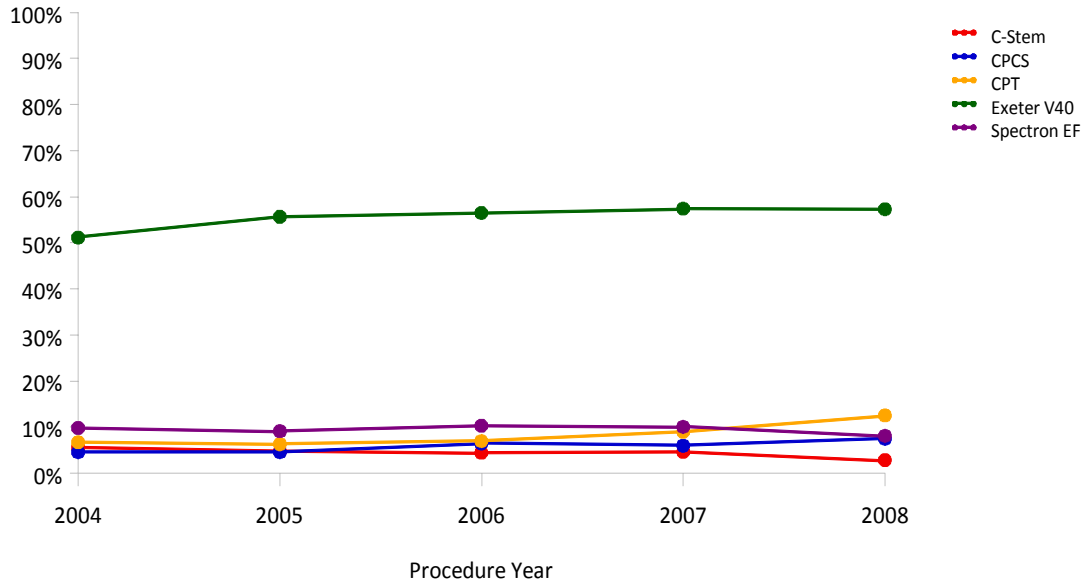


Table HT8: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

Rank	2004	2005	2006	2007	2008
1	Synergy 1361	Synergy 1247	Corail 1430	Corail 2048	Corail 3128
2	Alloclassic 994	Alloclassic 1222	Synergy 1398	Accolade 1562	Accolade 1158
3	ABGII 907	Accolade 945	Accolade 1350	Synergy 1095	Synergy 1088
4	Secur-Fit Plus 762	Corail 940	Alloclassic 1057	Alloclassic 1075	Alloclassic 1067
5	Accolade 577	ABGII 762	Summit 621	SL-Plus 563	Secur-Fit 830
6	VerSys 577	Secur-Fit Plus 664	ABGII 518	Summit 557	Anthology 700
7	Corail 499	VerSys 561	Secur-Fit 503	Anthology 508	SL-Plus 658
8	S-Rom 497	Summit 550	VerSys 480	Secur-Fit 490	Summit 639
9	Secur-Fit 448	Secur-Fit 507	SL-Plus 476	S-Rom 472	S-Rom 448
10	Summit 407	S-Rom 462	S-Rom 436	ABGII 428	ABGII 367
Top 10 Usage	70.8%	71.4%	70.6%	72.3%	73.4%
Total Procedures	9921	11016	11708	12168	13740
N Prosthesis Types	61	74	77	85	81

Figure HT6: 5 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

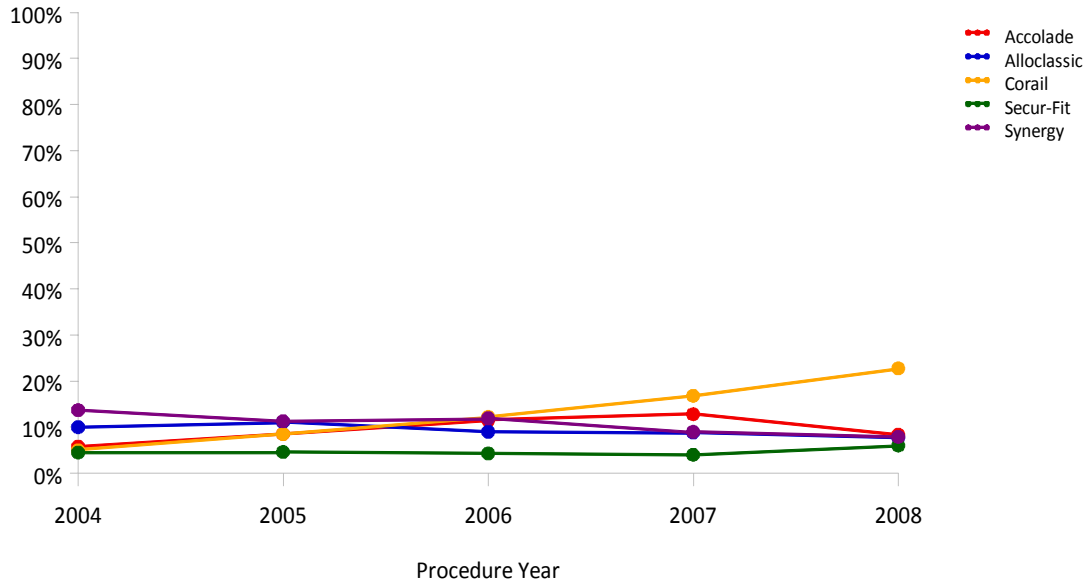


Table HT9: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement

Rank	2004	2005	2006	2007	2008
1	Trident	Trident	Trident	Trident	Trident
	4751	5465	5736	6059	5585
2	Reflection	Reflection	Reflection	Reflection	Pinnacle
	2440	2130	2529	2525	3239
3	Trilogy	Pinnacle	Pinnacle	Pinnacle	R3
	1387	1392	1724	2145	1875
4	Pinnacle	Trilogy	Trilogy	Trilogy	Trilogy
	1094	1352	1295	1366	1619
5	Allofit	Allofit	Allofit	ASR	Reflection
	880	956	982	1181	1388
6	Contemporary	Contemporary	ASR	Allofit	ASR
	802	912	957	889	1167
7	ABGII	Mallory-Head	Contemporary	Contemporary	Allofit
	750	647	903	800	943
8	Duraloc	ASR	BHR	BHR	Contemporary
	630	582	548	579	765
9	Mallory-Head	Fitmore	Mallory-Head	Trabecular Metal Shell	Trabecular Metal Shell
	599	498	433	489	607
10	Fitmore	ABGII	EPF-Plus	EPF-Plus	BHR
	589	452	408	431	472
Top 10 Usage	76.7%	75.8%	79.1%	80.9%	79.9%
Total Procedures	18153	18969	19622	20352	22109
N Prosthesis Types	71	87	85	85	82

Figure HT7: 5 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement

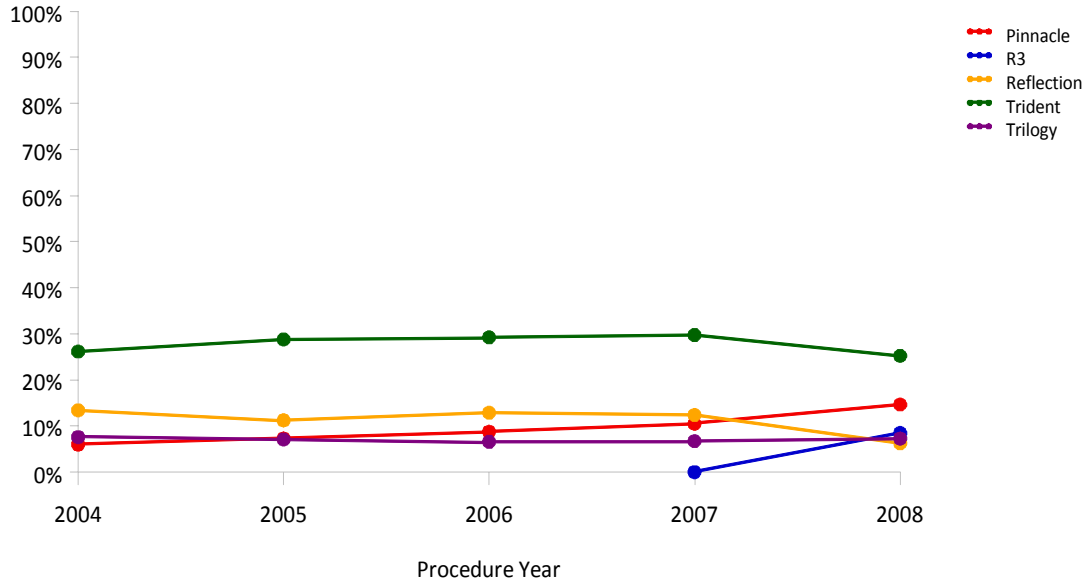


Table HT10: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cement Fixation

Rank	2004	2005	2006	2007	2008
1	Contemporary 802	Contemporary 912	Contemporary 902	Contemporary 799	Contemporary 765
2	Reflection 321	Reflection 225	Reflection 233	Reflection 223	Reflection 212
3	Exeter 224	Exeter 136	Exeter 133	Exeter 109	Exeter 124
4	Charnley Ogee 191	Charnley Ogee 96	Elite Plus LPW 86	Brunswick 72	ZCA 87
5	Elite Plus Ogee 117	Charnley 74	Brunswick 78	ZCA 59	Charnley 79
6	Low Profile Cup 96	Elite Plus Ogee 71	CCB 67	Charnley 55	Brunswick 68
7	ZCA 96	Low Profile Cup 66	Charnley Ogee 65	CCB 52	CCB 48
8	Elite Plus LPW 51	ZCA 66	ZCA 56	Elite Plus LPW 41	Low Profile Cup 41
9	Brunswick 42	Elite Plus LPW 65	Elite Plus Ogee 50	Low Profile Cup 36	Charnley Ogee 35
10	Charnley 40	Brunswick 63	Charnley 48	Elite Plus Ogee 31	Polarcup 22
Top 10 Usage	87.6%	88.4%	90.3%	90.7%	91.2%
Total Procedures	2260	2006	1902	1628	1624
N Prosthesis Types	40	43	36	38	39

Figure HT8: 5 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cement Fixation

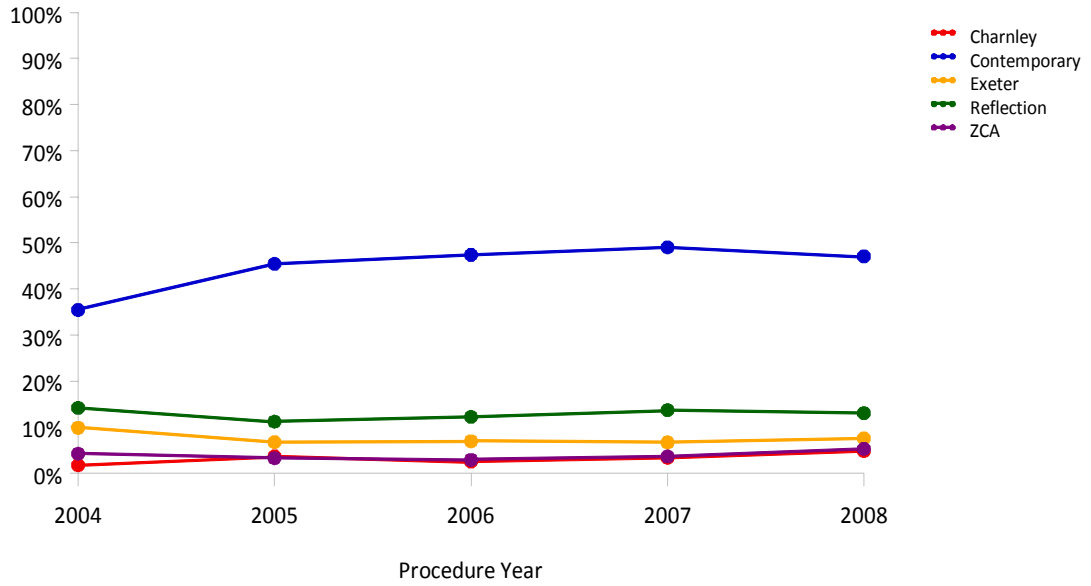


Table HT11: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

Rank	2004	2005	2006	2007	2008
1	Trident	Trident	Trident	Trident	Trident
	4738	5451	5723	6040	5565
2	Reflection	Reflection	Reflection	Reflection	Pinnacle
	2119	1905	2296	2302	3237
3	Trilogy	Pinnacle	Pinnacle	Pinnacle	R3
	1385	1391	1723	2142	1871
4	Pinnacle	Trilogy	Trilogy	Trilogy	Trilogy
	1092	1351	1294	1364	1611
5	Allofit	Allofit	Allofit	ASR	Reflection
	878	954	978	1181	1176
6	ABGII	Mallory-Head	ASR	Allofit	ASR
	748	646	957	887	1165
7	Duraloc	ASR	BHR	BHR	Allofit
	630	581	548	576	938
8	Mallory-Head	Fitmore	Mallory-Head	Trabecular Metal Shell	Trabecular Metal Shell
	598	494	433	478	596
9	Fitmore	ABGII	EPF-Plus	EPF-Plus	BHR
	588	452	408	431	471
10	Vitalock	Duraloc	Durom	Mallory-Head	EPF-Plus
	579	447	322	394	411
Top 10 Usage	84%	80.6%	82.9%	84.4%	83.2%
Total Procedures	15893	16963	17720	18724	20485
N Prosthesis Types	47	60	61	62	60

Figure HT9: 5 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

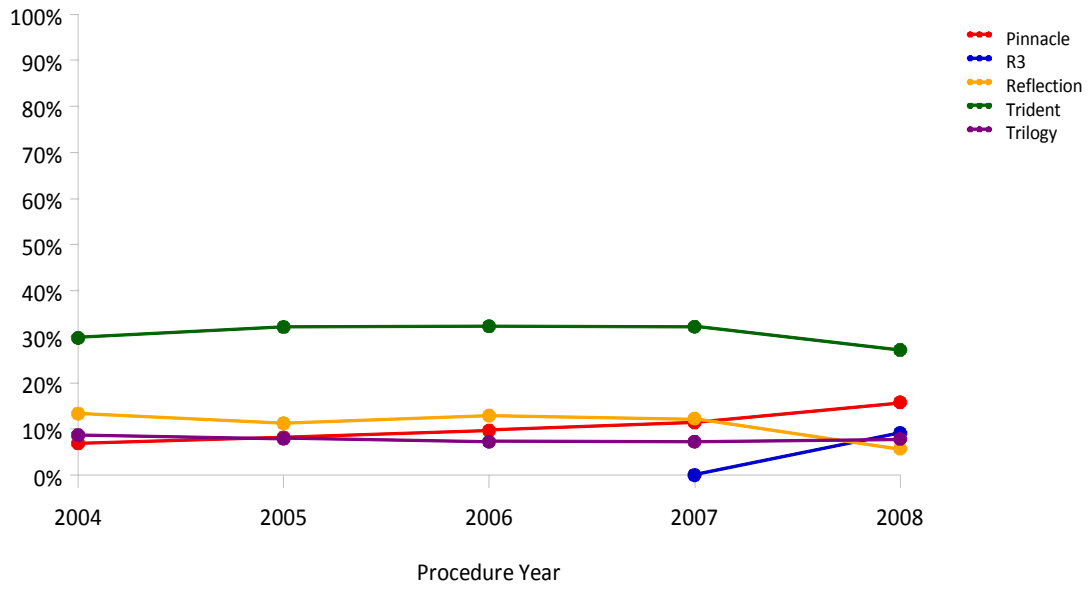
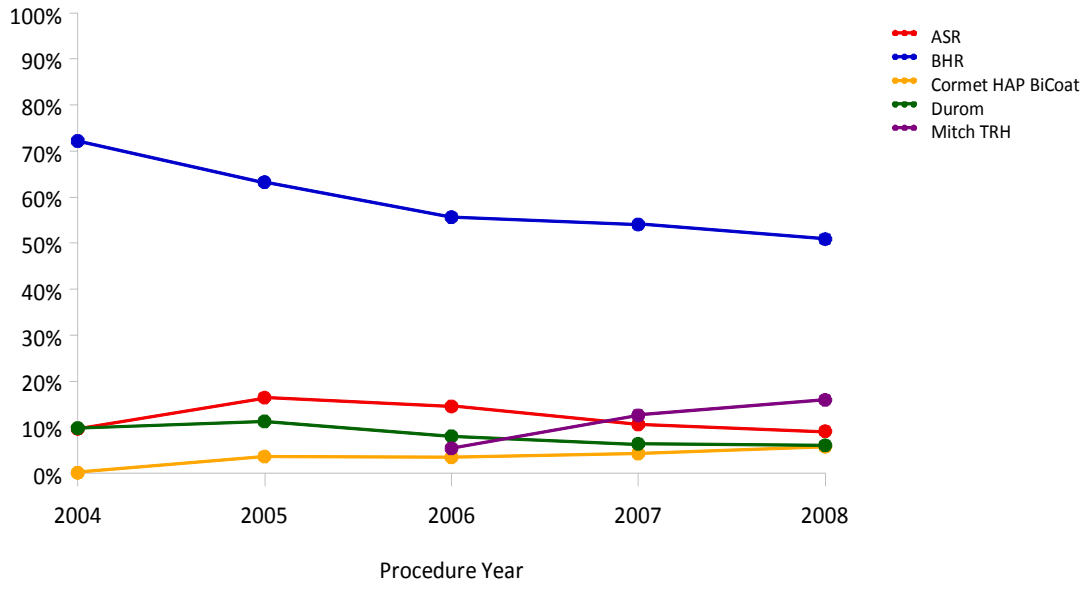


Table HT12: 10 Most Common Primary Total Resurfacing Hip Replacement

Rank	2004	2005	2006	2007	2008
1	BHR	BHR	BHR	BHR	BHR
	1219	1159	984	889	734
2	Durom	ASR	ASR	Mitch TRH	Mitch TRH
	166	301	258	208	230
3	ASR	Durom	Durom	ASR	ASR
	164	207	143	175	132
4	Cormet	Cormet HAP BiCoat	Adept	Durom	Durom
	47	67	126	105	88
5	Cormet 2000 HAP	Adept	Mitch TRH	Adept	Cormet HAP BiCoat
	39	19	96	85	84
6	Recap	Cormet	Cormet HAP BiCoat	Cormet HAP BiCoat	Adept
	27	18	62	71	62
7	Conserve Plus	Icon	Bionik	Recap	Recap
	18	18	33	42	45
8	Icon	Conserve Plus	Icon	Bionik	Bionik
	4	15	30	33	41
9	Cormet HAP BiCoat	Recap	Cormet	Icon	Icon
	3	14	12	25	19
10	Conserve	Bionik	Conserve Plus	Cormet	Cormet
	1	12	11	5	6
Top 10 Usage	100%	99.9%	99.3%	99.7%	99.9%
Total Procedures	1688	1832	1768	1643	1442
N Prosthesis Types	10	11	12	12	11

Figure HT10: 5 Most Common Primary Total Resurfacing Hip Replacement



Outcomes of Primary Conventional Total and Total Resurfacing Hip Replacement

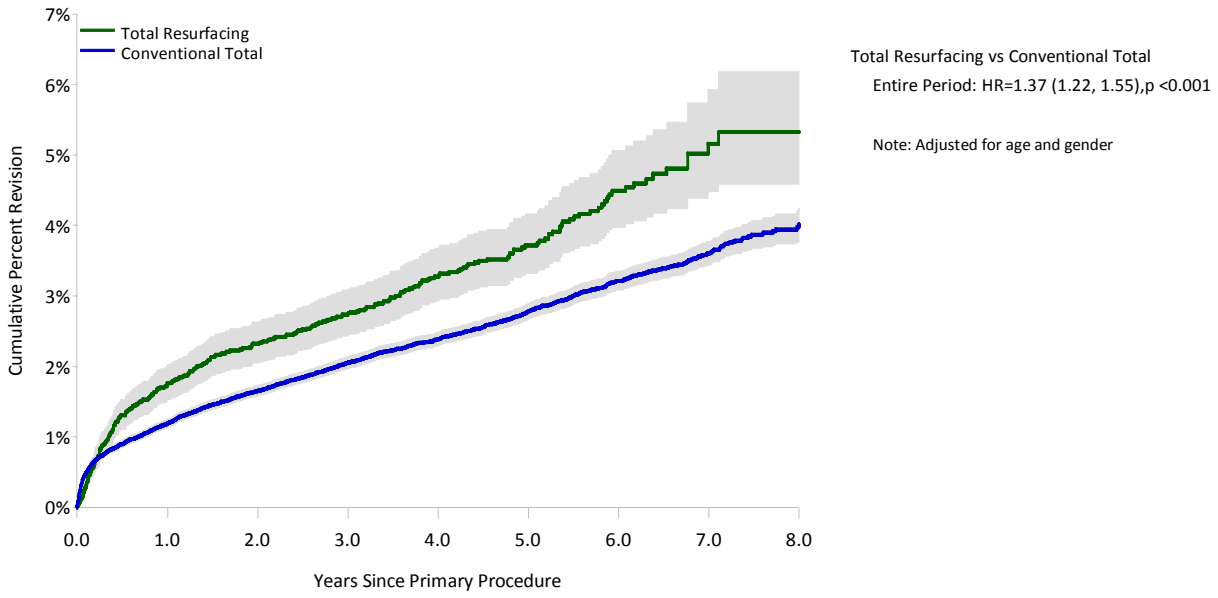
Table HT13: Revision Rates of Primary Conventional Total and Total Resurfacing Hip Replacement (Primary Diagnosis OA excluding Infection)

Type of Hip	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Total Resurfacing	352	11361	40514	0.9	(0.78, 0.96)
Conventional Total	2877	129575	454236	0.6	(0.61, 0.66)
TOTAL	**3229**	**140936**	**494750**	**0.7**	**(0.63, 0.68)**

Table HT14: Yearly Cumulative Percent Revision of Primary Conventional Total and Total Resurfacing Hip Replacement (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Total Resurfacing	1.8 (1.5, 2.0)	2.7 (2.4, 3.1)	3.7 (3.3, 4.2)	5.2 (4.5, 5.9)	5.3 (4.6, 6.2)
Conventional Total	1.2 (1.1, 1.3)	2.1 (2.0, 2.1)	2.8 (2.7, 2.9)	3.6 (3.4, 3.8)	4.0 (3.8, 4.2)

Figure HT11: Cumulative Percent Revision of Primary Conventional Total and Total Resurfacing Hip Replacement (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Total Resurfacing	11361	9771	8163	6504	4771	3250	1873	671	82
Conventional Total	129575	107351	87944	69686	52647	37017	23030	10767	2730

Primary Conventional Total Hip Replacement

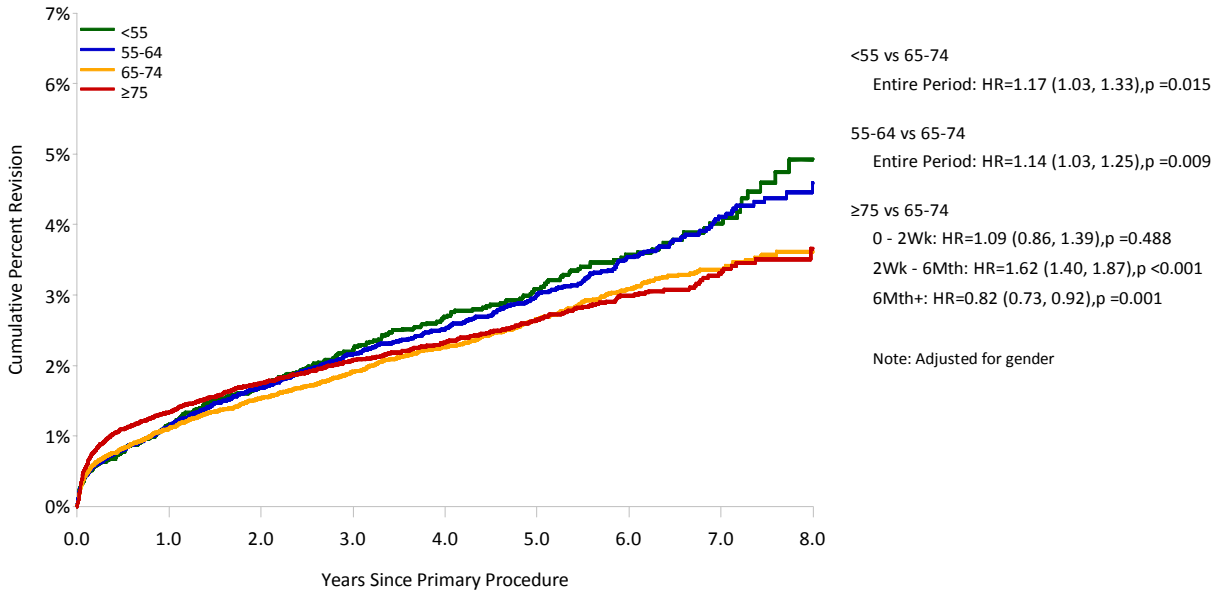
Table HT15: Revision Rates of Primary Conventional Total Hip Replacement by Age (Primary Diagnosis OA excluding Infection)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	322	12951	46725	0.7	(0.62, 0.77)
55-64	714	29955	105906	0.7	(0.63, 0.73)
65-74	976	45979	165236	0.6	(0.55, 0.63)
≥75	865	40690	136368	0.6	(0.59, 0.68)
TOTAL	**2877**	**129575**	**454236**	**0.6**	**(0.61, 0.66)**

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

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	1.2 (1.0, 1.4)	2.2 (2.0, 2.5)	3.1 (2.7, 3.5)	4.0 (3.5, 4.6)	4.9 (4.2, 5.8)
55-64	1.1 (1.0, 1.3)	2.2 (2.0, 2.3)	3.0 (2.8, 3.3)	4.1 (3.7, 4.5)	4.6 (4.1, 5.1)
65-74	1.1 (1.0, 1.2)	1.9 (1.8, 2.1)	2.7 (2.5, 2.8)	3.4 (3.1, 3.6)	3.6 (3.3, 3.9)
≥75	1.3 (1.2, 1.5)	2.1 (1.9, 2.2)	2.6 (2.5, 2.8)	3.3 (3.0, 3.6)	3.7 (3.2, 4.1)

Figure HT12: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<55	12951	10789	8876	7088	5464	4024	2632	1283	354
55-64	29955	24787	20252	16240	12336	8735	5503	2691	737
65-74	45979	38392	31842	25484	19478	13844	8648	4019	1017
≥75	40690	33383	26974	20874	15369	10414	6247	2774	622

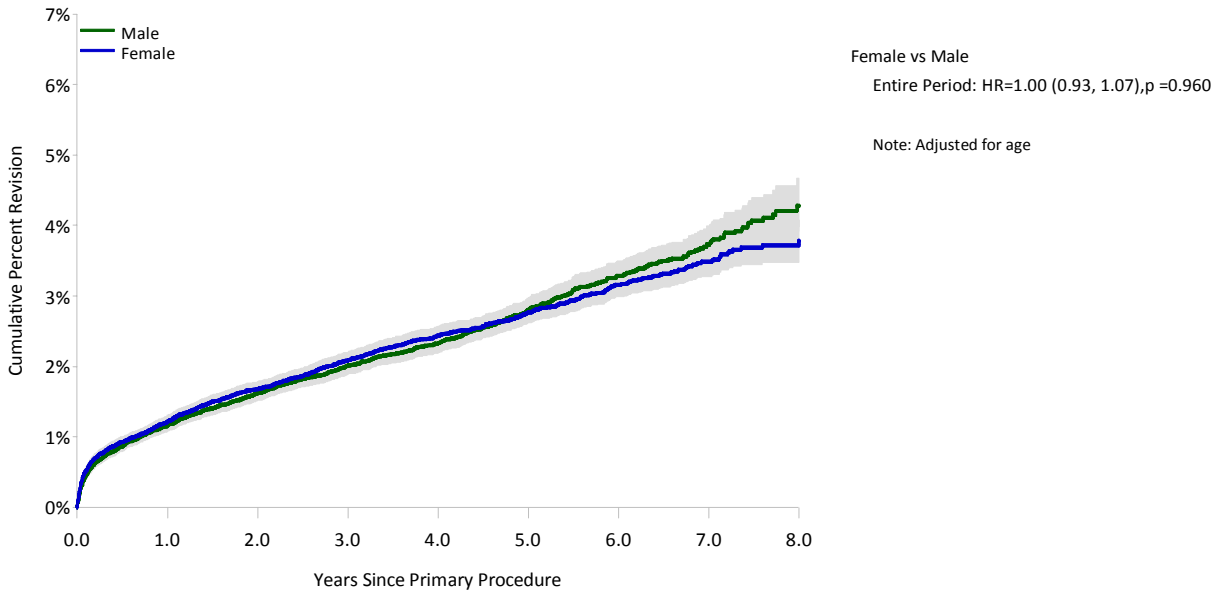
Table HT17: Revision Rates of Primary Conventional Total Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)

Gender	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	1324	59431	207947	0.6	(0.60, 0.67)
Female	1553	70144	246289	0.6	(0.60, 0.66)
TOTAL	**2877**	**129575**	**454236**	**0.6**	**(0.61, 0.66)**

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

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	1.2 (1.1, 1.2)	2.0 (1.9, 2.1)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	4.3 (3.9, 4.7)
Female	1.2 (1.1, 1.3)	2.1 (2.0, 2.2)	2.8 (2.6, 2.9)	3.5 (3.3, 3.7)	3.8 (3.5, 4.1)

Figure HT13: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	59431	49147	40177	31706	24031	16982	10662	5052	1256
Female	70144	58204	47767	37980	28616	20035	12368	5715	1474

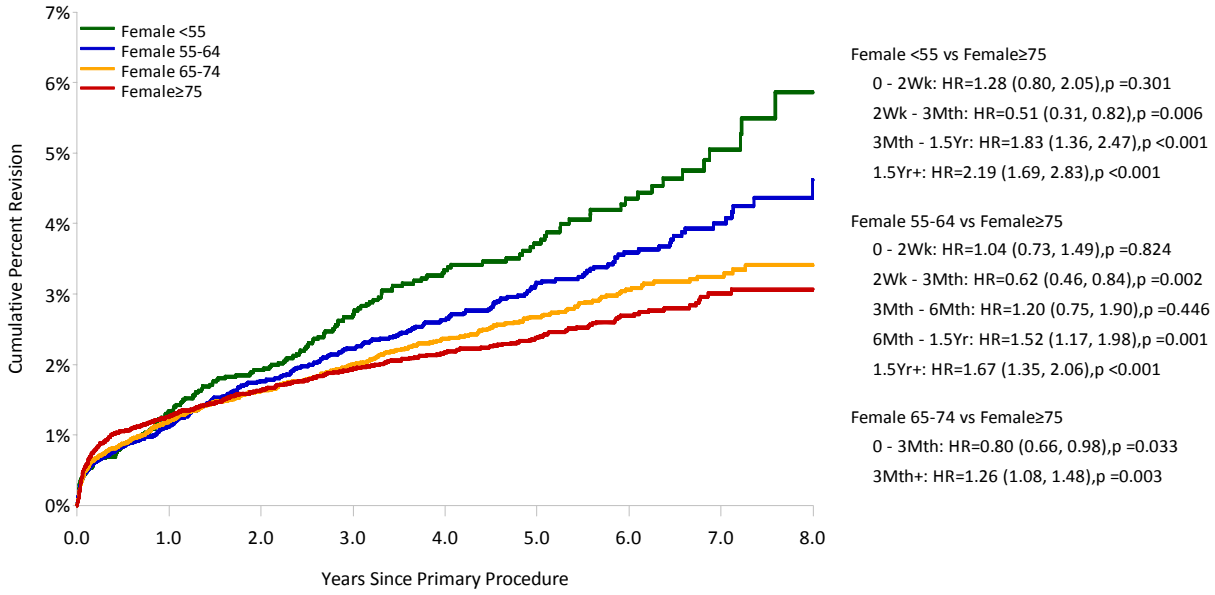
Table HT19: Revision Rates of Primary Conventional Total Hip Replacement by Age and Gender (Primary Diagnosis OA excluding Infection)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<55	145	6984	25483	0.6	(0.48, 0.67)
	55-64	353	14921	53753	0.7	(0.59, 0.73)
	65-74	457	21906	78673	0.6	(0.53, 0.64)
	≥75	369	15620	50039	0.7	(0.66, 0.82)
Female	<55	177	5967	21242	0.8	(0.72, 0.97)
	55-64	361	15034	52153	0.7	(0.62, 0.77)
	65-74	519	24073	86564	0.6	(0.55, 0.65)
	≥75	496	25070	86329	0.6	(0.53, 0.63)
TOTAL		**2877**	**129575**	**454236**	**0.6**	**(0.61, 0.66)**

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

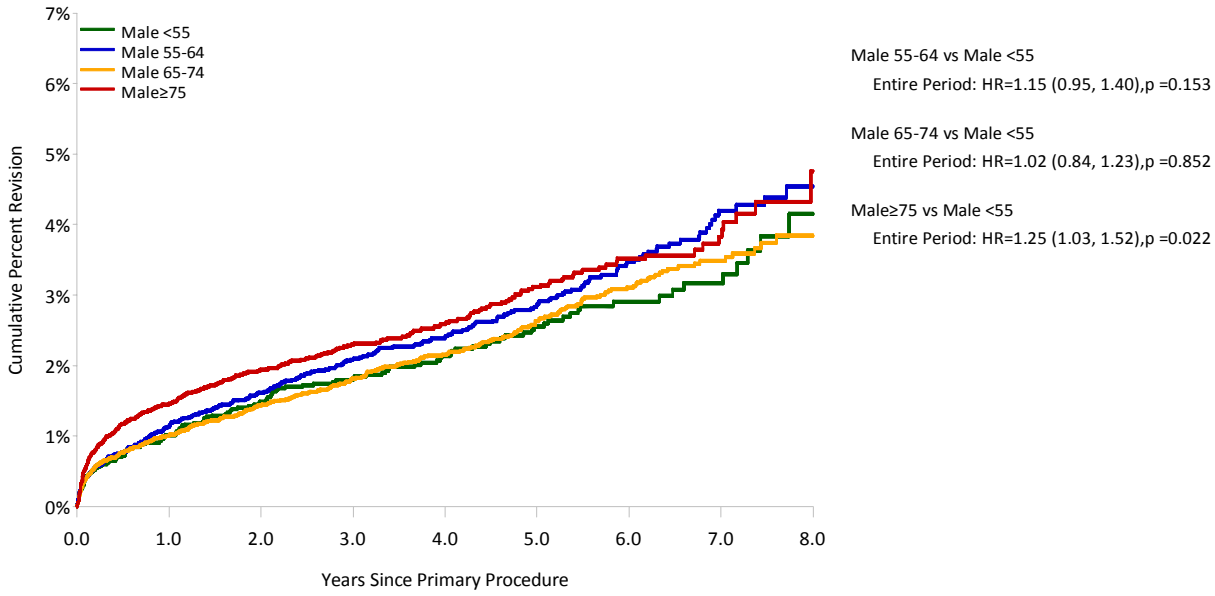
Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<55	1.0 (0.8, 1.3)	1.8 (1.5, 2.2)	2.6 (2.1, 3.1)	3.2 (2.6, 3.8)	4.2 (3.2, 5.4)
	55-64	1.1 (1.0, 1.3)	2.1 (1.8, 2.4)	2.9 (2.6, 3.2)	4.2 (3.7, 4.8)	4.5 (3.9, 5.3)
	65-74	1.0 (0.9, 1.2)	1.8 (1.6, 2.0)	2.6 (2.4, 2.9)	3.5 (3.1, 3.9)	3.8 (3.4, 4.4)
	≥75	1.5 (1.3, 1.7)	2.3 (2.1, 2.6)	3.1 (2.8, 3.5)	3.8 (3.3, 4.4)	4.8 (3.8, 6.0)
Female	<55	1.3 (1.1, 1.7)	2.7 (2.3, 3.2)	3.7 (3.2, 4.4)	5.1 (4.2, 6.0)	5.9 (4.7, 7.3)
	55-64	1.1 (1.0, 1.3)	2.2 (2.0, 2.5)	3.2 (2.8, 3.5)	4.0 (3.5, 4.5)	4.6 (3.9, 5.5)
	65-74	1.2 (1.1, 1.3)	2.0 (1.8, 2.2)	2.7 (2.4, 2.9)	3.2 (2.9, 3.6)	3.4 (3.1, 3.8)
	≥75	1.3 (1.1, 1.4)	1.9 (1.8, 2.1)	2.4 (2.2, 2.6)	3.0 (2.7, 3.4)	3.1 (2.7, 3.4)

Figure HT14: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Females by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Female < 55	5967	4953	4064	3249	2463	1802	1158	551	143
55-64	15034	12384	10051	8023	6013	4164	2587	1250	368
65-74	24073	20057	16652	13400	10236	7282	4516	2072	547
≥ 75	25070	20810	17000	13308	9904	6787	4107	1842	416

Figure HT15: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Males by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male < 55	6984	5836	4812	3839	3001	2222	1474	732	211
55-64	14921	12403	10201	8217	6323	4571	2916	1441	369
65-74	21906	18335	15190	12084	9242	6562	4132	1947	470
≥ 75	15620	12573	9974	7566	5465	3627	2140	932	206

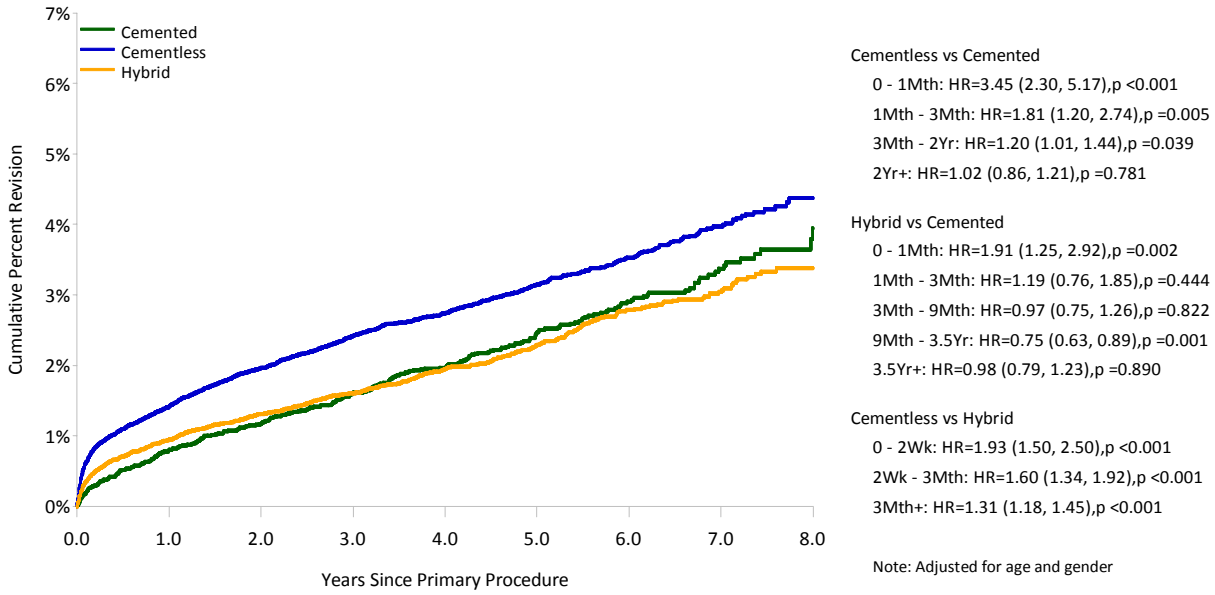
Table HT21: Revision Rates of Primary Conventional Total Hip Replacement by Fixation (Primary Diagnosis OA excluding Infection)

Fixation	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Cemented	314	14388	61387	0.5	(0.46, 0.57)
Cementless	1760	71977	236488	0.7	(0.71, 0.78)
Hybrid	803	43210	156361	0.5	(0.48, 0.55)
TOTAL	**2877**	**129575**	**454236**	**0.6**	**(0.61, 0.66)**

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

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Cemented	0.8 (0.7, 1.0)	1.6 (1.4, 1.8)	2.5 (2.2, 2.8)	3.4 (3.0, 3.8)	3.9 (3.3, 4.6)
Cementless	1.4 (1.3, 1.5)	2.4 (2.3, 2.5)	3.1 (3.0, 3.3)	4.0 (3.7, 4.2)	4.4 (4.0, 4.7)
Hybrid	0.9 (0.9, 1.0)	1.6 (1.5, 1.7)	2.3 (2.1, 2.5)	3.0 (2.8, 3.3)	3.4 (3.1, 3.7)

Figure HT16: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Fixation (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	14388	12776	11279	9540	7823	5955	4074	2177	633
Cementless	71977	58235	46813	36157	26406	17916	10620	4536	1034
Hybrid	43210	36340	29852	23989	18418	13146	8336	4054	1063

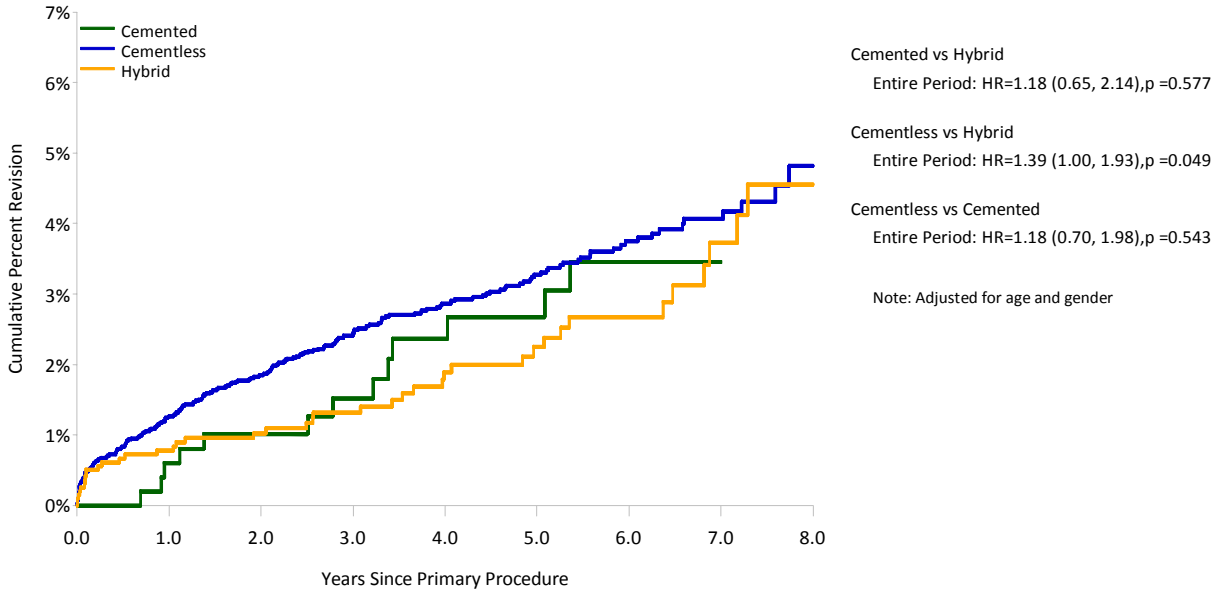
Table HT23: Revision Rates of Primary Conventional Total Hip Replacement by Fixation and Age (Primary Diagnosis OA excluding Infection)

Age	Fixation	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	Cemented	15	548	2476	0.6	(0.34, 1.00)
	Cementless	266	10422	36362	0.7	(0.65, 0.82)
	Hybrid	41	1981	7887	0.5	(0.37, 0.71)
55-64	Cemented	57	1763	7957	0.7	(0.54, 0.93)
	Cementless	529	21390	72351	0.7	(0.67, 0.80)
	Hybrid	128	6802	25598	0.5	(0.42, 0.59)
65-74	Cemented	120	5003	22551	0.5	(0.44, 0.64)
	Cementless	543	24940	82282	0.7	(0.61, 0.72)
	Hybrid	313	16036	60403	0.5	(0.46, 0.58)
≥75	Cemented	122	7074	28402	0.4	(0.36, 0.51)
	Cementless	422	15225	45492	0.9	(0.84, 1.02)
	Hybrid	321	18391	62474	0.5	(0.46, 0.57)
TOTAL		**2877**	**129575**	**454236**	**0.6**	**(0.61, 0.66)**

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

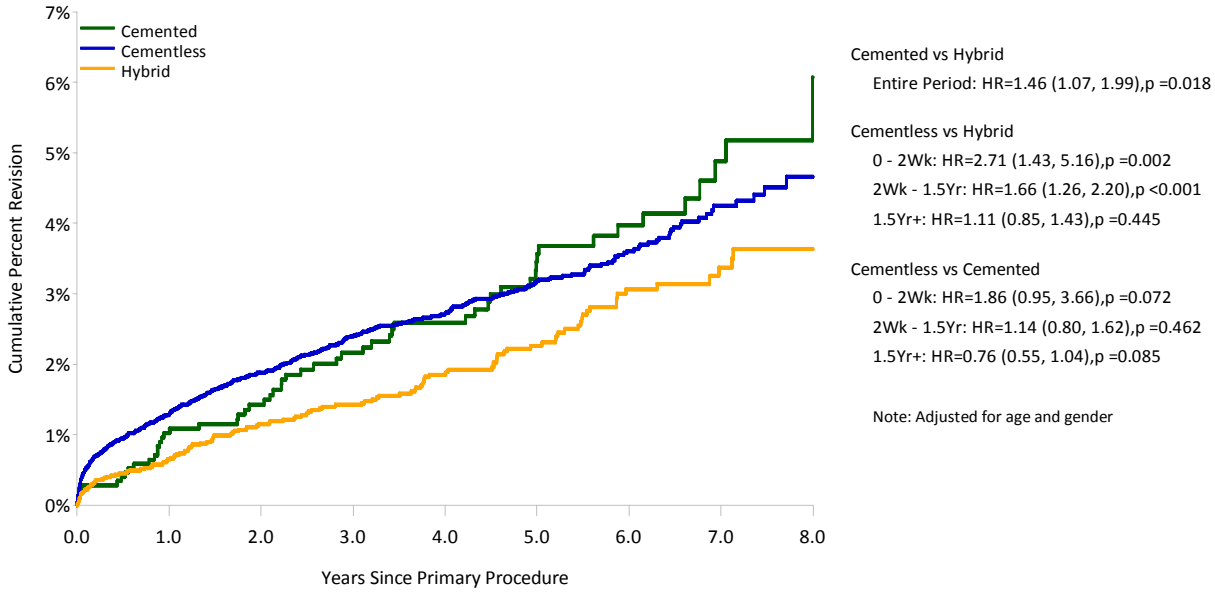
Age	Fixation	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	Cemented	0.6 (0.2, 1.9)	1.5 (0.7, 3.2)	2.7 (1.5, 4.8)	3.5 (2.0, 6.0)	
	Cementless	1.3 (1.1, 1.5)	2.4 (2.1, 2.8)	3.3 (2.9, 3.7)	4.1 (3.5, 4.7)	4.8 (3.9, 5.9)
	Hybrid	0.8 (0.5, 1.3)	1.3 (0.9, 2.0)	2.2 (1.6, 3.2)	3.7 (2.6, 5.4)	4.6 (3.1, 6.7)
55-64	Cemented	1.0 (0.6, 1.6)	2.2 (1.5, 3.0)	3.6 (2.7, 4.8)	4.9 (3.6, 6.5)	6.1 (4.1, 8.9)
	Cementless	1.3 (1.1, 1.4)	2.4 (2.2, 2.6)	3.2 (2.9, 3.5)	4.2 (3.8, 4.7)	4.7 (4.1, 5.3)
	Hybrid	0.6 (0.5, 0.9)	1.4 (1.1, 1.8)	2.3 (1.9, 2.8)	3.4 (2.7, 4.1)	3.6 (2.9, 4.5)
65-74	Cemented	0.7 (0.5, 1.0)	1.6 (1.3, 2.0)	2.5 (2.0, 3.1)	3.6 (3.0, 4.4)	3.9 (3.1, 4.7)
	Cementless	1.2 (1.1, 1.4)	2.1 (1.9, 2.3)	2.8 (2.6, 3.1)	3.5 (3.1, 3.9)	3.8 (3.4, 4.3)
	Hybrid	1.0 (0.9, 1.2)	1.7 (1.5, 1.9)	2.4 (2.1, 2.7)	3.0 (2.6, 3.4)	3.2 (2.8, 3.7)
≥75	Cemented	0.8 (0.6, 1.1)	1.5 (1.2, 1.8)	2.1 (1.7, 2.6)	2.7 (2.2, 3.4)	3.1 (2.3, 4.2)
	Cementless	2.0 (1.8, 2.2)	2.9 (2.6, 3.2)	3.5 (3.1, 3.9)	4.2 (3.6, 4.8)	4.2 (3.6, 4.8)
	Hybrid	1.0 (0.9, 1.2)	1.6 (1.4, 1.8)	2.2 (1.9, 2.4)	2.8 (2.5, 3.2)	3.3 (2.7, 3.9)

Figure HT17: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Patients Aged <55 Years by Fixation (Primary Diagnosis OA excluding Infection)



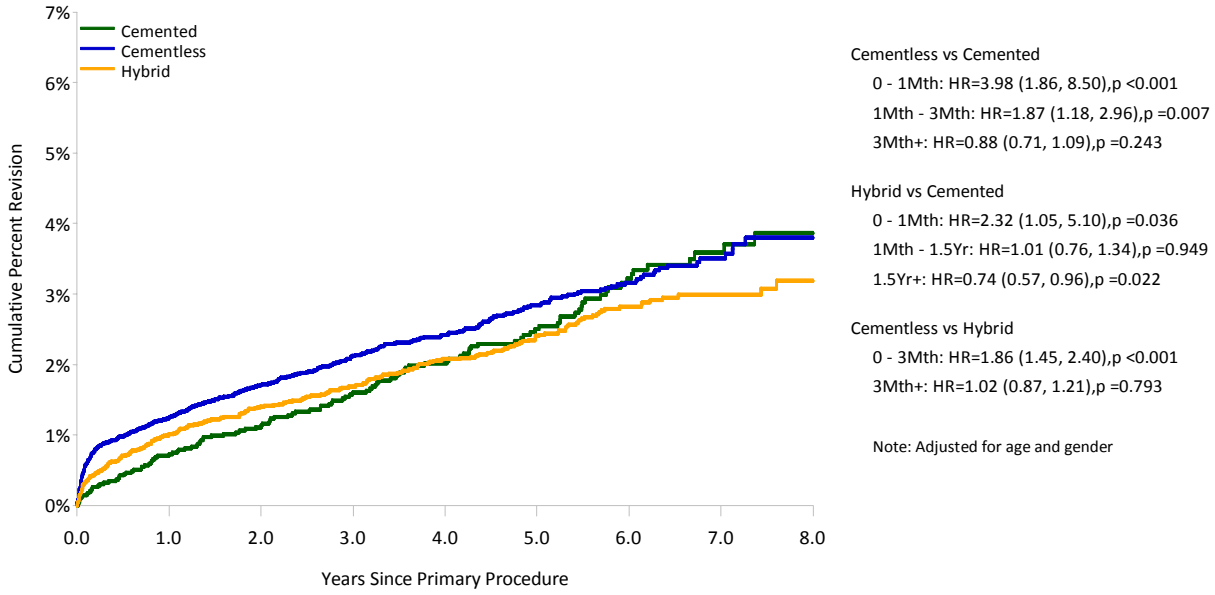
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	548	487	435	372	310	266	196	110	32
Cementless	10422	8591	7020	5537	4187	3015	1930	888	222
Hybrid	1981	1711	1421	1179	967	743	506	285	100

Figure HT18: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Patients Aged 55-64 Years by Fixation (Primary Diagnosis OA excluding Infection)



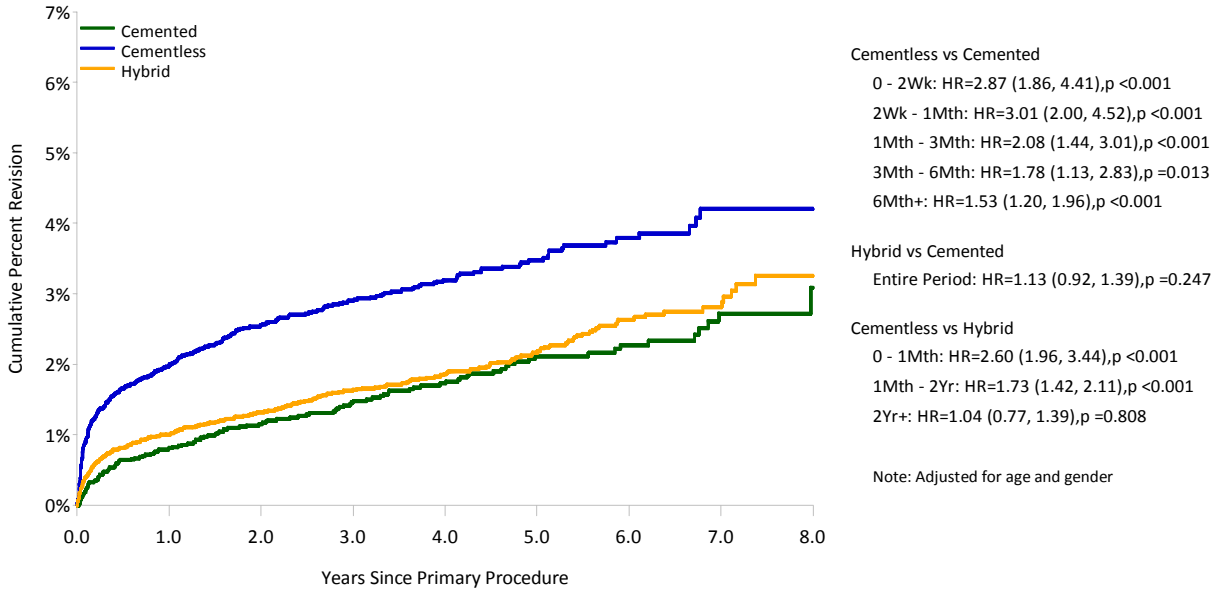
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	1763	1564	1410	1211	1023	826	603	329	105
Cementless	21390	17448	14083	11127	8278	5691	3423	1554	393
Hybrid	6802	5775	4759	3902	3035	2218	1477	808	239

Figure HT19: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Patients Aged 65-74 Years by Fixation (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	5003	4547	4101	3537	2940	2277	1575	839	241
Cementless	24940	20186	16306	12650	9255	6253	3661	1509	322
Hybrid	16036	13659	11435	9297	7283	5314	3412	1671	454

Figure HT20: Cumulative Percent Revision of Primary Conventional Total Hip Replacement for Patients Aged ≥75 Years by Fixation (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	7074	6178	5333	4420	3550	2586	1700	899	255
Cementless	15225	12010	9404	6843	4686	2957	1606	585	97
Hybrid	18391	15195	12237	9611	7133	4871	2941	1290	270

Table HT25: Revision Rates of Primary Conventional Total Hip Replacement by Bearing Surface (Primary Diagnosis OA excluding Infection)

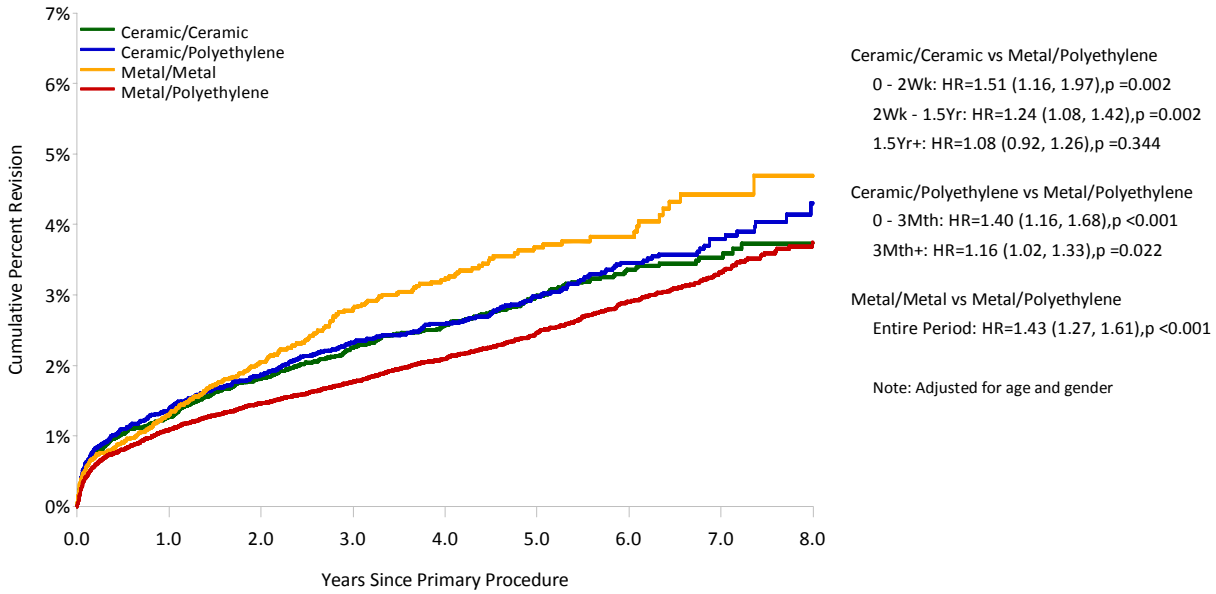
Bearing Surface	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Ceramic/Ceramic	575	24855	85114	0.7	(0.62, 0.73)
Ceramic/Polyethylene	422	16131	63145	0.7	(0.61, 0.74)
Metal/Metal	364	15398	41273	0.9	(0.79, 0.98)
Metal/Polyethylene	1470	72766	262670	0.6	(0.53, 0.59)
Ceramic/Metal	1	124	327	0.3	(0.01, 1.70)
Unknown	4	109	470	0.9	(0.23, 2.18)
TOTAL	**2836**	**129383**	**453000**	**0.6**	**(0.60, 0.65)**

Note: The Artek and Inter-Op Cups have been excluded from analysis as they were removed from the market for having a higher than anticipated revision rate.

Table HT26: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Bearing Surface (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Ceramic/Ceramic	1.3 (1.1, 1.4)	2.3 (2.1, 2.5)	3.0 (2.7, 3.3)	3.5 (3.2, 3.9)	3.7 (3.3, 4.2)
Ceramic/Polyethylene	1.4 (1.2, 1.6)	2.3 (2.1, 2.6)	3.0 (2.7, 3.3)	3.8 (3.4, 4.2)	4.3 (3.7, 5.0)
Metal/Metal	1.3 (1.1, 1.5)	2.8 (2.5, 3.1)	3.7 (3.3, 4.1)	4.4 (3.8, 5.1)	4.7 (3.9, 5.6)
Metal/Polyethylene	1.1 (1.0, 1.2)	1.8 (1.7, 1.9)	2.5 (2.3, 2.6)	3.3 (3.1, 3.5)	3.7 (3.5, 4.1)
Ceramic/Metal	1.0 (0.1, 7.0)				
Unknown	2.8 (0.9, 8.4)	3.9 (1.5, 10.2)			

Figure HT21: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Bearing Surface (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Ceramic/Ceramic	24855	20285	16598	13293	9993	6883	4077	1631	289
Ceramic/Polyethylene	16131	13831	11845	9744	7823	5818	3754	1926	576
Metal/Metal	15398	11899	8538	5632	3516	2219	1337	573	96
Metal/Polyethylene	72766	60992	50650	40732	31058	21874	13665	6480	1720

Table HT27: Revision Rates of Primary Conventional Total Hip Replacement by Bearing Surface and Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

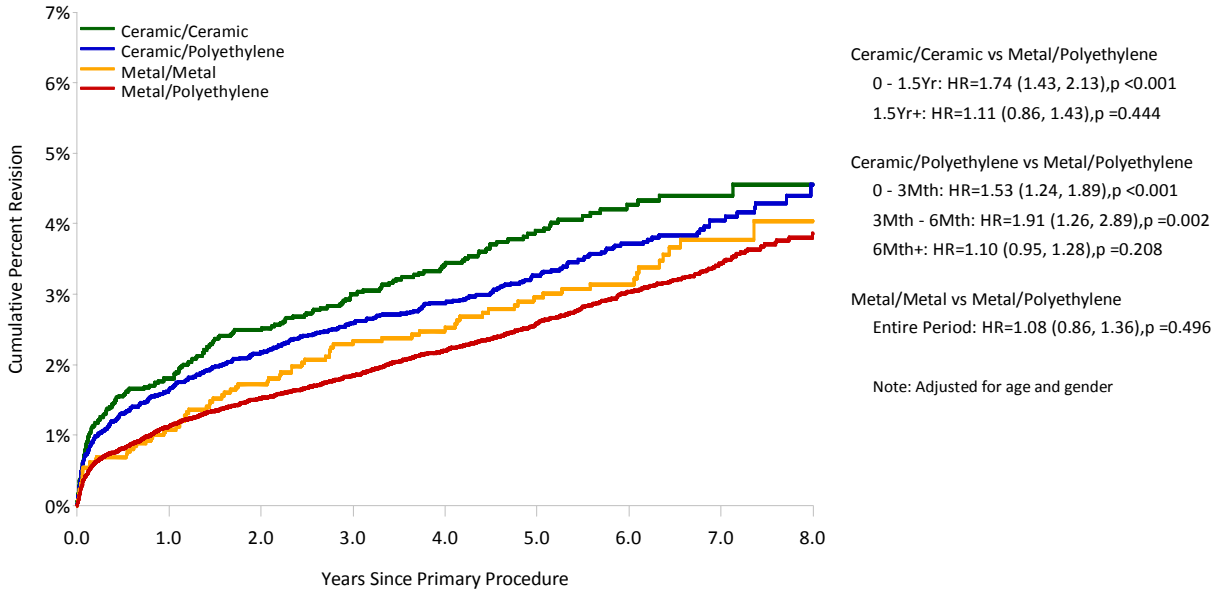
Bearing Surface	Femoral Head Size	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Ceramic/Ceramic	≤28mm	183	5049	23329	0.8	(0.67, 0.91)
	>28mm	392	19806	61785	0.6	(0.57, 0.70)
Ceramic/Polyethylene	≤28mm	364	11096	53530	0.7	(0.61, 0.75)
	>28mm	58	5035	9616	0.6	(0.46, 0.78)
Metal/Metal	≤28mm	81	2620	13839	0.6	(0.46, 0.73)
	>28mm	283	12778	27434	1.0	(0.91, 1.16)
Metal/Polyethylene	≤28mm	1217	51397	219302	0.6	(0.52, 0.59)
	>28mm	253	21369	43368	0.6	(0.51, 0.66)
Ceramic/Metal	≤28mm	1	41	241	0.4	(0.01, 2.31)
	>28mm	0	83	87	0.0	(0.00, 4.26)
TOTAL		**2832**	**129274**	**452530**	**0.6**	**(0.60, 0.65)**

Note: The Artek and Inter-Op Cups have been excluded from analysis as they were removed from the market for having a higher than anticipated revision rate.

Table HT28: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Bearing Surface and Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

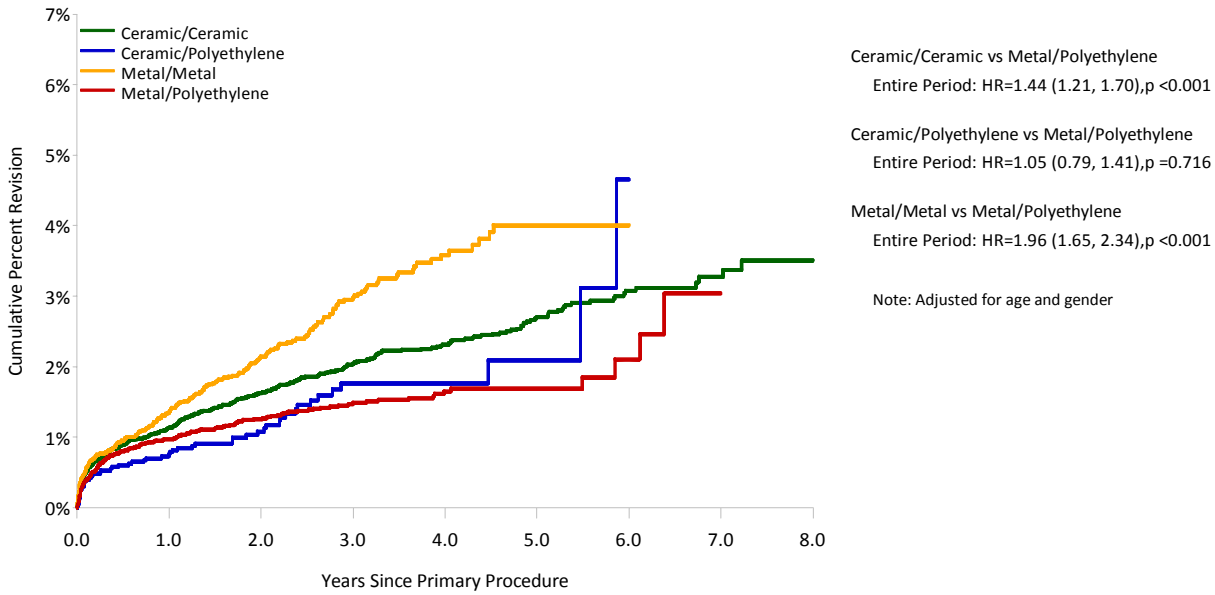
Bearing Surface	Femoral Head Size	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Ceramic/Ceramic	≤28mm	1.8 (1.5, 2.2)	3.0 (2.6, 3.5)	3.9 (3.4, 4.5)	4.4 (3.8, 5.1)	4.6 (3.9, 5.3)
	>28mm	1.1 (1.0, 1.3)	2.0 (1.8, 2.3)	2.7 (2.4, 3.0)	3.3 (2.9, 3.7)	3.5 (3.0, 4.1)
Ceramic/Polyethylene	≤28mm	1.6 (1.4, 1.9)	2.6 (2.3, 2.9)	3.3 (2.9, 3.6)	4.1 (3.6, 4.5)	4.6 (4.0, 5.2)
	>28mm	0.8 (0.5, 1.1)	1.8 (1.3, 2.4)	2.1 (1.4, 3.1)		
Metal/Metal	≤28mm	1.1 (0.7, 1.6)	2.3 (1.8, 3.0)	3.0 (2.3, 3.7)	3.8 (3.0, 4.7)	4.0 (3.2, 5.2)
	>28mm	1.4 (1.2, 1.6)	3.0 (2.6, 3.4)	4.0 (3.4, 4.7)		
Metal/Polyethylene	≤28mm	1.1 (1.0, 1.2)	1.8 (1.7, 2.0)	2.6 (2.4, 2.7)	3.4 (3.2, 3.7)	3.9 (3.6, 4.2)
	>28mm	1.0 (0.8, 1.1)	1.5 (1.3, 1.7)	1.7 (1.5, 2.0)	3.0 (1.9, 4.9)	3.0 (1.9, 4.9)
Ceramic/Metal	≤28mm	2.5 (0.4, 16.5)				
	>28mm	0.0 (0.0, 0.0)				

Figure HT22: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Bearing Surface and Femoral Component Head Size ≤28mm (Primary Diagnosis OA excluding Infection)



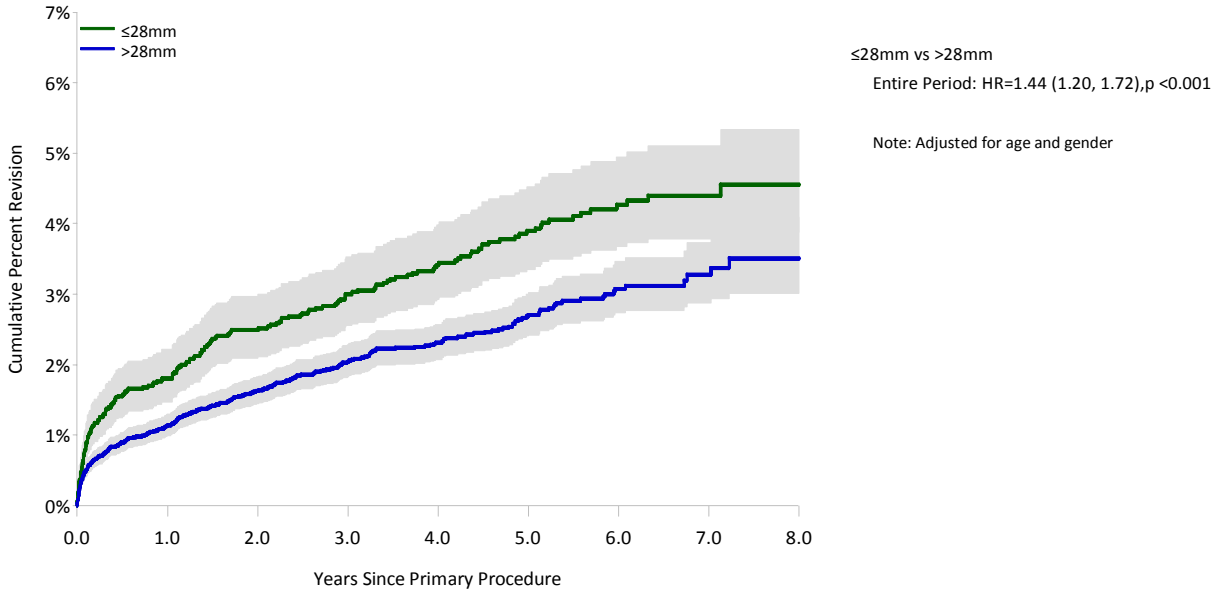
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Ceramic/Ceramic	5049	4672	4263	3815	3195	2442	1614	696	147
Ceramic/Polyethylene	11096	10416	9725	8677	7348	5649	3705	1922	576
Metal/Metal	2620	2499	2352	2158	1931	1672	1247	570	96
Metal/Polyethylene	51397	46606	41396	35277	28222	20767	13348	6434	1714

Figure HT23: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Bearing Surface and Femoral Component Head Size >28mm (Primary Diagnosis OA excluding Infection)



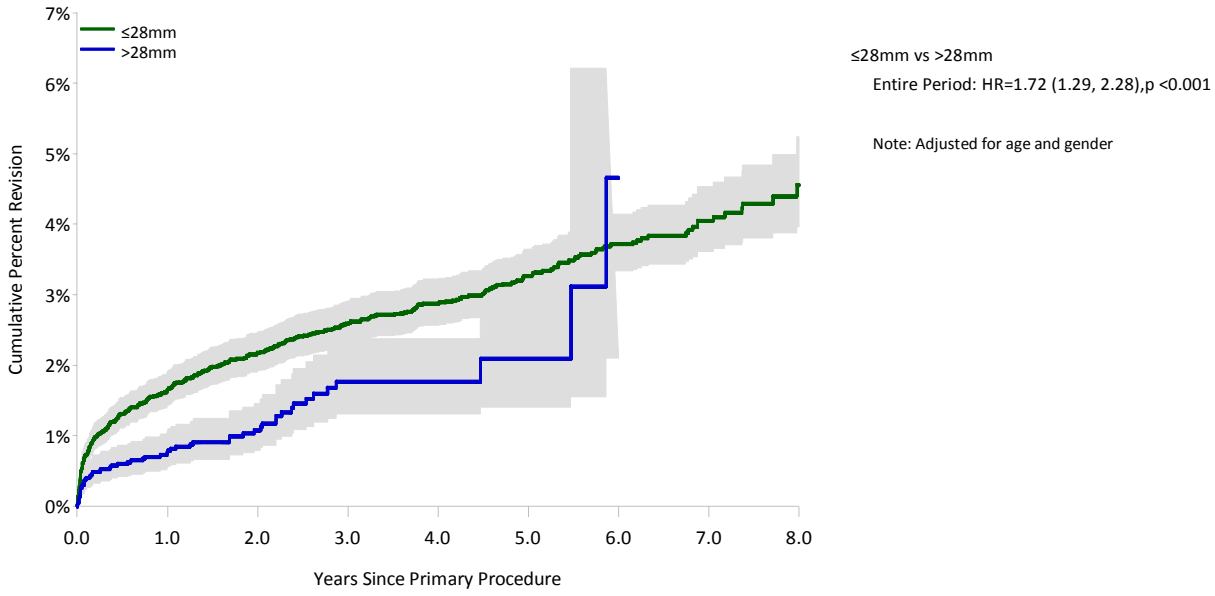
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Ceramic/Ceramic	19806	15613	12335	9478	6798	4441	2463	935	142
Ceramic/Polyethylene	5035	3415	2120	1067	475	169	49	4	0
Metal/Metal	12778	9400	6186	3474	1585	547	90	3	0
Metal/Polyethylene	21369	14386	9254	5455	2836	1107	317	46	6

Figure HT24: Cumulative Percent Revision of Ceramic/Ceramic Primary Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



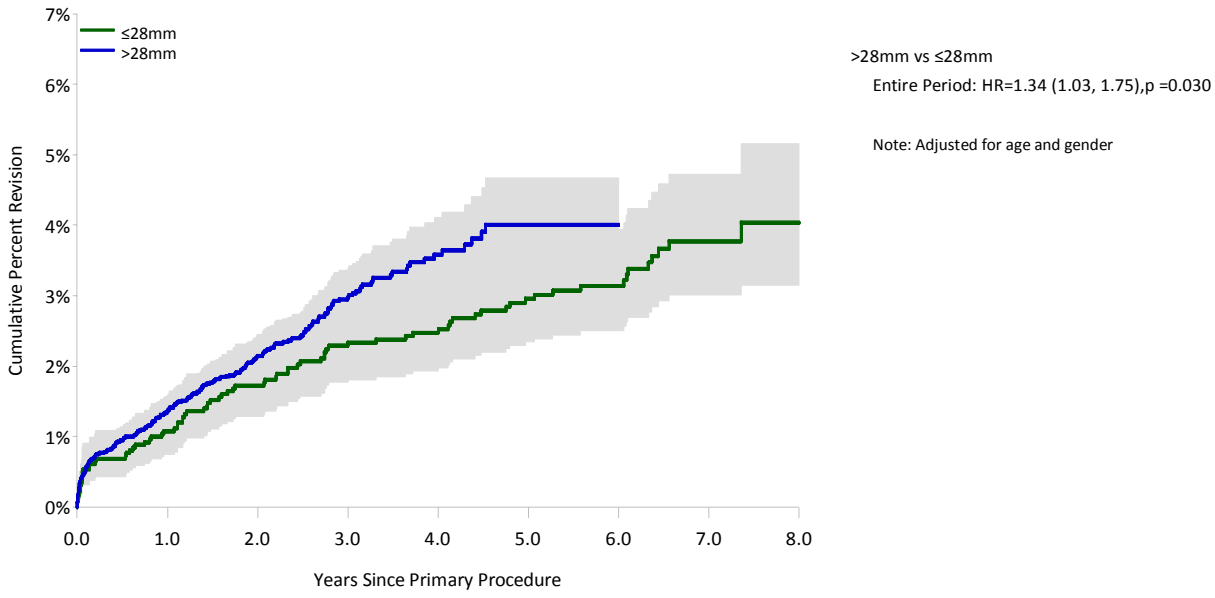
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
≤28mm	5049	4672	4263	3815	3195	2442	1614	696	147
>28mm	19806	15613	12335	9478	6798	4441	2463	935	142

Figure HT25: Cumulative Percent Revision of Ceramic/Polyethylene Primary Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



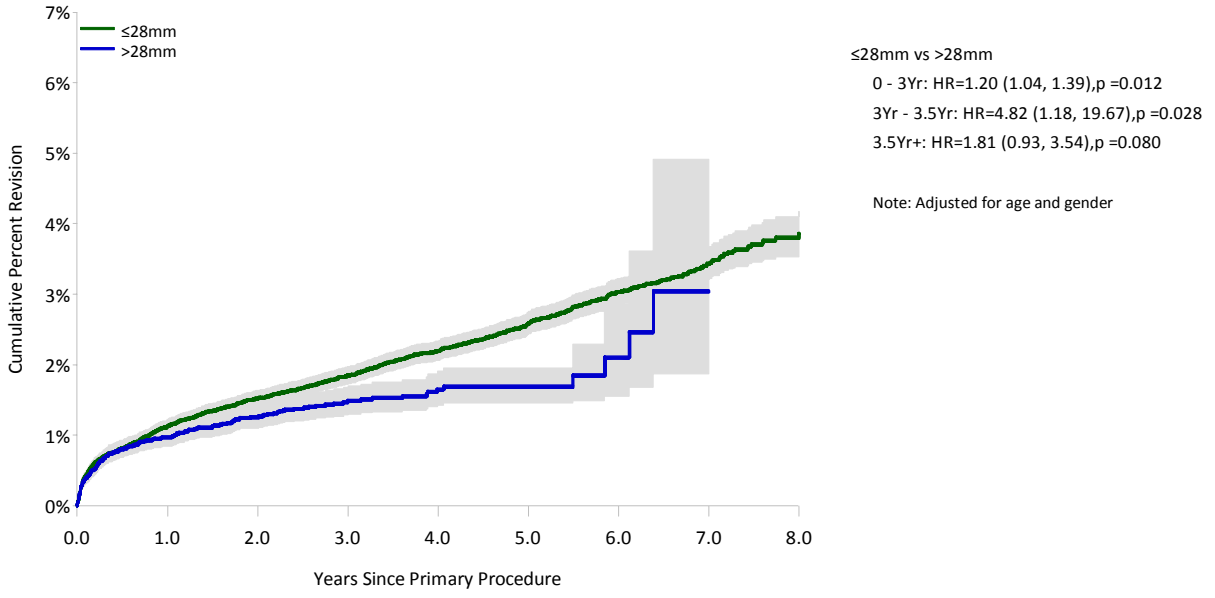
Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
≤28mm	11096	10416	9725	8677	7348	5649	3705	1922	576
>28mm	5035	3415	2120	1067	475	169	49	4	0

Figure HT26: Cumulative Percent Revision of Metal/Metal Primary Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
≤28mm	2620	2499	2352	2158	1931	1672	1247	570	96
>28mm	12778	9400	6186	3474	1585	547	90	3	0

Figure HT27: Cumulative Percent Revision of Metal/ Polyethylene Primary Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
≤28mm	51397	46606	41396	35277	28222	20767	13348	6434	1714
>28mm	21369	14386	9254	5455	2836	1107	317	46	6

Table HT29: Revision Rates of Primary Conventional Total Hip Replacement with Cement Fixation

Femoral Component	Acetabular Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
C-Stem	Elite Plus LPW	8	395	1640	0.5	(0.21, 0.96)
CPCS	Reflection	15	566	1806	0.8	(0.46, 1.37)
CPT	ZCA	12	485	2257	0.5	(0.27, 0.93)
Charnley	Charnley	13	538	2205	0.6	(0.31, 1.01)
Charnley	Charnley Ogee	29	678	3061	0.9	(0.63, 1.36)
Exeter	Contemporary	28	515	3224	0.9	(0.58, 1.26)
Exeter	Exeter	13	420	2832	0.5	(0.24, 0.79)
Exeter V40	Contemporary	130	5489	17693	0.7	(0.61, 0.87)
Exeter V40	Exeter	38	1455	6106	0.6	(0.44, 0.85)
MS 30	Low Profile Cup	5	627	3180	0.2	(0.05, 0.37)
Spectron EF	Reflection	37	1397	5873	0.6	(0.44, 0.87)
Other (264)		159	4906	21099	0.8	(0.64, 0.88)
TOTAL		**487**	**17471**	**70977**	**0.7**	**(0.63, 0.75)**

Note: Some cementless components have been cemented
Only prostheses with over 350 procedures have been listed.

Table HT30: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement with Cement Fixation

Femoral Component	Acetabular Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
C-Stem	Elite Plus LPW	0.5 (0.1, 2.1)	1.2 (0.4, 3.0)	2.5 (1.2, 5.3)		
CPCS	Reflection	1.3 (0.6, 2.7)	3.3 (1.9, 5.5)	3.6 (2.2, 6.0)		
CPT	ZCA	0.6 (0.2, 2.0)	2.0 (1.0, 3.9)	2.6 (1.4, 4.8)	3.4 (1.8, 6.6)	
Charnley	Charnley	0.6 (0.2, 2.0)	1.4 (0.6, 3.1)	2.8 (1.5, 5.3)	3.8 (1.9, 7.5)	
Charnley	Charnley Ogee	1.1 (0.5, 2.2)	3.0 (1.9, 4.7)	4.5 (3.1, 6.7)	6.0 (4.1, 8.8)	
Exeter	Contemporary	1.8 (0.9, 3.4)	3.7 (2.3, 5.8)	4.4 (2.9, 6.6)	5.4 (3.7, 8.0)	6.6 (4.4, 9.8)
Exeter	Exeter	1.0 (0.4, 2.6)	1.2 (0.5, 2.9)	2.3 (1.2, 4.4)	3.2 (1.8, 5.6)	3.2 (1.8, 5.6)
Exeter V40	Contemporary	1.3 (1.0, 1.6)	2.5 (2.0, 3.0)	3.0 (2.5, 3.6)	4.1 (3.1, 5.4)	
Exeter V40	Exeter	0.8 (0.5, 1.5)	1.9 (1.3, 2.9)	3.0 (2.2, 4.3)	4.3 (3.0, 6.3)	
MS 30	Low Profile Cup	0.3 (0.1, 1.3)	0.5 (0.2, 1.6)	1.0 (0.4, 2.5)	1.0 (0.4, 2.5)	1.0 (0.4, 2.5)
Spectron EF	Reflection	1.0 (0.6, 1.7)	1.9 (1.2, 2.8)	2.9 (2.0, 4.2)	3.9 (2.7, 5.6)	6.9 (3.9, 12.0)
Other (264)		1.4 (1.1, 1.8)	2.4 (2.0, 2.9)	3.7 (3.1, 4.4)	4.7 (4.0, 5.6)	5.3 (4.4, 6.3)

Table HT31: Revision Rates of Primary Conventional Total Hip Replacement with Cementless Fixation

Femoral Component	Acetabular Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
ABGII	ABGII	118	2844	13375	0.9	(0.73, 1.06)
ABGII	ABGII (Shell/Insert)	15	586	2579	0.6	(0.33, 0.96)
ABGII	Trident	69	1641	5363	1.3	(1.00, 1.63)
Accolade	Trident	136	5307	12636	1.1	(0.90, 1.27)
Adapter	Bionik	13	359	545	2.4	(1.27, 4.08)
Alloclassic	Allofit	94	3854	12633	0.7	(0.60, 0.91)
Alloclassic	Durom	21	566	1269	1.7	(1.02, 2.53)
Alloclassic	Fitmore	54	1340	5469	1.0	(0.74, 1.29)
Alloclassic	Morscher	14	407	2260	0.6	(0.34, 1.04)
Alloclassic	Trabecular Metal Shell	7	459	768	0.9	(0.37, 1.88)
Alloclassic	Trilogy	4	426	715	0.6	(0.15, 1.43)
Anthology	R3	6	464	212	2.8	(1.04, 6.17)
Anthology	Reflection	7	656	942	0.7	(0.30, 1.53)
CLS	Allofit	17	597	2228	0.8	(0.44, 1.22)
CLS	Fitmore	22	487	2436	0.9	(0.57, 1.37)
Citation	Trident	24	981	3170	0.8	(0.49, 1.13)
Citation	Vitalock	19	555	3126	0.6	(0.37, 0.95)
Corail	ASR	85	2529	3935	2.2	(1.73, 2.67)
Corail	Duraloc	26	1097	3653	0.7	(0.46, 1.04)
Corail	Pinnacle	83	4664	7516	1.1	(0.88, 1.37)
Epoch	Trilogy	18	719	1956	0.9	(0.55, 1.45)
F2L Multineck	SPH-Blind	39	613	3285	1.2	(0.84, 1.62)
Mallory-Head	Mallory-Head	68	2061	8941	0.8	(0.59, 0.96)
Meridian	Vitalock	14	387	2123	0.7	(0.36, 1.11)
Natural Hip	Fitmore	17	803	3761	0.5	(0.26, 0.72)
Omnifit	Secur-Fit	38	508	2834	1.3	(0.95, 1.84)
Omnifit	Trident	36	1034	4924	0.7	(0.51, 1.01)
S-Rom	Option	21	666	3660	0.6	(0.36, 0.88)
S-Rom	Pinnacle	42	1647	4056	1.0	(0.75, 1.40)
SL-Plus	EPF-Plus	44	1710	3850	1.1	(0.83, 1.53)
Secur-Fit	Trident	81	3741	12539	0.6	(0.51, 0.80)
Secur-Fit Plus	Trident	81	3496	16312	0.5	(0.39, 0.62)
Stability	Duraloc	13	401	2334	0.6	(0.30, 0.95)
Summit	ASR	28	1074	2193	1.3	(0.85, 1.85)
Summit	Pinnacle	23	1836	4902	0.5	(0.30, 0.70)
Synergy	BHR	10	625	1320	0.8	(0.36, 1.39)
Synergy	R3	5	565	245	2.0	(0.66, 4.75)
Synergy	Reflection	167	6773	25781	0.6	(0.55, 0.75)
Taperloc	M2a	16	438	1449	1.1	(0.63, 1.79)
Taperloc	Mallory-Head	20	790	3127	0.6	(0.39, 0.99)
Taperloc	Recap	9	410	684	1.3	(0.60, 2.50)
VerSys	Trilogy	110	3659	14646	0.8	(0.62, 0.91)
Other (679)		632	16765	54448	1.2	(1.07, 1.25)
TOTAL		**2366**	**80540**	**264203**	**0.9**	**(0.86, 0.93)**

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

Table HT32: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement with Cementless Fixation

Femoral Component	Acetabular Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ABGII	ABGII	1.8 (1.4, 2.4)	3.2 (2.6, 3.9)	4.3 (3.5, 5.2)	5.3 (4.4, 6.5)	5.6 (4.6, 6.9)
ABGII	ABGII (Shell/Insert)	1.4 (0.7, 2.7)	1.9 (1.1, 3.4)	2.8 (1.7, 4.7)		
ABGII	Trident	2.1 (1.5, 3.0)	4.0 (3.1, 5.2)	5.2 (4.0, 6.6)		
Accolade	Trident	1.6 (1.3, 2.0)	3.0 (2.5, 3.6)	4.2 (3.3, 5.3)		
Adapter	Bionik	2.4 (1.2, 4.8)				
Alloclassic	Allofit	1.5 (1.2, 2.0)	2.5 (2.0, 3.1)	3.2 (2.6, 3.9)	3.3 (2.7, 4.2)	
Alloclassic	Durom	1.4 (0.7, 2.9)	5.4 (3.4, 8.6)			
Alloclassic	Fitmore	2.2 (1.5, 3.2)	3.6 (2.7, 4.7)	4.3 (3.2, 5.6)	5.2 (3.8, 7.0)	
Alloclassic	Morscher	1.0 (0.4, 2.6)	2.7 (1.5, 4.9)	3.6 (2.1, 6.0)	3.6 (2.1, 6.0)	
Alloclassic	Trabecular Metal Shell	1.8 (0.8, 3.7)	1.8 (0.8, 3.7)			
Alloclassic	Trilogy	0.8 (0.3, 2.6)	1.2 (0.5, 3.3)			
Anthology	R3					
Anthology	Reflection	1.0 (0.4, 2.1)				
CLS	Allofit	1.6 (0.8, 3.0)	2.9 (1.7, 4.7)	3.2 (1.9, 5.2)		
CLS	Fitmore	1.9 (1.0, 3.6)	4.2 (2.7, 6.5)	4.5 (2.9, 6.8)	5.5 (3.6, 8.5)	
Citation	Trident	2.0 (1.3, 3.1)	2.6 (1.7, 3.9)	2.9 (1.9, 4.5)	2.9 (1.9, 4.5)	
Citation	Vitalock	0.5 (0.2, 1.7)	2.2 (1.3, 3.9)	2.9 (1.7, 4.7)	4.2 (2.6, 6.8)	5.9 (3.0, 11.3)
Corail	ASR	2.2 (1.6, 2.9)	5.5 (4.3, 7.0)			
Corail	Duraloc	1.5 (0.9, 2.5)	2.1 (1.4, 3.3)	2.7 (1.8, 4.1)		
Corail	Pinnacle	1.7 (1.4, 2.2)	2.2 (1.7, 2.7)	2.6 (2.0, 3.4)		
Epoch	Trilogy	2.0 (1.2, 3.4)	3.1 (1.9, 4.9)	3.1 (1.9, 4.9)		
F2L Multineck	SPH-Blind	3.1 (2.0, 4.8)	4.9 (3.5, 7.0)	6.0 (4.4, 8.3)	7.4 (5.2, 10.3)	
Mallory-Head	Mallory-Head	1.9 (1.4, 2.6)	2.3 (1.8, 3.1)	3.3 (2.5, 4.3)	4.5 (3.5, 5.9)	5.5 (4.1, 7.3)
Meridian	Vitalock	1.0 (0.4, 2.8)	2.6 (1.4, 4.8)	3.6 (2.1, 6.1)	4.2 (2.4, 7.1)	
Natural Hip	Fitmore	1.1 (0.6, 2.2)	1.4 (0.8, 2.5)	2.0 (1.2, 3.4)	3.7 (2.0, 6.7)	
Omnifit	Secur-Fit	3.2 (1.9, 5.1)	5.0 (3.4, 7.3)	6.8 (4.9, 9.5)	8.2 (6.0, 11.3)	
Omnifit	Trident	1.7 (1.0, 2.7)	2.8 (1.9, 4.1)	4.0 (2.9, 5.6)	4.3 (3.1, 6.1)	
S-Rom	Option	1.5 (0.8, 2.8)	2.4 (1.5, 3.9)	3.2 (2.1, 4.9)	3.5 (2.3, 5.3)	
S-Rom	Pinnacle	1.9 (1.4, 2.8)	3.1 (2.2, 4.3)	3.7 (2.6, 5.2)		
SL-Plus	EPF-Plus	1.5 (1.0, 2.3)	3.2 (2.3, 4.5)	4.5 (3.0, 6.6)		
Secur-Fit	Trident	1.3 (1.0, 1.7)	2.1 (1.6, 2.7)	2.5 (2.0, 3.2)	3.4 (2.7, 4.5)	
Secur-Fit Plus	Trident	1.3 (0.9, 1.7)	2.1 (1.6, 2.6)	2.5 (2.0, 3.1)	2.5 (2.0, 3.2)	2.8 (2.1, 3.7)
Stability	Duraloc	0.7 (0.2, 2.3)	2.3 (1.2, 4.3)	2.5 (1.4, 4.6)	4.4 (2.4, 8.0)	
Summit	ASR	1.2 (0.7, 2.1)	4.4 (2.9, 6.7)			
Summit	Pinnacle	1.0 (0.6, 1.7)	1.4 (0.9, 2.2)	1.6 (1.0, 2.4)		
Synergy	BHR	1.3 (0.6, 2.6)	1.8 (1.0, 3.3)			
Synergy	R3					
Synergy	Reflection	1.4 (1.2, 1.8)	2.3 (2.0, 2.7)	2.7 (2.3, 3.2)	3.5 (2.9, 4.4)	3.8 (3.0, 4.9)
Taperloc	M2a	1.7 (0.8, 3.5)	3.5 (2.0, 6.0)	5.0 (3.0, 8.2)		
Taperloc	Mallory-Head	1.7 (1.0, 2.9)	2.5 (1.6, 3.9)	2.8 (1.8, 4.5)	3.2 (2.0, 5.1)	
Taperloc	Recap	2.2 (1.1, 4.4)	3.0 (1.5, 6.1)			
VerSys	Trilogy	2.1 (1.7, 2.6)	2.8 (2.3, 3.4)	3.3 (2.7, 4.0)	3.7 (3.0, 4.6)	3.7 (3.0, 4.6)
Other (679)		2.1 (1.9, 2.4)	3.8 (3.5, 4.2)	5.0 (4.6, 5.5)	6.1 (5.6, 6.7)	6.8 (6.0, 7.7)

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

Table HT33: Revision Rates of Primary Conventional Total Hip Replacement with Hybrid Fixation (femoral cemented)

Femoral Component	Acetabular Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
C-Stem	Duraloc	38	1025	4338	0.9	(0.62, 1.20)
C-Stem	Pinnacle	13	547	1150	1.1	(0.60, 1.93)
CPCS	Reflection	23	1668	4710	0.5	(0.31, 0.73)
CPT	Trabecular Metal Shell	8	482	744	1.1	(0.46, 2.12)
CPT	Trilogy	79	3294	11046	0.7	(0.57, 0.89)
Charnley	Vitalock	18	378	2234	0.8	(0.48, 1.27)
Definition	Vitalock	5	379	2380	0.2	(0.07, 0.49)
Elite Plus	Duraloc	64	1078	5962	1.1	(0.83, 1.37)
Exeter	Vitalock	42	1218	8432	0.5	(0.36, 0.67)
Exeter V40	ABGII	26	994	5088	0.5	(0.33, 0.75)
Exeter V40	Mallory-Head	12	790	3127	0.4	(0.20, 0.67)
Exeter V40	Trident	316	16715	45873	0.7	(0.61, 0.77)
Exeter V40	Trilogy	10	443	1358	0.7	(0.35, 1.35)
Exeter V40	Vitalock	46	1959	9557	0.5	(0.35, 0.64)
MS 30	Allofit	21	968	3533	0.6	(0.37, 0.91)
MS 30	Fitmore	6	377	1998	0.3	(0.11, 0.65)
Omnifit	Trident	49	1468	6122	0.8	(0.59, 1.06)
Spectron EF	Reflection	119	4066	15830	0.8	(0.62, 0.90)
VerSys	Trilogy	11	706	2997	0.4	(0.18, 0.66)
Other (370)		310	10321	37882	0.8	(0.73, 0.91)
TOTAL		**1216**	**48876**	**174360**	**0.7**	**(0.66, 0.74)**

Note: Only prostheses with over 350 procedures have been listed.
Some cementless components have been cemented

Table HT34: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement with Hybrid Fixation (femoral cemented)

Femoral Component	Acetabular Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
C-Stem	Duraloc	2.2 (1.4, 3.3)	3.1 (2.2, 4.4)	4.0 (2.9, 5.6)	5.0 (3.4, 7.4)	
C-Stem	Pinnacle	1.9 (1.0, 3.6)	3.2 (1.8, 5.6)			
CPCS	Reflection	0.9 (0.5, 1.5)	1.2 (0.8, 2.0)	1.4 (0.9, 2.3)		
CPT	Trabecular Metal Shell	1.4 (0.6, 3.0)	2.2 (1.1, 4.6)			
CPT	Trilogy	1.4 (1.0, 1.8)	2.4 (1.9, 3.1)	3.0 (2.4, 3.8)	3.7 (2.9, 4.8)	
Charnley	Vitalock	1.9 (0.9, 3.9)	2.9 (1.6, 5.2)	4.1 (2.5, 6.7)	5.3 (3.3, 8.3)	5.3 (3.3, 8.3)
Definition	Vitalock	0.5 (0.1, 2.1)	0.8 (0.3, 2.5)	1.2 (0.4, 3.1)	1.5 (0.6, 3.6)	1.5 (0.6, 3.6)
Elite Plus	Duraloc	1.9 (1.2, 2.9)	3.6 (2.6, 4.9)	5.3 (4.1, 6.9)	7.1 (5.5, 9.1)	8.1 (6.1, 10.8)
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)	3.6 (2.7, 4.9)
Exeter V40	ABGII	1.2 (0.7, 2.2)	1.6 (0.9, 2.6)	2.3 (1.5, 3.5)	3.4 (2.3, 5.2)	
Exeter V40	Mallory-Head	0.6 (0.2, 1.5)	1.2 (0.6, 2.4)	1.4 (0.7, 2.8)	2.3 (1.2, 4.4)	
Exeter V40	Trident	1.2 (1.1, 1.4)	2.0 (1.8, 2.2)	2.8 (2.4, 3.2)	3.4 (2.9, 4.0)	
Exeter V40	Trilogy	1.7 (0.8, 3.4)	2.4 (1.2, 4.7)	3.2 (1.6, 6.3)		
Exeter V40	Vitalock	0.9 (0.6, 1.5)	1.7 (1.2, 2.4)	2.2 (1.6, 3.0)	2.8 (2.1, 3.8)	
MS 30	Allofit	1.4 (0.8, 2.4)	2.2 (1.4, 3.5)	2.6 (1.7, 4.0)	2.6 (1.7, 4.0)	
MS 30	Fitmore	0.0 (0.0, 0.0)	0.3 (0.0, 2.2)	1.1 (0.3, 3.3)	2.1 (0.9, 5.2)	
Omnifit	Trident	2.0 (1.4, 2.9)	3.3 (2.4, 4.4)	3.7 (2.8, 4.9)	4.1 (3.1, 5.5)	
Spectron EF	Reflection	1.2 (0.9, 1.6)	2.3 (1.9, 2.9)	3.4 (2.8, 4.2)	5.0 (4.0, 6.1)	5.4 (4.3, 6.7)
VerSys	Trilogy	1.2 (0.6, 2.3)	1.5 (0.8, 2.7)	1.5 (0.8, 2.7)	1.9 (1.0, 3.5)	
Other (370)		1.6 (1.4, 1.9)	2.8 (2.4, 3.1)	3.7 (3.3, 4.2)	4.6 (4.0, 5.2)	5.0 (4.3, 5.7)

Primary Total Resurfacing Hip Replacement

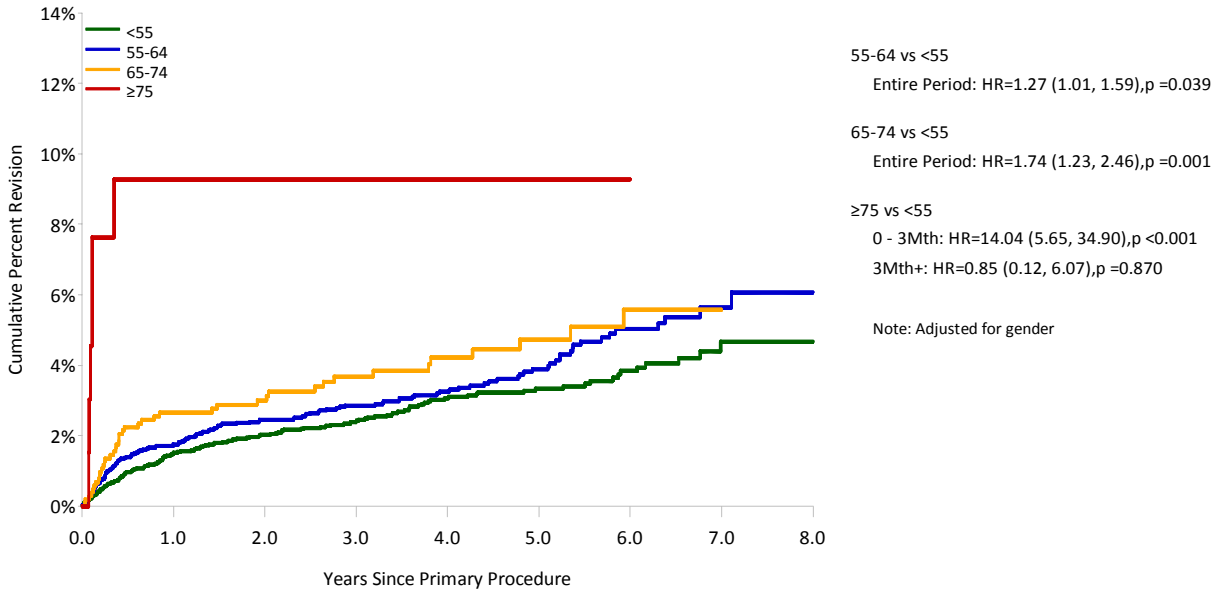
Table HT35: Revision Rates of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA excluding Infection)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	154	5693	20299	0.8	(0.64, 0.89)
55-64	150	4559	16101	0.9	(0.79, 1.09)
65-74	42	1043	3860	1.1	(0.78, 1.47)
≥75	6	66	254	2.4	(0.87, 5.14)
TOTAL	**352**	**11361**	**40514**	**0.9**	**(0.78, 0.96)**

Table HT36: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	1.5 (1.2, 1.9)	2.4 (2.0, 2.9)	3.3 (2.8, 4.0)	4.7 (3.7, 5.8)	4.7 (3.7, 5.8)
55-64	1.8 (1.4, 2.2)	2.9 (2.4, 3.4)	3.9 (3.2, 4.7)	5.6 (4.6, 6.9)	6.1 (4.8, 7.7)
65-74	2.7 (1.8, 3.8)	3.7 (2.6, 5.1)	4.7 (3.4, 6.5)	5.6 (3.9, 7.8)	
≥75	9.3 (4.3, 19.5)	9.3 (4.3, 19.5)	9.3 (4.3, 19.5)		

Figure HT28: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<55	5693	4866	4074	3228	2400	1661	965	353	53
55-64	4559	3939	3258	2605	1873	1245	713	259	26
65-74	1043	913	785	629	461	318	181	55	3
≥75	66	53	46	42	37	26	14	4	0

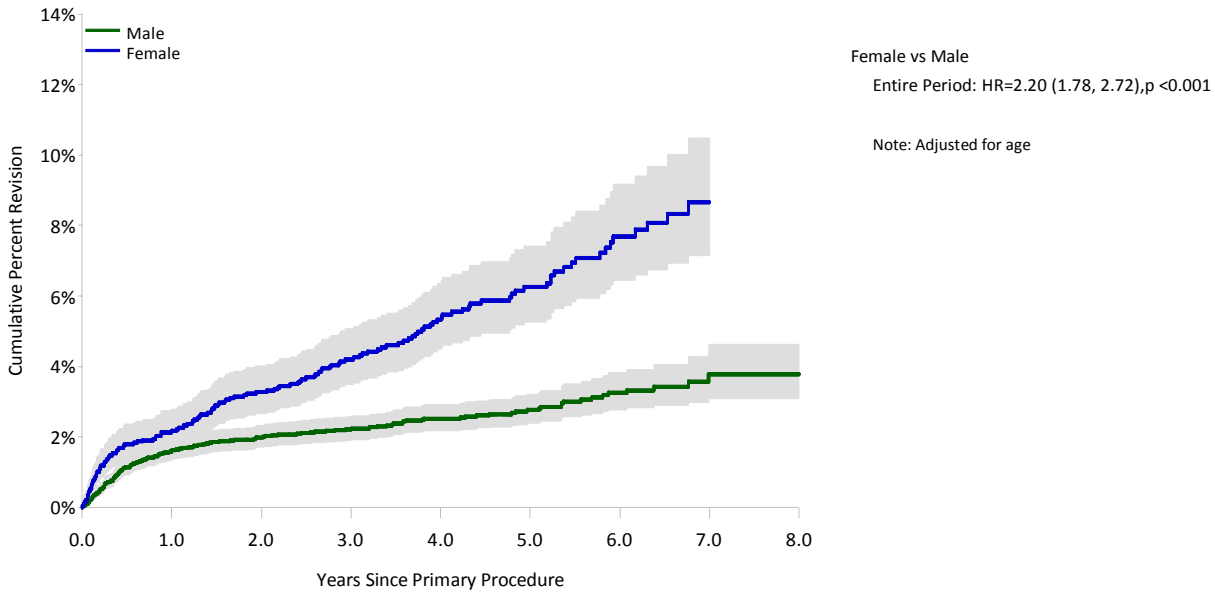
Table HT37: Revision Rates of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)

Gender	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	200	8471	29582	0.7	(0.59, 0.78)
Female	152	2890	10932	1.4	(1.18, 1.63)
TOTAL	**352**	**11361**	**40514**	**0.9**	**(0.78, 0.96)**

Table HT38: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	1.6 (1.4, 1.9)	2.2 (1.9, 2.6)	2.8 (2.4, 3.2)	3.8 (3.1, 4.6)	3.8 (3.1, 4.6)
Female	2.2 (1.7, 2.8)	4.2 (3.5, 5.1)	6.3 (5.3, 7.4)	8.7 (7.1, 10.5)	

Figure HT29: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	8471	7218	5989	4722	3447	2319	1321	460	57
Female	2890	2553	2174	1782	1324	931	552	211	25

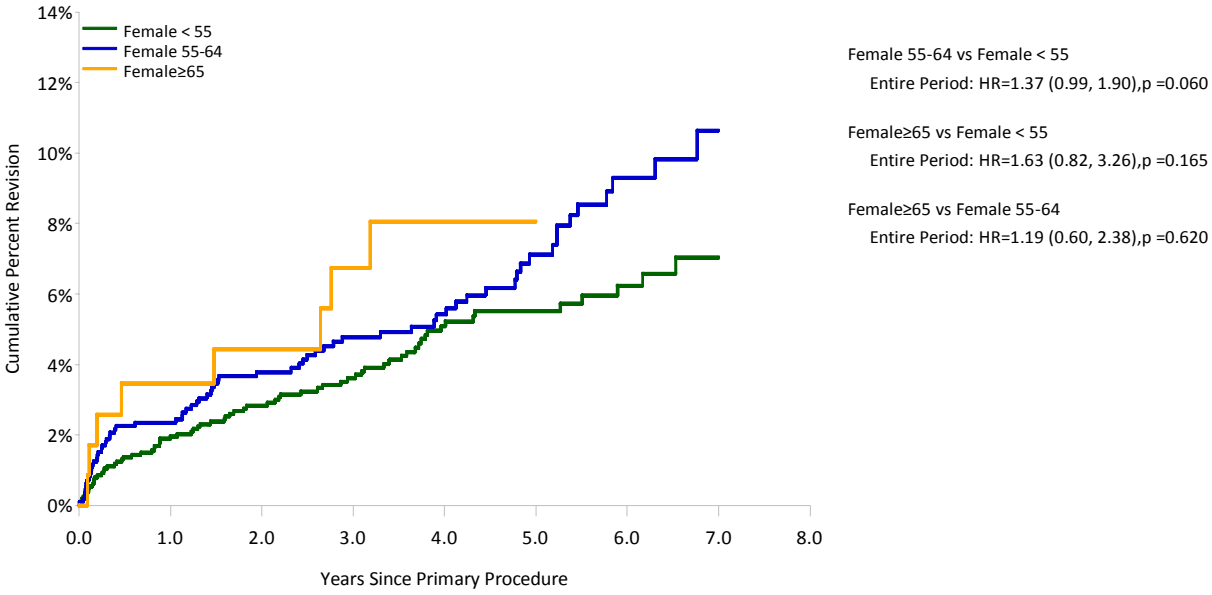
Table HT39: Revision Rates of Primary Total Resurfacing Hip Replacement by Age and Gender (Primary Diagnosis OA excluding Infection)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	< 55	81	4048	14156	0.6	(0.45, 0.71)
	55-64	80	3431	11780	0.7	(0.54, 0.85)
	≥65	39	992	3646	1.1	(0.76, 1.46)
Female	< 55	73	1645	6143	1.2	(0.93, 1.49)
	55-64	70	1128	4321	1.6	(1.26, 2.05)
	≥65	9	117	468	1.9	(0.88, 3.65)
TOTAL		**352**	**11361**	**40514**	**0.9**	**(0.78, 0.96)**

Table HT40: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age and Gender (Primary Diagnosis OA excluding Infection)

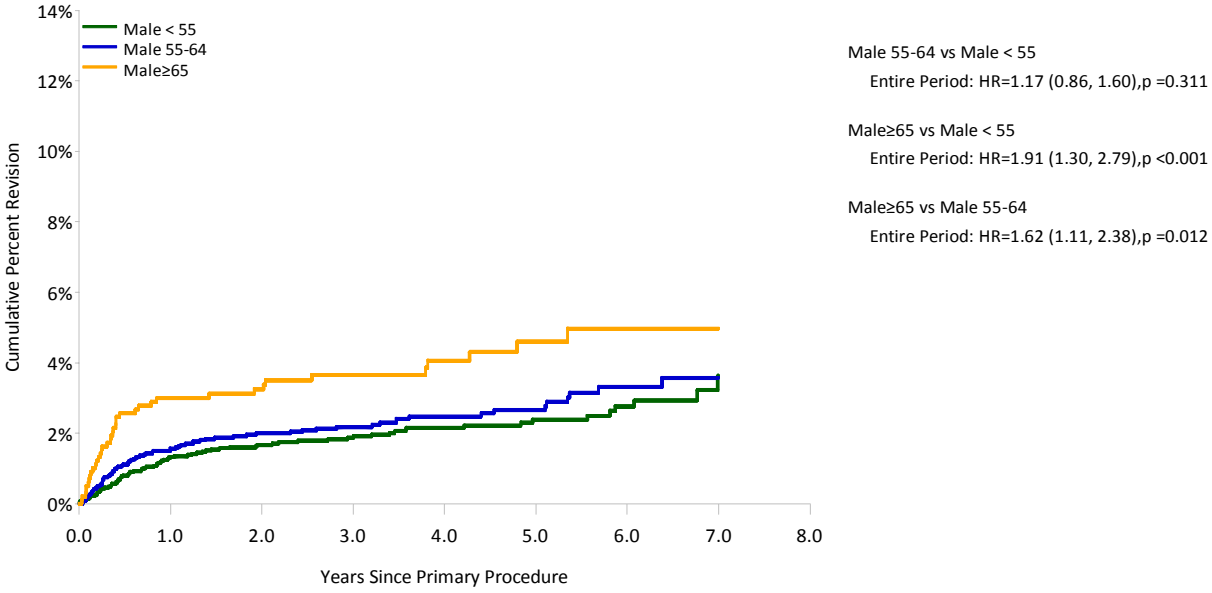
Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	< 55	1.3 (1.0, 1.7)	1.9 (1.5, 2.4)	2.4 (1.9, 3.0)	3.6 (2.6, 5.1)	
	55-64	1.6 (1.2, 2.1)	2.2 (1.7, 2.8)	2.7 (2.1, 3.4)	3.6 (2.7, 4.7)	
	≥65	3.0 (2.1, 4.3)	3.7 (2.6, 5.1)	4.6 (3.3, 6.4)	5.0 (3.5, 7.0)	
Female	< 55	2.0 (1.4, 2.8)	3.6 (2.8, 4.7)	5.5 (4.3, 7.0)	7.0 (5.4, 9.2)	
	55-64	2.3 (1.6, 3.4)	4.8 (3.6, 6.3)	7.1 (5.5, 9.2)	10.6 (8.0, 14.1)	
	≥65	3.5 (1.3, 9.0)	6.7 (3.2, 13.7)	8.1 (4.1, 15.6)		

Figure HT30: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement for Females by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Female < 55	1645	1450	1228	985	725	515	314	117	17
55-64	1128	998	852	720	540	371	210	86	8
≥65	117	105	94	77	59	45	28	8	0

Figure HT31: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement for Males by Age (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male < 55	4048	3416	2846	2243	1675	1146	651	236	36
55-64	3431	2941	2406	1885	1333	874	503	173	18
≥65	992	861	737	594	439	299	167	51	3

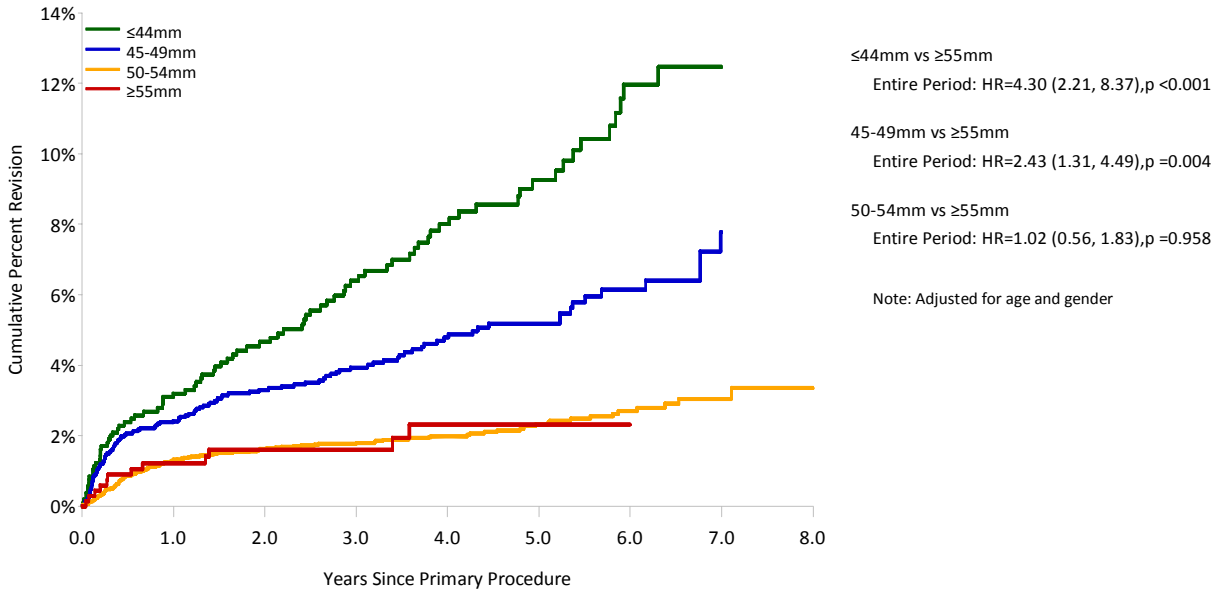
Table HT41: Revision Rates of Primary Total Resurfacing Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

Femoral Head Size	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
≤44mm	84	1068	4072	2.1	(1.65, 2.55)
45-49mm	121	2787	9487	1.3	(1.06, 1.52)
50-54mm	135	6815	24772	0.5	(0.46, 0.65)
≥55mm	12	691	2183	0.5	(0.28, 0.96)
TOTAL	**352**	**11361**	**40514**	**0.9**	**(0.78, 0.96)**

Table HT42: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
≤44mm	3.2 (2.3, 4.5)	6.4 (5.0, 8.2)	9.2 (7.4, 11.6)	12.5 (9.8, 15.7)	
45-49mm	2.4 (1.9, 3.1)	3.9 (3.2, 4.8)	5.2 (4.3, 6.3)	7.8 (6.0, 10.1)	
50-54mm	1.3 (1.1, 1.6)	1.8 (1.5, 2.1)	2.3 (1.9, 2.8)	3.0 (2.5, 3.8)	3.3 (2.6, 4.4)
≥55mm	1.2 (0.6, 2.4)	1.6 (0.9, 2.9)	2.3 (1.3, 4.2)		

Figure HT32: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
≤44mm	1068	930	777	650	512	378	213	92	13
45-49mm	2787	2353	1928	1496	1073	711	416	169	13
50-54mm	6815	5923	5014	4026	2966	2012	1140	377	50
≥55mm	691	565	444	332	220	149	104	33	6

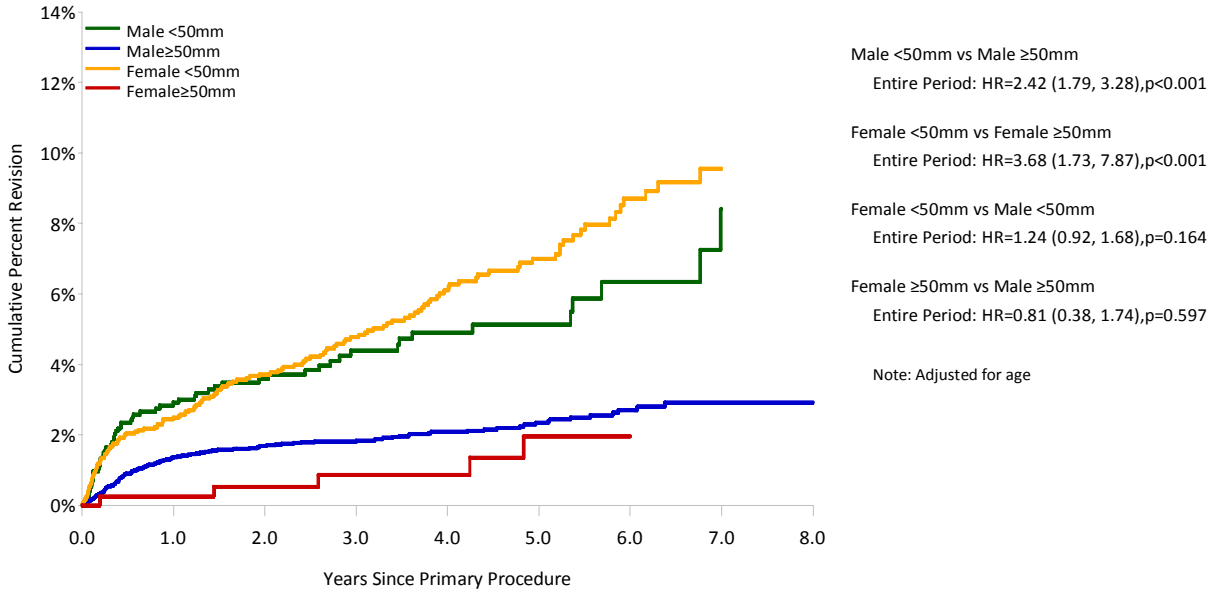
Table HT43: Revision Rates of Primary Total Resurfacing Hip Replacement by Gender and Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

Gender	Femoral Head Size	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<50mm	60	1369	4309	1.4	(1.06, 1.79)
	≥50mm	140	7102	25273	0.6	(0.47, 0.65)
Female	<50mm	145	2486	9250	1.6	(1.32, 1.84)
	≥50mm	7	404	1682	0.4	(0.17, 0.86)
TOTAL		**352**	**11361**	**40514**	**0.9**	**(0.78, 0.96)**

Table HT44: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

Gender	Femoral Head Size	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<50mm	2.9 (2.1, 4.0)	4.4 (3.3, 5.8)	5.1 (3.9, 6.7)	8.4 (5.6, 12.6)	
	≥50mm	1.4 (1.1, 1.7)	1.8 (1.5, 2.2)	2.3 (2.0, 2.8)	2.9 (2.4, 3.6)	2.9 (2.4, 3.6)
Female	<50mm	2.5 (1.9, 3.2)	4.8 (3.9, 5.8)	7.0 (5.9, 8.3)	9.5 (7.9, 11.6)	
	≥50mm	0.3 (0.0, 1.8)	0.9 (0.3, 2.7)	2.0 (0.8, 4.9)		

Figure HT33: Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Femoral Component Head Size (Primary Diagnosis OA excluding Infection)



Number at Risk		0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	<50mm	1369	1103	862	653	480	310	170	80	3
	≥50mm	7102	6115	5127	4069	2967	2009	1151	380	54
Female	<50mm	2486	2180	1843	1493	1105	779	459	181	23
	≥50mm	404	373	331	289	219	152	93	30	2

Table HT45: Revision Rates of Primary Total Resurfacing Hip Replacement

Head Component	Acetabular Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
ASR	ASR	64	1073	2814	2.3	(1.75, 2.90)
Adept	Adept	4	292	525	0.8	(0.21, 1.95)
BHR	BHR	269	8427	34340	0.8	(0.69, 0.88)
Bionik	Bionik	5	119	181	2.8	(0.90, 6.45)
Conserve	Conserve Plus	0	10	25	0.0	(0.00, 14.61)
Conserve Plus	Conserve Plus	5	62	249	2.0	(0.65, 4.69)
Cormet	Cormet	14	192	915	1.5	(0.84, 2.57)
Cormet 2000 HAP	Cormet	10	95	460	2.2	(1.04, 4.00)
Cormet HAP BiCoat	Cormet	10	287	534	1.9	(0.90, 3.44)
Durom	Durom	37	767	2223	1.7	(1.17, 2.29)
Icon	Icon	2	96	196	1.0	(0.12, 3.69)
Mitch TRH	Mitch TRH	7	534	627	1.1	(0.45, 2.30)
Recap	Recap	8	137	255	3.1	(1.35, 6.18)
TOTAL		**435**	**12091**	**43344**	**1.0**	**(0.91, 1.10)**

Note: Two resurfacing hip procedures using only a Conserve resurfacing head and no acetabular component have been removed from the above table.

Table HT46: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement

Head Component	Acetabular Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
ASR	ASR	3.6 (2.6, 4.9)	6.0 (4.6, 7.8)	8.7 (6.6, 11.5)		
Adept	Adept	0.7 (0.2, 2.7)	1.9 (0.7, 5.1)			
BHR	BHR	1.5 (1.3, 1.8)	2.5 (2.2, 2.9)	3.6 (3.2, 4.1)	4.8 (4.2, 5.6)	5.0 (4.3, 5.8)
Bionik	Bionik	4.3 (1.6, 11.1)	6.7 (2.6, 16.4)			
Conserve	Conserve Plus	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
Conserve Plus	Conserve Plus	3.2 (0.8, 12.3)	5.1 (1.7, 15.1)	9.7 (4.1, 22.1)	9.7 (4.1, 22.1)	
Cormet	Cormet	1.6 (0.5, 4.8)	3.8 (1.8, 7.9)	5.3 (2.8, 10.1)	16.0 (7.1, 33.6)	
Cormet 2000 HAP	Cormet	6.3 (2.9, 13.5)	8.4 (4.3, 16.1)	9.5 (5.0, 17.4)		
Cormet HAP BiCoat	Cormet	2.8 (1.3, 5.8)	5.0 (2.6, 9.5)			
Durom	Durom	3.0 (2.0, 4.5)	4.7 (3.4, 6.7)	6.7 (4.7, 9.7)		
Icon	Icon	1.1 (0.2, 7.9)	2.5 (0.6, 9.6)			
Mitch TRH	Mitch TRH	1.4 (0.6, 3.1)				
Recap	Recap	5.0 (2.3, 10.8)	7.6 (3.8, 15.0)			

Note: Two resurfacing hip procedures using only a Conserve resurfacing head and no acetabular component have been removed from the above table.

Primary Conventional Total Hip Replacement Prostheses with a higher than anticipated Revision Rate

Table HT47: Revision Rate of Individual Primary Conventional Total Hip Replacement identified as having a higher than anticipated Revision Rate

Femoral/Acetabular Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and no longer used				
Elite Plus/Charnley LPW	89	492	2.0	Entire Period: HR=2.95 (1.59, 5.49), p<0.001
Elite Plus/Apollo	52	316	2.8	Entire Period: HR=4.33 (2.25, 8.32), p<0.001
F2L Multineck/Delta	110	322	3.1	Entire Period: HR=3.52 (1.90, 6.55), p<0.001
H Moos/Mueller	19	94	7.5	Entire Period: HR=10.73 (5.12, 22.46), p<0.001
*Margron	687	3028	2.3	Entire Period: HR=3.18 (2.51, 4.02), p<0.001
*Revitan (non mod)	82	409	1.7	Entire Period: HR=2.39 (1.14, 5.01), p=0.020
**Artek	178	1154	3.3	0 - 1.5Yr: HR=2.07 (0.98, 4.34), p=0.055 1.5Yr+: HR=7.24 (5.06, 10.35), p<0.001
**Inter-Op	33	205	3.9	Entire Period: HR=5.92 (2.96, 11.85), p<0.001
**SPH-Blind	951	4759	1.4	Entire Period: HR=2.02 (1.59, 2.57), p<0.001
Re-identified and still used				
*Adapter (cemented)	133	203	3.5	Entire Period: HR=2.94 (1.40, 6.18), p=0.004
* Anca_Fit	179	346	2.3	Entire Period: HR=2.15 (1.08, 4.31), p=0.030
* Consensus	243	627	2.4	Entire Period: HR=2.62 (1.58, 4.36), p<0.001
*Lyderic II	162	628	1.9	Entire Period: HR=2.55 (1.45, 4.50), p=0.001
*Profemur Z	183	555	3.6	Entire Period: HR=4.20 (2.70, 6.51), p<0.001
**Bionik	428	642	2.5	Entire Period: HR=2.09 (1.28, 3.41), p=0.003
**MBA	124	537	2.2	Entire Period: HR=3.11 (1.76, 5.48), p<0.001
Newly Identified				
Alloclassic/Durom	568	1276	1.6	0 - 2Yr: HR=1.01 (0.56, 1.82), p=0.976 2Yr+: HR=5.38 (2.88, 10.05), p<0.001
Charnley/Duraloc	180	1009	1.7	0 - 3.5Yr: HR=1.20 (0.54, 2.68), p=0.647 3.5Yr+: HR=6.05 (3.34, 10.98), p<0.001
CLS/Trilogy	150	353	2.3	Entire Period: HR=2.32 (1.16, 4.63), p=0.017
Edinburgh/Icon	46	56	8.9	Entire Period: HR=7.23 (3.01, 17.38), p<0.001
Esop/Atlas	156	464	1.7	Entire Period: HR=2.02 (1.01, 4.03), p=0.047
ML Taper/Fitmore	112	112	4.5	Entire Period: HR=3.10 (1.29, 7.46), p=0.011
Secur-Fit Plus/Secur-Fit	197	974	1.6	Entire Period: HR=2.31 (1.42, 3.77), p<0.001
Quadra-H/Versafit	245	150	6.7	0 - 2Wk: HR=11.30 (5.35, 23.86), p<0.001 2Wk+: HR=1.34 (0.43, 4.15), p=0.613
**ASR	3971	6854	1.8	0 - 2Wk: HR=1.35 (0.79, 2.30), p=0.270 2Wk - 1Mth: HR=0.33 (0.12, 0.87), p=0.025 1Mth - 2Yr: HR=1.81 (1.47, 2.24), p<0.001 2Yr - 3Yr: HR=5.41 (2.95, 9.91), p<0.001 3Yr+: HR=3.87 (1.60, 9.39), p=0.002

Note: All components have been compared to Conventional Total Hip components
* Femoral Component
** Acetabular Component

Table HT48: Yearly Cumulative Percent Revision of Individual Primary Conventional Total Hip Replacement identified as having a higher than anticipated Revision Rate

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and no longer used					
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)	12.8 (7.1, 22.6)
Elite Plus/Apollo	2.0 (0.3, 13.4)	4.0 (1.0, 15.1)	12.1 (5.6, 25.0)	20.0 (10.7, 35.6)	
F2L Multineck/Delta	5.5 (2.5, 11.8)	9.7 (5.3, 17.3)			
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)	38.9 (20.8, 64.7)
*Margron	5.9 (4.3, 7.9)	8.4 (6.5, 10.8)	11.0 (8.7, 13.9)	12.8 (9.8, 16.6)	
*Revitan (non mod)	2.4 (0.6, 9.4)	6.1 (2.6, 14.0)	8.9 (4.3, 17.8)		
**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)	
**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)	24.9 (13.3, 43.7)
**SPH-Blind	3.8 (2.8, 5.2)	5.6 (4.3, 7.2)	7.0 (5.5, 8.9)	8.4 (6.5, 10.9)	
Re-identified and still used					
*Adapter (cemented)	4.3 (1.8, 10.0)				
* Anca_Fit	3.4 (1.6, 7.5)				
* Consensus	3.8 (2.0, 7.1)	5.4 (3.1, 9.3)			
* Lyderic II	3.2 (1.3, 7.4)	6.0 (3.2, 11.2)			
*Profemur Z	6.1 (3.4, 10.7)	11.2 (7.3, 17.2)			
**Bionik	2.9 (1.6, 5.2)				
**MBA	4.0 (1.7, 9.4)	8.4 (4.6, 15.1)	11.0 (6.3, 18.8)		
Newly Identified					
Alloclassic/Durom	1.4 (0.7, 2.9)	5.4 (3.4, 8.5)			
Charnley/Duraloc	0.6 (0.1, 3.9)	2.9 (1.2, 6.7)	8.9 (5.4, 14.6)	12.3 (7.6, 19.5)	
CLS/Trilogy	3.4 (1.4, 8.0)	5.8 (2.9, 11.4)			
Edinburgh/Icon	9.4 (3.6, 23.2)				
Esop/Atlas	3.2 (1.3, 7.5)	4.2 (1.9, 9.3)			
ML Taper/Fitmore	4.5 (1.9, 10.5)				
Secur-Fit Plus/Secur-Fit	3.1 (1.4, 6.7)	7.3 (4.4, 12.0)	8.0 (4.9, 12.9)		
Quadra-H/Versafit	4.9 (2.5, 9.4)				
**ASR	1.8 (1.4, 2.3)	5.4 (4.4, 6.6)			

Note: * Femoral Component
** Acetabular Component

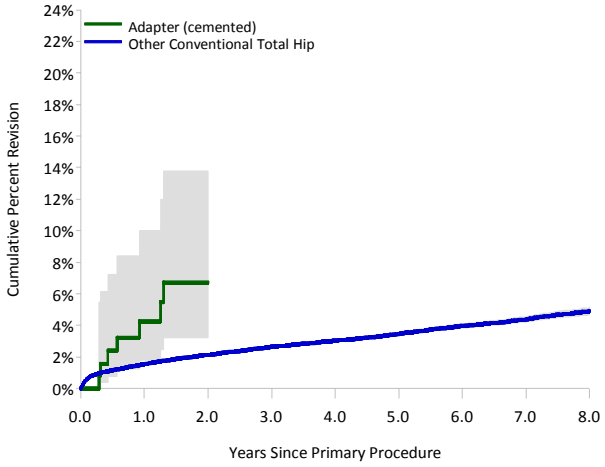
Table HT49: Yearly Usage of Individual Primary Conventional Total Hip Replacement identified as having a higher than anticipated Revision Rate

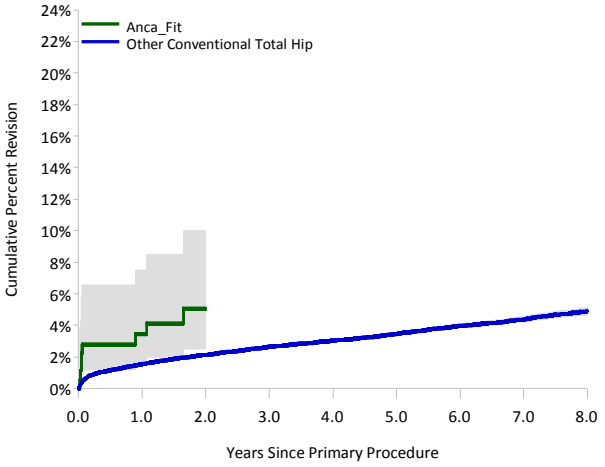
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and no longer used										
Elite Plus/Charnley LPW	3	19	23	29	15					
Elite Plus/Apollo		9	16	17	10					
F2L Multineck/Delta						10	62	28	10	
H Moos/Mueller		5	9	5						
*Margron		28	56	130	123	140	96	83	29	2
*Revitan (non mod)				6	53	23				
**Artek	12	33	111	22						
**Inter-Op		9	24							
**SPH-Blind		32	116	228	262	204	41	49	19	
Re-identified and still used										
*Adapter (cemented)							7	41	52	33
* Anca_Fit						9	21	51	67	31
* Consensus				1	15	40	75	31	36	45
* Lyderic II			5	28	16	63	23	12	8	7
*Profemur Z						41	79	56	6	1
**Bionik							11	147	136	134
**MBA			8	41	29	19	11	9	5	2
Newly Identified										
Alloclassic/Durom					3	51	151	139	112	112
Charnley/Duraloc		6	60	41	33	19	20	1		
CLS/Trilogy				1	1	3	42	64	25	14
Edinburgh/Icon							3	14	14	15
Esop/Atlas					8	50	24	39	20	15
ML Taper/Fitmore							7	11	24	70
Secur-Fit Plus/Secur-Fit		1	40	60	27	21	26	22		
Quadra-H/Versafit									64	181
**ASR						84	582	957	1181	1167

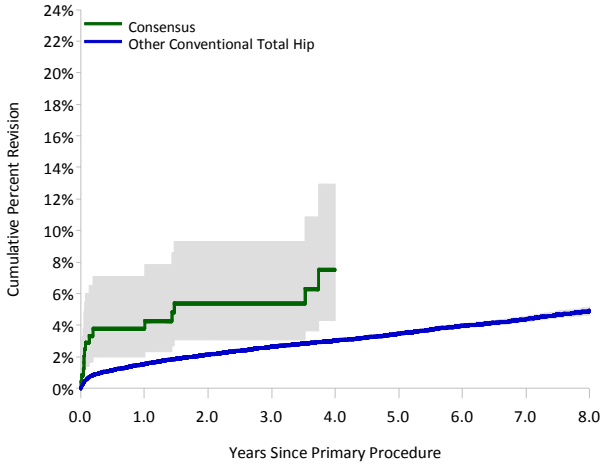
Note: * Femoral Component
** Acetabular Component

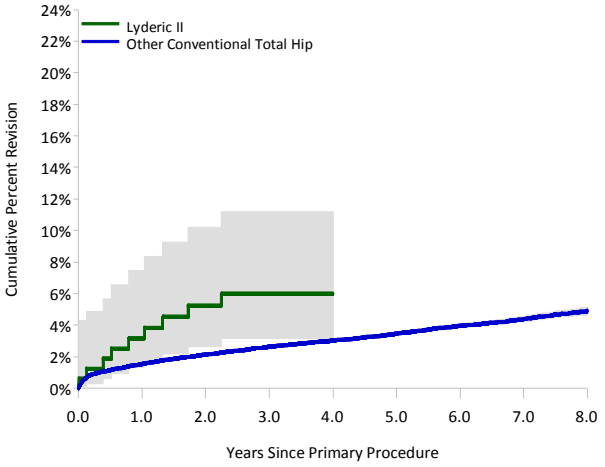
Figure HT34-49: Cumulative Percent Revision of Individual Primary Conventional Total Hip Replacement identified as having a higher than anticipated Revision Rate

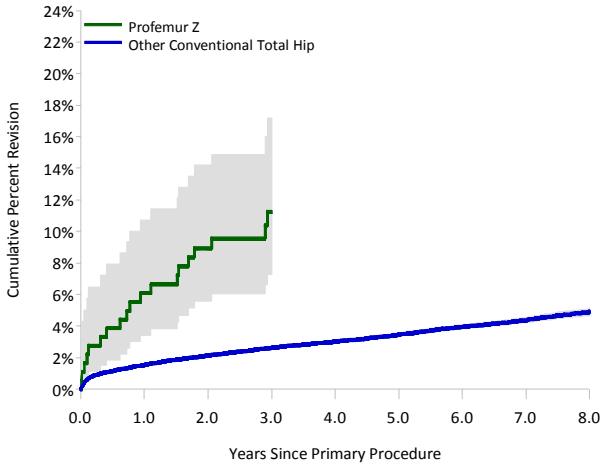
Re-identified and still used

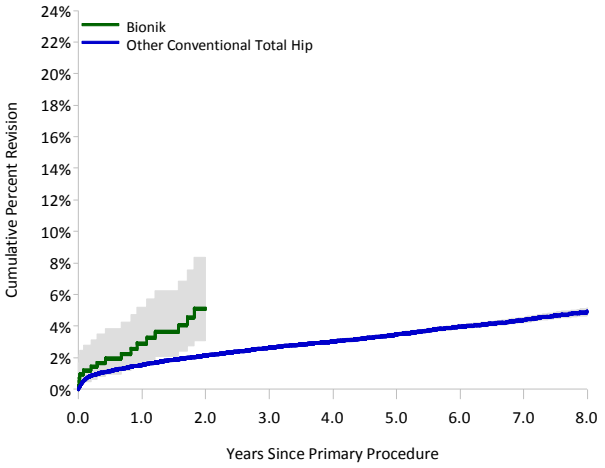


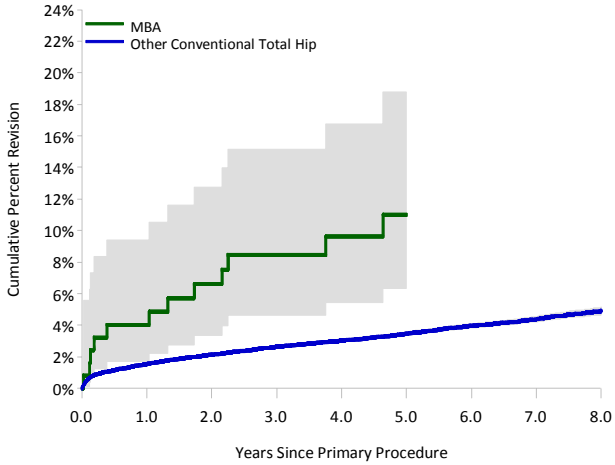




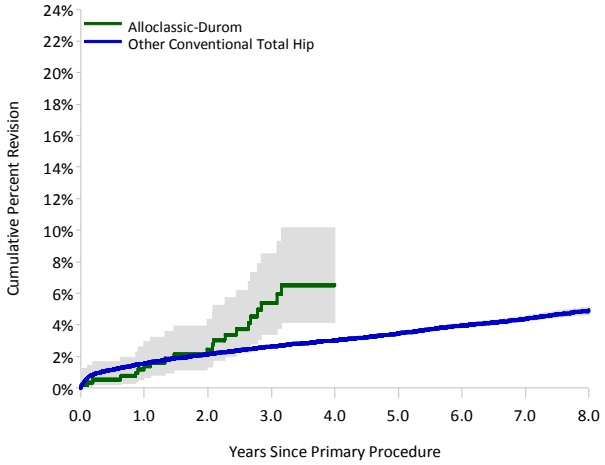


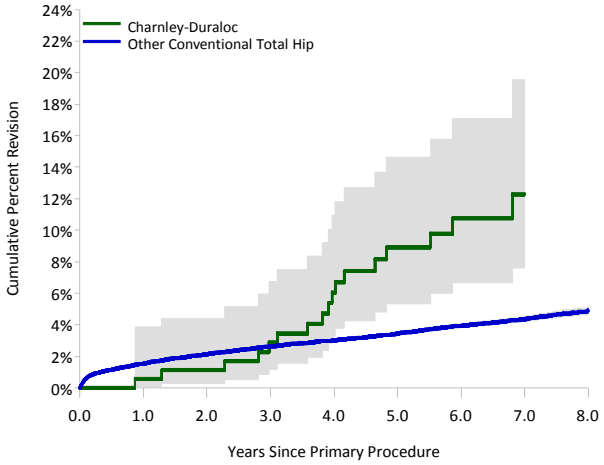


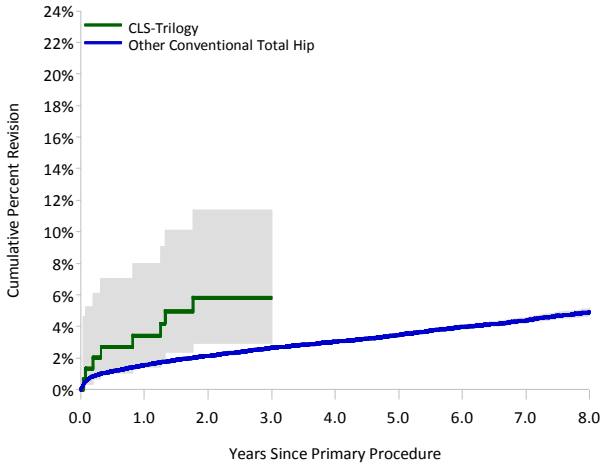


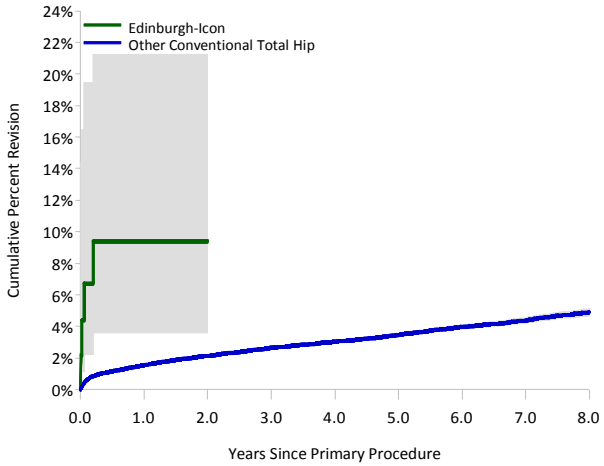


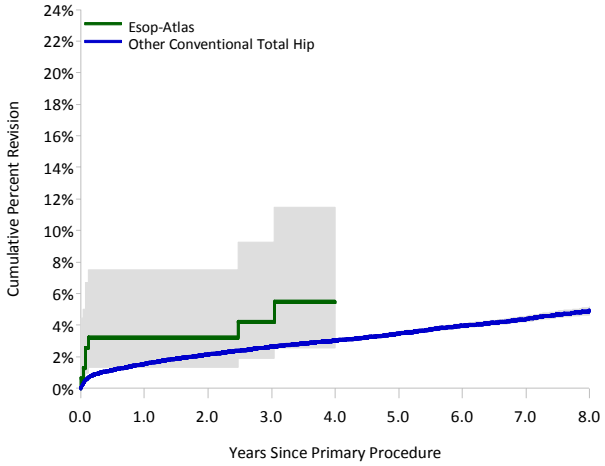
Newly Identified

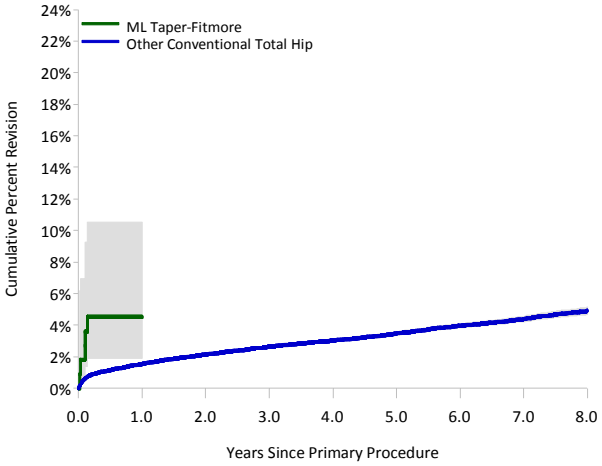


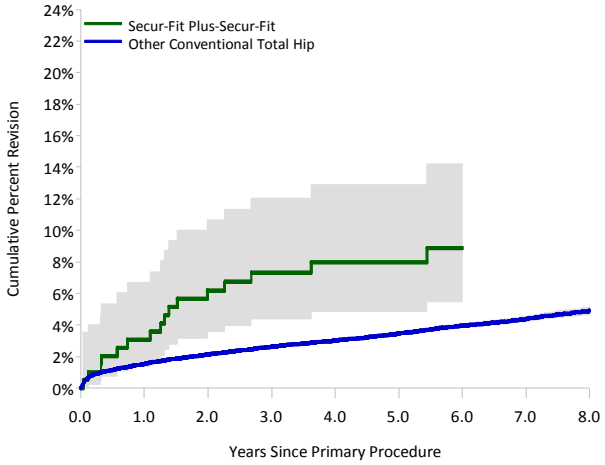


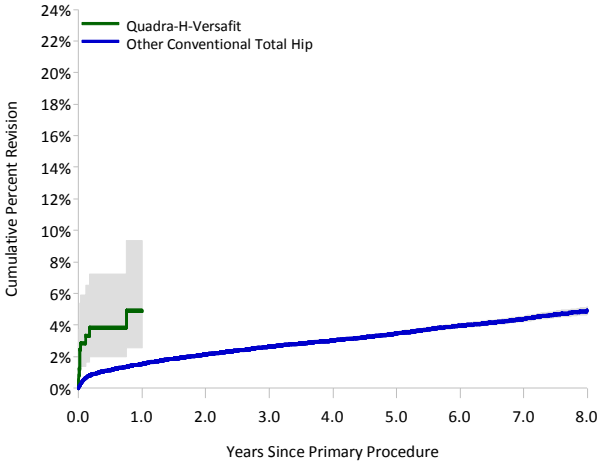


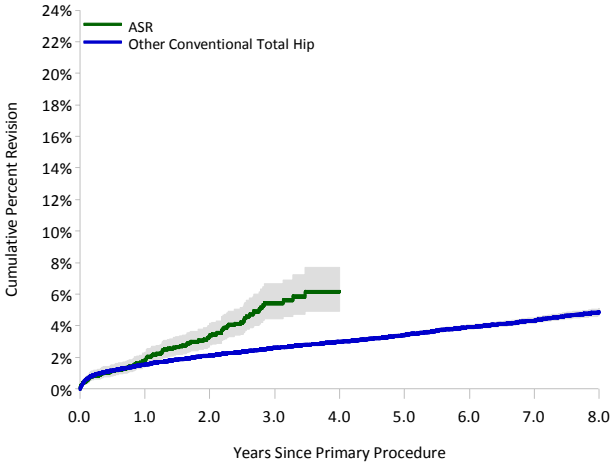



Esop-Atlas
Other Conventional Total Hip
Cumulative Percent Revision
24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Years Since Primary Procedure


ML Taper-Fitmore
Other Conventional Total Hip
Cumulative Percent Revision
24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Years Since Primary Procedure


Secur-Fit Plus-Secur-Fit
Other Conventional Total Hip
Cumulative Percent Revision
24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Years Since Primary Procedure


Quadra-H-Versafit
Other Conventional Total Hip
Cumulative Percent Revision
24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Years Since Primary Procedure


ASR
Other Conventional Total Hip
Cumulative Percent Revision
24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Years Since Primary Procedure

Primary Total Resurfacing Hip Replacement Prostheses with a higher than anticipated Revision Rate

Table HT50: Revision Rate of Individual Primary Total Resurfacing Hip Replacement identified as having a higher than anticipated Revision Rate

Resurfacing Head/Cup Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and no longer used				
*Cormet 2000 HAP	95	460	2.2	Entire Period: HR=2.59 (1.38, 4.85), p=0.003
Re-Identified and still used				
ASR/ASR	1073	2814	2.3	Entire Period: HR=2.19 (1.67, 2.86), p<0.001
Durom/Durom	767	2223	1.7	Entire Period: HR=1.68 (1.20, 2.36), p=0.002
Newly Identified				
Recap/Recap	137	255	3.1	Entire Period: HR=2.59 (1.29, 5.22), p=0.007

Note: All Components have been compared to all other Total Resurfacing Hip components.
*Resurfacing Head Component

Table HT51: Yearly Cumulative Percent Revision of Individual Primary Total Resurfacing Hip Replacement identified as having a higher than anticipated Revision Rate

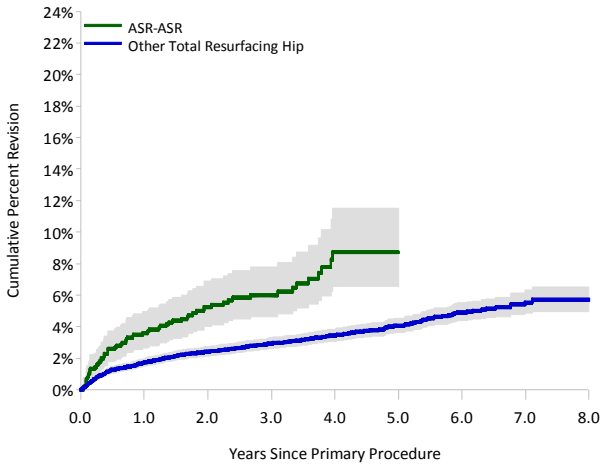
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and no longer used					
*Cormet 2000 HAP	6.3 (2.9, 13.5)	8.4 (4.3, 16.1)	9.5 (5.0, 17.4)		
Re-identified and still used					
ASR/ASR	3.6 (2.6, 4.9)	6.0 (4.6, 7.8)	8.7 (6.6, 11.5)		
Durom/Durom	3.0 (2.0, 4.5)	4.7 (3.4, 6.7)	6.7 (4.7, 9.7)		
Newly Identified					
Recap/Recap	5.0 (2.3, 10.8)				

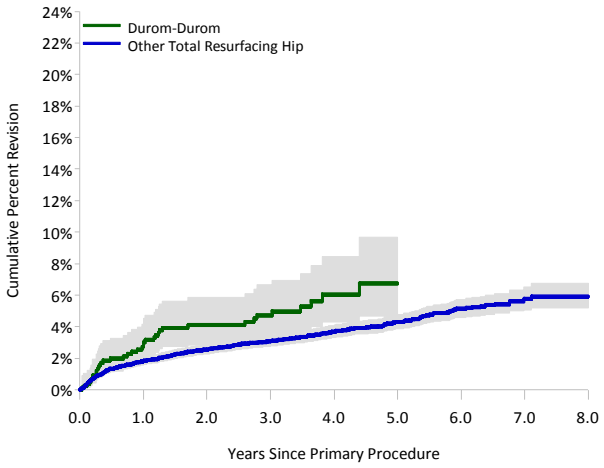
Table HT52: Yearly Usage of Individual Primary Total Resurfacing Hip Replacement identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and no longer used										
*Cormet 2000 HAP			1	17	38	39				
Re-identified and still used										
ASR/ASR					43	164	301	258	175	132
Durom/Durom					58	166	207	143	105	88
Newly Identified										
Recap/Recap						27	14	9	42	45

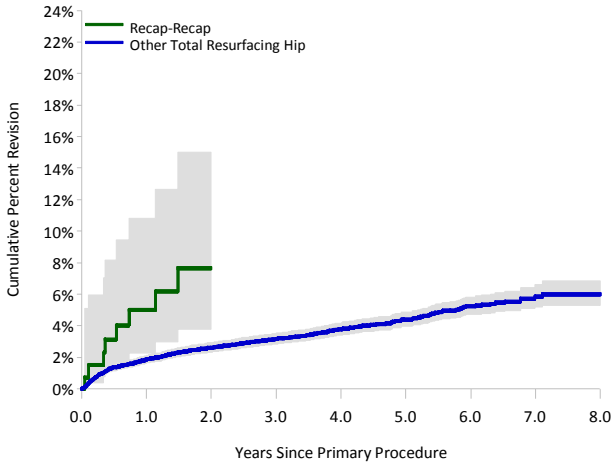
Figures HT50-52: Cumulative Percent Revision of Individual Primary Total Resurfacing Hip Replacement identified as having a higher than anticipated Revision Rate

Re-identified and still used





Newly Identified



REVISION HIP REPLACEMENT

This report is based on the analysis of 27,515 revision hip procedures recorded by the Registry up to and including the 31st December 2008. Included in this group of revisions is a subgroup containing 5,732 first revisions of primary hip procedures (both partial and total).

Revision procedures are either major or minor. A major revision involves the removal and/or replacement of a major component. The Registry defines a major component as one that interfaces with bone i.e. either the femoral stem or acetabular cup or shell. When only one of the femoral or acetabular components is revised this is referred to as a partial major revision. If both are revised this is referred to as a total major revision. A minor revision is a revision where a major component has not been removed or replaced. Examples of this include exchange of the femoral head, exchangeable femoral neck component and/or acetabular insert exchange.

The major focus of this section of the report is to provide preliminary information on the outcome of the first revision of primary total hip replacement. To achieve this effectively the Registry needs to have a full chronological list of procedures dating back to the original primary procedure. At this stage of the Registry's development primary data are not available for the majority of revisions recorded as the primary procedure was performed prior to the commencement of the Registry. Not only is the Registry unaware of the original primary procedure, it is not certain if the first revision recorded is the first revision procedure for that individual. Consequently, it is not possible to undertake an analysis of outcome based on the data of all revision procedures. Analysis of these data however is able to provide information on the types of revisions being undertaken, how this is changing over time and the reasons for these revisions.

There is an increasing proportion of revision procedures where the Registry has a record of the original primary and a chronological list of all subsequent procedures. The Registry refers to this subgroup of revisions as 'known primary revisions'. These procedures are used to determine the outcome of revision surgery. The outcome analysis is based on determining the rate of any subsequent second revision. The known primary procedures include partial, conventional total and total resurfacing hip procedures.

ANALYSIS OF ALL REVISION HIP REPLACEMENT

The 'all revisions' group covers the full spectrum of revisions recorded by the Registry i.e. early, mid and late revisions as well as revision of primary and previous revision procedures.

TYPE OF REVISION HIP REPLACEMENT

Most revisions recorded by the Registry are categorised as major revisions (85.4% of all revisions). Of the major revisions 35.7% involve revision of both the femoral stem and acetabular cup or shell. Most major revisions however involve revision of only one of the major components (58.4%). When only one major component is revised it is most commonly the acetabular cup or shell (37.4% of all major revisions). Femoral stem only revisions account for 21.0% of all major revisions. There are a small number of major revisions where prostheses are either removed and replaced by a cement spacer (3.1%), removed and not replaced (1.2%) or removed and reinserted (0.1%) (Table HR1).

Minor revisions account for 14.6% of all revision procedures. Most minor revisions involve exchange of both the head and insert (70.4% of all minor revisions) (Table HR2).

During the last five years there has been no major change in the national figures for the proportion of major partial, major total and minor revisions. There is however some state and territory variation in these proportions (Figure HR1).

AGE AND GENDER

Revision hip replacement is more common in females. There has been no change in the proportion of females undergoing revisions in the last year (Table HR3).

There has been a small increase in the number of individuals aged less than 65 years having hip revision surgery in recent years. In 2008 this group accounted for 28.4% of all revisions which is the highest proportion recorded for this group in the last five years (Table HR4).

DIAGNOSIS

The most common reason for revision in the 'all revision' group is loosening/lysis, which is reported in over half of all revisions (56.4%). Dislocation is the next most common reason (14.5%) followed by infection (11.1%) and fracture (8.8%) (Table HR5).

REVISION OF KNOWN PRIMARY HIP REPLACEMENT

The following analysis is from a subgroup of revisions that are first revisions of primary procedures recorded by the Registry. The Registry started collecting data in 1999 becoming fully national in mid 2002. These revisions are therefore revisions of primary procedures with a maximum possible follow up of nine years, the majority of which have a considerably shorter follow up period.

The essential difference between the 'all revision' and 'known primary revision' groups is that first revisions of known primary procedures are either early or mid term revisions. The 'all revision' group contains these revisions, revisions of primaries undertaken prior to the Registry collecting data (late revisions) as well as any subsequent revisions of previous revision procedures.

Type of Revision Hip Replacement

There are differences in the type of revision between the 'known primary revision' and the 'all revision' groups with a smaller proportion of revisions being major revisions (78.6% compared to 85.4%) (Tables HR1, HR2, HR6 and HR7).

There are less major total revisions in the 'known primary revision' group (25.7%) compared to the 'all revision' group (35.7%). Unlike the 'all revision' group, revision of the femoral stem occurs more often than the acetabular cup or shell for major partial revisions of known primary procedures (stem only 35.8% compared to 21.0%, and acetabular cup or shell 27.8% compared to 37.4%) (Tables HR1 and HR6).

There is a higher proportion of minor revisions in the 'known primary revision' group (21.4%) compared to the 'all revision' group (14.6%) (Tables HR7 and HR2). The most common minor revision involves the replacement of both the head and insert (61.4%), head only revisions account for 25.3% of minor revisions (Table HR7).

Diagnosis

There are differences in the reason for revision of known primaries when compared to the 'all revision' group. Loosening/lysis is still the most common reason but the proportion is less (30.9% compared to 56.4%). Other diagnoses such as dislocation, infection and fracture are more common in the 'known primary revision' group (Table HR5).

Outcome of First Revision of Primary Conventional Total Hip Replacement

This analysis examines the risk of subsequent revision following the first revision of a known primary conventional total hip replacement. First revisions with infection as the reason for the initial revision have been excluded. Outcome analysis for infected total hip revisions is more complex than non-infected revisions. There are many additional factors to consider, for example antibiotic treatment, adequacy of debridement, infective organism(s) and revision strategy such as planned multi-staged procedures. The Registry has information on some but not all of these factors therefore meaningful interpretation of any subsequent revision data related to infection is very difficult.

After excluding revisions of primary hip replacement other than conventional total hip replacement as well as revisions with a diagnosis of infection, the number of procedures available for analysis is reduced to 3,394.

As previously reported the outcome of the first revision of a primary conventional total hip replacement is dependent on the type of the first revision performed.

Minor revisions have a greater risk of subsequent revision compared to major partial and major total revisions (5.7, 4.2 and 3.6 revisions per 100 observed component years respectively) (Table HR8). At three years the cumulative percent revision of a minor revision is 17.9%, a major partial is 12.8% and a major total revision is 9.2%. Minor revision has a significantly higher rate of re-revision compared to major revision. The difference between major partial and major total is not statistically significant (Table HR9 and Figure HR2). Regardless of the type of initial revision, the risk of revision following a revision procedure is far greater than the risk of revision following a primary procedure (2.6% at three years for primary conventional total hip replacement) (Table HG5).

Outcome of First Revision of Primary Total Resurfacing Hip Replacement

In the 2008 Annual Report the Registry presented the results of the first revision of primary total resurfacing hip replacement. As most resurfacing prostheses are a combination of a solid metal acetabular component and a one piece femoral component the only possible type of revision is a major revision. These major revisions may either be partial or total. Major partial revisions may be either a femoral only or an acetabular only revision.

In the 2008 Annual Report the Registry only considered all major revisions. This year those revisions have been subdivided into major partial (acetabular only and femoral only) and major total (acetabular and femoral) revisions.

Acetabular only revision for primary total resurfacing procedures has a higher rate of re-revision compared to femoral only revision and femoral and acetabular revision (4.9, 1.8 and 2.3 revisions per 100 observed component years and cumulative percent revision of 20.1%, 7.0% and 5.3% at five years respectively). This difference however is only significantly higher for acetabular only compared to femoral only revision (Tables HR10 and HR11 and Figure HR3).

REVISION HIP REPLACEMENT
1/9/1999 - 31/12/2008

Table HR1: Major Revisions of All Hip Replacement by Fixation

Components Used	Cemented		Cementless		Hybrid		NA - Removal		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Acetabular Only	2466	10.5	6331	26.9	0	0.0	0	0.0	8797	37.4
THR (Femoral/Acetabular)	1611	6.9	4285	18.2	2490	10.6	0	0.0	8386	35.7
Femoral Only	1462	6.2	3469	14.8	0	0.0	0	0.0	4931	21.0
Cement Spacer	0	0.0	0	0.0	0	0.0	727	3.1	727	3.1
Bipolar Head and Femoral	1	0.0	147	0.6	189	0.8	0	0.0	337	1.4
Removal of Prostheses	0	0.0	0	0.0	0	0.0	290	1.2	290	1.2
Reinsertion of Components	14	0.1	7	0.0	0	0.0	0	0.0	21	0.1
Thrust Plate	0	0.0	3	0.0	0	0.0	0	0.0	3	0.0
TOTAL	**5554**	**23.6**	**14242**	**60.6**	**2679**	**11.4**	**1017**	**4.3**	**23492**	**100.0**

Table HR2: Minor Revisions of All Hip Replacement

Components Used	Number	Percent
Head/Insert	2833	70.4
Head Only	605	15.0
Insert Only	308	7.7
Minor Components	268	6.7
Neck Only	8	0.2
Cement Only	1	0.0
TOTAL	**4023**	**100.0**

Figure HR1: Trends in Usage of Hip Replacement by State/Territory and Year

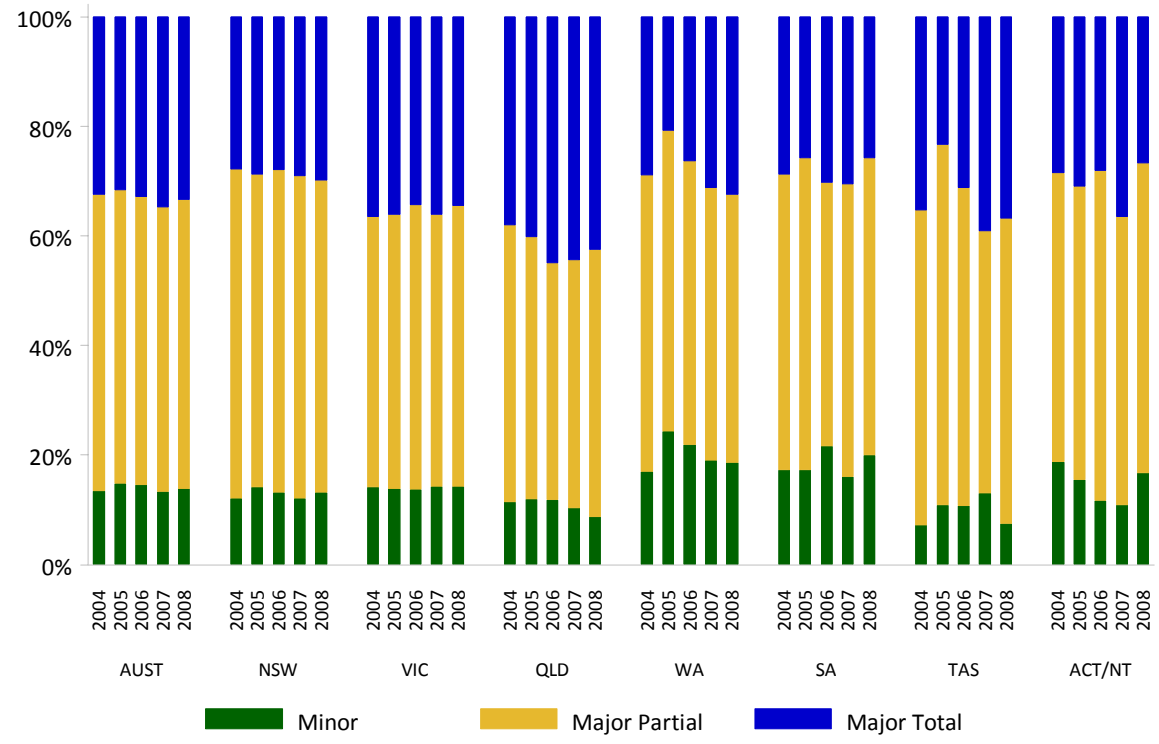


Table HR3: Revision Hip Replacement by Gender and Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	1870	53.5	1624	46.5	3494	100.0
2005	1931	54.4	1619	45.6	3550	100.0
2006	1958	55.6	1565	44.4	3523	100.0
2007	1827	52.4	1658	47.6	3485	100.0
2008	1928	52.4	1749	47.6	3677	100.0

Table HR4: Revision Hip Replacement by Age and Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	353	10.1	569	16.3	1049	30.0	1192	34.1	331	9.5	3494	100.0
2005	334	9.4	575	16.2	1038	29.2	1231	34.7	372	10.5	3550	100.0
2006	360	10.2	615	17.5	1040	29.5	1165	33.1	343	9.7	3523	100.0
2007	331	9.5	589	16.9	1022	29.3	1140	32.7	403	11.6	3485	100.0
2008	375	10.2	671	18.2	1061	28.9	1146	31.2	424	11.5	3677	100.0

Table HR5: Revision Diagnosis of Revision Hip Replacement

Diagnosis	Revisions of Known Primary		All Revisions	
	N	%	N	%
Loosening/Lysis	1771	30.9	15507	56.4
Dislocation Of Prosthesis	1361	23.7	3984	14.5
Infection	874	15.2	3049	11.1
Fracture	994	17.3	2431	8.8
Other	85	1.5	492	1.8
Pain	214	3.7	476	1.7
Implant Breakage Acetabular	55	1.0	426	1.5
Wear Acetabulum	10	0.2	323	1.2
Implant Breakage Stem	34	0.6	242	0.9
Malposition	60	1.0	107	0.4
Metal Sensitivity	60	1.0	84	0.3
Leg Length Discrepancy	60	1.0	80	0.3
Instability	24	0.4	72	0.3
Chondrolysis/Acetab. Erosion	36	0.6	53	0.2
Implant Breakage Head	20	0.3	43	0.2
Incorrect Sizing	32	0.6	41	0.1
Avascular Necrosis	14	0.2	30	0.1
Heterotropic Bone	11	0.2	28	0.1
Tumour	4	0.1	21	0.1
Progression Of Disease	10	0.2	20	0.1
Synovitis	2	0.0	5	0.0
Dislocation of Prosthesis	1	0.0	1	0.0
TOTAL	**5732**	**100.0**	**27515**	**100.0**

'Revision of Known Primary' Hip Replacement

Table HR6: Major 'Revision of Known Primary' Revision Hip Replacement by Fixation

Components Used	Cemented		Cementless		Hybrid		NA - Removal		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Femoral Only	502	11.1	1111	24.6	0	0.0	0	0.0	1613	35.8
Acetabular Only	233	5.2	1021	22.6	0	0.0	0	0.0	1254	27.8
THR (Femoral/Acetabular)	249	5.5	569	12.6	341	7.6	0	0.0	1159	25.7
Cement Spacer	0	0.0	0	0.0	0	0.0	246	5.5	246	5.5
Bipolar Head and Femoral	0	0.0	79	1.8	71	1.6	0	0.0	150	3.3
Removal of Prostheses	0	0.0	0	0.0	0	0.0	77	1.7	77	1.7
Reinsertion of Components	4	0.1	5	0.1	0	0.0	0	0.0	9	0.2
Thrust Plate	0	0.0	1	0.0	0	0.0	0	0.0	1	0.0
TOTAL	**988**	**21.9**	**2786**	**61.8**	**412**	**9.1**	**323**	**7.2**	**4509**	**100.0**

Table HR7: Minor 'Revision of Known Primary' Revision Hip Replacement

Components Used	Number	Percent
Head/Insert	751	61.4
Head Only	310	25.3
Minor Components	92	7.5
Insert Only	66	5.4
Neck Only	3	0.2
Cement Only	1	0.1
TOTAL	**1223**	**100.0**

Table HR8: Revision Rates of 'Revision of Known Primary' Conventional Total Hip Replacement (excluding Infection)

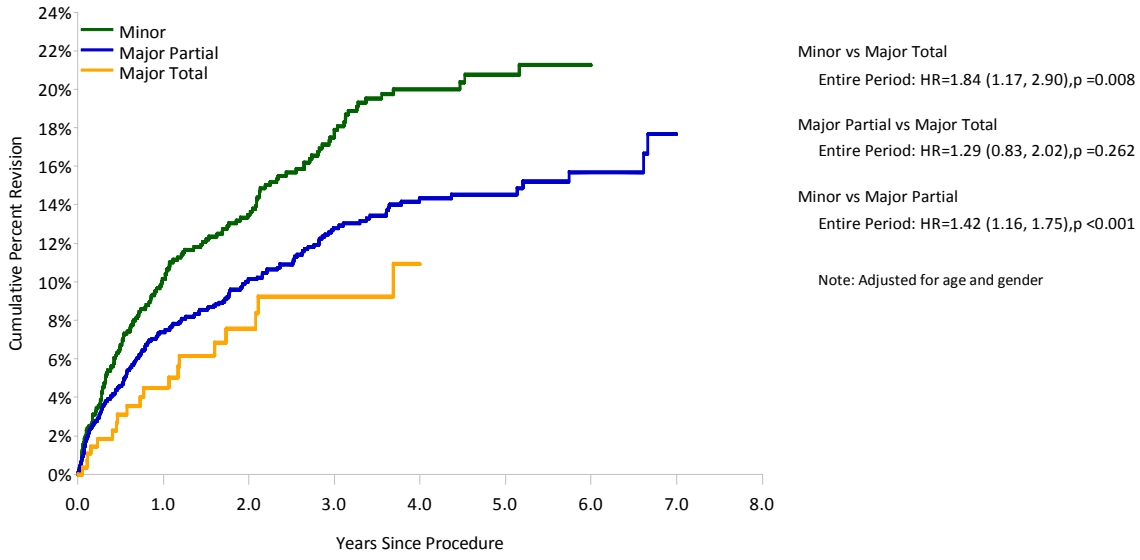
Primary Conventional Total Hip Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Minor	156	981	2743	5.7	(4.83, 6.65)
Major Partial	225	2133	5374	4.2	(3.66, 4.77)
Major Total	21	280	583	3.6	(2.23, 5.51)
TOTAL	**402**	**3394**	**8699**	**4.6**	**(4.18, 5.10)**

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

Table HR9: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Conventional Total Hip Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Minor	10.1 (8.3, 12.3)	17.9 (15.3, 20.8)	20.7 (17.8, 24.1)		
Major Partial	7.4 (6.3, 8.6)	12.8 (11.2, 14.6)	14.5 (12.7, 16.6)	17.7 (14.4, 21.5)	
Major Total	4.5 (2.5, 8.0)	9.2 (5.8, 14.6)			

Figure HR2: Cumulative Percent Revision of 'Revision of Known Primary' Conventional Total Hip Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Minor	981	725	577	425	283	169	84	28	7
Major Partial	2133	1519	1118	758	492	286	149	62	10
Major Total	280	183	115	70	44	25	12	5	2

Table HR10: Revision Rates of 'Revision of Known Primary' Total Resurfacing Hip Replacement (excluding Infection)

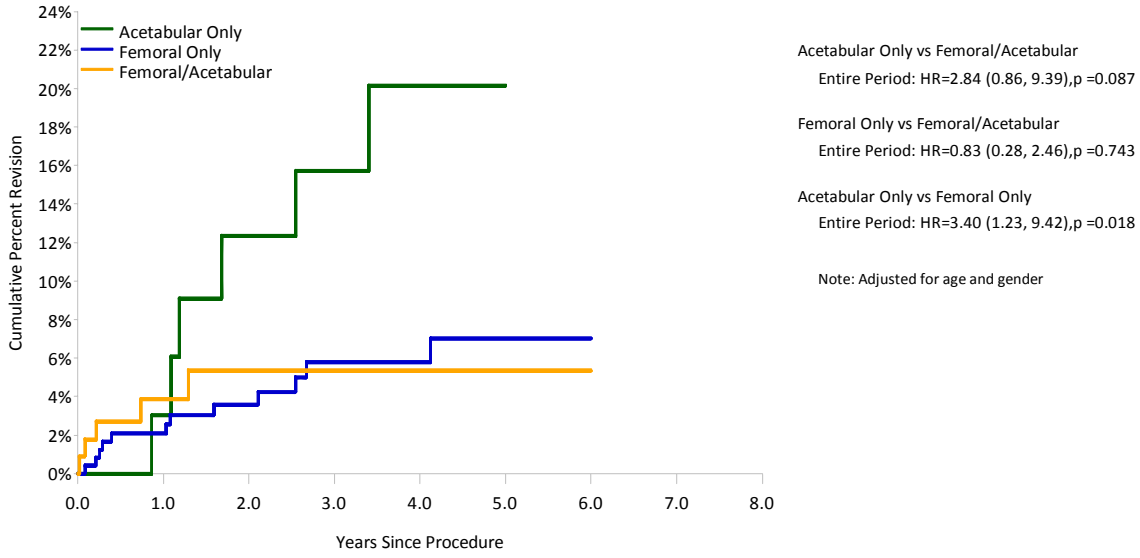
Primary Total Resurfacing Hip Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Acetabular Only	6	36	123	4.9	(1.78, 10.58)
Femoral Only	13	246	732	1.8	(0.95, 3.04)
Femoral/Acetabular	5	114	219	2.3	(0.74, 5.32)
TOTAL	**24**	**396**	**1075**	**2.2**	**(1.43, 3.32)**

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

Table HR11: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Total Resurfacing Hip Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Acetabular Only	3.0 (0.4, 19.6)	15.7 (6.8, 33.8)	20.1 (9.5, 39.9)		
Femoral Only	2.1 (0.9, 4.9)	5.8 (3.2, 10.4)	7.0 (3.9, 12.6)		
Femoral/Acetabular	3.9 (1.5, 10.0)	5.3 (2.2, 12.6)	5.3 (2.2, 12.6)		

Figure HR3: Cumulative Percent Revision of 'Revision of Known Primary' Total Resurfacing Hip Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Acetabular Only	36	32	27	21	13	10	2	0	0
Femoral Only	246	203	155	110	79	48	22	3	0
Femoral /Acetabular	114	77	41	25	13	5	5	4	0

KNEE REPLACEMENT

GENERAL INTRODUCTION

The analysis of knee replacements for this report is based on data received by the Registry with a procedure date up and including 31st December 2008. There were 248,599 primary and revision knee procedures in this period. This is an additional 39,283 knee procedures compared to the 2008 Annual Report.

CATEGORIES OF KNEE REPLACEMENT

The Registry considers knee procedures to be either primary or revision procedures.

Primary procedures are categorised according to the extent of the knee replacement, either partial or total. Partial primary knee replacements are further sub-classified into five classes of partial knee replacement; partial resurfacing, unispacer (no longer used in Australia), patella/trochlear, unicompartmental and bicompartmental.

Revision procedures are re-operations that involve the addition, exchange or removal of one or more components used in a previous primary or revision knee replacement. Revision procedures are categorised as major or minor.

A major revision involves the removal and/or replacement of a major component. This is defined (with the exception of the patella) as a component that interfaces with bone i.e. either the femoral and/or tibial component.

A minor revision is a revision where a major component has not been removed or replaced. Examples of minor revisions include patella replacement and/or tibial insert exchange.

A complete breakdown of age, gender, primary diagnosis and revision diagnoses for each category of knee replacement is provided in a supplementary report entitled 'Demographics of Hip and Knee Arthroplasty' available on the Registry website www.dmac.adelaide.edu.au/aoanjrr/publications.jsp

GENDER

In general, knee replacement is more common in females (56.0%), however there are variations depending on the type of procedure. Primary partial resurfacing, patella/trochlear, bicompartmental and total knee replacement are more common in females (51.3% 75.6%, 52.2% and 57.3% respectively). Primary unispacer and unicompartmental knee replacement however are undertaken more often in males (51.3% and 51.2% respectively) (Table KG1).

Revision procedures are slightly more common in females (51.9%).

Since 2003, the first year of full national data collection, there has been little change in the proportion of males and females receiving primary unicompartmental and total knee replacement (Figure KG1).

AGE

The mean age for all knee replacement is 68.7 years (females 69.0 and males 68.3 years). Primary partial knee replacement is more frequently used in younger individuals compared to primary total knee replacement (partial resurfacing 48.8, unispacer 54.6, patella/trochlear 59.5, unicompartmental 65.5, bicompartmental 65.6 and total 69.2 years). The mean age for revision procedures is 69.4 years.

Although partial knee replacement is performed more frequently in younger individuals there is still a substantial percentage of individuals 65 years or older undergoing partial resurfacing (12.4%), unispacer (10.3%) and patella/trochlear (33.3%). Approximately half of all bicompartmental and unicompartmental knee replacement is undertaken in individuals 65 years or older (49.9% and 53.0% respectively). The majority of primary total and revision knee replacement is undertaken on individuals 65 years and older (69.4% and 69.2% respectively) (Table KG2).

Since 2003 there has been a small increase in the percentage of patients less than 65 years having a primary unicompartmental or primary total knee replacement. Unicompartmental increased from 45.2% in 2003 to 49.7% in 2008 and total knee increased from 29.4% to 33.9% (Figure KG2).

DIAGNOSIS

The indication for the majority of primary knee replacement is osteoarthritis (partial resurfacing 89.4%, unispacer 100%, patella/trochlear 98.7%, unicompartmental 98.8%, bicompartmental 98.9% and primary total 97.0%). The principal cause for revision knee replacement is loosening (43.5%).

USAGE OF KNEE REPLACEMENT

The most common knee replacement is a primary total knee (79.4% of all knee replacement). The proportion of other knee replacement is 11.6% for unicompartmental, 0.5% for patella/trochlear and 8.4% for revision. There are a small number of procedures recorded for partial resurfacing (113),

unispacer (39) and bicompartmental knee replacement (90) (Table KG1).

The proportion of all knee replacements that are primary total knee has increased each year from 78.7% in 2004 to 83.6% in 2008. The proportion of unicompartmental knee has decreased from a high of 12.4% in 2004 to 8.2% in 2008. The proportion of knee replacement that are revision procedures has decreased from 8.9% in 2004 to 8.2% in 2008 (Figure KG3).

State/Territory

There is some regional variation in the proportional use of different knee replacement. The use of unicompartmental knee replacement has continued to decline in all states and territories (Figure KG3).

Public/Private Sector

More knee replacements are undertaken in the private sector. The total number of knee replacement in all hospitals has increased by 37.6% since 2003, 8.5% in the last year. The private sector had the largest increase of knee replacement since 2003 (40.2%), with the public sector increasing by 32.5%. Knee replacement in public hospitals decreased by 2.6% in 2007 from the previous year, however in 2008 it increased by 7.2%. Knee replacement in the private sector has increased by 9.2% since 2007 (Figure KG4).

Bilateral Primary Knee Replacement

The Registry definition of a bilateral procedure is when an individual has undergone primary knee replacement on both knees regardless of the type of primary knee replacement or the timing of the second knee operation. Of all patients recorded by the Registry as having a primary knee replacement 22.8% have had replacement of both knees.

There are 42,230 individuals with bilateral knee procedures recorded, 24.6% were performed on the same day. The most common same day bilateral knee replacement is bilateral primary total knee replacement. This combination of knee replacement accounts for 79.3% of all same day bilateral procedures. Of the remaining same day bilateral procedures 17.1% are bilateral unicompartmental knee replacement (Table KG3).

Outcomes of Primary Knee Replacement

The main outcome measured by the Registry is the time to first revision of a primary joint replacement. The outcome is measured by the number of revisions per 100 observed component years and the cumulative percent revision (refer Appendix 2 'Glossary of Statistical Terms' for full definitions).

Primary total knee replacement has the lowest rate of revisions per 100 observed component years when comparing all primary knee replacement (primary total 0.8, unicompartmental 1.9, patella/trochlear 3.3 and unispacer 31.7). Partial resurfacing and bicompartmental primary knee replacement are being reported for the second year. Both have higher rates of revisions per 100 observed component years compared to all other primary procedures other than the unispacer (partial resurfacing 7.0 and bicompartmental 7.5) (Table KG4).

Comparison of the cumulative percent revision further highlights the difference in the risk of revision for each of these procedures. At eight years the cumulative percent revision of primary total knee replacement is 5.0%, unicompartmental 13.2% and patella/trochlear 24.3%. The unispacer does not have eight years follow up, however the five year cumulative percent revision is 66.7%. The cumulative percent revision for partial resurfacing is 16.8% at three years and bicompartmental is 7.0% at one year (Table KG5).

Outcome by Diagnosis

Outcomes stratified by primary diagnosis are presented for primary total knee replacement. This analysis has not been presented for other classes of primary knee replacement as there is insufficient data available to make a comparison as almost all of these procedures have been undertaken for osteoarthritis.

The outcomes of the four most common diagnoses for primary total knee replacement were compared using osteoarthritis as the comparator. These diagnoses include rheumatoid arthritis, other inflammatory arthritis, avascular necrosis as well as osteoarthritis. Rheumatoid arthritis had the lowest risk of revision with a significantly lower revision rate than osteoarthritis. There is no difference in the risk of revision for avascular necrosis and other inflammatory arthritis compared to osteoarthritis (Tables KG6 and KG7 and Figure KG5).

KNEE REPLACEMENT

1/9/1999 - 31/12/2008

Primary Partial Knee Replacement

Partial Resurfacing	▪ Partial articular surface replacement
Unispacer	▪ Medial or lateral compartment articular spacer
Patella/Trochlear	▪ Patella and trochlear articular surface replacement
Unicompartmental	▪ Medial or lateral unicompartmental knee replacement
Bicompartmental	▪ Medial and patello-femoral replacement

Primary Total Knee Replacement

▪ Femoro-tibial and patello-femoral replacement

Revision Knee Replacement

▪ Exchange or removal of one or more components

Table KG1: Number of Knee Replacements by Gender

Type of Knee Replacement	Female		Male		TOTAL	
	N	%	N	%	N	%
Partial Resurfacing	58	51.3	55	48.7	113	0.4
Unispacer	19	48.7	20	51.3	39	0.1
Patella/Trochlear	977	75.6	315	24.4	1292	4.3
Unicompartmental	14070	48.8	14752	51.2	28822	94.9
Bicompartmental	47	52.2	43	47.8	90	0.3
Primary Partial	**15171**	**50.0**	**15185**	**50.0**	**30356**	**100.0**
Total Knee	**113143**	**57.3**	**84158**	**42.7**	**197301**	**100.0**
Revision	**10879**	**51.9**	**10063**	**48.1**	**20942**	**100.0**
TOTAL	**139193**	**56.0**	**109406**	**44.0**	**248599**	**100.0**

Figure KG1: Percentage of Females by Type of Knee Replacement and Year

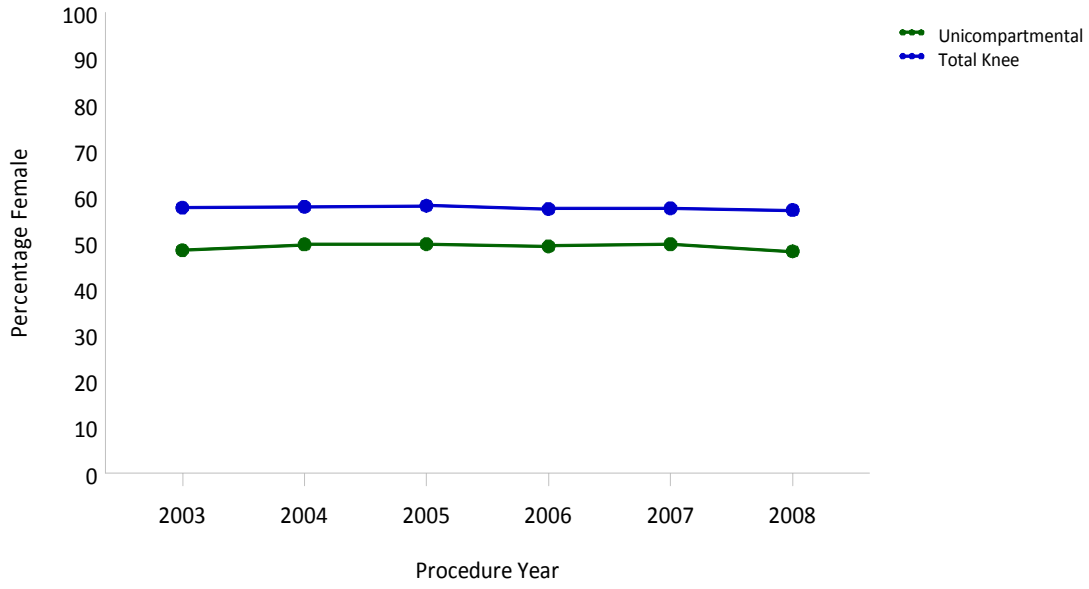


Table KG2: Number of Knee Replacements by Age

Type of Knee Replacement	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
Partial Resurfacing	86	76.1	13	11.5	12	10.6	2	1.8	0	0.0	113	0.4
Unispacer	18	46.2	17	43.6	3	7.7	1	2.6	0	0.0	39	0.1
Patella/Trochlear	485	37.5	376	29.1	244	18.9	167	12.9	20	1.5	1292	4.3
Unicompartmental	4036	14.0	9502	33.0	9181	31.9	5546	19.2	557	1.9	28822	94.9
Bicompartmental	15	16.7	30	33.3	21	23.3	22	24.4	2	2.2	90	0.3
Primary Partial	**4640**	**15.3**	**9938**	**32.7**	**9461**	**31.2**	**5738**	**18.9**	**579**	**1.9**	**30356**	**100.0**
Total Knee	**13301**	**6.7**	**47146**	**23.9**	**73957**	**37.5**	**56461**	**28.6**	**6436**	**3.3**	**197301**	**100.0**
Revision	**1876**	**9.0**	**4584**	**21.9**	**6909**	**33.0**	**6576**	**31.4**	**997**	**4.8**	**20942**	**100.0**
TOTAL	**19817**	**8.0**	**61668**	**24.8**	**90327**	**36.3**	**68775**	**27.7**	**8012**	**3.2**	**248599**	**100.0**

Figure KG2: Percentage of Patients Aged < 65 by Type of Knee Replacement and Year

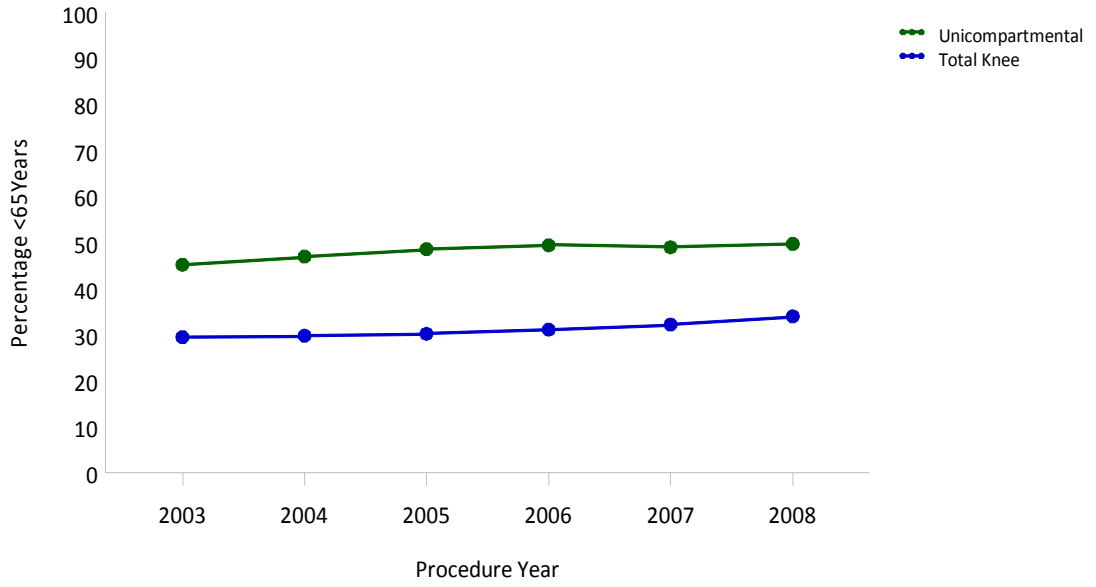


Figure KG3: Trends in Usage of Knee Replacement by State/Territory and Year

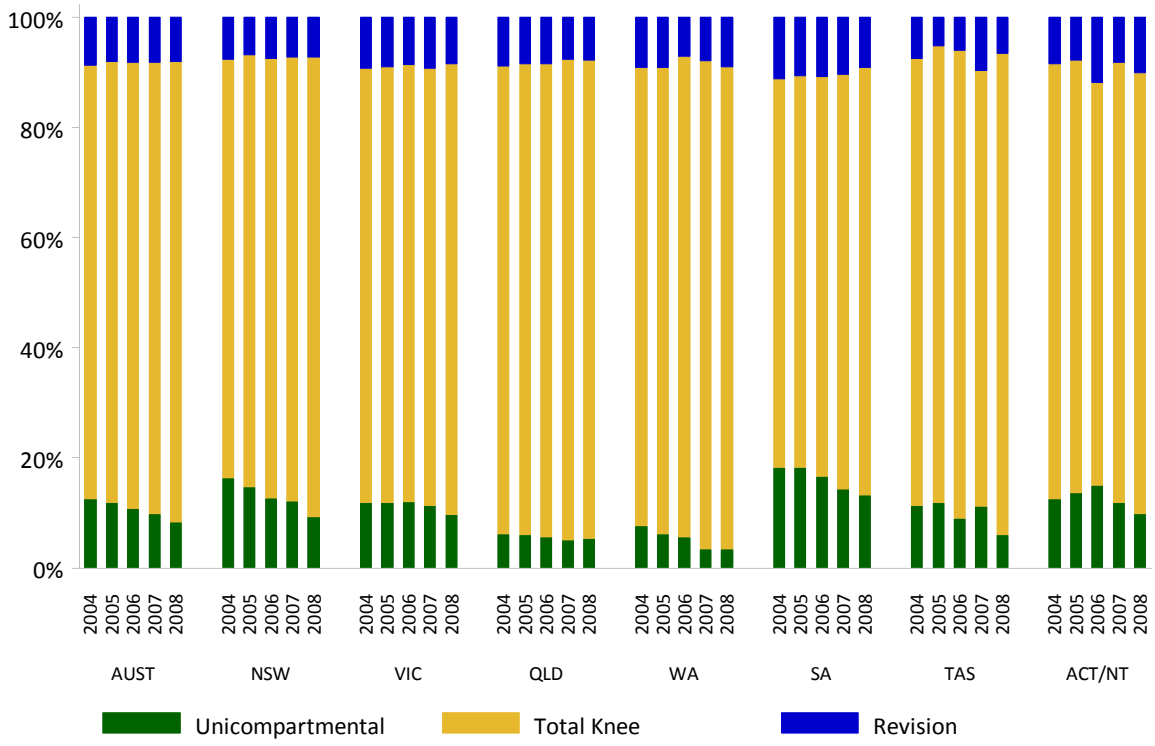


Figure KG4: Number of Knee Replacements by Public/Private Sector and Year

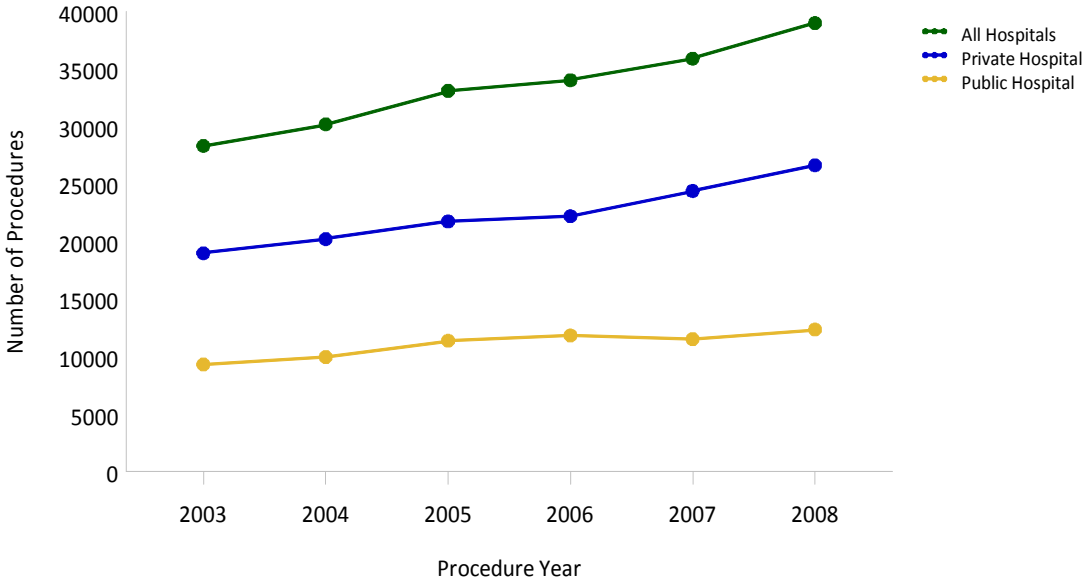


Table KG3: Time between Procedures for Bilateral Primary Knee Replacement

Bilateral Procedures	Same Day		1day-6months		≥6months		TOTAL	
	N	%	N	%	N	%	N	%
Both Total	8238	19.5	5376	12.7	21903	51.9	35517	84.1
Both Unicompartmental	1771	4.2	643	1.5	1815	4.3	4229	10.0
Unicompartmental/Total	208	0.5	135	0.3	1793	4.2	2136	5.1
Both Other Partial	153	0.4	39	0.1	52	0.1	244	0.6
Total/Other Partial	12	0.0	4	0.0	69	0.2	85	0.2
Unicompartmental/Other Partial	2	0.0	1	0.0	16	0.0	19	0.0
TOTAL	**10384**	**24.6**	**6198**	**14.7**	**25648**	**60.7**	**42230**	**100.0**

Note: 'Other Partial' includes unispacer, partial resurfacing, patella/trochlear and bicompartmental.

Table KG4: Revision Rates of Primary Knee Replacement

Type of Knee Replacement	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Partial Resurfacing	14	113	200	7.0	(3.83, 11.76)
Unispacer	27	39	85	31.7	(20.87, 46.07)
Patella/Trochlear	132	1292	3999	3.3	(2.76, 3.91)
Unicompartmental	2052	28822	107675	1.9	(1.82, 1.99)
Bicompartmental	6	90	80	7.5	(2.77, 16.41)
Total Knee	5406	197301	661601	0.8	(0.80, 0.84)
TOTAL	**7637**	**227657**	**773640**	**1.0**	**(0.97, 1.01)**

Table KG5: Yearly Cumulative Percent Revision of Primary Knee Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Partial Resurfacing	7.0 (3.4, 14.1)	16.8 (10.2, 27.1)			
Unispacer	43.6 (29.8, 60.4)	66.7 (52.0, 80.7)	66.7 (52.0, 80.7)		
Patella/Trochlear	2.7 (1.9, 3.8)	9.3 (7.5, 11.3)	15.3 (12.7, 18.3)	23.0 (18.4, 28.5)	24.3 (19.2, 30.4)
Unicompartmental	2.2 (2.1, 2.4)	6.2 (5.9, 6.5)	8.8 (8.4, 9.2)	11.9 (11.3, 12.5)	13.2 (12.4, 14.1)
Bicompartmental	7.0 (3.0, 16.3)				
Total Knee	1.0 (1.0, 1.1)	2.8 (2.8, 2.9)	3.8 (3.6, 3.9)	4.6 (4.4, 4.7)	5.0 (4.8, 5.2)

Table KG6: Revision Rates of Primary Total Knee Replacement by Primary Diagnosis

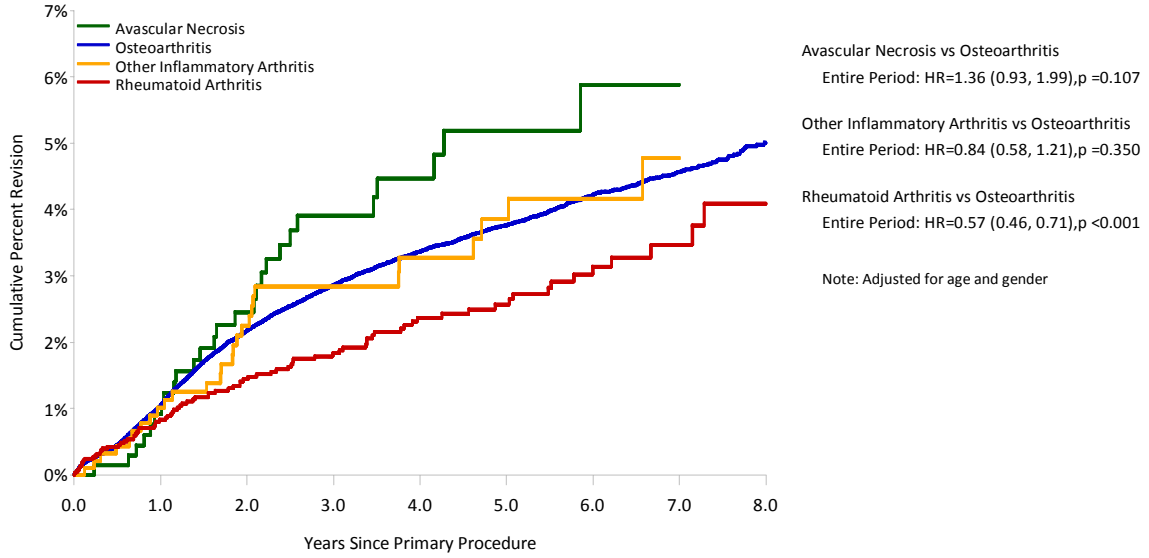
Primary Diagnosis	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Avascular Necrosis	27	733	2550	1.1	(0.70, 1.54)
Osteoarthritis	5238	191317	639822	0.8	(0.80, 0.84)
Other Inflammatory Arthritis	28	968	3566	0.8	(0.52, 1.13)
Rheumatoid Arthritis	84	3857	14546	0.6	(0.46, 0.71)
Tumour	23	256	634	3.6	(2.30, 5.44)
Other (2)	6	170	483	1.2	(0.46, 2.70)
TOTAL	**5406**	**197301**	**661601**	**0.8**	**(0.80, 0.84)**

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

Table KG7: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	0.9 (0.4, 2.0)	3.9 (2.6, 5.9)	5.2 (3.5, 7.7)	5.9 (3.9, 8.9)	
Osteoarthritis	1.1 (1.0, 1.1)	2.9 (2.8, 2.9)	3.8 (3.7, 3.9)	4.6 (4.4, 4.7)	5.0 (4.8, 5.2)
Other Inflammatory Arthritis	1.0 (0.5, 1.9)	2.8 (1.9, 4.3)	3.9 (2.6, 5.7)	4.8 (3.1, 7.3)	
Rheumatoid Arthritis	0.8 (0.6, 1.2)	1.8 (1.4, 2.4)	2.6 (2.0, 3.3)	3.5 (2.7, 4.5)	4.1 (3.0, 5.5)
Tumour	3.2 (1.5, 6.7)	10.6 (6.6, 16.7)			
Other (2)	0.7 (0.1, 4.6)	4.2 (1.8, 10.0)			

Figure KG5 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Avascular Necrosis	733	620	501	386	286	204	127	49	6
Osteoarthritis	191317	156415	125217	97284	71401	49154	29662	13367	3360
Other Inflammatory Arthritis	968	825	663	543	413	306	203	113	29
Rheumatoid Arthritis	3857	3291	2781	2259	1749	1264	790	375	104

PRIMARY PARTIAL KNEE REPLACEMENT

Primary partial knee replacement details the outcome of partial resurfacing, unispacer, patella/trochlear, unicompartmental and bicompartmental knee replacement. All involve surgery to a single compartment of the knee, with the exception of bicompartmental knee replacement, which involves surgery to two compartments, in contrast to total knee replacement which involves surgery to all three compartments.

PARTIAL RESURFACING KNEE REPLACEMENT

Partial resurfacing knee replacement involves the replacement of part of the articular surface on one side of the joint in one or more compartments. In the five years that these prostheses have been used, 113 have been implanted including 22 in 2008.

Slightly more partial resurfacing procedures have been performed on females (51.3%) (Table KG1). The majority of procedures (76.1%) have been performed on patients under the age of 55 years, with 12.4% performed on patients 65 years or older (Table KG2).

Partial resurfacing has a revision rate per 100 observed component years of 7.0 and a cumulative percent revision of 7.0% at one year and 16.8% at three years (Tables KP1 and KP2 and Figure KP1). The main reason for revision is progression of disease (42.9%), with 21.4% revised for loosening/lysis and 14.3% revised for pain. Most partial resurfacings have been revised to unicompartmental (46%) or total knee replacement (31%). There have been two revised to another partial resurfacing (15%) and one removal of prosthesis (8%) (data not shown).

UNISPACER KNEE REPLACEMENT

The Registry continues to follow the progress of unispacer procedures. No new procedures have been reported to the Registry since April 2005. Only two types of unispacer components have been used in Australia, the Zimmer UniSpacer (30) and the Advance Biosurfaces Inc. InterCushion (9) (Table KP3).

The high early revision rate has been reported for five years and there has been one further revision in 2008. All nine InterCushion prostheses and 18 Zimmer UniSpacer prostheses have been revised. The one year cumulative percent revision of the Zimmer UniSpacer is 40% (Table KP4 and Figure KP2).

PATELLA/TROCHLEAR KNEE REPLACEMENT

There are 1,292 patella/trochlear knee replacement, an increase of 231 in 2008. Patella/trochlear replacement accounts for 0.5% of all knee replacement, they are more common in females (75.6%), and patients under the age of 64 years (66.6%) (Tables KG1 and KG2).

Nine patella/trochlear prostheses were used in 2008, the same number as last year. The trochlear prostheses have been combined with 17 different patella prostheses, some from different companies. On 18 occasions, six trochlear prostheses were used either without a patellar prosthesis or following patellectomy. The Avon, LCS, RBK and Lubinus Patella Glide remain the most used prostheses in 2008 and account for 84% of all patella/trochlear procedures (Table KP5).

Primary patella/trochlear replacement has a higher revision rate compared to primary unicompartmental and total knee replacement. The eight year cumulative percent revision for patella/trochlear replacement is 24.3%, compared to 13.2% for unicompartmental and 5.0% for total knee replacement (Tables KG4 and KG5 and Figure KP3). The most common reasons for revision are progression of disease (29%), loosening/lysis (22%) and pain (14%). A total knee replacement is the most common type of revision for a primary patella/trochlear replacement (74%).

The risk of revision in patients less than 65 years of age is significantly higher compared to patents 65 years or older (Adj HR=1.63; 95%CI (1.08, 2.45) p=0.019) (data not shown). The five year cumulative percent revision for the under 55, 55-64 and 65-74 year age groups is 17.6%, 17.7% and 10.0% respectively. The three year cumulative percent revision for patients 75 years or older is 5.5% (Table KP9).

Males have a significantly higher risk of revision compared to females (Adj HR=1.62; 95%CI (1.12, 2.33) p=0.010) (data not shown). The cumulative percent revision for males is 22.8% compared to 13.0% for females at five years. The cumulative percent revision of females at seven years (22.7%) is still less than that of males at five years (Table KP11).

There are differences in outcomes for the four most used prostheses. At five years the Avon has the lowest cumulative percent revision of 9.9%, compared to 18.1% for Lubinus Patella Glide and 21.8% for LCS. The RBK has only been reported to the Registry for a short time and has a cumulative percent revision of 1.8% at one year (Tables KP6 and KP7).

UNICOMPARTMENTAL KNEE REPLACEMENT

The Registry has recorded 28,822 primary unicompartmental knee replacement, most have been undertaken for osteoarthritis (98.8%).

USAGE

The use of unicompartmental knee replacement continues to decline from 3,878 in 2005 to 3,173 in 2008, representing an 18% decrease in the last three years (Table KP13).

TYPE OF PROSTHESES USED

The Registry has recorded 24 different unicompartmental knee prostheses, 20 of which were used in 2008. The ten most used prostheses account for 89.3% of all unicompartmental prostheses in 2008. The Oxford 3 continues to be the most used and has decreased by 19% since 2004. The ZUK unicompartmental knee replacement has been the second most used prosthesis since 2007 (Table KP12 and Figure KP4).

AGE AND GENDER

Unicompartmental knee replacement is performed slightly more often in females. The gender proportion is relatively constant although in 2008 there was a small increase in the proportion of males (Table KP13).

In 2008 unicompartmental knee replacement was most frequently undertaken in the 55-64 and 65-74 age groups (35.2% and 30.2% respectively). Over 20% of procedures are performed in individuals 75 years or older. The proportion of patients under the age of 55 years receiving unicompartmental knee replacement has changed little over the last five years, 14.5% in 2008 (Table KP14).

FIXATION

Cement fixation of both femoral and tibial components has been used in 88.8% of all unicompartmental knee replacement. The use of cementless replacement however has increased from 7.5% in 2004 to 15.1% in 2008 and is used most frequently in Victoria (42%). Hybrid fixation was used in 3.8% of unicompartmental knee replacement in 2008 (Table KP15 and Figure KP5).

OUTCOMES OF UNICOMPARTMENTAL KNEE REPLACEMENT

The eight year cumulative percent revision of unicompartmental knee replacement is 13.2% (Table KG5).

AGE AND GENDER

There is a significant difference in the risk of revision depending on age, the risk of revision decreases with increasing age. The highest revision rate occurs in the under 55 age group with an eight year cumulative percent revision of 18.0%. In the older age groups, 55-64, 65-74 and 75 or older, the cumulative percent revision at eight years is 15.9%, 11.6%, and 8.3% respectively (Tables KP16 and KP17 and Figure KP6).

Females have a slightly higher risk of revision compared to males (Adj HR=1.11; 95%CI (1.02, 1.21) p=0.016). The eight year cumulative percent revision is 13.6% for females and 12.8% for males (Tables KP18 and KP19 and Figure KP7).

The decreasing risk of revision with increasing age is evident for both males and females (Tables KP20 and KP21 and Figures KP8 and KP9).

PROSTHESIS SPECIFIC OUTCOMES

The revisions per 100 observed component years and cumulative percent revision for all unicompartmental knee prostheses with more than 50 procedures are presented in Tables KP22 and KP23. There are 13 prostheses with over 1,000 observed component years recorded. There is considerable variation in the length of follow up for these prostheses.

PATELLA/TROCHLEAR KNEE PROSTHESES WITH A HIGHER THAN ANTICIPATED REVISION RATE

The LCS was identified by the Registry last year as having a higher than anticipated rate of revision compared to all other patella/trochlear prostheses. This remains the situation with 4.8 revisions per 100 observed component years and a five year cumulative percent revision of 21.8% (Adj HR=1.83; 95%CI (1.29, 2.61) p<0.001) (Tables KP24-KP26 and Figure KP10).

On most occasions the LCS patella/trochlear prosthesis has been used with either a LCS metal backed or a LCS all polyethylene patellar component. The metal backed LCS patellar component is associated with a higher rate of revision compared to the LCS all polyethylene component (three year cumulative percent revision of 16.6% and 7.8% respectively) (data not shown).

UNICOMPARTMENTAL KNEE PROSTHESES WITH A HIGHER THAN ANTICIPATED REVISION RATE

This year the Registry is identifying four unicompartmental prostheses as having a higher than anticipated rate of revision. All have been previously identified. Three of the prostheses continued to be used in 2008, the fourth, the Preservation-Mobile did not have any recorded use in 2008 (Tables KP27-KP29 and Figures KP11-KP13).

In the 2008 Annual Report the Registry identified the BalanSys unicompartmental knee as having a higher than anticipated rate of revision. This prosthesis has both fixed and mobile bearing tibial components. The higher than anticipated revision rate reported last year was due to the higher incidence of revision for the mobile bearing tibial component. This year the Balansys/Balansys Uni Mobile has 5.1 revisions per 100 observed component years and a cumulative percent revision at three years of 14.6% (Adj HR=2.35; 95%CI (1.59, 3.46) p<0.001).

Other than the Preservation-Mobile and BalanSys Uni Mobile the remaining unicompartmental knee prostheses identified as having a higher than anticipated rate of revision are Advance and AMC.

BICOMPARTMENTAL KNEE REPLACEMENT

The Registry defines a bicompartmental knee replacement as a procedure that involves the use of a single femoral component to replace the medial and trochlear surfaces of the femoral condyle but not the lateral condyle. The tibial component of a bicompartmental knee replacement is a medial tibial replacement.

There have been 90 bicompartmental knee replacements in 47 females and 43 males over three years to 31st December 2008. The age of females ranges from 46 to 83 years, and 49 to 86 years for males. All but one procedure was undertaken for osteoarthritis.

A single femoral component, the Journey Deuce, has been combined with two tibial components, the Journey (16%) and the Journey Deuce (83%). The tibial components differ in that the Journey is a moulded medial tibial prosthesis and the Journey Deuce is a medial tibial tray with a separate insert.

The follow up period remains short with 80 observed component years. There have been six revisions, all in males, involving insertion of a patellar component only. The revisions per 100 observed component years is 7.5 with a one year cumulative percent revision of 7% (Tables KG4 and KG5).

PRIMARY PARTIAL KNEE REPLACEMENT

1/9/1999 – 31/12/2008

Primary Partial Resurfacing Knee Replacement

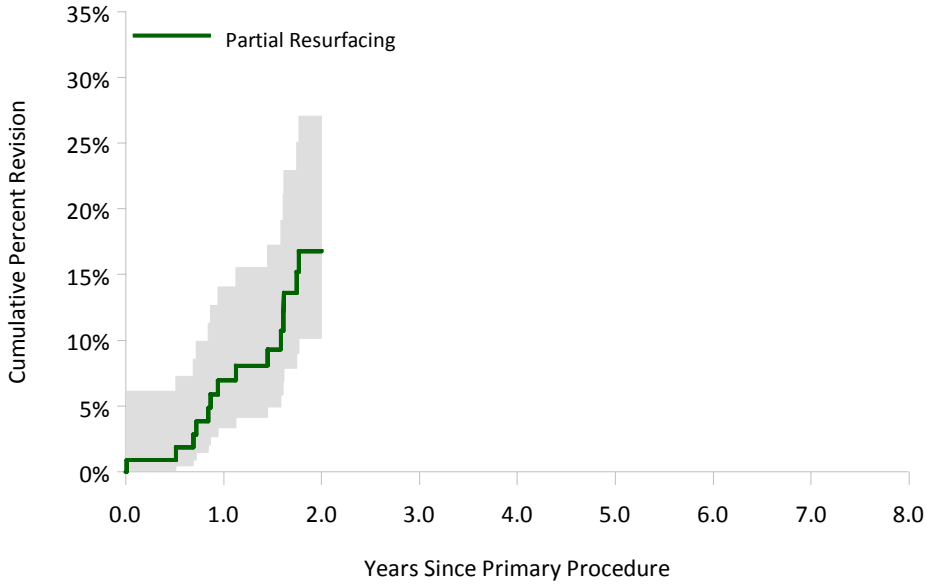
Table KP1: Revision Rates of Primary Partial Resurfacing Knee Replacement

Partial Resurfacing	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Partial Resurfacing	14	113	200	7.0	(3.83, 11.76)
TOTAL	**14**	**113**	**200**	**7.0**	**(3.83, 11.76)**

Table KP2: Yearly Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Partial Resurfacing	7.0 (3.4, 14.1)	16.8 (10.2, 27.1)			

Figure KP1: Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Partial Resurfacing	113	86	48	12	1	0	0	0	0

Primary Unispacer Knee Replacement

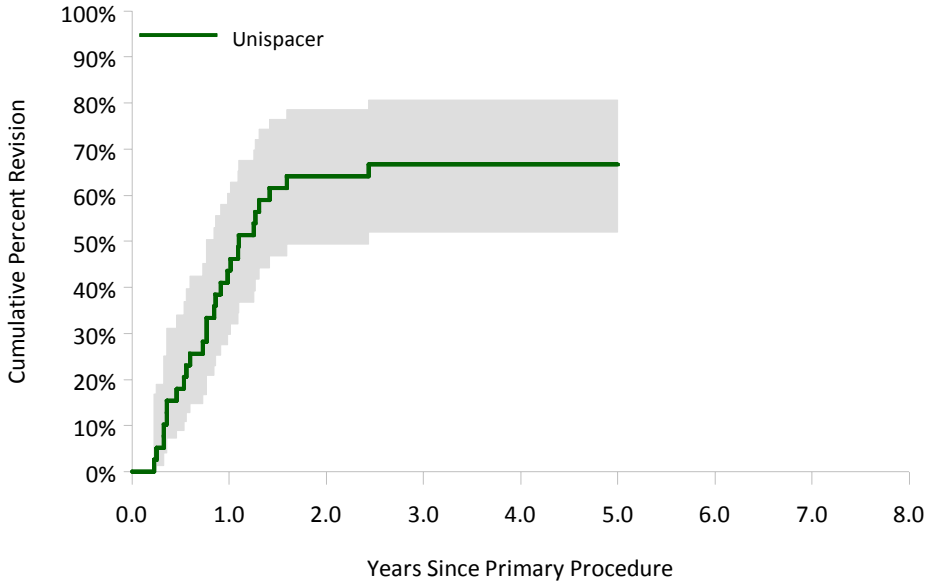
Table KP3: Revision Rates of Primary Unispacer Knee Replacement

Unispacer	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
InterCushion	9	9	8	110.8	(50.64, 210.3)
UniSpacer	18	30	77	23.3	(13.83, 36.88)
TOTAL	**27**	**39**	**85**	**31.7**	**(20.87, 46.07)**

Table KP4: Yearly Cumulative Percent Revision of Primary Unispacer Knee Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
InterCushion	55.6 (28.1, 86.4)				
UniSpacer	40.0 (25.0, 59.5)	56.7 (40.1, 74.4)	56.7 (40.1, 74.4)		
Primary Unispacer	**43.6 (29.8, 60.4)**	**66.7 (52.0, 80.7)**	**66.7 (52.0, 80.7)**		

Figure KP2: Cumulative Percent Revision of Primary Unispacer Knee Replacement



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Unispacer	39	22	14	13	12	5	0	0	0

Table KP5: Prosthesis Usage of Primary Patella/Trochlear Knee Replacement

Resurfacing Trochlear	Patella	N	%
Avon	Kinemax Plus	267	20.7
	Avon	143	11.1
	-	4	0.3
	Nexgen	3	0.2
	Duracon	2	0.2
LCS	LCS	369	28.6
	PFC Sigma	26	2.0
	-	9	0.7
	Scorpio	1	0.1
	MBK (Zimmer)	1	0.1
RBK	RBK	140	10.8
	-	2	0.2
	Natural Knee II	1	0.1
Lubinus Patella Glide	Duracon	77	6.0
	Lubinus Patella Glide	37	2.9
	Genesis II	1	0.1
Competitor	Genesis II	88	6.8
	-	1	0.1
MOD III	MOD III	64	5.0
	LCS	4	0.3
	Genesis II	1	0.1
	-	1	0.1
Themis	Themis	38	2.9
	-	1	0.1
	Nexgen	1	0.1
Vanguard	Series A	6	0.5
	AGC	3	0.2
Global Custom Made	Global Custom Made	1	0.1
TOTAL		**1292**	**100.0**

Note: Some of these patients have had a previous patellectomy.

Table KP6: Revision Rates of Primary Patella/Trochlear Knee Replacement

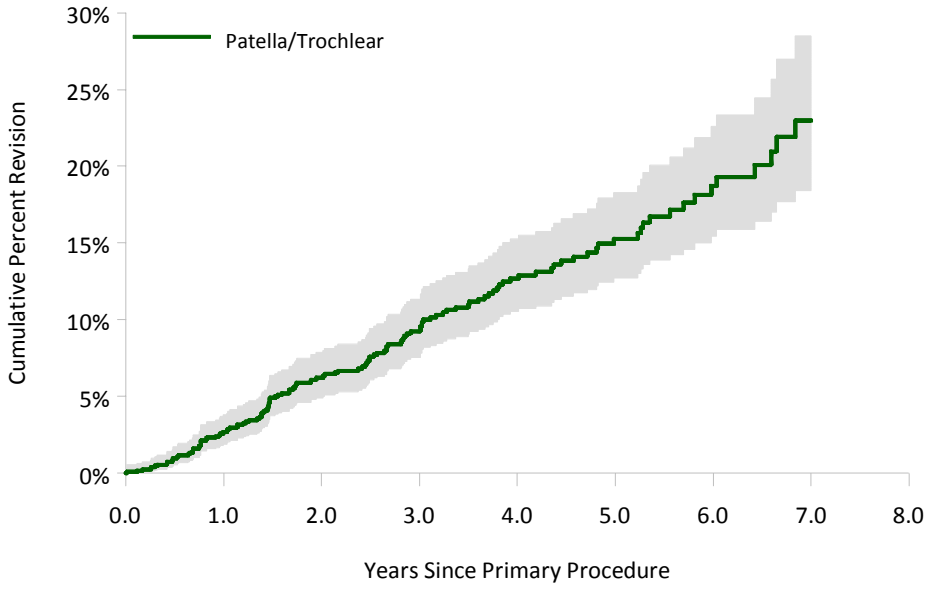
Resurfacing Trochlear	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Avon	35	419	1451	2.4	(1.68, 3.35)
Competitor	0	89	76	0.0	(0.00, 4.87)
Global Custom Made	0	1	6	0.0	(0.00, 61.10)
LCS	54	406	1131	4.8	(3.59, 6.23)
Lubinus Patella Glide	20	115	505	4.0	(2.42, 6.12)
MOD III	13	70	377	3.4	(1.84, 5.90)
RBK	6	143	282	2.1	(0.78, 4.64)
Themis	4	40	164	2.4	(0.66, 6.25)
Vanguard	0	9	8	0.0	(0.00, 48.73)
TOTAL	**132**	**1292**	**3999**	**3.3**	**(2.76, 3.91)**

Table KP7: Yearly Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Avon	1.6 (0.7, 3.6)	5.3 (3.3, 8.5)	9.9 (6.7, 14.4)		
LCS	3.7 (2.2, 6.2)	13.4 (9.9, 18.0)	21.8 (16.6, 28.4)		
Lubinus Patella Glide	3.5 (1.3, 9.0)	12.4 (7.5, 20.0)	18.1 (11.5, 27.7)		
RBK	1.8 (0.4, 6.9)				
Other (5)	2.9 (1.2, 6.9)	9.1 (5.2, 15.7)	14.0 (8.5, 22.3)		

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

Figure KP3: Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Patella/Trochlear	1292	1032	810	608	433	270	141	64	22

Table KP8: Revision Rates of Patella/Trochlear Knee Replacement by Age

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	60	485	1576	3.8	(2.90, 4.90)
55-64	42	376	1137	3.7	(2.66, 4.99)
65-74	18	244	760	2.4	(1.40, 3.75)
≥75	12	187	526	2.3	(1.18, 3.99)
TOTAL	**132**	**1292**	**3999**	**3.3**	**(2.76, 3.91)**

Table KP9: Yearly Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Age

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	3.0 (1.7, 5.1)	11.2 (8.3, 15.0)	17.6 (13.6, 22.7)		
55-64	2.7 (1.4, 5.1)	9.4 (6.5, 13.6)	17.7 (12.6, 24.5)		
65-74	2.3 (0.9, 5.4)	7.9 (4.7, 13.2)	10.0 (6.0, 16.3)		
≥75	2.5 (0.9, 6.4)	5.5 (2.8, 10.7)			

Table KP10: Revision Rates of Patella/Trochlear Knee Replacement by Gender

Gender	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	42	315	911	4.6	(3.32, 6.23)
Female	90	977	3088	2.9	(2.34, 3.58)
TOTAL	**132**	**1292**	**3999**	**3.3**	**(2.76, 3.91)**

Table KP11: Yearly Cumulative Percent Revision of Patella/Trochlear Knee Replacement by Gender

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	4.2 (2.3, 7.4)	13.3 (9.4, 18.6)	22.8 (16.8, 30.5)		
Female	2.2 (1.4, 3.4)	8.0 (6.2, 10.3)	13.0 (10.3, 16.3)	22.7 (17.2, 29.8)	

Table KP12: 10 Most Common Unicompartmental Knee Prostheses used in Primary Knee Replacement

Rank	2004	2005	2006	2007	2008
1	Oxford 3	Oxford 3	Oxford 3	Oxford 3	Oxford 3
	1149	1114	1065	969	929
2	Repicci	Pres -Fixed	Unix	ZUK	ZUK
	395	340	351	448	495
3	M/G	Genesis	Genesis	Unix	Unix
	367	305	290	362	358
4	Pres-Fixed	M/G	ZUK	Freedom/Active	GRU
	367	301	287	262	204
5	Genesis	GRU	Freedom/Active	Genesis	Genesis
	301	298	281	224	203
6	GRU	Unix	Pres -Fixed	GRU	Pres -Fixed
	290	270	256	214	179
7	Unix	Repicci	GRU	Pres -Fixed	Freedom/Active
	238	259	222	199	155
8	Allegretto Uni	Freedom/Active	M/G	Repicci	Repicci
	192	223	179	172	118
9	Endo-Model Sled	Endo-Model Sled	Repicci	Allegretto Uni	Allegretto Uni
	178	209	171	124	101
10	AMC	Allegretto Uni	Endo-Model Sled	Endo-Model Sled	AMC
	66	167	144	114	93
Top 10 Usage	95.1%	89.9%	89.5%	88.7%	89.3%
Total Procedures	3726	3878	3628	3482	3173
N Prosthesis Types	16	18	18	21	20

Note: Freedom PRK/Active has been reported in the above tables as Freedom/Active.
Preservation-Fixed has been reported in the above tables as Pres-Fixed.

Figure KP4: 5 Most Common Unicompartmental Knee Prostheses used in Primary Knee Replacement

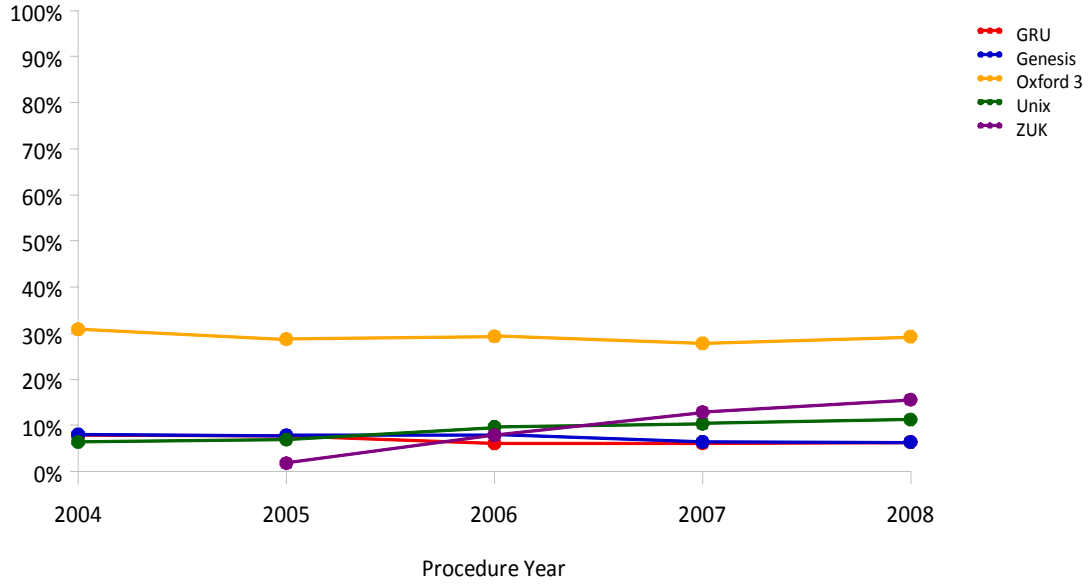


Table KP13: Primary Unicompartmental Knee Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	1849	49.6	1877	50.4	3726	100.0
2005	1928	49.7	1950	50.3	3878	100.0
2006	1787	49.3	1841	50.7	3628	100.0
2007	1730	49.7	1752	50.3	3482	100.0
2008	1528	48.2	1645	51.8	3173	100.0

Table KP14: Primary Unicompartmental Knee Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	513	13.8	1236	33.2	1138	30.5	769	20.6	70	1.9	3726	100.0
2005	555	14.3	1328	34.2	1200	30.9	720	18.6	75	1.9	3878	100.0
2006	552	15.2	1241	34.2	1133	31.2	622	17.1	80	2.2	3628	100.0
2007	498	14.3	1207	34.7	1057	30.4	644	18.5	76	2.2	3482	100.0
2008	461	14.5	1116	35.2	958	30.2	565	17.8	73	2.3	3173	100.0

Table KP15: Prosthesis Fixation of Primary Unicompartmental Knee Replacement

Fixation	N	%
Tibial and femoral cemented	25582	88.8
Tibial and femoral cementless	2924	10.1
Tibial only cemented	178	0.6
Femoral only cemented	138	0.5
TOTAL	**28822**	**100.0**

Figure KP5: Trends in Usage of Unicompartmental Knee Replacement by State/Territory and Year

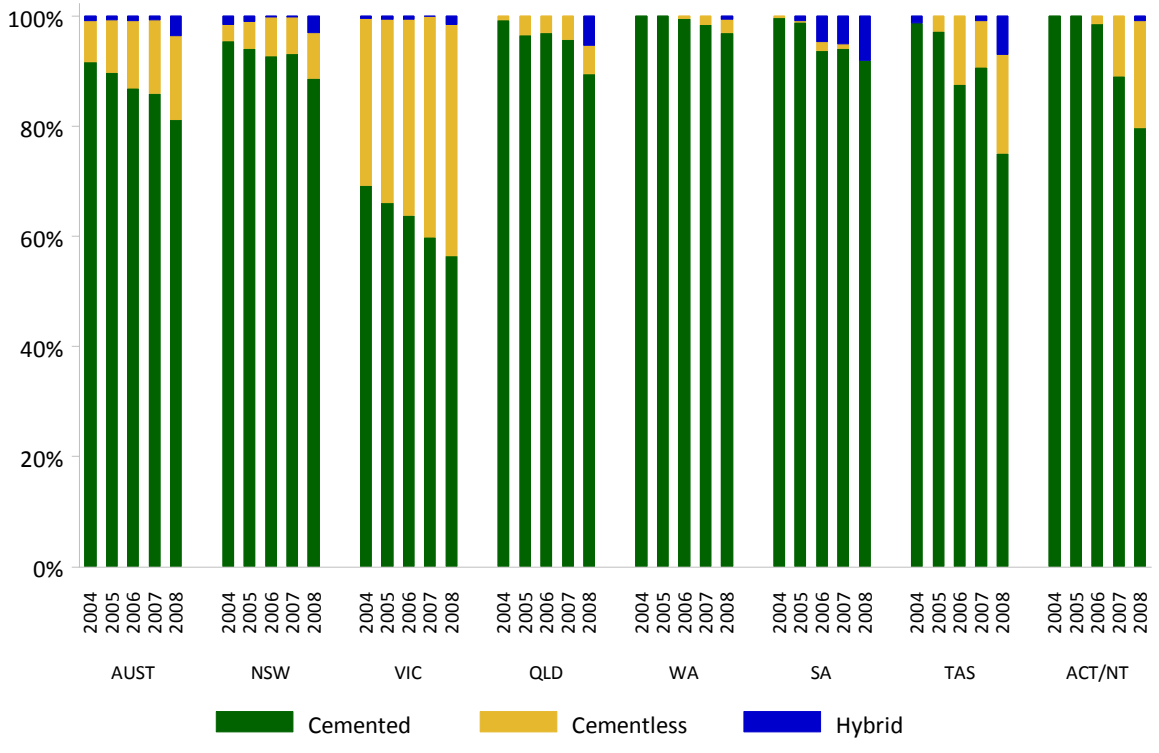


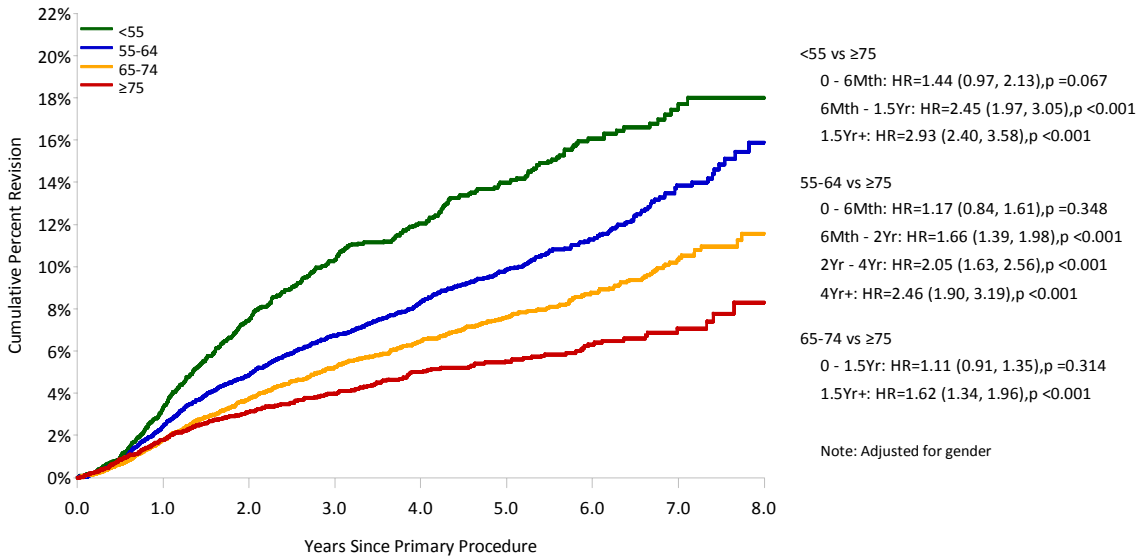
Table KP16: Revision Rates of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	444	3988	14353	3.1	(2.81, 3.40)
55-64	743	9428	34434	2.2	(2.01, 2.32)
65-74	568	9075	35135	1.6	(1.49, 1.76)
≥75	270	5999	22389	1.2	(1.07, 1.36)
TOTAL	**2025**	**28490**	**106311**	**1.9**	**(1.82, 1.99)**

Table KP17: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	3.3 (2.8, 4.0)	10.3 (9.3, 11.4)	14.0 (12.7, 15.3)	17.7 (15.9, 19.7)	18.0 (16.1, 20.0)
55-64	2.4 (2.1, 2.8)	6.7 (6.2, 7.3)	9.9 (9.1, 10.6)	13.8 (12.7, 15.1)	15.9 (14.1, 17.9)
65-74	1.8 (1.5, 2.1)	5.2 (4.7, 5.8)	7.6 (7.0, 8.3)	10.3 (9.4, 11.4)	11.6 (10.2, 13.1)
≥75	1.8 (1.5, 2.2)	4.0 (3.5, 4.6)	5.5 (4.9, 6.3)	7.1 (6.1, 8.2)	8.3 (6.7, 10.2)

Figure KP6: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<55	3988	3414	2793	2203	1679	1211	743	322	69
55-64	9428	8092	6722	5433	4097	2905	1708	704	134
65-74	9075	7947	6733	5508	4313	3210	1953	833	167
≥75	5999	5216	4368	3577	2712	1906	1117	435	89

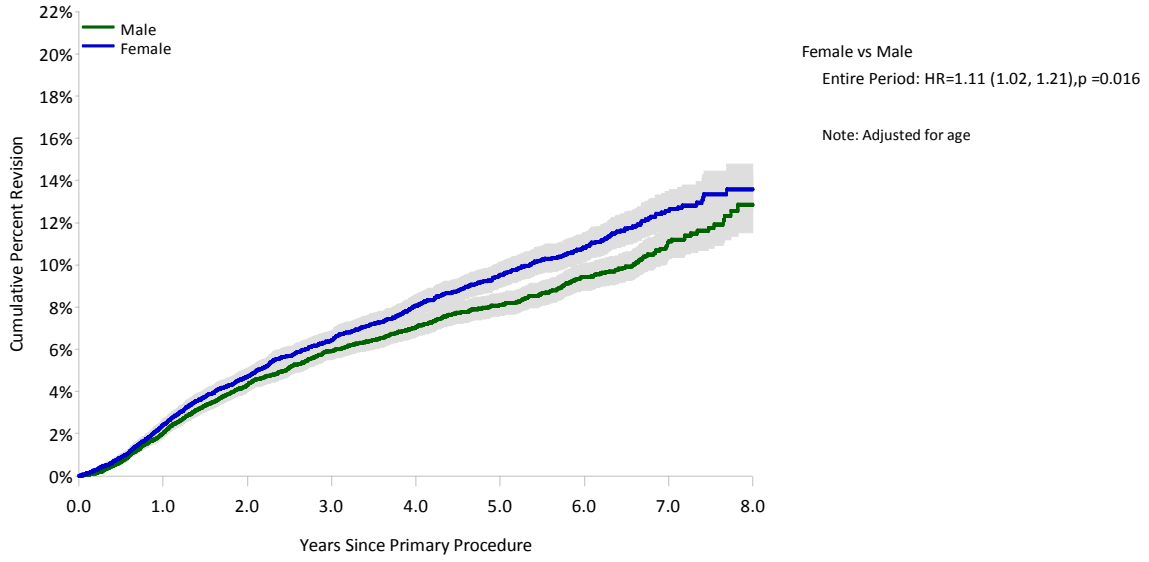
Table KP18: Revision Rates of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)

Gender	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	968	14617	54468	1.8	(1.67, 1.89)
Female	1057	13873	51843	2.0	(1.92, 2.17)
TOTAL	**2025**	**28490**	**106311**	**1.9**	**(1.82, 1.99)**

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

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	2.0 (1.8, 2.3)	5.9 (5.5, 6.4)	8.1 (7.6, 8.7)	11.1 (10.3, 12.0)	12.8 (11.5, 14.3)
Female	2.4 (2.2, 2.7)	6.4 (6.0, 6.9)	9.5 (8.9, 10.1)	12.6 (11.7, 13.5)	13.6 (12.5, 14.8)

Figure KP7: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	14617	12642	10549	8530	6560	4762	2861	1192	233
Female	13873	12027	10067	8191	6241	4470	2660	1102	226

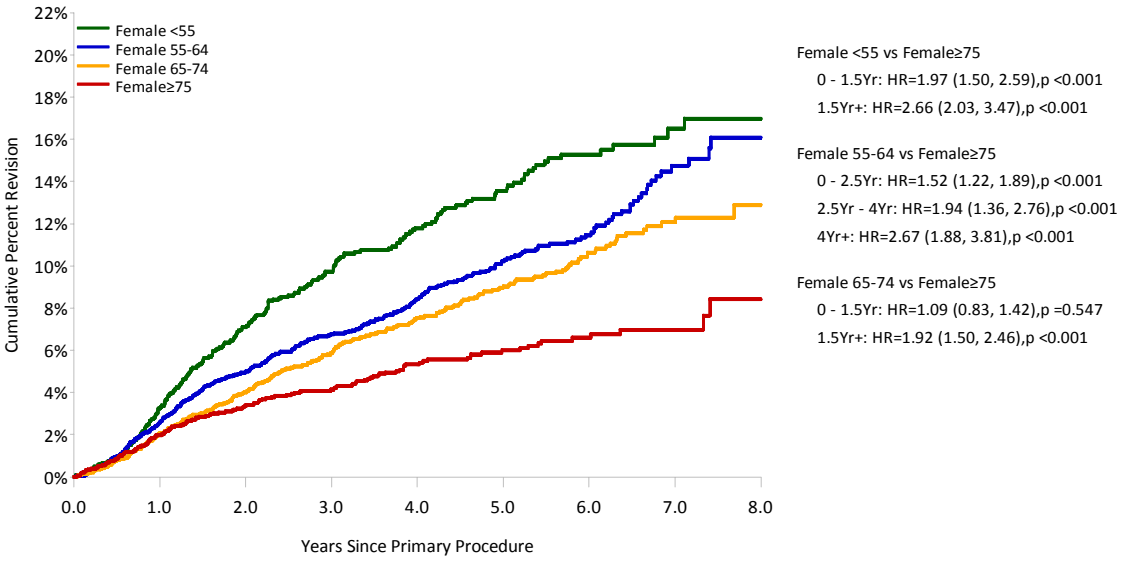
Table KP20: Revision Rates of Primary Unicompartmental Knee Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<55	200	1706	6102	3.3	(2.84, 3.76)
	55-64	376	4883	17999	2.1	(1.88, 2.31)
	65-74	263	4936	19016	1.4	(1.22, 1.56)
	≥75	129	3092	11352	1.1	(0.95, 1.35)
Female	<55	244	2282	8251	3.0	(2.60, 3.35)
	55-64	367	4545	16435	2.2	(2.01, 2.47)
	65-74	305	4139	16119	1.9	(1.69, 2.12)
	≥75	141	2907	11038	1.3	(1.08, 1.51)
TOTAL		**2025**	**28490**	**106311**	**1.9**	**(1.82, 1.99)**

Table KP21: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Gender and Age (Primary Diagnosis OA)

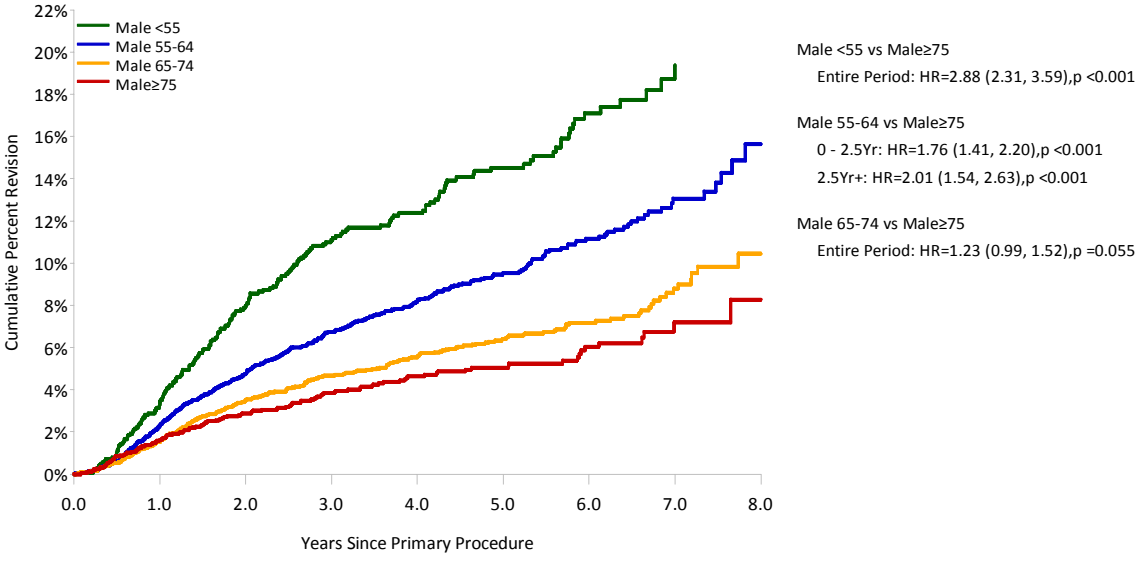
Gender	Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	<55	3.5 (2.7, 4.5)	11.1 (9.5, 12.9)	14.5 (12.6, 16.7)	19.4 (16.4, 22.7)	
	55-64	2.3 (1.9, 2.8)	6.7 (6.0, 7.6)	9.5 (8.6, 10.6)	13.1 (11.6, 14.7)	15.6 (13.1, 18.7)
	65-74	1.6 (1.2, 2.0)	4.7 (4.1, 5.4)	6.4 (5.6, 7.3)	8.8 (7.5, 10.2)	10.4 (8.6, 12.7)
	≥75	1.6 (1.2, 2.2)	3.8 (3.2, 4.7)	5.0 (4.2, 6.1)	7.2 (5.7, 9.0)	8.3 (6.0, 11.4)
Female	<55	3.2 (2.6, 4.1)	9.7 (8.5, 11.2)	13.6 (11.9, 15.4)	16.5 (14.4, 18.9)	17.0 (14.7, 19.6)
	55-64	2.6 (2.2, 3.1)	6.8 (6.0, 7.6)	10.2 (9.2, 11.4)	14.8 (13.0, 16.8)	16.1 (13.8, 18.7)
	65-74	2.1 (1.7, 2.6)	5.9 (5.1, 6.7)	9.0 (8.0, 10.2)	12.1 (10.6, 13.7)	12.9 (11.1, 15.0)
	≥75	2.0 (1.5, 2.6)	4.1 (3.4, 5.0)	6.0 (5.0, 7.1)	7.0 (5.8, 8.4)	8.4 (6.4, 11.1)

Figure KP8: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Females by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Female	<55	2282	1958	1602	1279	959	688	425	197	44
	55-64	4545	3892	3235	2612	1947	1346	780	296	50
	65-74	4139	3642	3094	2522	1970	1474	902	387	83
	≥75	2907	2535	2136	1778	1365	962	553	222	49

Figure KP9: Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Males by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	<55	1706	1456	1191	924	720	523	318	125	25
	55-64	4883	4200	3487	2821	2150	1559	928	408	84
	65-74	4936	4305	3639	2986	2343	1736	1051	446	84
	≥75	3092	2681	2232	1799	1347	944	564	213	40

Table KP22: Revision Rates of Primary Unicompartmental Knee Replacement

Uni Femoral	Uni Tibial	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
AMC	AMC	53	552	1440	3.7	(2.76, 4.81)
Allegretto Uni	Allegretto Uni	145	1778	8174	1.8	(1.50, 2.09)
BalanSys Uni	BalanSys Uni Fixed	7	179	402	1.7	(0.70, 3.59)
BalanSys Uni	BalanSys Uni Mobile	26	193	505	5.1	(3.36, 7.54)
Eius	Eius	15	132	456	3.3	(1.84, 5.42)
Endo-Model Sled	Endo-Model Sled	47	867	2728	1.7	(1.27, 2.29)
Freedom PKR/Active	Freedom PKR/Active	32	940	1956	1.6	(1.12, 2.31)
GCK	GCK	0	61	42	0.0	(0.00, 8.86)
GRU	GRU	82	1592	5070	1.6	(1.29, 2.01)
Genesis	Genesis	145	1718	5969	2.4	(2.05, 2.86)
Genesis	Journey Deuce	0	55	27	0.0	(0.00, 13.45)
HLS Uni Evolution	HLS Uni Evolution	8	114	194	4.1	(1.78, 8.12)
M/G	M/G	120	1993	8953	1.3	(1.11, 1.60)
Natural Knee II	Natural Knee II	20	143	777	2.6	(1.57, 3.97)
Oxford 3	Oxford 3	738	9549	38697	1.9	(1.77, 2.05)
PFC Sigma	PFC Sigma	20	137	953	2.1	(1.28, 3.24)
Preservation	Preservation-Fixed	169	2087	7774	2.2	(1.86, 2.53)
Preservation	Preservation-Mobile	82	401	1847	4.4	(3.53, 5.51)
Repicci	Repicci	168	2483	11415	1.5	(1.26, 1.71)
UC-Plus	UC-Plus	5	61	297	1.7	(0.55, 3.93)
Unix	Unix	131	2287	7724	1.7	(1.42, 2.01)
ZUK	ZUK	18	1301	1825	1.0	(0.58, 1.56)
Other (14)		21	199	449	4.7	(2.89, 7.15)
TOTAL		**2052**	**28822**	**107675**	**1.9**	**(1.82, 1.99)**

Note: Only prostheses with over 50 procedures have been listed.

Table KP23: Yearly Cumulative Percent Revision of Primary Unicompartmental Knee Replacement

Uni Femoral	Uni Tibial	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
AMC	AMC	3.9 (2.5, 6.0)	11.9 (9.0, 15.6)	15.1 (11.2, 20.1)		
Allegretto Uni	Allegretto Uni	2.9 (2.2, 3.8)	5.5 (4.5, 6.7)	8.1 (6.8, 9.6)	11.4 (9.5, 13.6)	13.3 (10.8, 16.3)
BalanSys Uni	BalanSys Uni Fixed	3.2 (1.3, 7.5)	5.0 (2.3, 10.3)			
BalanSys Uni	BalanSys Uni Mobile	7.4 (4.5, 12.2)	14.6 (10.0, 21.0)			
Eius	Eius	4.0 (1.7, 9.3)	10.0 (5.8, 17.0)	14.4 (8.7, 23.2)		
Endo-Model Sled	Endo-Model Sled	1.3 (0.7, 2.4)	4.5 (3.2, 6.3)	8.6 (6.3, 11.6)		
Freedom PKR/Active	Freedom PKR/Active	1.3 (0.7, 2.3)	4.9 (3.3, 7.0)			
GCK	GCK	0.0 (0.0, 0.0)				
GRU	GRU	1.4 (0.9, 2.1)	5.2 (4.1, 6.7)	7.2 (5.7, 9.0)		
Genesis	Genesis	2.7 (2.0, 3.6)	7.8 (6.6, 9.3)	10.5 (8.8, 12.4)	14.6 (11.6, 18.3)	14.6 (11.6, 18.3)
Genesis	Journey Deuce					
HLS Uni Evolution	HLS Uni Evolution	6.2 (2.8, 13.3)	9.6 (4.1, 21.4)			
M/G	M/G	1.5 (1.0, 2.1)	4.3 (3.5, 5.3)	6.7 (5.5, 8.0)	8.0 (6.6, 9.7)	9.6 (7.5, 12.3)
Natural Knee II	Natural Knee II	5.6 (2.8, 10.9)	12.0 (7.6, 18.5)	12.0 (7.6, 18.5)	16.1 (10.3, 24.6)	
Oxford 3	Oxford 3	2.3 (2.0, 2.6)	6.3 (5.8, 6.8)	9.0 (8.4, 9.7)	11.9 (11.0, 12.9)	12.9 (11.7, 14.3)
PFC Sigma	PFC Sigma	2.2 (0.7, 6.6)	6.6 (3.5, 12.2)	8.1 (4.6, 14.1)	14.3 (9.4, 21.5)	15.6 (10.3, 23.3)
Preservation	Preservation-Fixed	2.6 (2.0, 3.4)	7.4 (6.3, 8.8)	9.5 (8.1, 11.0)	12.4 (9.9, 15.4)	
Preservation	Preservation-Mobile	5.2 (3.5, 7.9)	15.9 (12.6, 19.9)	19.8 (16.1, 24.3)	24.2 (19.5, 29.7)	
Repicci	Repicci	1.3 (0.9, 1.9)	4.1 (3.4, 5.1)	7.3 (6.2, 8.5)	10.2 (8.6, 12.1)	10.8 (8.9, 13.0)
UC-Plus	UC-Plus	0.0 (0.0, 0.0)	2.1 (0.3, 14.2)	7.0 (2.3, 20.3)		
Unix	Unix	2.1 (1.6, 2.8)	5.8 (4.8, 7.0)	7.2 (6.0, 8.7)	10.4 (8.3, 12.9)	14.7 (10.2, 20.9)
ZUK	ZUK	1.0 (0.6, 1.9)	2.6 (1.5, 4.3)			
Other (14)		7.6 (4.1, 13.6)	15.7 (9.9, 24.4)	20.2 (12.7, 31.3)	26.9 (16.8, 41.5)	26.9 (16.8, 41.5)

Note: Only prostheses with over 50 procedures have been listed.

Primary Patella/Trochlear Knee Prostheses with a higher than anticipated Revision Rate

Table KP24: Revision Rate of Individual Primary Patella/Trochlear Knee Prostheses identified as having a higher than anticipated Revision Rate

Resurfacing Trochlear Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and still used				
LCS	406	1131	4.8	Entire Period: HR=1.83 (1.29, 2.61), p<0.001

Note: All Components have been compared to all other Patella/Trochlear Knee components.

Table KP25: Yearly Cumulative Percent Revision of Individual Primary Patella/Trochlear Knee Prostheses identified as having a higher than anticipated Revision Rate

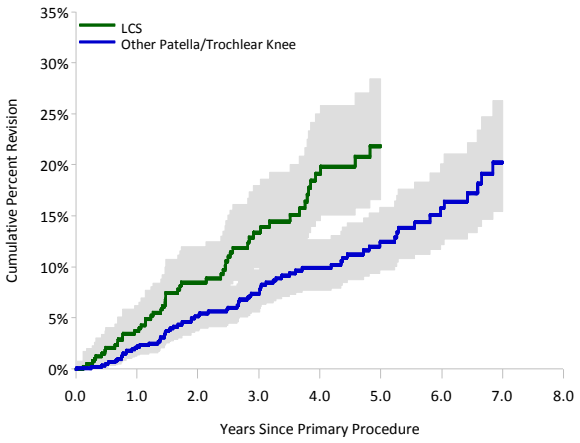
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and still used					
LCS	3.7 (2.2, 6.2)	13.4 (9.9, 18.0)	21.8 (16.6, 28.4)		

Table KP26: Yearly Usage of Individual Primary Patella/Trochlear Knee Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and still used										
LCS				26	56	68	47	65	78	66

Figure KP10: Cumulative Percent Revision of Individual Primary Patella/Trochlear Knee Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used



Primary Unicompartmental Knee Prostheses with a higher than anticipated Revision Rate

Table KP27: Revision Rate of Individual Primary Unicompartmental Knee Prostheses identified as having a higher than anticipated Revision Rate

Unicompartmental Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and no longer used				
*Preservation-Mobile	401	1847	4.4	Entire Period: HR=2.11 (1.69, 2.64), p<0.001
Re-identified and still used				
Advance/Advance	37	122	9.9	Entire Period: HR=5.44 (3.08, 9.59), p<0.001
AMC/AMC	552	1440	3.7	Entire Period: HR=1.74 (1.33, 2.29), p<0.001
BalanSys Uni/BalanSys Uni Mobile	193	505	5.1	Entire Period: HR=2.35 (1.59, 3.46), p<0.001

Note: All Components have been compared to all other Unicompartmental Knee components.
*Unicompartmental tibial component

Table KP28: Yearly Cumulative Percent Revision of Individual Primary Unicompartmental Knee Prostheses identified as having a higher than anticipated Revision Rate

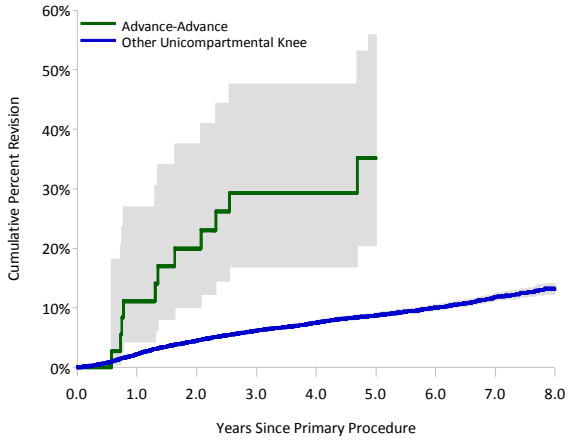
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and no longer used					
*Preservation-Mobile	5.2 (3.5, 7.9)	15.9 (12.6, 19.9)	19.8 (16.1, 24.3)		
Re-identified and still used					
Advance/Advance	11.1 (4.3, 26.9)	29.2 (16.9, 47.6)	35.1 (20.5, 55.9)		
AMC/AMC	3.9 (2.5, 6.0)	11.9 (9.0, 15.6)	15.1 (11.2, 20.1)		
BalanSys Uni/BalanSys Uni Mobile	7.4 (4.5, 12.2)	14.6 (10.0, 21.0)			

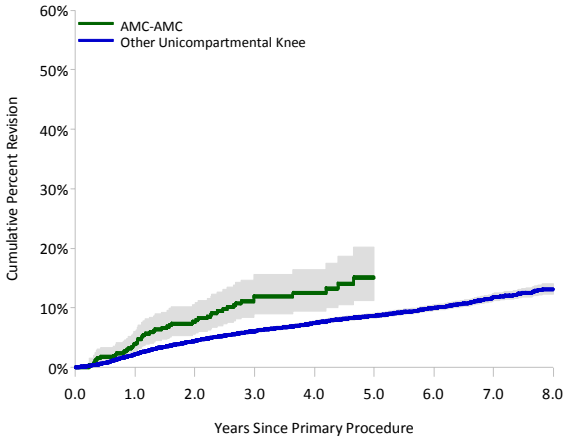
Table KP29: Yearly Usage of Individual Primary Unicompartmental Knee Prostheses identified as having a higher than anticipated Revision Rate

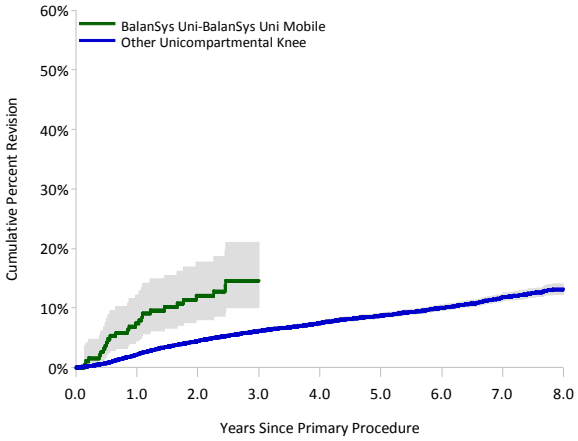
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and no longer used										
*Preservation-Mobile			15	150	121	59	26	17	13	
Re-identified and still used										
Advance/Advance					13	11	7	2	3	1
AMC/AMC					80	66	123	84	106	93
BalanSys Uni/BalanSys Uni Mobile						37	51	63	33	9

Figures KP11-KP13: Cumulative Percent Revision of Individual Primary **Unicompartmental** Knee Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used







PRIMARY TOTAL KNEE REPLACEMENT

This report is based on the analysis of 197,301 primary total knee replacements recorded in the Registry up to and including 31st December 2008, an additional 32,537 procedures since the 2008 Annual Report.

ANALYSIS OF KNEE REPLACEMENT SYSTEMS VERSUS INDIVIDUAL PROSTHESIS DESIGN

The Registry continues to present data on the different types of knee prostheses. Knee prostheses are generally available as part of a knee system which may contain many alternative prostheses varying in features such as method of fixation, stability, mobility, flexion capacity and materials used.

In order to present data by accommodating different design features in prostheses, the Registry subdivides all knee systems by fixation, with additional analysis related to common design features. The Registry reviews catalogue ranges to highlight design specific differences within each system.

USAGE OF TOTAL KNEE REPLACEMENT

Primary total knee replacement is the most frequently used primary knee procedure. Primary total knee replacement has increased from 78.2% in 2004 to 83.0% of all knee procedures in 2008. This trend has occurred in all states and territories (Figure KG3).

The Nexgen total knee was the most frequently used prosthesis, accounting for 13.5% of primary total knee replacement in 2008. The PFC Sigma total knee was the second most used. The ten most used prostheses are utilised in 82.6% of all primary total knee replacement (Table KT1 and Figure KT1).

In 2008, 51 different femoral components were used. This number has varied little over the last five years. Data for cemented, cementless and hybrid femoral components are presented in Table KT2-KT4 and Figures KT2-KT4.

AGE AND GENDER

There has been little change since 2004 in the proportion of females and males undergoing primary total knee replacement, with females accounting for 57.1% in 2008 (Table KT5).

In the last five years the proportion of patients aged less than 65 years has increased from 29.7% to 33.9%. There has been no change in the proportion of patients less than 55 years of age receiving primary total knee replacement (Table KT6).

FIXATION

Over half of all primary total knee replacements have all components cemented. Hybrid fixation is almost always cement fixation of the tibial component (24.0%) and only occasionally the femoral component (1.4%). Cementless fixation accounts for 23.8% of all primary total knee replacement (Table KT7).

The approach to fixation has changed little over recent years, however there remains considerable state and territory variation in the choice of fixation (Figure KT5).

PATELLAR RESURFACING

There has been a small increase in the use of patellar resurfacing nationally, from 38.4% in 2004 to 41.2% in 2008. When a patella is used it is almost always cemented.

There is considerable state and territory variation in the use of patellar resurfacing. This varies from 48.5% in New South Wales to 16.7% in Tasmania (Table KT7 and Figure KT6).

OUTCOMES OF PRIMARY TOTAL KNEE REPLACEMENT

AGE AND GENDER

The risk of revision in primary total knee replacement decreases significantly with increasing age. The Registry compares outcomes for the four different age groups; <55, 55-64, 65-74 and ≥75. The cumulative percent revision at eight years is 11.3%, 6.8%, 4.7% and 2.7% respectively (Tables KT8 and KT9 and Figure KT7).

There is a significantly higher revision rate in males compared to females. The cumulative percent revision at eight years is 5.5% for males and 4.6% for females (Adj HR=1.15; 95%CI (1.09, 1.21) p<0.001) (Tables KT10 and KT11 and Figure KT8).

The age related differences in outcome are evident for both males and females (Tables K12 and KT13 and Figures KT9 and KT10).

BEARING MOBILITY

The Registry has recorded 137,412 fixed and 53,807 mobile bearing primary total knee replacements. Bearing mobility relates to the tibial insert and is defined as inserts that can rotate, slide, or rotate and slide. There is a significant difference between fixed and mobile bearing inserts. The cumulative percent revision at eight years for fixed bearing inserts is 4.5% and 6.1% for mobile bearing inserts (Adj HR=1.23; 95%CI (1.16, 1.30) p<0.001) (Tables KT14 and KT15 and Figure KT11).

STABILITY

The Registry classifies stability for primary total knee replacement as minimally stabilised, posterior stabilised, fully stabilised (posterior and collateral stability) and hinged prostheses. This year the Registry analysis related to stability has been

confined to primary procedures undertaken for osteoarthritis. The fully stabilised and hinged prostheses are used infrequently in the primary situation and usually for very complex primary procedures.

The focus of this analysis has been to compare minimally and posterior stabilised primary total knee replacement. There is a significantly higher risk of revision for posterior stabilised compared to minimally stabilised prostheses (Adj HR=1.20; 95%CI (1.13, 1.28) p<0.001) (Tables KT16 and KT17 and Figure KT12).

Patellar Resurfacing

The Registry has recorded 108,824 primary total knee replacement procedures where a patellar prosthesis was not used and 82,493 procedures where a patellar prosthesis was inserted. The eight year cumulative percent revision is 5.4% when the patella has not been resurfaced and 4.5% when it has been resurfaced (Tables KT18 and KT19).

There is a significantly higher risk of revision in the first eight years when a patella prosthesis is not used in primary total knee replacement (Adj HR=1.32; 95%CI (1.25, 1.40) p<0.001) (Figure KT13).

Fixation

The Registry has previously reported no difference in the revision rates of cemented, cementless and hybrid fixation in primary total knee replacement. This year cementless has a slightly lower revision rate after one and a half years compared to hybrid fixation however at eight years cementless fixation has a higher cumulative percent revision than both cemented and hybrid fixation (5.3%, 4.9% and 4.7% respectively) (Tables KT20 and KT21 and Figure KT14).

As in previous reports, the Registry has excluded the cementless Oxinium prostheses from this analysis, as these prostheses were withdrawn from the market some years ago due to their significantly higher revision rates.

Prosthesis Specific Outcomes

The Registry has detailed the revision rates and cumulative percent revision for the different prostheses in the three categories of cemented, cementless and hybrid fixation. Only prostheses with 300 or more procedures recorded are listed. All prostheses that have been used on less than 300 occasions are combined to form the 'Other' group, the risk of revision for this group is higher than the listed prostheses regardless of the method of fixation (Tables KT22-KT27).

At eight years the least revised cemented and hybrid primary total knee prosthesis is the Nexgen/Nexgen and the least revised cementless total knee prosthesis is the Advantim/Advantim.

Total Knee Prostheses with a higher than anticipated Revision Rate

The Registry uses a standard algorithm to identify prostheses with more than twice the risk of revision compared to other prostheses in the same category. Only a small proportion of these prostheses are identified in the report. It is only prostheses with sufficient numbers that have undergone further extensive analysis and subsequent review by a panel of orthopaedic surgeons who determine which of the prostheses to be identified.

In the 2008 Annual Report, the Registry identified 15 prostheses. This year a further four primary total knee prostheses have been identified. They have been categorised into three groups. The first group include prostheses with no record of use in 2008 (no longer used). The second includes prostheses with reported use in 2008 and previously identified as having a higher than anticipated rate of revision (still used). The third group are prostheses being identified for the first time (Tables KT28-30 and Figures KT15-KT23).

The first group includes ten prostheses, three more than last year. The three prostheses that have been moved to the 'Re-identified and no longer used' group are the AMK/AMK, IB II/IB II and Genesis II Oxinium PS Cted/Genesis II (Keel) prostheses (Tables KT28-30).

In the 2008 Annual Report the Registry identified the Genesis II Oxinium PS Cted/Genesis II prosthesis. Within this group there are a number of different tibial components used, one of which has a shortened keel (the Genesis II Oxinium PS Cted/Genesis II (Keel)). This was designed to be used for minimally invasive surgery. This prosthesis is no longer used. When the Genesis II (Keel) is removed from the other Genesis II Oxinium PS Cted/Genesis II prosthesis the revision rate is not significantly different from all other total knee replacement.

The second group includes five prostheses that were identified last year and still used in 2008. They are the Optetrak-PS/Optetrak, Optetrak-PS/Optetrak RBK, Profix/Mobile Bearing Knee, Rotaglide Plus/Rotaglide Plus and TC Plus/TC Plus prostheses. The revisions per 100 observed component years and hazard ratios for these prostheses are detailed in Table KT28. The cumulative percent revision at seven years for the Profix/Mobile Bearing Knee is 11.2% and 8.4% for the Rotaglide Plus/Rotaglide Plus. The five year cumulative percent revision for the Optetrak-PS/Optetrak is 7.0%, the three year cumulative percent revision for the TC Plus/TC Plus is 8.5% and one year cumulative percent revision for the Optetrak-PS/Optetrak RBK is 2.7% (Tables KT28-KT30 and Figures KT15-KT19).

Last year the Registry identified the subgroup of Rotaglide Plus/Rotaglide Plus knee replacement used

with hybrid fixation as contributing disproportionally to the revision rate for this prosthesis. Analysis of the most recent data has been able to further identify that the revision of this prosthesis has largely occurred when a mobile bearing insert is used with a cemented tibial base plate.

The third group is the newly identified prostheses, the four in this group are the Journey/Journey, Columbus/Columbus, Eska RP/Eska RP and the Optetrak-PS/Optetrak-PS knee systems. Of these prostheses the Eska RP/Eska RP and Optetrak-PS/Optetrak-PS were not used in 2008. Details of these four prostheses are shown in Tables KT28-KT30 and Figures KT20-KT23.

The Journey/Journey was introduced to the Australian market in 2006, 589 procedures in 2008. The Registry has recorded 1,049 procedures overall and 26 revisions. There have been 2.5 revisions per 100 observed component years and the cumulative percent revision at one year is 2.7%. The hazard ratio for the Journey/Journey varies depending on the time since the primary procedure, and is significantly different from other knee replacement between nine months and one and a half years. Most revisions have been minor revisions involving either revision of the patella, insert or both (data not shown).

The Columbus/Columbus has been used in 378 procedures, 14 of which have been revised. There have been 2.4 revisions per 100 observed component years and a cumulative percent revision of 5.9% at three years (Adj HR=2.38; 95%CI (1.41, 4.02) p=0.001).

The Registry has only recorded 38 primary procedures using the Eska RP/Eska RP prosthesis however five have been revised in a relatively short time. There are 5.6 revisions per 100 observed component years and the cumulative percent revision at three years is 16.5% (Adj HR=5.81; 95%CI (2.42, 13.96) p<0.001).

The Optetrak-PS/Optetrak-PS combination has also been used in small numbers with 55 recorded by the Registry. Of these procedures eight have been revised. There are 5.4 revisions per 100 observed component years and a cumulative percent revision of 16.2% at three years) (Adj HR=6.27; 95%CI (3.14, 12.53) p<0.001).

In previous years we have detailed various Optetrak knee combinations used in Australia. It is becoming increasingly apparent that use of the Optetrak-PS femoral component is associated with a high risk of revision when used with different tibial base plates.

Table KT1: 10 Most Common Femoral Components used in Primary Total Knee Replacement

Rank	2004	2005	2006	2007	2008
1	LCS 3557	LCS 3707	LCS 3610	Nexgen 3944	Nexgen 4365
2	Duracon 2664	Nexgen 3092	PFC Sigma 3414	LCS 3742	PFC Sigma 4021
3	Nexgen 2527	PFC Sigma 2942	Nexgen 3120	PFC Sigma 3572	LCS 3774
4	PFC Sigma 2516	Duracon 2672	Scorpio 2570	Scorpio 2508	Triathlon 3460
5	Scorpio 2146	Scorpio 2481	Genesis II 2449	Triathlon 2333	Genesis II 2588
6	Genesis II 2017	Genesis II 2342	Duracon 2308	Genesis II 2271	Scorpio 2534
7	Nexgen LPS Flex 1274	Nexgen LPS Flex 1699	Nexgen LPS Flex 1766	Duracon 1962	Genesis II Oxinium 2082
8	Profix 1199	Genesis II Oxinium 1311	Genesis II Oxinium 1558	Genesis II Oxinium 1786	Duracon 1371
9	Genesis II Oxinium 1004	Profix 1253	Triathlon 1008	Nexgen LPS Flex 1256	Nexgen LPS Flex 1284
10	Active Knee 837	Active Knee 769	Profix 874	Vanguard 760	Vanguard 1241
Top 10 Usage	83.7%	84.6%	82.9%	82.7%	82.6%
Total Procedures	23594	26314	27350	29193	32338
N Prosthesis Types	50	49	51	51	51

Figure KT1: 5 Most Common Femoral Components used in Primary Total Knee Replacement

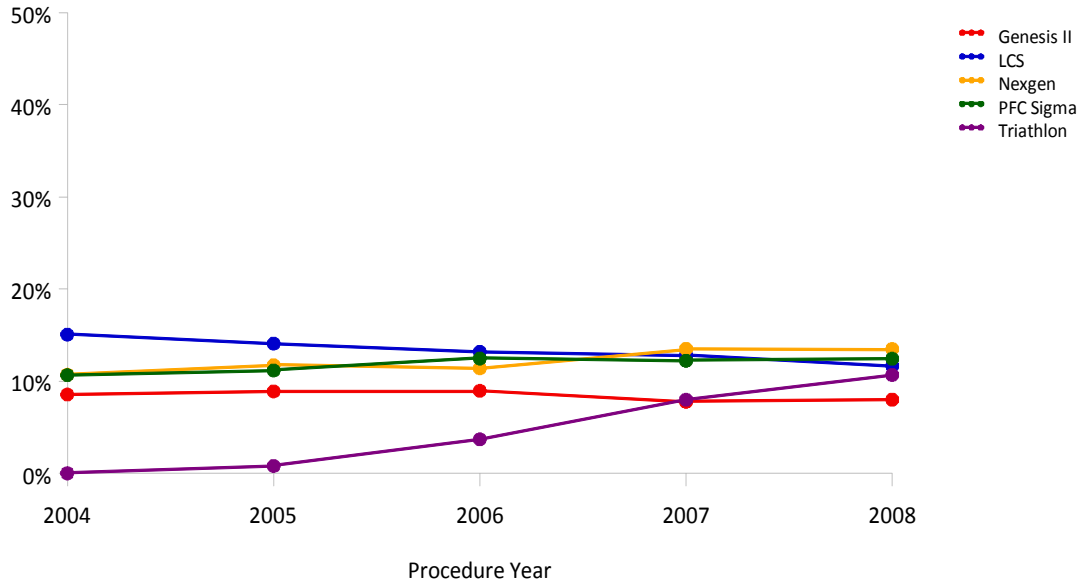


Table KT2: 10 Most Common Femoral Components used in Primary Total Knee Replacement used with Cement Fixation

Rank	2004	2005	2006	2007	2008
1	Genesis II 1434	Genesis II 1740	PFC Sigma 2057	PFC Sigma 2119	PFC Sigma 2208
2	PFC Sigma 1429	Nexgen LPS Flex 1670	Genesis II 1808	Nexgen 2011	Nexgen 2120
3	Nexgen LPS Flex 1266	PFC Sigma 1593	Nexgen LPS Flex 1683	Genesis II Oxinium 1773	Genesis II Oxinium 2051
4	Duracon 1219	Genesis II Oxinium 1290	Genesis II Oxinium 1540	Genesis II 1762	Genesis II 1962
5	LCS 1021	Duracon 1195	Duracon 1174	Triathlon 1347	Triathlon 1904
6	Genesis II Oxinium 992	Nexgen 964	Nexgen 1089	Nexgen LPS Flex 1188	Nexgen LPS Flex 1192
7	Nexgen 952	LCS 938	Scorpio 853	Duracon 1083	Scorpio 1071
8	Scorpio 713	Scorpio 796	LCS 802	Scorpio 1006	LCS 760
9	Profix 708	Profix 764	Triathlon 714	LCS 798	Vanguard 726
10	Nexgen LPS 668	Nexgen LPS 425	Profix 562	Profix 398	Duracon 644
Top 10 Usage	88.8%	86.8%	85.7%	85.2%	84.3%
Total Procedures	11718	13106	14338	15825	17370
N Prosthesis Types	41	44	48	46	47

Figure KT2: 5 Most Common Femoral Components used in Primary Total Knee Replacement used with Cement Fixation

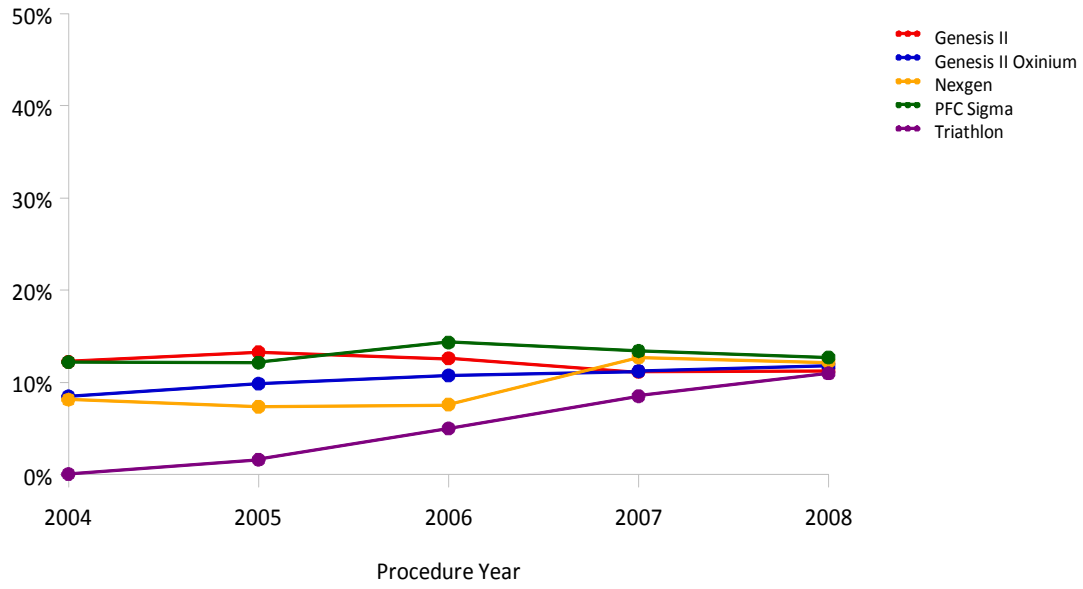


Table KT3: 10 Most Common Femoral Components used in Primary Total Knee Replacement used with Cementless Fixation

Rank	2004	2005	2006	2007	2008
1	LCS 1762	LCS 1952	LCS 2080	LCS 2235	LCS 2315
2	Nexgen 797	Nexgen 1119	Nexgen 955	Nexgen 942	Nexgen 1221
3	Active Knee 696	Scorpio 605	Scorpio 603	Triathlon 571	Triathlon 920
4	Scorpio 547	Active Knee 477	PFC Sigma 446	Scorpio 524	Scorpio 654
5	Duracon 375	Duracon 444	Duracon 414	PFC Sigma 442	RBK 477
6	Natural Knee II 373	PFC Sigma 392	RBK 366	RBK 378	PFC Sigma 448
7	PFC Sigma 323	RBK 385	Active Knee 266	Active Knee 372	Active Knee 387
8	RBK 280	Natural Knee II 298	Natural Knee II 262	Duracon 358	Duracon 300
9	Profix 202	Profix 216	Triathlon 186	Natural Knee II 220	Natural Knee II 162
10	Maxim 87	Advantim 79	Profix 162	Profix 169	Profix 157
Top 10 Usage	95.6%	95.2%	90.9%	91.4%	88.1%
Total Procedures	5690	6265	6313	6797	7993
N Prosthesis Types	21	25	25	25	28

Figure KT3: 5 Most Common Femoral Components used in Primary Total Knee Replacement used with Cementless Fixation

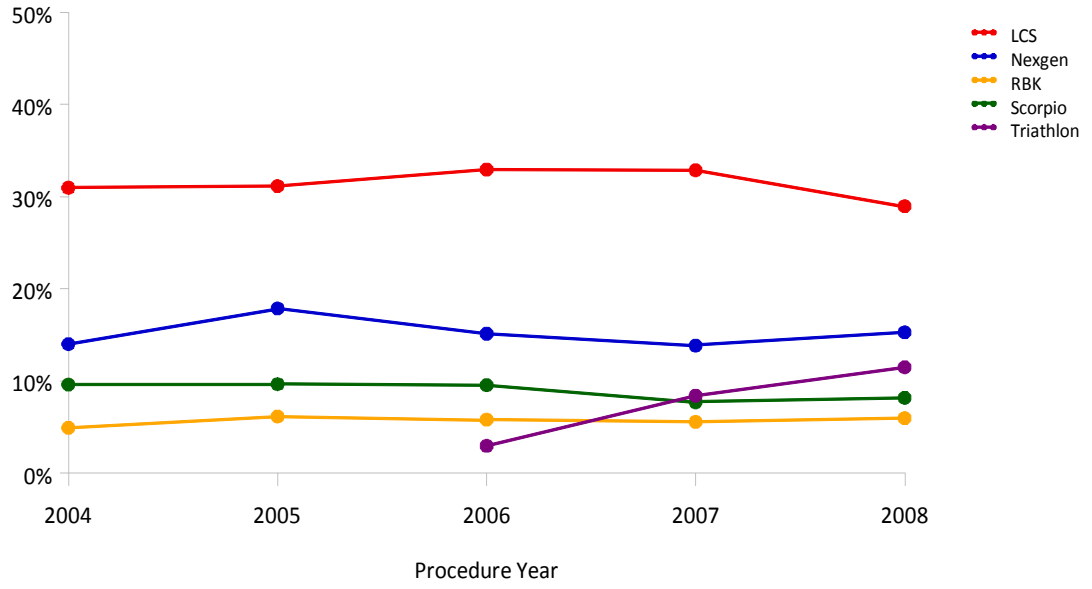


Table KT4: 10 Most Common Femoral Components used in Primary Total Knee Replacement used with Hybrid Fixation

Rank	2004	2005	2006	2007	2008
1	Duracon 1070	Scorpio 1080	Scorpio 1114	PFC Sigma 1011	PFC Sigma 1365
2	Scorpio 886	Duracon 1033	Nexgen 1076	Nexgen 991	Nexgen 1024
3	Nexgen 778	Nexgen 1009	PFC Sigma 911	Scorpio 978	Scorpio 809
4	LCS 774	PFC Sigma 957	LCS 728	LCS 709	LCS 699
5	PFC Sigma 764	LCS 817	Duracon 720	Duracon 521	Triathlon 636
6	Genesis II 501	Genesis II 547	Genesis II 574	Genesis II 464	Genesis II 502
7	Profix 289	Profix 273	Active Knee 202	Triathlon 415	Vanguard 477
8	Maxim 285	Maxim 216	Maxim 183	Vanguard 337	Duracon 427
9	Natural Knee II 208	Natural Knee II 214	Profix 150	Maxim 203	Nexgen LPS 130
10	AGC 138	Active Knee 211	Natural Knee II 148	Active Knee 143	Active Knee 99
Top 10 Usage	92%	91.6%	86.7%	87.8%	88.4%
Total Procedures	6186	6943	6699	6571	6975
N Prosthesis Types	38	34	34	35	38

Figure KT4: 5 Most Common Femoral Components used in Primary Total Knee Replacement used with Hybrid Fixation

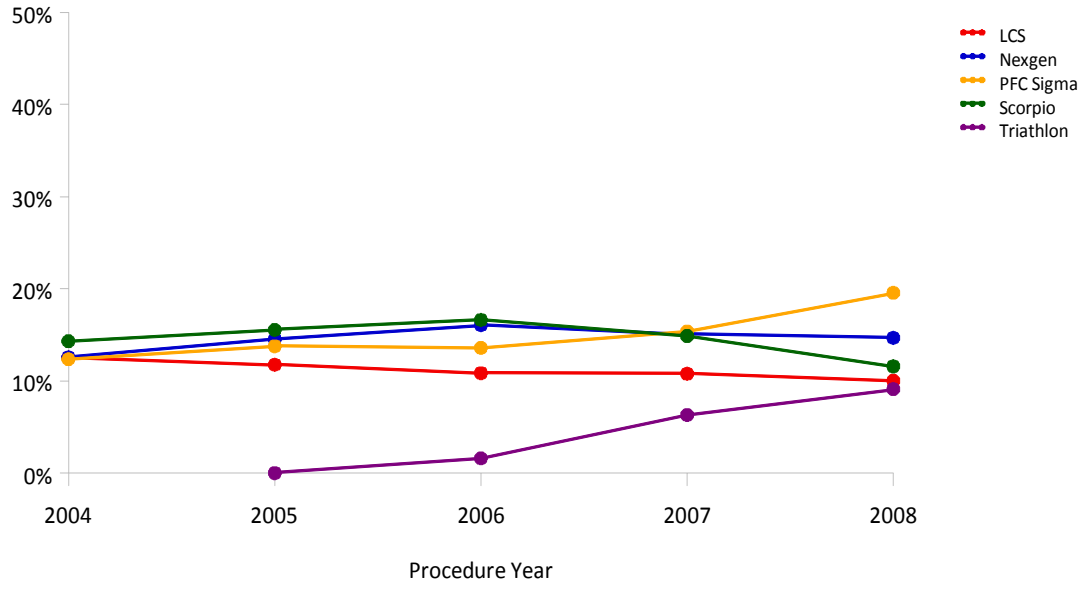


Table KT5: Primary Total Knee Replacement by Gender and Procedure Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	13643	57.8	9951	42.2	23594	100.0
2005	15271	58.0	11043	42.0	26314	100.0
2006	15688	57.4	11662	42.6	27350	100.0
2007	16784	57.5	12409	42.5	29193	100.0
2008	18458	57.1	13880	42.9	32338	100.0

Table KT6: Primary Total Knee Replacement by Age and Procedure Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	1600	6.8	5412	22.9	8930	37.8	6940	29.4	712	3.0	23594	100.0
2005	1731	6.6	6210	23.6	9684	36.8	7850	29.8	839	3.2	26314	100.0
2006	1787	6.5	6717	24.6	10140	37.1	7773	28.4	933	3.4	27350	100.0
2007	2022	6.9	7371	25.2	10774	36.9	8029	27.5	997	3.4	29193	100.0
2008	2208	6.8	8767	27.1	11922	36.9	8339	25.8	1102	3.4	32338	100.0

Table KT7: Prosthesis Fixation of Primary Total Knee Replacement

Fixation	TOTAL		Patella Used			
			Patella Cementless		Patella Cemented	
	N	%	N	%	N	%
Tibial and femoral cemented	100351	50.9	109	0.1	51277	51.1
Tibial and femoral cementless	46926	23.8	4701	10.0	10198	21.7
Tibial only cemented	47283	24.0	588	1.2	17116	36.2
Femoral only cemented	2741	1.4	115	4.2	1436	52.4
TOTAL	**197301**	**100.0**	**5513**	**2.8**	**80027**	**40.6**

Figure KT5: Trends in Prosthesis Fixation of Primary Total Knee Replacement by State/Territory and Year

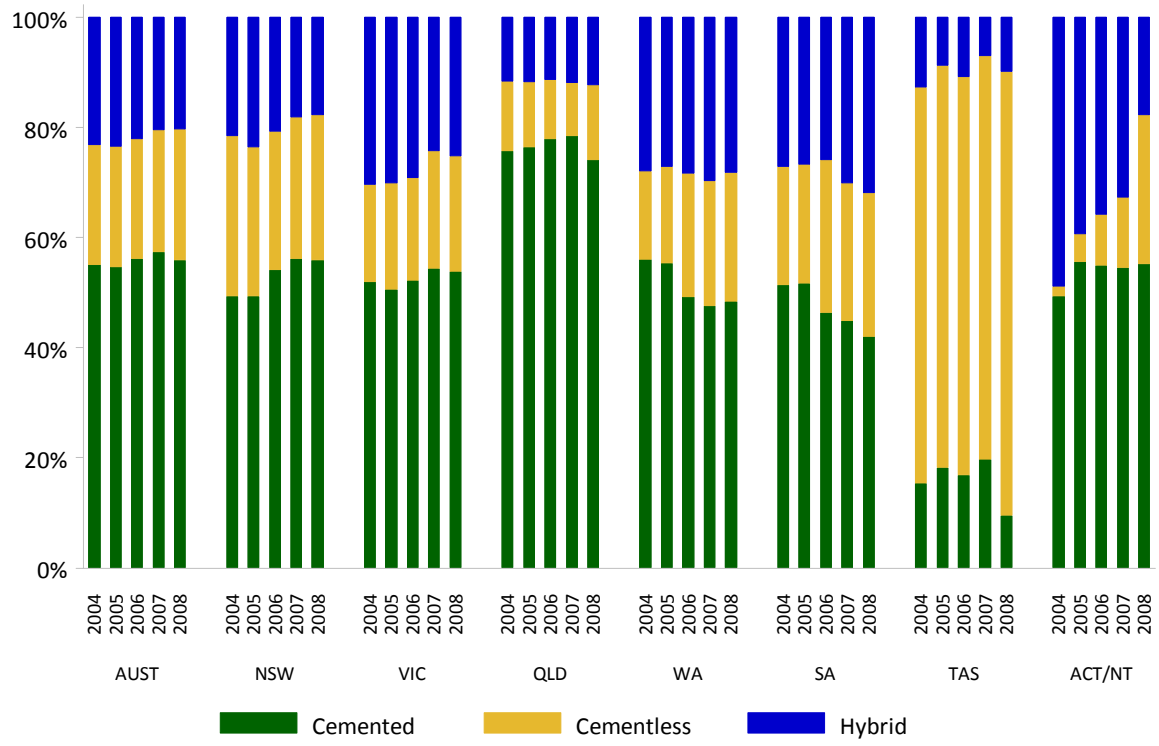


Figure KT6: Trends in Patellar Usage and Fixation of Primary Total Knee Replacement by State/Territory and Year

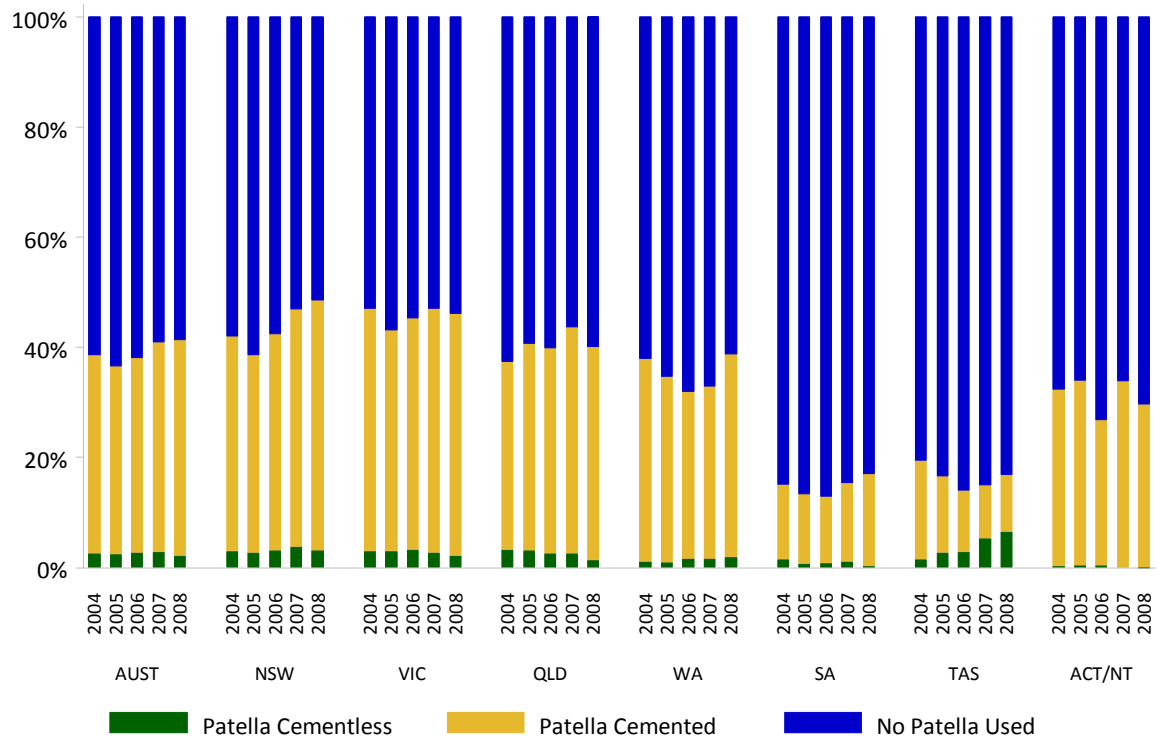


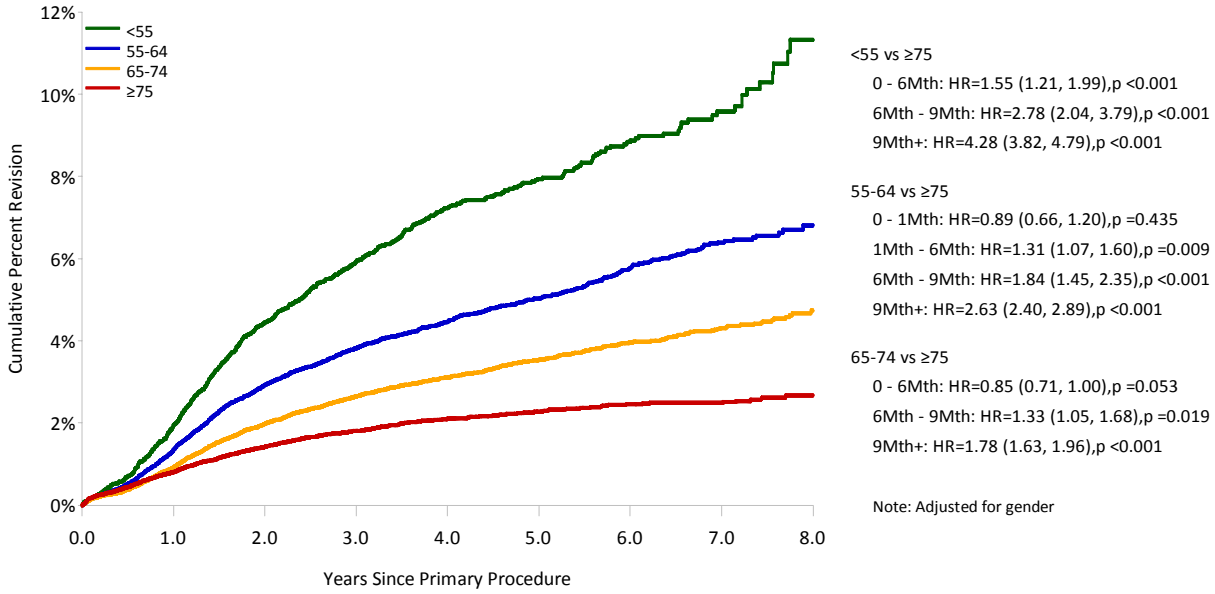
Table KT8: Revision Rates of Primary Total Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
<55	700	12189	40369	1.7	(1.61, 1.87)
55-64	1635	45627	147293	1.1	(1.06, 1.17)
65-74	1864	72119	247256	0.8	(0.72, 0.79)
≥75	1039	61382	204903	0.5	(0.48, 0.54)
TOTAL	**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT9: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)

Age	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
<55	1.9 (1.7, 2.2)	5.9 (5.5, 6.4)	7.9 (7.3, 8.6)	9.6 (8.8, 10.5)	11.3 (10.0, 12.8)
55-64	1.4 (1.2, 1.5)	3.8 (3.6, 4.0)	5.0 (4.8, 5.3)	6.4 (6.0, 6.8)	6.8 (6.3, 7.3)
65-74	0.9 (0.9, 1.0)	2.6 (2.5, 2.8)	3.5 (3.4, 3.7)	4.3 (4.1, 4.6)	4.7 (4.4, 5.1)
≥75	0.8 (0.7, 0.9)	1.8 (1.7, 1.9)	2.3 (2.1, 2.4)	2.5 (2.3, 2.7)	2.7 (2.4, 2.9)

Figure KT7: Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
<55	12189	9869	7820	6123	4548	3173	1900	856	211
55-64	45627	36437	28755	22124	16185	11138	6746	2973	749
65-74	72119	59412	47948	37626	28098	19567	12034	5560	1458
≥75	61382	50697	40694	31411	22570	15276	8982	3978	942

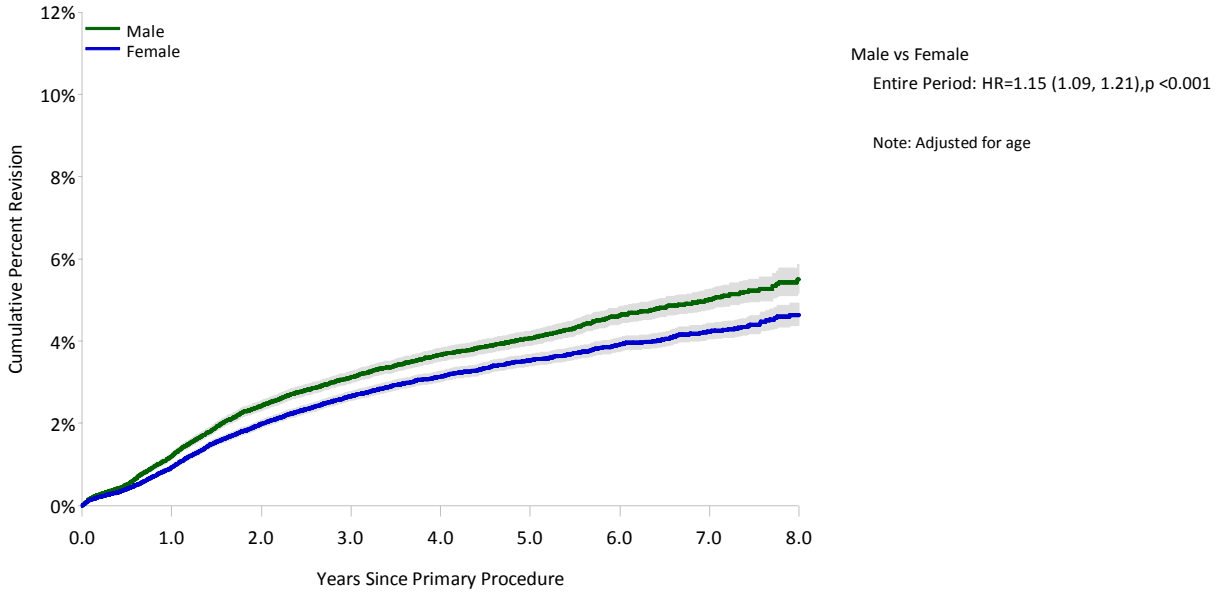
Table KT10: Revision Rates of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)

Gender	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	2461	82386	272731	0.9	(0.87, 0.94)
Female	2777	108931	367091	0.8	(0.73, 0.79)
TOTAL	**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT11: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Male	1.2 (1.1, 1.3)	3.1 (3.0, 3.3)	4.1 (3.9, 4.2)	5.0 (4.8, 5.3)	5.5 (5.2, 5.9)
Female	0.9 (0.9, 1.0)	2.7 (2.5, 2.8)	3.5 (3.4, 3.7)	4.2 (4.0, 4.4)	4.6 (4.4, 4.9)

Figure KT8: Cumulative Percent Revision of Primary Total Knee Replacement by Gender (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	82386	66985	53422	41296	30248	20827	12617	5688	1450
Female	108931	89430	71795	55988	41153	28327	17045	7679	1910

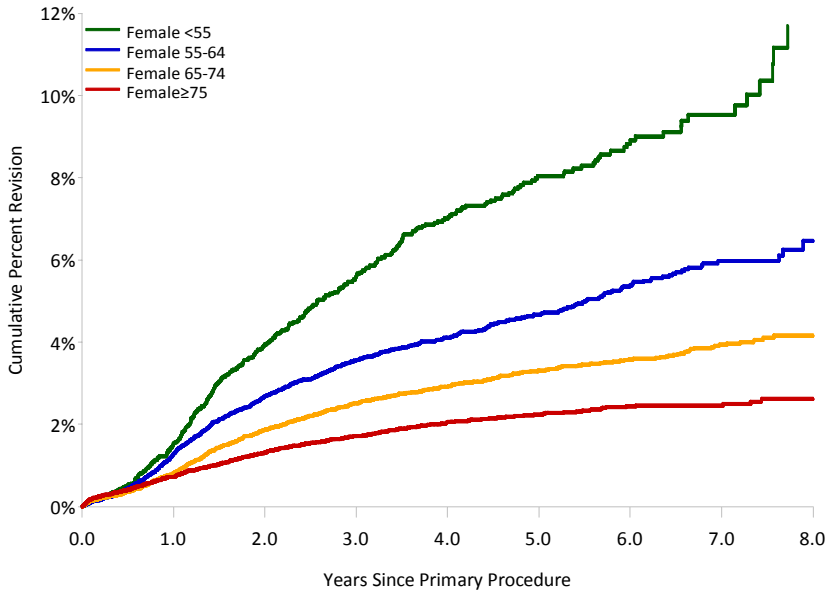
Table KT12: Revision Rates of Primary Total Knee Replacement by Gender and Age (Primary Diagnosis OA)

Gender	Age	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Male	<55	324	5373	18019	1.8	(1.61, 2.00)
	55-64	813	20804	67241	1.2	(1.13, 1.30)
	65-74	893	31826	107697	0.8	(0.78, 0.89)
	≥75	431	24383	79774	0.5	(0.49, 0.59)
Female	<55	376	6816	22350	1.7	(1.52, 1.86)
	55-64	822	24823	80052	1.0	(0.96, 1.10)
	65-74	971	40293	139559	0.7	(0.65, 0.74)
	≥75	608	36999	125129	0.5	(0.45, 0.53)
TOTAL		**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT13: 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	8 Yrs
Male	<55	2.5 (2.1, 3.0)	6.4 (5.6, 7.1)	7.8 (7.0, 8.8)	9.7 (8.5, 11.0)	10.2 (8.9, 11.8)
	55-64	1.4 (1.3, 1.6)	4.1 (3.8, 4.5)	5.4 (5.1, 5.9)	6.9 (6.3, 7.5)	7.2 (6.6, 7.9)
	65-74	1.1 (1.0, 1.2)	2.8 (2.6, 3.0)	3.8 (3.6, 4.1)	4.8 (4.4, 5.2)	5.5 (4.9, 6.2)
	≥75	0.9 (0.8, 1.1)	1.9 (1.8, 2.1)	2.3 (2.1, 2.6)	2.5 (2.3, 2.8)	2.8 (2.4, 3.3)
Female	<55	1.5 (1.2, 1.9)	5.6 (5.0, 6.3)	8.0 (7.2, 8.9)	9.5 (8.5, 10.7)	12.2 (10.1, 14.8)
	55-64	1.3 (1.1, 1.4)	3.5 (3.3, 3.8)	4.7 (4.3, 5.0)	6.0 (5.5, 6.5)	6.5 (5.7, 7.3)
	65-74	0.8 (0.7, 0.9)	2.5 (2.3, 2.7)	3.3 (3.1, 3.5)	3.9 (3.7, 4.2)	4.2 (3.8, 4.5)
	≥75	0.7 (0.6, 0.8)	1.7 (1.6, 1.9)	2.2 (2.1, 2.4)	2.5 (2.2, 2.7)	2.6 (2.3, 2.9)

Figure KT9: Cumulative Percent Revision of Primary Total Knee Replacement for Females by Age (Primary Diagnosis OA)



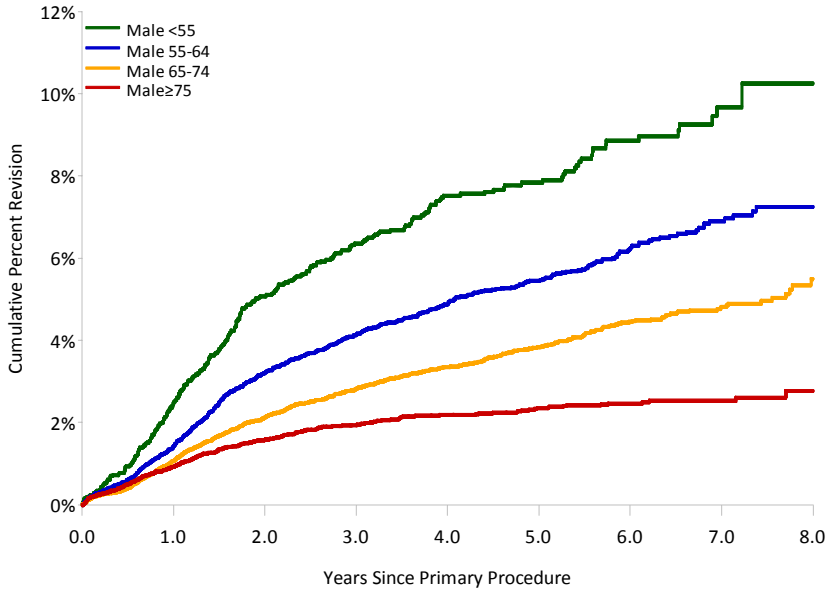
Female <55 vs Female≥75
- 0 - 1Mth: HR=0.71 (0.33, 1.52),p =0.375
- 1Mth - 6Mth: HR=1.63 (1.08, 2.46),p =0.020
- 6Mth - 9Mth: HR=2.60 (1.70, 3.96),p <0.001
- 9Mth - 1.5Yr: HR=4.57 (3.55, 5.87),p <0.001
- 1.5Yr+: HR=4.30 (3.58, 5.16),p <0.001

Female 55-64 vs Female≥75
- 0 - 3Mth: HR=0.81 (0.58, 1.12),p =0.202
- 3Mth - 9Mth: HR=1.80 (1.41, 2.29),p <0.001
- 9Mth - 1.5Yr: HR=2.97 (2.41, 3.65),p <0.001
- 1.5Yr - 2.5Yr: HR=2.06 (1.67, 2.53),p <0.001
- 2.5Yr+: HR=2.45 (2.03, 2.96),p <0.001

Female 65-74 vs Female≥75
- 0 - 6Mth: HR=0.90 (0.72, 1.13),p =0.370
- 6Mth - 9Mth: HR=1.18 (0.87, 1.60),p =0.297
- 9Mth - 1.5Yr: HR=1.90 (1.55, 2.33),p <0.001
- 1.5Yr+: HR=1.58 (1.36, 1.83),p <0.001

Number at Risk		0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Female	<55	6816	5523	4355	3378	2510	1710	1037	448	111
	55-64	24823	19780	15676	12072	8823	6043	3583	1563	382
	65-74	40293	33429	27020	21307	15878	11092	6828	3191	842
	≥75	36999	30698	24744	19231	13942	9482	5597	2477	575

Figure KT10: Cumulative Percent Revision of Primary Total Knee Replacement for Males by Age (Primary Diagnosis OA)



Male <55 vs Male≥75
- 0 - 9Mth: HR=2.14 (1.65, 2.79),p <0.001
- 9Mth - 1.5Yr: HR=3.71 (2.83, 4.86),p <0.001
- 1.5Yr+: HR=4.63 (3.68, 5.83),p <0.001

Male 55-64 vs Male≥75
- 0 - 9Mth: HR=1.37 (1.12, 1.68),p =0.002
- 9Mth - 1Yr: HR=1.92 (1.39, 2.65),p <0.001
- 1Yr - 1.5Yr: HR=2.70 (2.11, 3.45),p <0.001
- 1.5Yr+: HR=3.18 (2.62, 3.86),p <0.001

Male 65-74 vs Male≥75
- 0 - 9Mth: HR=0.98 (0.81, 1.20),p =0.878
- 9Mth - 1.5Yr: HR=1.56 (1.25, 1.95),p <0.001
- 1.5Yr - 2.5Yr: HR=2.00 (1.58, 2.53),p <0.001
- 2.5Yr+: HR=2.48 (1.99, 3.08),p <0.001

Number at Risk		0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Male	<55	5373	4346	3465	2745	2038	1463	863	408	100
	55-64	20804	16657	13079	10052	7362	5095	3163	1410	367
	65-74	31826	25983	20928	16319	12220	8475	5206	2369	616
	≥75	24383	19999	15950	12180	8628	5794	3385	1501	367

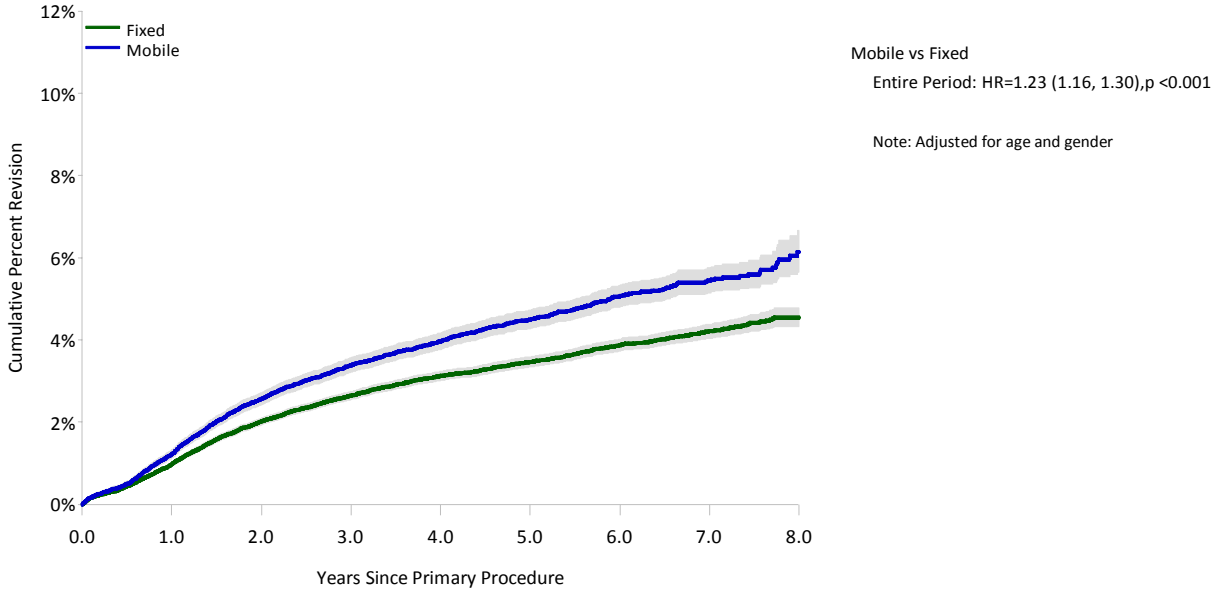
Table KT14: Revision Rates of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)

Bearing Mobility	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Fixed	3450	137412	456478	0.8	(0.73, 0.78)
Rotating	1560	48543	159681	1.0	(0.93, 1.03)
Rotating - Sliding	171	4317	17172	1.0	(0.85, 1.16)
Sliding	52	947	6099	0.9	(0.64, 1.12)
Unknown	5	98	392	1.3	(0.41, 2.98)
TOTAL	**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT15: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Fixed Bearing	1.0 (0.9, 1.0)	2.6 (2.5, 2.7)	3.5 (3.3, 3.6)	4.2 (4.0, 4.4)	4.5 (4.3, 4.8)
Mobile Bearing	1.2 (1.1, 1.3)	3.4 (3.2, 3.6)	4.5 (4.3, 4.7)	5.4 (5.1, 5.8)	6.1 (5.7, 6.7)

Figure KT11: Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Fixed Bearing	137412	111680	89530	69304	50588	34923	21092	9499	2416
Mobile Bearing	53807	44642	35612	27914	20769	14202	8550	3856	942

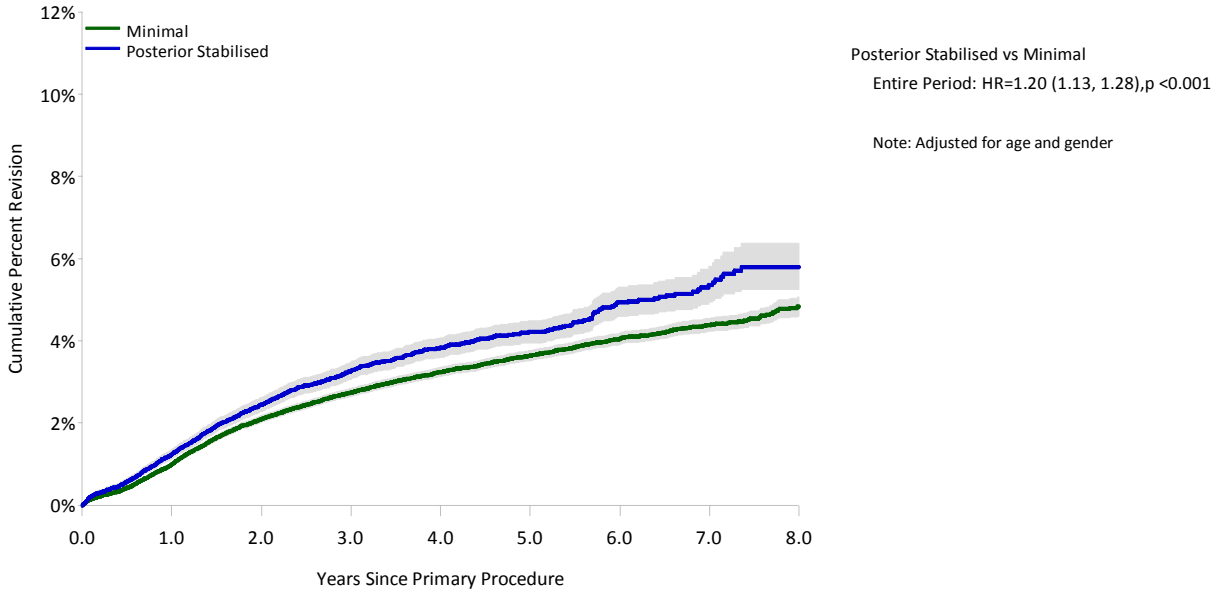
Table KT16: Revision Rates of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Stability	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Minimally Stabilised	4019	147331	517227	0.8	(0.75, 0.80)
Posterior Stabilised	1183	42694	119659	1.0	(0.93, 1.05)
Fully Stabilised	25	1044	2120	1.2	(0.76, 1.74)
Hinged	6	150	424	1.4	(0.52, 3.08)
Unknown	5	98	392	1.3	(0.41, 2.98)
TOTAL	**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT17: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Minimally Stabilised	1.0 (0.9, 1.1)	2.7 (2.6, 2.8)	3.6 (3.5, 3.8)	4.4 (4.2, 4.6)	4.8 (4.6, 5.1)
Posterior Stabilised	1.2 (1.1, 1.4)	3.3 (3.1, 3.5)	4.2 (4.0, 4.5)	5.4 (4.9, 5.8)	5.8 (5.3, 6.4)

Figure KT12: Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Minimally Stabilised	147331	122815	100212	79626	59552	41910	25722	11787	2972
Posterior Stabilised	42694	32805	24501	17270	11569	7048	3831	1532	378

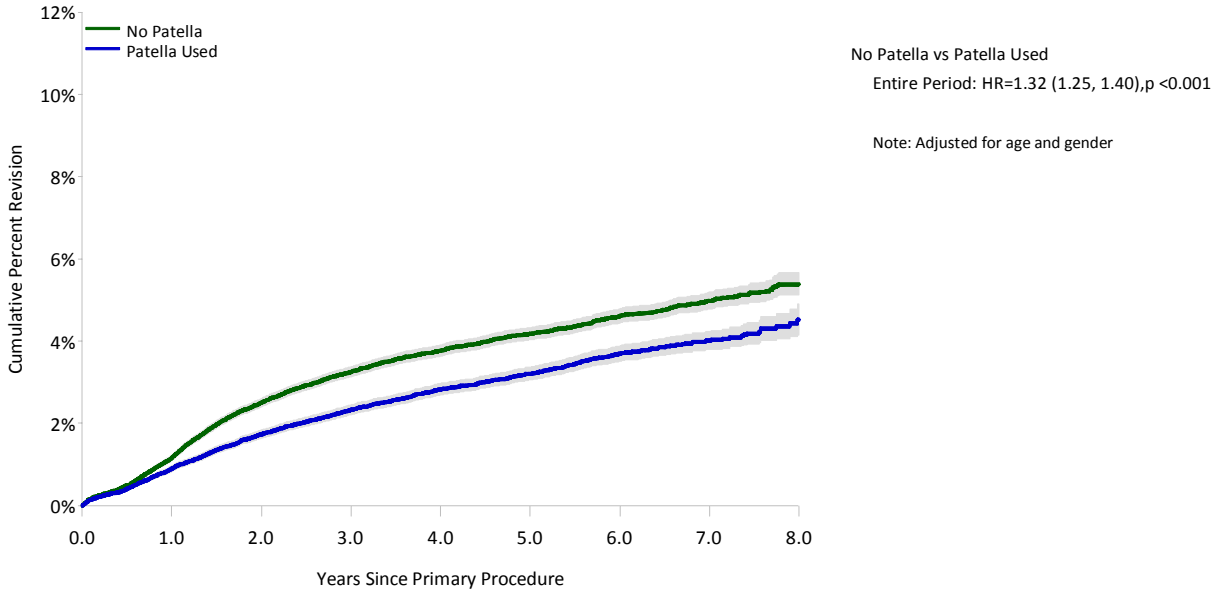
Table KT18: Revision Rates of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)

Patella Usage	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
No Patella	3352	108824	367344	0.9	(0.88, 0.94)
Patella Used	1886	82493	272478	0.7	(0.66, 0.72)
TOTAL	**5238**	**191317**	**639822**	**0.8**	**(0.80, 0.84)**

Table KT19: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
No Patella	1.2 (1.1, 1.2)	3.2 (3.1, 3.4)	4.2 (4.0, 4.3)	5.0 (4.8, 5.2)	5.4 (5.1, 5.7)
Patella Used	0.9 (0.8, 1.0)	2.3 (2.2, 2.5)	3.2 (3.1, 3.4)	4.0 (3.8, 4.2)	4.5 (4.2, 4.9)

Figure KT13: Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
No Patella	108824	89264	71924	55907	40747	28239	17308	8098	2295
Patella Used	82493	67151	53293	41377	30654	20915	12354	5269	1065

Table KT20: Revision Rates of Primary Total Knee Replacement by Fixation (excluding cementless Genesis II Oxinium and Profix Oxinium) (Primary Diagnosis OA)

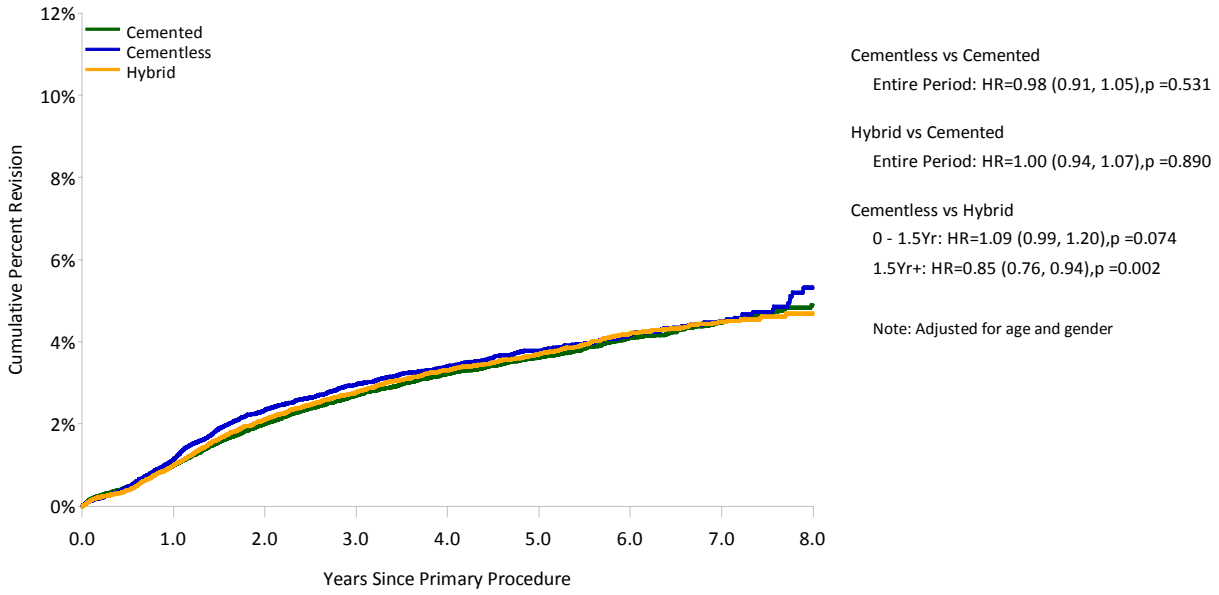
Fixation	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Cemented	2469	96587	313699	0.8	(0.76, 0.82)
Cementless	1270	45658	151678	0.8	(0.79, 0.88)
Hybrid	1370	48810	173522	0.8	(0.75, 0.83)
TOTAL	**5109**	**191055**	**638898**	**0.8**	**(0.78, 0.82)**

Note: Cementless Genesis II Oxinium and Profix Oxinium have higher than anticipated revision rates that increase the cementless revision rates overall

Table KT21: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (excluding cementless Genesis II Oxinium and Profix Oxinium) (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Cemented	1.0 (0.9, 1.1)	2.7 (2.6, 2.8)	3.6 (3.5, 3.8)	4.5 (4.3, 4.7)	4.9 (4.6, 5.2)
Cementless	1.2 (1.1, 1.3)	3.0 (2.8, 3.1)	3.8 (3.6, 4.0)	4.5 (4.2, 4.8)	5.3 (4.8, 5.9)
Hybrid	1.0 (0.9, 1.1)	2.8 (2.6, 2.9)	3.7 (3.5, 3.9)	4.5 (4.2, 4.8)	4.7 (4.4, 5.0)

Figure KT14: Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (excluding cementless Genesis II Oxinium and Profix Oxinium) (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Cemented	96587	78058	61467	46903	34131	23213	14217	6705	1668
Cementless	45658	37019	29725	23346	17141	11746	6761	2837	732
Hybrid	48810	41119	33874	26907	20003	14074	8643	3818	960

Table KT22: Revision Rates of Primary Total Knee Replacement with Cement Fixation

Femoral Component	Tibial Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
AGC	AGC	83	2929	12302	0.7	(0.54, 0.84)
Advance	Advance	38	589	2597	1.5	(1.04, 2.01)
Duracon	Duracon	228	8832	34842	0.7	(0.57, 0.75)
Genesis II	Genesis II	309	11746	38691	0.8	(0.71, 0.89)
Genesis II Oxinium	Genesis II	219	8275	20508	1.1	(0.93, 1.22)
Genesis II Oxinium	Mobile Bearing Knee	12	330	1194	1.0	(0.52, 1.76)
Journey	Journey	26	1042	1024	2.5	(1.66, 3.72)
Kinemax Plus	Kinemax Plus	54	1776	8856	0.6	(0.46, 0.80)
LCS	LCS	209	4110	22875	0.9	(0.79, 1.05)
LCS	MBT	56	3454	9560	0.6	(0.44, 0.76)
LCS	PFC Sigma	10	482	1271	0.8	(0.38, 1.45)
Maxim	Maxim	26	567	2482	1.0	(0.68, 1.53)
Natural Knee II	Natural Knee II	23	1356	5081	0.5	(0.29, 0.68)
Nexgen	Nexgen	105	9274	27104	0.4	(0.32, 0.47)
Nexgen LPS	Nexgen	115	4001	18820	0.6	(0.50, 0.73)
Nexgen LPS Flex	Nexgen	183	7815	21782	0.8	(0.72, 0.97)
Optetrak-PS	Optetrak	60	1158	3352	1.8	(1.37, 2.30)
PFC Sigma	MBT	15	693	1420	1.1	(0.59, 1.74)
PFC Sigma	PFC Sigma	194	10981	32662	0.6	(0.51, 0.68)
Profix	Mobile Bearing Knee	37	334	1561	2.4	(1.67, 3.27)
Profix	Profix	137	3786	14108	1.0	(0.82, 1.15)
RBK	RBK	20	812	2052	1.0	(0.60, 1.50)
Scorpio	Scorpio/Series 7000	171	6234	20275	0.8	(0.72, 0.98)
Triathlon	Triathlon	32	4182	5344	0.6	(0.41, 0.85)
Vanguard	Maxim	10	1187	1241	0.8	(0.39, 1.48)
Other (109)		201	4406	15931	1.3	(1.09, 1.45)
TOTAL		**2573**	**100351**	**326935**	**0.8**	**(0.76, 0.82)**

Note: Some Cementless components have been cemented.
Only prostheses with over 300 procedures have been listed.

Table KT23: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Cement Fixation

Femoral Component	Tibial Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
AGC	AGC	0.7 (0.4, 1.1)	2.3 (1.8, 3.0)	3.4 (2.7, 4.3)	4.1 (3.2, 5.1)	4.3 (3.4, 5.5)
Advance	Advance	2.0 (1.1, 3.6)	5.5 (3.8, 7.9)	6.8 (4.8, 9.4)	9.0 (6.4, 12.6)	
Duracon	Duracon	1.0 (0.8, 1.2)	2.3 (2.0, 2.7)	3.1 (2.7, 3.6)	3.8 (3.2, 4.4)	4.4 (3.6, 5.4)
Genesis II	Genesis II	1.0 (0.9, 1.3)	2.9 (2.5, 3.2)	3.6 (3.2, 4.1)	4.3 (3.8, 4.9)	4.4 (3.9, 5.1)
Genesis II Oxinium	Genesis II	1.3 (1.1, 1.6)	3.3 (2.9, 3.8)	4.7 (4.1, 5.6)	5.3 (4.4, 6.3)	
Genesis II Oxinium	Mobile Bearing Knee	0.6 (0.2, 2.5)	4.2 (2.4, 7.6)	4.9 (2.8, 8.5)		
Journey	Journey	2.7 (1.7, 4.4)				
Kinemax Plus	Kinemax Plus	0.9 (0.5, 1.4)	2.3 (1.7, 3.2)	2.9 (2.2, 3.9)	4.2 (3.1, 5.6)	4.7 (3.3, 6.5)
LCS	LCS	1.0 (0.7, 1.4)	3.7 (3.2, 4.3)	4.8 (4.2, 5.6)	5.8 (5.0, 6.6)	6.3 (5.3, 7.4)
LCS	MBT	0.9 (0.6, 1.4)	1.9 (1.4, 2.6)	2.6 (1.9, 3.5)	3.6 (2.1, 5.9)	
LCS	PFC Sigma	0.4 (0.1, 1.8)	1.8 (0.8, 4.0)	3.2 (1.5, 6.7)		
Maxim	Maxim	1.2 (0.6, 2.6)	3.0 (1.8, 4.9)	5.3 (3.6, 7.7)	7.6 (3.9, 14.3)	
Natural Knee II	Natural Knee II	0.5 (0.3, 1.1)	1.5 (1.0, 2.5)	2.2 (1.4, 3.3)	2.8 (1.7, 4.4)	
Nexgen	Nexgen	0.5 (0.4, 0.7)	1.4 (1.1, 1.7)	1.7 (1.4, 2.1)	2.0 (1.6, 2.6)	2.9 (1.9, 4.3)
Nexgen LPS	Nexgen	0.8 (0.6, 1.2)	2.1 (1.7, 2.6)	2.8 (2.3, 3.4)	4.0 (3.3, 4.9)	4.3 (3.4, 5.3)
Nexgen LPS Flex	Nexgen	1.0 (0.8, 1.3)	2.7 (2.3, 3.1)	3.7 (3.1, 4.4)		
Optetrak-PS	Optetrak	1.6 (1.0, 2.5)	5.8 (4.4, 7.6)	7.1 (5.5, 9.2)		
PFC Sigma	MBT	2.0 (1.1, 3.5)	3.0 (1.7, 5.1)			
PFC Sigma	PFC Sigma	0.8 (0.7, 1.0)	1.9 (1.6, 2.2)	2.7 (2.3, 3.2)	3.2 (2.6, 4.0)	3.6 (2.7, 4.7)
Profix	Mobile Bearing Knee	2.1 (1.0, 4.4)	8.0 (5.5, 11.5)	11.2 (8.0, 15.6)		
Profix	Profix	1.3 (1.0, 1.8)	3.5 (2.9, 4.1)	4.5 (3.8, 5.3)	5.1 (4.1, 6.3)	5.1 (4.1, 6.3)
RBK	RBK	1.1 (0.5, 2.2)	3.2 (2.0, 5.2)	3.9 (2.3, 6.5)		
Scorpio	Scorpio/Series 7000	0.9 (0.7, 1.2)	2.9 (2.4, 3.4)	3.9 (3.3, 4.6)	4.8 (4.0, 5.7)	4.8 (4.0, 5.7)
Triathlon	Triathlon	0.7 (0.5, 1.1)	1.3 (0.9, 1.8)			
Vanguard	Maxim	1.0 (0.5, 2.0)				
Other (109)		1.6 (1.2, 2.0)	4.5 (3.8, 5.2)	6.2 (5.3, 7.2)	7.6 (6.5, 8.8)	8.3 (7.0, 9.7)

Note: Some Cementless components have been cemented.
Only prostheses with over 300 procedures have been listed.

Table KT24: Revision Rates of Primary Total Knee Replacement with Cementless Fixation

Femoral Component	Tibial Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Active Knee	Active Knee	94	2864	9639	1.0	(0.79, 1.19)
Advance	Advance	17	303	1415	1.2	(0.70, 1.92)
Advantim	Advantim	8	666	2752	0.3	(0.13, 0.57)
Duracon	Duracon	86	3249	12892	0.7	(0.53, 0.82)
Genesis II	Mobile Bearing Knee	15	474	2641	0.6	(0.32, 0.94)
LCS	LCS	111	2311	13802	0.8	(0.66, 0.97)
LCS	MBT	305	12019	33869	0.9	(0.80, 1.01)
Maxim	Maxim	20	577	3111	0.6	(0.39, 0.99)
Natural Knee II	Natural Knee	45	899	4419	1.0	(0.74, 1.36)
Natural Knee II	Natural Knee II	46	1509	5604	0.8	(0.60, 1.09)
Nexgen	Nexgen	120	7100	23964	0.5	(0.42, 0.60)
Nexgen LPS	Nexgen	7	323	509	1.4	(0.55, 2.83)
PFC Sigma	Coordinate	22	1201	3910	0.6	(0.35, 0.85)
PFC Sigma	MBT	59	1420	3987	1.5	(1.13, 1.91)
Profix	Profix	32	1072	3801	0.8	(0.58, 1.19)
RBK	RBK	65	2451	7330	0.9	(0.68, 1.13)
Rocc	Rocc	6	333	497	1.2	(0.44, 2.63)
Rotaglide Plus	Rotaglide Plus	14	362	1644	0.9	(0.47, 1.43)
Scorpio	Scorpio/Series 7000	129	4009	13178	1.0	(0.82, 1.16)
Triathlon	Triathlon	16	1677	1680	1.0	(0.54, 1.55)
Other (47)		209	2107	5702	3.7	(3.19, 4.20)
TOTAL		**1426**	**46926**	**156347**	**0.9**	**(0.87, 0.96)**

Note: Only prostheses with over 300 procedures have been listed.

Table KT25: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Cementless Fixation

Femoral Component	Tibial Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Active Knee	Active Knee	1.0 (0.7, 1.5)	3.3 (2.7, 4.2)	4.4 (3.6, 5.4)		
Advance	Advance	2.7 (1.4, 5.4)	5.3 (3.2, 8.6)	6.2 (3.9, 9.9)	6.2 (3.9, 9.9)	
Advantim	Advantim	0.3 (0.1, 1.3)	1.5 (0.8, 3.0)	1.5 (0.8, 3.0)	1.5 (0.8, 3.0)	1.5 (0.8, 3.0)
Duracon	Duracon	0.9 (0.7, 1.4)	2.6 (2.1, 3.3)	3.3 (2.6, 4.1)	3.6 (2.9, 4.5)	3.6 (2.9, 4.5)
Genesis II	Mobile Bearing Knee	1.5 (0.7, 3.1)	1.9 (1.0, 3.7)	3.0 (1.7, 5.1)	3.8 (2.2, 6.2)	3.8 (2.2, 6.2)
LCS	LCS	1.4 (1.0, 2.0)	3.4 (2.7, 4.2)	4.3 (3.5, 5.2)	5.0 (4.1, 6.0)	6.5 (5.2, 8.1)
LCS	MBT	1.1 (0.9, 1.3)	3.0 (2.7, 3.4)	3.8 (3.3, 4.3)	4.3 (3.7, 4.9)	
Maxim	Maxim	1.7 (0.9, 3.2)	3.2 (2.0, 5.0)	3.6 (2.3, 5.5)	3.6 (2.3, 5.5)	
Natural Knee II	Natural Knee	1.2 (0.7, 2.2)	2.9 (1.9, 4.2)	4.6 (3.3, 6.3)	7.9 (5.5, 11.2)	
Natural Knee II	Natural Knee II	1.0 (0.6, 1.6)	2.3 (1.6, 3.4)	3.4 (2.4, 4.8)	6.7 (4.4, 9.9)	
Nexgen	Nexgen	0.7 (0.5, 0.9)	1.9 (1.6, 2.3)	2.2 (1.8, 2.6)	2.7 (2.2, 3.3)	2.9 (2.3, 3.7)
Nexgen LPS	Nexgen	2.3 (1.0, 5.0)	2.3 (1.0, 5.0)			
PFC Sigma	Coordinate	0.7 (0.3, 1.4)	1.9 (1.2, 3.1)	2.9 (1.9, 4.5)		
PFC Sigma	MBT	2.6 (1.9, 3.7)	4.6 (3.6, 6.1)	6.1 (4.6, 8.1)		
Profix	Profix	1.3 (0.8, 2.3)	3.3 (2.3, 4.7)	3.9 (2.7, 5.6)	3.9 (2.7, 5.6)	
RBK	RBK	1.1 (0.7, 1.6)	3.0 (2.3, 3.9)	3.8 (2.9, 4.9)		
Rocc	Rocc	1.4 (0.5, 3.8)				
Rotaglide Plus	Rotaglide Plus	0.9 (0.3, 2.6)	3.1 (1.7, 5.8)	3.9 (2.2, 6.9)		
Scorpio	Scorpio/Series 7000	1.3 (1.0, 1.8)	3.4 (2.8, 4.1)	4.5 (3.8, 5.4)	5.3 (4.3, 6.5)	
Triathlon	Triathlon	0.7 (0.4, 1.4)				
Other (47)		4.1 (3.3, 5.2)	13.9 (12.2, 15.9)	15.4 (13.5, 17.6)	16.6 (14.4, 19.1)	

Note: Only prostheses with over 300 procedures have been listed.

Table KT26: Revision Rates of Primary Total Knee Replacement with Hybrid Fixation

Femoral Component	Tibial Component	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
AGC	AGC	25	1217	5551	0.5	(0.29, 0.66)
Active Knee	Active Knee	23	906	2715	0.8	(0.54, 1.27)
Advance	Advance	11	300	1027	1.1	(0.53, 1.92)
Duracon	Duracon	219	7329	32262	0.7	(0.59, 0.77)
Genesis II	Genesis II	94	3583	12426	0.8	(0.61, 0.93)
LCS	LCS	84	2165	11669	0.7	(0.57, 0.89)
LCS	MBT	61	2937	8032	0.8	(0.58, 0.98)
LCS	PFC Sigma	11	593	1306	0.8	(0.42, 1.51)
Maxim	Maxim	36	1371	4963	0.7	(0.51, 1.00)
Natural Knee II	Natural Knee II	35	1440	6114	0.6	(0.40, 0.80)
Nexgen	Nexgen	97	6446	20752	0.5	(0.38, 0.57)
Nexgen LPS	Nexgen	20	748	2287	0.9	(0.53, 1.35)
PFC Sigma	MBT	24	1363	2384	1.0	(0.65, 1.50)
PFC Sigma	PFC Sigma	163	5642	20196	0.8	(0.69, 0.94)
Profix	Mobile Bearing Knee	41	624	2652	1.5	(1.11, 2.10)
Profix	Profix	27	734	3022	0.9	(0.59, 1.30)
RBK	RBK	8	343	1062	0.8	(0.33, 1.48)
Scorpio	Scorpio/Series 7000	229	7284	26551	0.9	(0.75, 0.98)
Triathlon	Triathlon	4	1160	1166	0.3	(0.09, 0.88)
Vanguard	Maxim	7	764	864	0.8	(0.33, 1.67)
Other (82)		188	3075	11317	1.7	(1.43, 1.92)
TOTAL		**1407**	**50024**	**178319**	**0.8**	**(0.75, 0.83)**

Note: Only prostheses with over 300 procedures have been listed.
Some cementless components have been cemented.

Table KT27: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Hybrid Fixation

Femoral Component	Tibial Component	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
AGC	AGC	0.9 (0.5, 1.6)	1.6 (1.0, 2.5)	2.1 (1.4, 3.3)	3.0 (2.0, 4.6)	3.0 (2.0, 4.6)
Active Knee	Active Knee	0.6 (0.2, 1.3)	2.6 (1.7, 4.1)	3.8 (2.2, 6.5)		
Advance	Advance	1.4 (0.5, 3.7)	3.3 (1.7, 6.2)	4.0 (2.1, 7.6)		
Duracon	Duracon	1.2 (1.0, 1.5)	2.6 (2.2, 3.0)	3.4 (2.9, 3.9)	3.9 (3.4, 4.5)	3.9 (3.4, 4.5)
Genesis II	Genesis II	1.0 (0.7, 1.4)	2.9 (2.4, 3.6)	3.4 (2.7, 4.2)	3.8 (3.0, 4.8)	3.8 (3.0, 4.8)
LCS	LCS	1.0 (0.6, 1.5)	2.4 (1.9, 3.2)	3.5 (2.8, 4.4)	4.9 (3.9, 6.1)	4.9 (3.9, 6.1)
LCS	MBT	0.8 (0.5, 1.2)	2.5 (1.9, 3.3)	3.4 (2.6, 4.6)		
LCS	PFC Sigma	1.4 (0.7, 2.9)	2.4 (1.3, 4.6)			
Maxim	Maxim	0.7 (0.4, 1.4)	2.3 (1.6, 3.3)	3.6 (2.5, 5.1)		
Natural Knee II	Natural Knee II	1.0 (0.6, 1.7)	2.1 (1.4, 3.0)	2.7 (1.9, 3.8)	3.5 (2.3, 5.4)	
Nexgen	Nexgen	0.5 (0.3, 0.7)	1.6 (1.3, 2.0)	2.3 (1.9, 2.9)	2.4 (1.9, 3.0)	2.9 (2.0, 4.1)
Nexgen LPS	Nexgen	0.5 (0.2, 1.5)	2.9 (1.7, 4.9)	5.2 (3.3, 8.3)		
PFC Sigma	MBT	1.5 (0.9, 2.4)	2.5 (1.5, 4.0)	3.8 (2.1, 6.9)		
PFC Sigma	PFC Sigma	1.2 (0.9, 1.5)	2.9 (2.5, 3.4)	3.9 (3.3, 4.5)	4.1 (3.5, 4.8)	4.7 (3.5, 6.2)
Profix	Mobile Bearing Knee	1.3 (0.6, 2.6)	5.1 (3.6, 7.2)	6.8 (5.0, 9.3)		
Profix	Profix	1.3 (0.7, 2.4)	3.0 (2.0, 4.7)	4.0 (2.7, 5.9)	5.4 (3.5, 8.1)	
RBK	RBK	0.3 (0.0, 2.2)	2.4 (1.1, 5.4)	3.1 (1.4, 6.4)		
Scorpio	Scorpio/Series 7000	0.9 (0.7, 1.2)	2.9 (2.5, 3.4)	4.1 (3.6, 4.7)	5.3 (4.5, 6.2)	5.6 (4.7, 6.7)
Triathlon	Triathlon	0.3 (0.1, 1.1)				
Vanguard	Maxim	0.4 (0.1, 1.4)				
Other (82)		2.1 (1.6, 2.7)	6.4 (5.5, 7.5)	7.8 (6.7, 9.0)	9.1 (7.9, 10.5)	9.7 (8.2, 11.4)

Note: Only prostheses with over 300 procedures have been listed.

Primary Total Knee Prostheses with a higher than anticipated Revision Rate

Table KT28: Revision Rate of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

Femoral/Tibial Component	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Hazard Ratio (95%CI), P Value
Re-identified and no longer used				
AMK/AMK	202	1445	1.3	Entire Period: HR=2.10 (1.34, 3.30), p=0.001
Gemini MK II/Gemini MK II	21	109	4.6	Entire Period: HR=5.72 (2.38, 13.75), p<0.001
Genesis II Oxinium Cless/Genesis II	111	427	9.8	Entire Period: HR=10.87 (8.02, 14.72), p<0.001
Genesis II Oxinium Cless/MBK	88	279	17.9	Entire Period: HR=18.70 (14.15, 24.71), p<0.001
Genesis II Oxinium PS Cted/Genesis II (Keel)	269	539	5.6	Entire Period: HR=4.90 (3.42, 7.02), p<0.001
IB II/IB II	199	1337	1.7	0 - 2Yr: HR=0.75 (0.24, 2.34), p=0.625 2Yr - 2.5Yr: HR=4.51 (1.45, 14.04), p=0.009 2.5Yr+: HR=4.73 (2.93, 7.65), p<0.001
Interax/Interax	58	388	2.1	Entire Period: HR=3.43 (1.71, 6.86), p<0.001
Profix Oxinium Cless/MBK	158	624	10.6	Entire Period: HR=12.37 (9.70, 15.77), p<0.001
Profix Oxinium Cless/Profix	75	301	9.3	Entire Period: HR=10.10 (6.96, 14.64), p<0.001
Trac/Trac	138	894	1.8	Entire Period: HR=2.50 (1.53, 4.09), p<0.001
Re-identified and still used				
Optetrak-PS/Optetrak	1299	3904	1.7	Entire Period: HR=2.02 (1.59, 2.56), p<0.001
Optetrak-PS/Optetrak RBK	421	537	2.8	Entire Period: HR=2.65 (1.60, 4.41), p<0.001
Profix/Mobile Bearing Knee	1217	5184	1.9	Entire Period: HR=2.30 (1.89, 2.81), p<0.001
Rotaglide Plus/Rotaglide Plus	631	2812	1.4	0 - 1.5Yr: HR=1.14 (0.65, 2.01), p=0.648 1.5Yr+: HR=2.31 (1.58, 3.37), p<0.001
TC-Plus/TC-Plus	76	228	2.2	Entire Period: HR=2.59 (1.08, 6.19), p=0.032
Newly Identified				
Journey/Journey	1049	1029	2.5	0 - 9Mth: HR=1.41 (0.73, 2.72), p=0.299 9Mth - 1Yr: HR=4.46 (2.12, 9.38), p<0.001 1Yr - 1.5Yr: HR=2.80 (1.33, 5.89), p=0.006 1.5Yr+: HR=2.37 (0.76, 7.36), p=0.135
Columbus/Columbus	378	572	2.4	Entire Period: HR=2.38 (1.41, 4.02), p=0.001
Eska RP/Eska RP	38	90	5.6	Entire Period: HR=5.81 (2.42, 13.96), p<0.001
Optetrak-PS/Optetrak-PS	55	147	5.4	Entire Period: HR=6.27 (3.14, 12.53), p<0.001

Note: All components have been compared to all other total knee components.

Table KT29: Yearly Cumulative Percent Revision of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

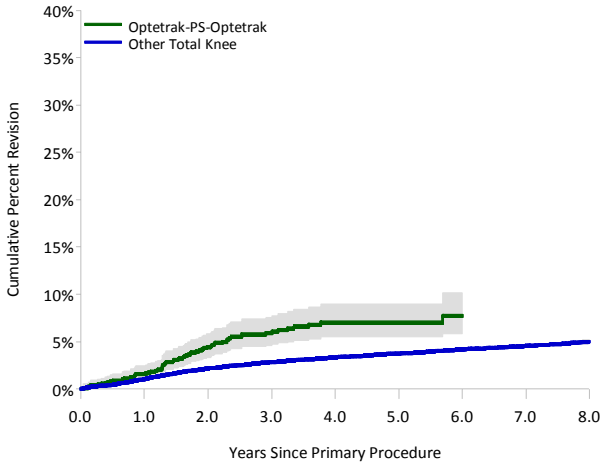
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Re-identified and no longer used					
AMK/AMK	1.0 (0.3, 3.9)	5.1 (2.8, 9.2)	6.6 (3.9, 11.1)	8.9 (5.6, 13.9)	9.6 (6.1, 14.8)
Gemini MK II/Gemini MK II	9.5 (2.5, 33.0)	14.3 (4.8, 38.0)	23.8 (10.7, 48.1)		
Genesis II Oxinium Cless/Genesis II	10.9 (6.3, 18.4)	38.1 (29.7, 48.0)	39.1 (30.6, 49.0)		
Genesis II Oxinium Cless/MBK	24.0 (16.3, 34.4)	52.8 (42.8, 63.5)	57.4 (47.4, 67.9)		
Genesis II Oxinium PS Cted/Genesis II (Keel)	4.5 (2.6, 7.7)				
IB II/IB II	0.0 (0.0, 0.0)	3.6 (1.7, 7.3)	7.3 (4.4, 12.0)	11.4 (7.5, 16.9)	13.0 (8.8, 19.0)
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)
Profix Oxinium Cless/MBK	8.3 (4.9, 13.9)	40.2 (32.9, 48.3)	41.5 (34.2, 49.7)		
Profix Oxinium Cless/Profix	13.3 (7.4, 23.4)	36.1 (26.4, 48.1)	37.5 (27.6, 49.5)		
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)	
Re-identified and still used					
Optetrak-PS/Optetrak	1.6 (1.0, 2.4)	5.9 (4.6, 7.6)	7.0 (5.5, 8.9)		
Optetrak-PS/Optetrak RBK	2.7 (1.5, 5.0)				
Profix/Mobile Bearing Knee	2.2 (1.5, 3.1)	6.6 (5.3, 8.1)	8.7 (7.1, 10.7)	11.2 (8.9, 14.1)	
Rotaglide Plus/Rotaglide Plus	0.8 (0.3, 1.9)	4.3 (2.9, 6.3)	6.3 (4.5, 8.7)	8.4 (6.0, 11.6)	
TC-Plus/TC-Plus	1.4 (0.2, 9.2)	8.5 (3.6, 19.4)			
Newly Identified					
Journey/Journey	2.7 (1.6, 4.4)				
Columbus/Columbus	3.4 (1.8, 6.3)	5.9 (3.4, 10.2)			
Eska RP/Eska RP	7.9 (2.6, 22.5)	16.5 (6.6, 37.7)			
Optetrak-PS/Optetrak-PS	1.8 (0.3, 12.2)	16.2 (8.4, 30.1)			

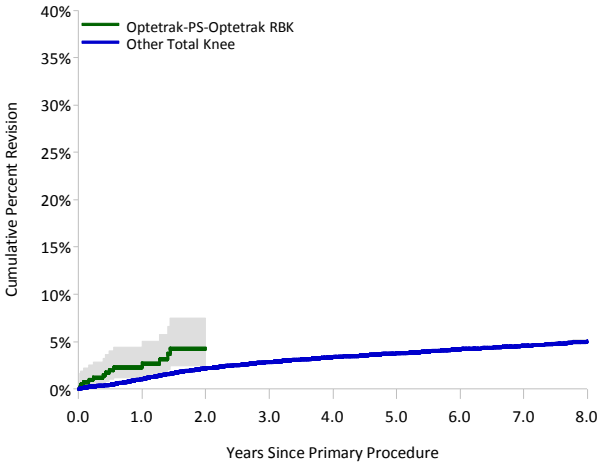
Table KT30: Yearly Usage of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

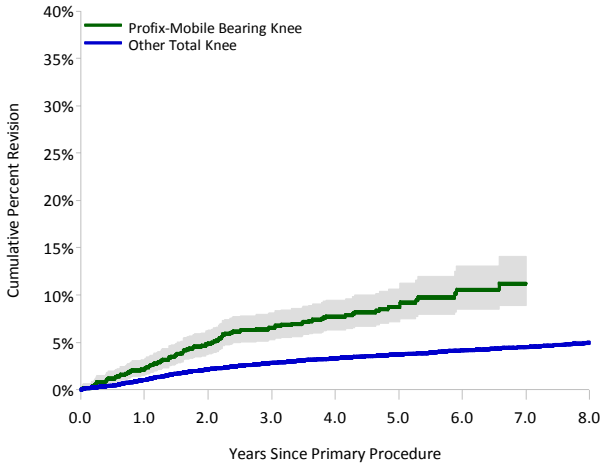
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Re-identified and no longer used										
AMK/AMK	34	92	70	3	2	1				
Gemini MK II/Gemini MK II			4	10	7					
Genesis II Oxinium Cless/Genesis II				4	106					
Genesis II Oxinium Cless/MBK				22	66					
Genesis II Oxinium PS Cted/Genesis II (Keel)							18	124	127	
IB II/IB II		64	90	33	12					
Interax/Interax	10	30	18							
Profix Oxinium Cless/MBK				63	95					
Profix Oxinium Cless/Profix				10	65					
Trac/Trac	7	36	52	33	9	1				
Re-identified and still used										
Optetrak-PS/Optetrak		14	22	90	130	155	252	253	216	167
Optetrak-PS/Optetrak RBK							1	81	173	166
Profix/Mobile Bearing Knee			55	214	204	349	269	54	60	12
Rotaglide Plus/Rotaglide Plus			56	125	151	110	101	43	30	15
TC-Plus/TC-Plus					1	27	27	6	6	9
Newly Identified										
Journey/Journey								134	326	589
Columbus/Columbus							49	92	89	148
Eska RP/Eska RP							9	24	5	
Optetrak-PS/Optetrak-PS						8	14	18	15	

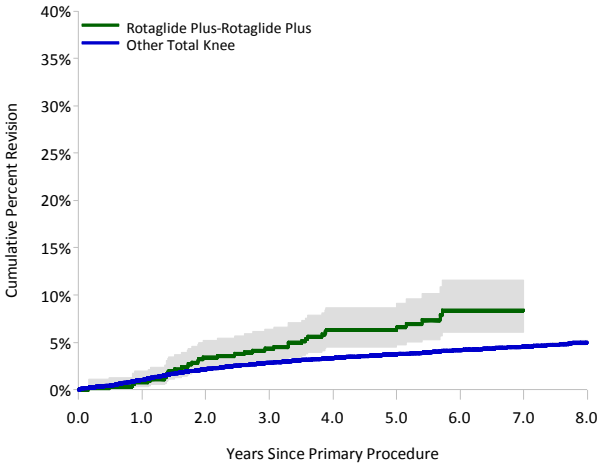
Figures KT15-23: Cumulative Percent Revision of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

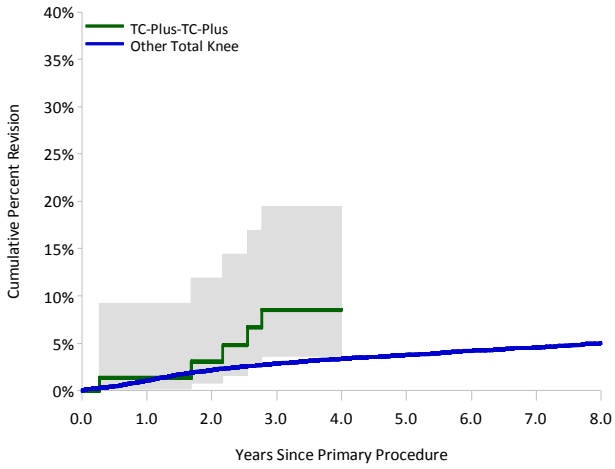
Re-identified and still used











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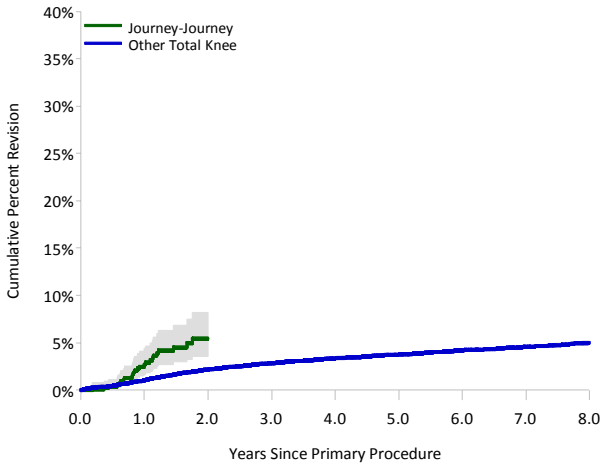
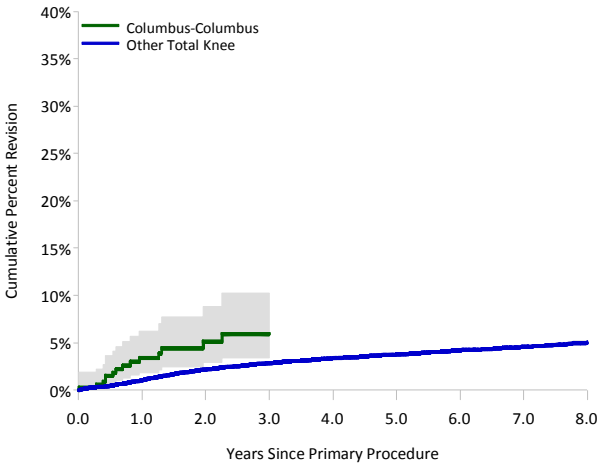
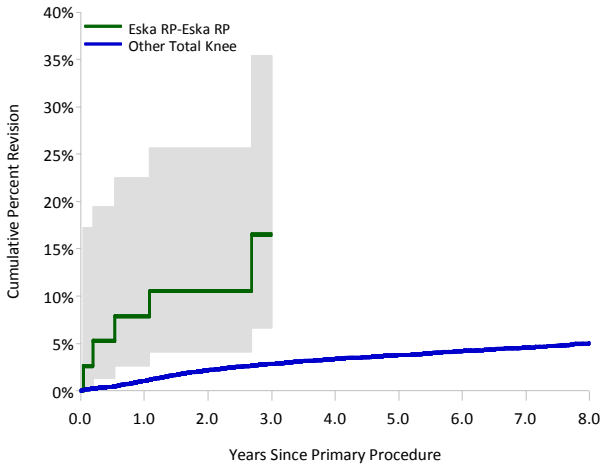
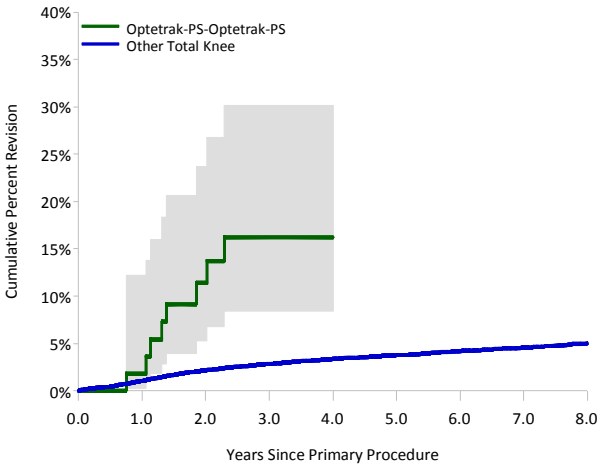








REVISION KNEE REPLACEMENT

This report is based on the analysis of 20,942 revision knee procedures recorded by the Registry up to and including the 31st December 2008. Included in this group of revisions is a subgroup of 7,637 first revisions of a primary knee replacement. The remaining 13,305 procedures are either revisions of primary or revision procedures performed before the implementation of the Registry or revisions of revision procedures.

Revision knee procedures are categorised as major or minor. A major revision involves the removal and/or replacement of a major component. The Registry defines a major component (with the exception of the patella) as one that interfaces with bone i.e. either the femoral and/or tibial component. When either the femoral or tibial component is revised it is referred to as a partial major revision, if both are revised it is referred to as a total major revision. A minor revision is a revision where a major component has not been removed or replaced. Examples of this include patellar replacement, tibial insert exchange, or both.

The major focus of this section of the report is to provide preliminary information on the outcome of the first revision of primary unicompartmental and total knee replacement. To achieve this effectively the Registry needs to have a full chronological list of procedures dating back to the original primary procedure. At this stage of the Registry's development primary data are not available for the majority of revisions recorded as the primary was performed prior to the commencement of the Registry. Not only is the Registry unaware of the original primary procedure, it is not certain if the first revision recorded is the first revision procedure for that individual. Consequently an analysis of outcome based on the data of all revision procedures is not possible. Analysis of these data can however provide information on the types of revisions being performed, the way in which it is changing and the reasons for those revisions.

There is however an increasing proportion of revision procedures where this is a record of the original primary and a chronological list of all subsequent procedures. The Registry refers to this subgroup of revisions as 'known primary revisions'. The outcome analysis reported in this section is based on determining the rate of subsequent revision of the first revision of known primary knee i.e. the re-revision rate.

Analysis of All Revision Knee Replacement

Type of Revision Knee Replacement

The majority of knee revisions are major revisions (67.9%). The most common major revision is a major total revision involving both femoral and tibial components (71.0%). When a major partial revision is undertaken it more often involves revision of the tibial component only (12.6% of all major revisions) rather than the femoral component only (6.6% of all major revisions) (Table KR1).

Primary partial knee replacement may be revised by using partial or total knee prostheses. The other type of major revision with a large number of procedures is when both components are removed and replaced with a cement spacer (6.1%) (Table KR1).

The Registry has recorded 6,731 minor revisions (32.1% of all knee revisions). Insert only exchanges comprise 41.0% of this group, 31.3% are patellar resurfacing procedures and 23.2% are patellar resurfacing plus insert exchange (Table KR2).

During the last five years there has been little change in the proportion of the different types of revision procedures. Similarly there is little variation in the proportion of the different types of revision procedures within each state and territory (Figure KR1).

Age and Gender

The proportion of females undergoing knee revision is a little higher than males (52.0% in 2008). This has changed little in the last five years (Table KR3).

There has been no major change in the age of patients undergoing revision knee surgery with the major age group in 2008 continuing to be between 65 and 74 years (32.3%) (Table KR4).

Diagnosis

The most common reason for revision is loosening/lysis (43.5%). Other major reasons for revision include infection (17.5%), tibial wear (6.7%), pain (6.6%) and patello-femoral pain (5.9%) (Table KR5).

Analysis of First Revision of Known Primary Knee Replacement

The essential difference between the 'known primary revision' group compared to the 'all revision' group is the time to revision. In the 'known primary revision' group the original primary has been recorded by the Registry. The Registry started collecting data in 1999 becoming fully national in mid 2002, therefore most of these revisions have occurred within less than six years of the original primary (i.e. early to mid term revisions).

Type of Revision Knee Replacement

There are differences in the type of revision in the 'known primary revision' group when compared to the 'all revision' group.

The 'known primary revision' group has a lower proportion of major revisions (62.8%) compared to

the 'all revision' group (67.9%). There is also a reduction in the proportion of major revisions that are major total revisions (63.5% compared to 71.0%). Other differences include a higher proportion of femoral only major revisions (10.5% compared to 6.6%) (Table KR6). There is a higher proportion of minor revisions (37.2% compared to 32.1%). The most common minor revisions are patellar resurfacing only (42.3%) and insert only (38.3%) (Table KR7).

Diagnosis

Revisions undertaken because of pain or patello-femoral pain occur more frequently in this group compared to the 'all revision' group. As would be anticipated there are fewer revisions for wear related diagnoses in the 'known primary revision' group although loosening and/or lysis is still the most common reason for revision (36.8%). Infection is the next most common reason (17.1%) (Table KR5).

Outcome of Known Primary Revision Knee Replacement

This analysis examines the risk of subsequent revision following the first revision of known primary unicompartmental and primary total knee replacement. This analysis has not been undertaken for the other classes of primary knee procedures recorded by the Registry because of the smaller number of primary and hence subsequent revision procedures in each of these classes. First revisions revised for infection have been excluded for the same reasons as previously detailed in the outcome of the first revision of known primary hip replacement.

The outcomes of the first revision of known primary unicompartmental knee replacement (1,948 procedures) and known primary total knee replacement (4,153 procedures) are considered separately.

Outcome of First Revision of Known Primary Unicompartmental Knee Replacement

The outcome of the first revision of primary unicompartmental knees is dependent on the type of revision undertaken. There are four options for revising a unicompartmental knee replacement. The first three options are unicompartmental to unicompartmental revisions, minor revision (insert replacement), major partial unicompartmental revision (replacement of either the tibial or the femoral prosthesis) and major total unicompartmental revision (replacement of both femoral and tibial unicompartmental prostheses). The final option is to convert the unicompartmental knee to a total knee replacement.

Revision to a total knee has a significantly lower rate of re-revision compared to a unicompartmental to unicompartmental option. The outcome of the three different unicompartmental to unicompartmental options appear similar, however it is difficult to be certain about the major total unicompartmental revision group as only a few of these procedures have been performed (Tables KR8 and KR9 and Figure KR2).

Unicompartmental to unicompartmental revisions when combined into one group have a revision rate of 9.7 revisions per 100 observed component years compared to 3.3 for unicompartmental to total knee. The risk of revision of a unicompartmental to unicompartmental revision is over four times greater in the first one and a half years following the first revision compared to a unicompartmental to total knee (Adj HR=4.39; 95%CI (3.06, 6.29) p<0.001). The cumulative percent revision at five years is 35.2% for unicompartmental to unicompartmental and 14.6% for unicompartmental to total knee revision (Tables KR10 and KR11 and Figure KR3).

Although the re-revision rate of a unicompartmental knee to a total knee is less than the re-revision rate of a unicompartmental to unicompartmental it is important to be aware that the conversion of a unicompartmental knee to a total knee does not give the same outcome as a primary total knee. The rate of re-revision of the unicompartmental knee to total is over three and a half times greater than a primary total knee (Adj HR=3.70; 95%CI (3.12, 4.39) p<0.001). The cumulative percent revision of a primary total knee replacement at five years is 3.0% and a conversion of a unicompartmental knee to a total knee is 14.6% (Tables KR12 and KR13 and Figure KR4).

Outcome of First Revision of Known Primary Total Knee Replacement

Unlike unicompartmental knee replacement the outcome of the first revision of primary total knee replacement does not appear to be related to the type of revision undertaken. There is no difference in the re-revision rate between minor and major total revisions compared to major partial (4.5, 3.9 and 4.6 revisions per 100 observed component years respectively). At five years the cumulative percent revision of a minor revision is 17.5%, a major partial revision is 18.1% and a major total revision is 17.5% (Tables KR14 and KR15 and Figure KR5).

Analysis of different types of minor revision demonstrates a difference in the re-revision rates. Three different minor revision procedures were compared, patella only, patella and insert and insert only revisions.

There is no difference between patella only and patella and insert revision. Insert only has a significantly higher rate of revision compared to revisions involving resurfacing of the patella. At five years 26.3% of insert only revisions have been re-revised.

Patella and patella and insert revisions i.e. patella resurfacing (with and without insert exchange) are

not low risk revision procedures as the cumulative percent revision of a further revision at five years is 12.7% and 16.5% respectively (Tables KR16 and KR17 and Figure KR6).

The Registry has also directly compared the outcome of total knee revisions (early and mid term) of both primary unicompartmental and primary total knee replacement. Last year the Registry reported that the risk of re-revision was significantly less if the primary was a unicompartmental knee replacement. This difference is no longer evident and it appears that the outcome of an early to mid term revision of a unicompartmental knee to a total knee is the same as that of an early to mid term major total revision of a primary total knee replacement (Tables KR18 and KR19 and Figure KR7).

REVISION KNEE REPLACEMENT

1/9/1999 – 31/12/2008

Table KR1: Major Revisions of All knee Replacement by Fixation

Components Used	Cemented		Cementless		Hybrid Tibial Cemented		Hybrid Tibial Cementless		N/A - Removal		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
TKR (Tibial/Femoral)	8118	57.1	720	5.1	934	6.6	319	2.2	0	0.0	10091	71.0
Tibial Only	1693	11.9	91	0.6	0	0.0	0	0.0	0	0.0	1784	12.6
Femoral Only	871	6.1	71	0.5	0	0.0	0	0.0	0	0.0	942	6.6
Cement Spacer	0	0.0	0	0.0	0	0.0	0	0.0	871	6.1	871	6.1
Uni Tibial Only	131	0.9	20	0.1	0	0.0	0	0.0	0	0.0	151	1.1
Removal of Prostheses	0	0.0	0	0.0	0	0.0	0	0.0	135	0.9	135	0.9
UKR (Uni Tibial/Uni Femoral)	79	0.6	6	0.0	2	0.0	5	0.0	0	0.0	92	0.6
Uni Femoral Only	68	0.5	2	0.0	0	0.0	0	0.0	0	0.0	70	0.5
Fusion Nail	0	0.0	0	0.0	0	0.0	0	0.0	41	0.3	41	0.3
Patella/Trochlear Resurfacing	24	0.2	3	0.0	0	0.0	0	0.0	0	0.0	27	0.2
Reinsertion of Components	2	0.0	1	0.0	1	0.0	2	0.0	0	0.0	6	0.0
Bicompartmental	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
TOTAL	**10987**	**77.3**	**914**	**6.4**	**937**	**6.6**	**326**	**2.3**	**1047**	**7.4**	**14211**	**100.0**

Table KR2: Minor Revisions of All Knee Replacement

Components Used	Number	Percent
Insert Only	2763	41.0
Patella Only	2107	31.3
Insert/Patella	1562	23.2
Uni Insert Only	219	3.3
Minor Components	51	0.8
Cement Only	15	0.2
Removal of Patella	8	0.1
Unispacer	4	0.1
Partial Resurfacing	2	0.0
TOTAL	**6731**	**100.0**

Figure KR1: Trends in Usage of Knee Replacement by State/Territory and Year

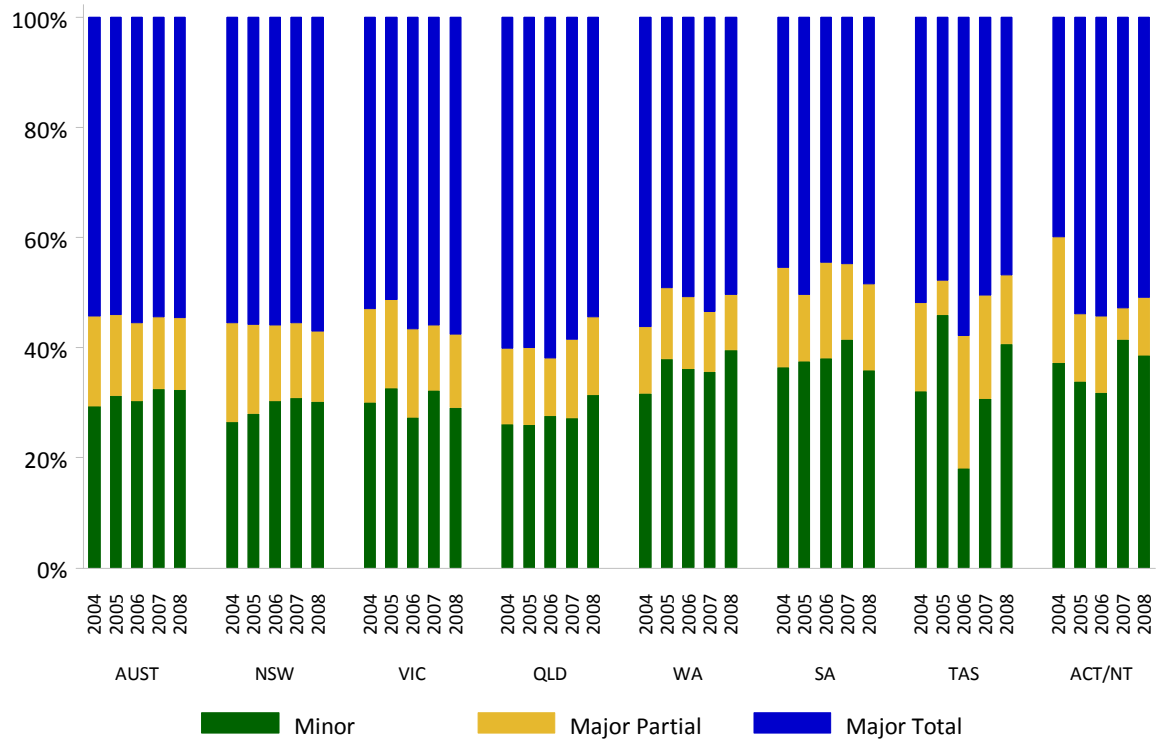


Table KR3: Revision Knee Replacement by Gender and Year

Procedure Year	Female		Male		TOTAL	
	N	%	N	%	N	%
2004	1379	51.9	1280	48.1	2659	100.0
2005	1367	50.3	1348	49.7	2715	100.0
2006	1445	51.2	1378	48.8	2823	100.0
2007	1563	52.8	1400	47.2	2963	100.0
2008	1642	52.0	1514	48.0	3156	100.0

Table KR4: Revision Knee Replacement by Age and Year

Procedure Year	<55		55-64		65-74		75-84		≥85		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
2004	274	10.3	592	22.3	888	33.4	799	30.0	106	4.0	2659	100.0
2005	232	8.5	574	21.1	924	34.0	868	32.0	117	4.3	2715	100.0
2006	250	8.9	665	23.6	925	32.8	849	30.1	134	4.7	2823	100.0
2007	266	9.0	708	23.9	949	32.0	877	29.6	163	5.5	2963	100.0
2008	311	9.9	775	24.6	1019	32.3	893	28.3	158	5.0	3156	100.0

Table KR5: Revision Diagnosis of Revision Knee Replacement

Diagnosis	Revisions of Known Primary		All Revisions	
	N	%	N	%
Loosening/Lysis	2814	36.8	9108	43.5
Infection	1304	17.1	3669	17.5
Wear Tibial	107	1.4	1395	6.7
Pain	785	10.3	1384	6.6
Patello Femoral Pain	733	9.6	1233	5.9
Progression Of Disease	437	5.7	774	3.7
Instability	306	4.0	626	3.0
Implant Breakage Tibial	54	0.7	473	2.3
Fracture	183	2.4	393	1.9
Arthrofibrosis	236	3.1	372	1.8
Other	131	1.7	268	1.3
Malalignment	134	1.8	231	1.1
Implant Breakage Patella	26	0.3	158	0.8
Incorrect Sizing	86	1.1	126	0.6
Wear Patella	5	0.1	122	0.6
Dislocation	65	0.9	109	0.5
Bearing/Dislocation	56	0.7	104	0.5
Implant Breakage Femoral	16	0.2	96	0.5
Patella Maltracking	44	0.6	94	0.4
Synovitis	33	0.4	62	0.3
Metal Sensitivity	17	0.2	49	0.2
Avascular Necrosis	27	0.4	32	0.2
Patella Erosion	28	0.4	29	0.1
Heterotropic Bone	3	0.0	13	0.1
Tumour	4	0.1	11	0.1
Dislocation Of Patella	1	0.0	3	0.0
Incorrect Side	2	0.0	2	0.0
Wear Femoral	0	0.0	6	0.0
TOTAL	**7637**	**100.0**	**20942**	**100.0**

Table KR6: Major 'Revision of Known Primary' Revision Knee Replacement by Fixation

Components Used	Cemented		Cementless		Hybrid Tibial Cemented		Hybrid Tibial Cementless		N/A - Removal		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
TKR (Tibial/Femoral)	2203	45.9	328	6.8	423	8.8	93	1.9	0	0.0	3047	63.5
Tibial Only	617	12.9	30	0.6	0	0.0	0	0.0	0	0.0	647	13.5
Femoral Only	472	9.8	31	0.6	0	0.0	0	0.0	0	0.0	503	10.5
Cement Spacer	0	0.0	0	0.0	0	0.0	0	0.0	302	6.3	302	6.3
Uni Tibial Only	101	2.1	17	0.4	0	0.0	0	0.0	0	0.0	118	2.5
UKR (Uni Tibial/Uni Femoral)	50	1.0	4	0.1	2	0.0	3	0.1	0	0.0	59	1.2
Removal of Prostheses	0	0.0	0	0.0	0	0.0	0	0.0	56	1.2	56	1.2
Uni Femoral Only	47	1.0	1	0.0	0	0.0	0	0.0	0	0.0	48	1.0
Patella/Trochlear Resurfacing	10	0.2	0	0.0	0	0.0	0	0.0	0	0.0	10	0.2
Reinsertion of Components	1	0.0	1	0.0	1	0.0	1	0.0	0	0.0	4	0.1
Fusion Nail	0	0.0	0	0.0	0	0.0	0	0.0	4	0.1	4	0.1
TOTAL	**3501**	**73.0**	**412**	**8.6**	**426**	**8.9**	**97**	**2.0**	**362**	**7.5**	**4798**	**100.0**

Table KR7: Minor 'Revision of Known Primary' Revision Knee Replacement

Components Used	Number	Percent
Patella Only	1200	42.3
Insert Only	1088	38.3
Insert/Patella	389	13.7
Uni Insert Only	137	4.8
Minor Components	10	0.4
Cement Only	9	0.3
Unispacer	4	0.1
Partial Resurfacing	2	0.1
TOTAL	**2839**	**100.0**

Table KR8: Revision Rates of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

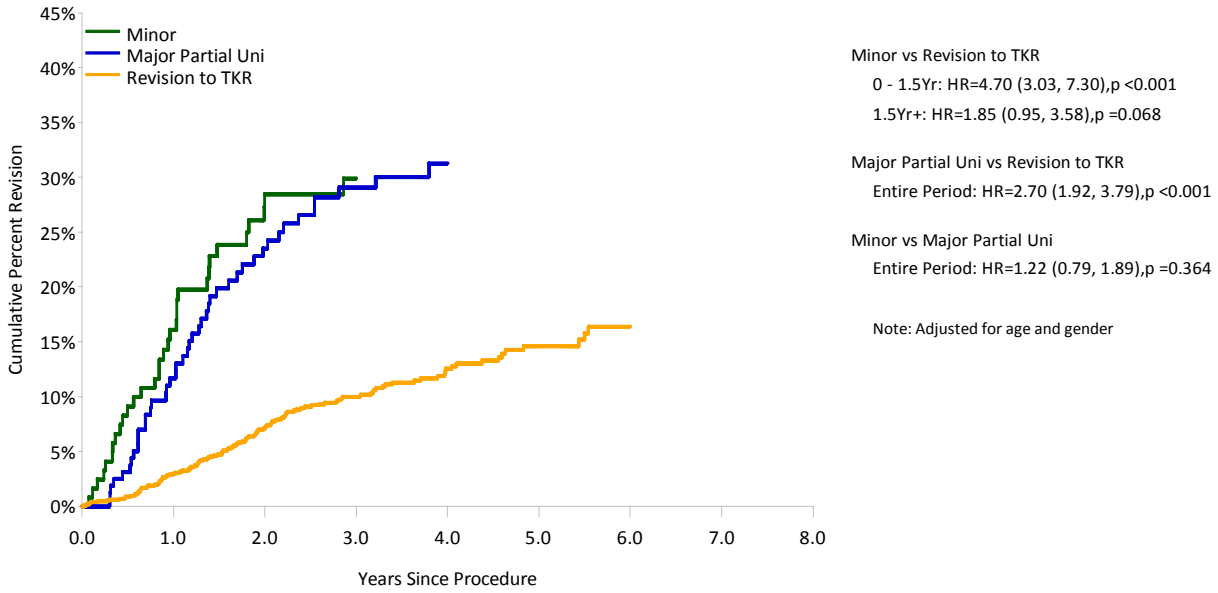
Primary UKR Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Minor	37	126	331	11.2	(7.86, 15.39)
Major Partial Uni	46	165	503	9.1	(6.70, 12.20)
Major Total Uni	6	30	83	7.2	(2.66, 15.76)
Revision to TKR	138	1627	4246	3.3	(2.73, 3.84)
TOTAL	**227**	**1948**	**5163**	**4.4**	**(3.84, 5.01)**

Note: Not including revisions where no femoral and tibial components have been inserted.
Excluding 3 Patella/Trochlear Resurfacing Revisions and i BKR revision

Table KR9: Yearly Cumulative Percent Revision of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Minor	16.1 (10.6, 24.1)	29.9 (22.0, 39.9)			
Major Partial Uni	11.7 (7.5, 17.9)	29.0 (22.3, 37.3)			
Revision to TKR	3.0 (2.2, 4.0)	10.0 (8.3, 12.0)	14.6 (12.2, 17.5)		

Figure KR2: Cumulative Percent Revision of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Minor	126	92	61	45	32	21	13	4	1
Major Partial Uni	165	131	104	78	53	34	19	7	1
Revision to TKR	1627	1256	904	619	393	205	86	16	1

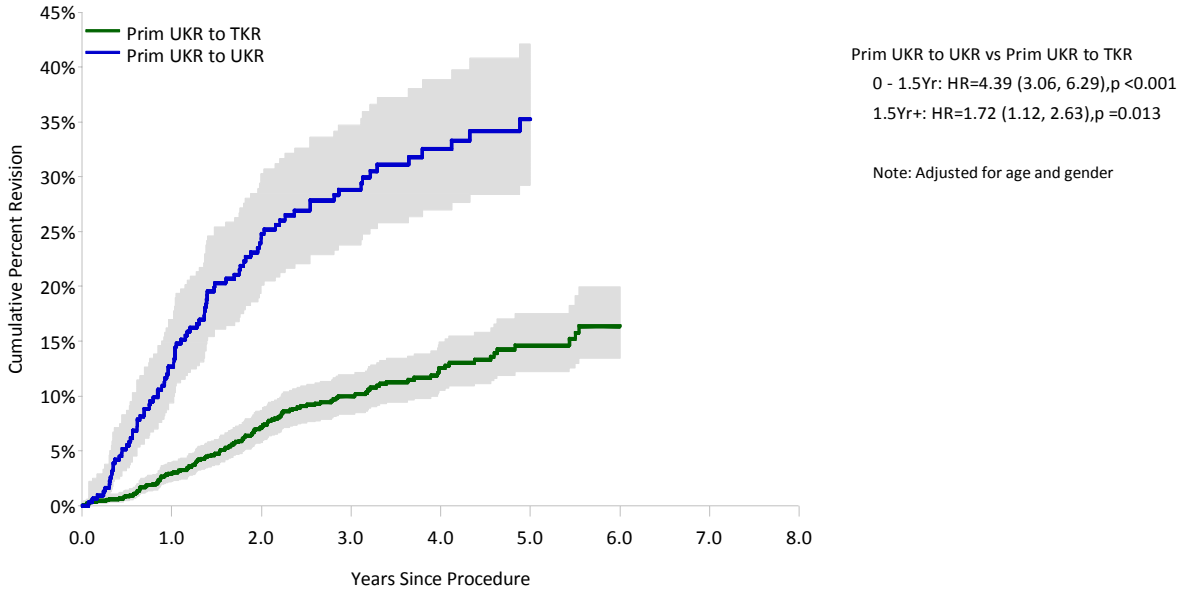
Table KR10: Revision Rates of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

Primary UKR Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Prim UKR to TKR	138	1627	4246	3.3	(2.73, 3.84)
Prim UKR to UKR	89	321	917	9.7	(7.79, 11.94)
TOTAL	**227**	**1948**	**5163**	**4.4**	**(3.84, 5.01)**

Table KR11: Yearly Cumulative Percent Revision of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Prim UKR to TKR	3.0 (2.2, 4.0)	10.0 (8.3, 12.0)	14.6 (12.2, 17.5)		
Prim UKR to UKR	12.7 (9.4, 17.0)	28.8 (23.8, 34.7)	35.2 (29.2, 42.1)		

Figure KR3: Cumulative Percent Revision of 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Prim UKR to TKR	1627	1256	904	619	393	205	86	16	1
Prim UKR to UKR	321	248	181	134	90	59	35	13	4

Table KR12: Revision Rates of Primary Total and 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

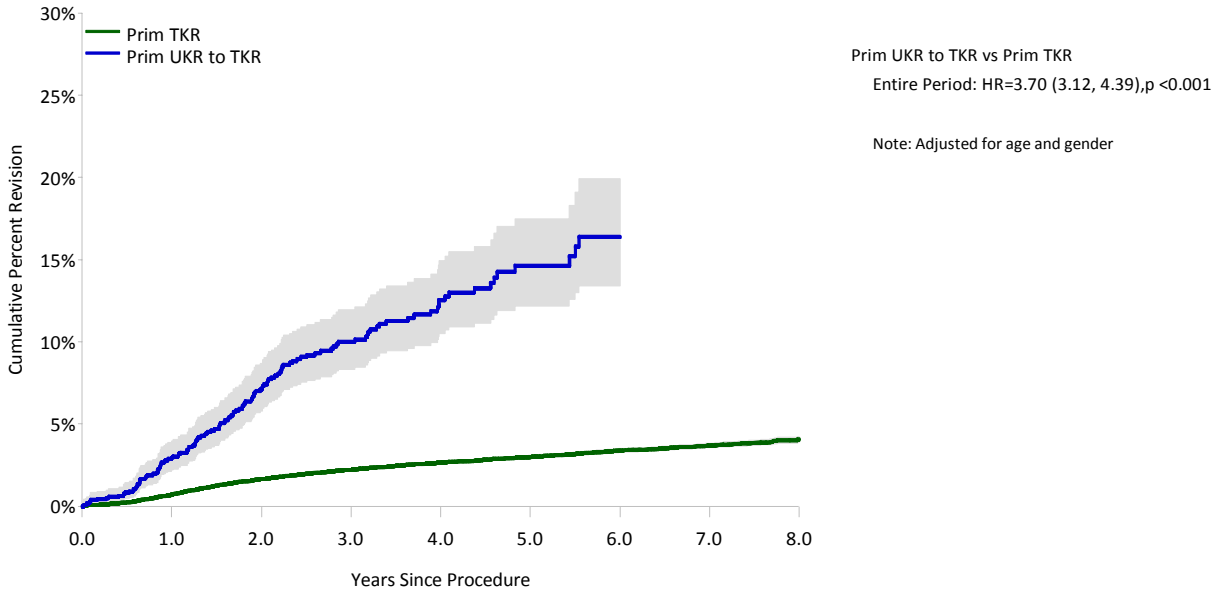
Procedure	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Prim TKR	4201	196096	659923	0.6	(0.62, 0.66)
Prim UKR to TKR	138	1627	4246	3.3	(2.73, 3.84)
TOTAL	**4339**	**197723**	**664168**	**0.7**	**(0.63, 0.67)**

Note: Excluding revisions where no minor or major tibial or femoral components have been inserted

Table KR13: Yearly Cumulative Percent Revision of Primary Total and 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Prim TKR	0.7 (0.7, 0.8)	2.2 (2.2, 2.3)	3.0 (2.9, 3.1)	3.7 (3.6, 3.8)	4.1 (3.9, 4.3)
Prim UKR to TKR	3.0 (2.2, 4.0)	10.0 (8.3, 12.0)	14.6 (12.2, 17.5)		

Figure KR4: Cumulative Percent Revision of Primary Total and 'Revision of Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Prim TKR	196096	160882	129084	100460	73878	50946	30808	13914	3504
Prim UKR to TKR	1627	1256	904	619	393	205	86	16	1

Table KR14: Revision Rates of 'Revision of Primary' Total Knee Replacement (excluding Infection)

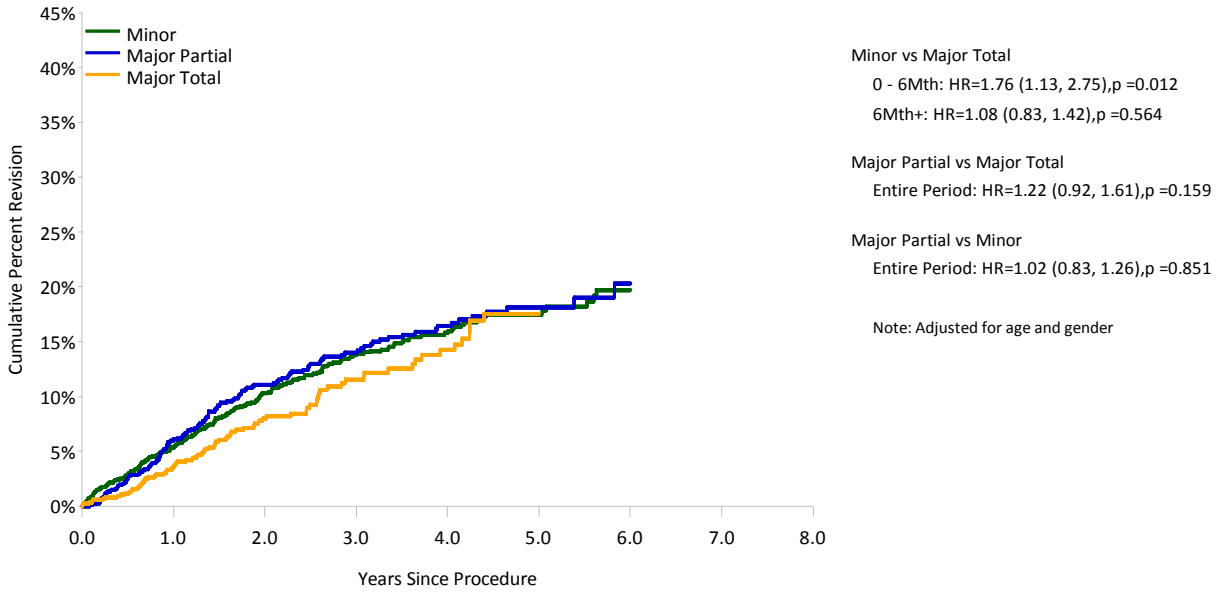
Primary TKR Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Minor	239	2177	5270	4.5	(3.98, 5.15)
Major Partial	133	1080	2897	4.6	(3.84, 5.44)
Major Total	81	896	2099	3.9	(3.06, 4.80)
TOTAL	**453**	**4153**	**10266**	**4.4**	**(4.02, 4.84)**

Note: Excluding revisions where no minor or major tibial or femoral components have been inserted

Table KR15: Yearly Cumulative Percent Revision of 'Revision of Primary' Total Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Minor	5.4 (4.4, 6.5)	13.8 (12.1, 15.7)	17.5 (15.3, 19.9)		
Major Partial	6.1 (4.7, 7.8)	14.0 (11.7, 16.6)	18.1 (15.3, 21.4)		
Major Total	3.6 (2.5, 5.2)	11.5 (9.0, 14.6)	17.5 (13.8, 22.1)		

Figure KR5: Cumulative Percent Revision of 'Revision of Primary' Total Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Minor	2177	1573	1092	737	441	238	115	30	7
Major Partial	1080	823	609	445	294	141	54	15	1
Major Total	896	650	432	275	181	88	37	7	1

Table KR16: Revision Rates of 'Minor Revision of Primary' Total Knee Replacement (excluding Infection)

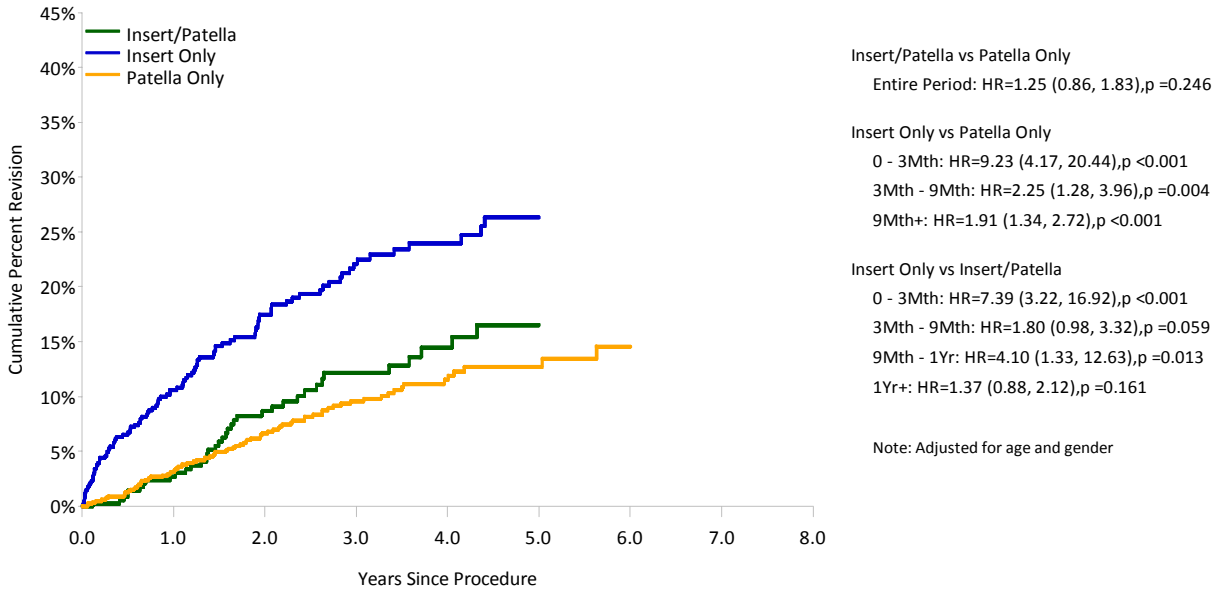
Primary TKR Minor Revisions	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Insert/Patella	39	383	1015	3.8	(2.73, 5.26)
Insert Only	108	622	1375	7.9	(6.44, 9.48)
Patella Only	87	1164	2863	3.0	(2.43, 3.75)
TOTAL	**234**	**2169**	**5253**	**4.5**	**(3.90, 5.06)**

Note: Only including minor revisions where an insert and/or patella have been inserted

Table KR17: Yearly Cumulative Percent Revision of 'Minor Revision of Primary' Total Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Insert/Patella	2.7 (1.4, 5.1)	12.1 (8.7, 16.9)	16.5 (11.8, 22.7)		
Insert Only	10.6 (8.3, 13.4)	22.1 (18.3, 26.5)	26.3 (21.7, 31.7)		
Patella Only	3.1 (2.2, 4.4)	9.6 (7.6, 12.0)	12.7 (10.1, 15.8)		

Figure KR6: Cumulative Percent Revision of 'Minor Revision of Primary' Total Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Insert/Patella	383	294	211	149	88	53	25	9	2
Insert Only	622	415	273	188	111	64	29	6	2
Patella Only	1164	860	605	398	240	120	60	15	3

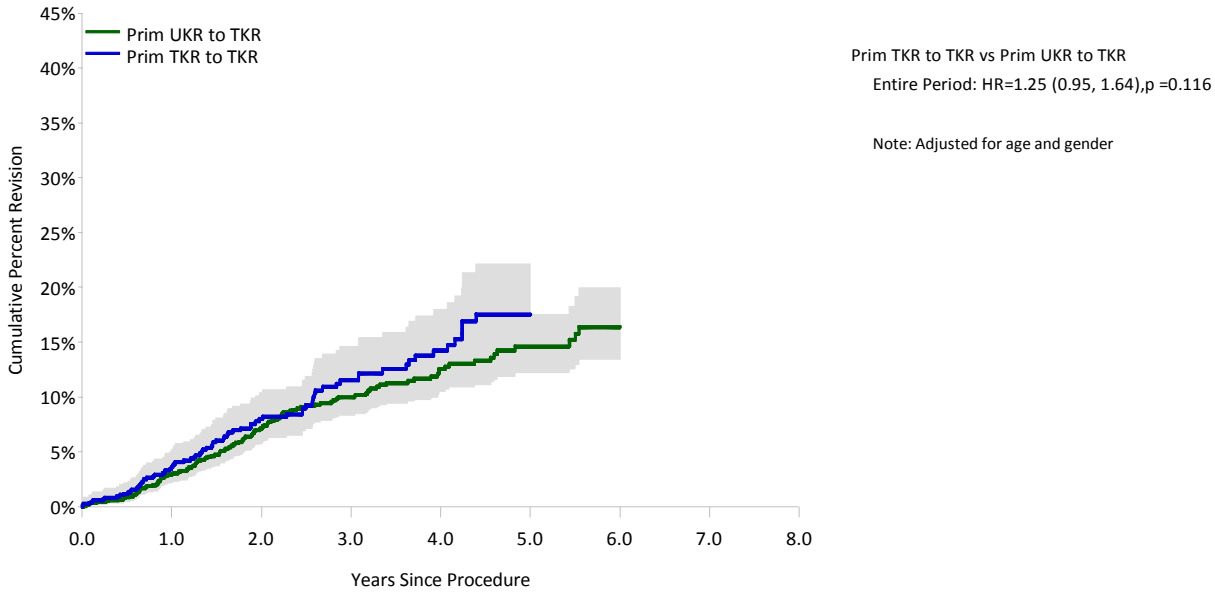
Table KR18: Revision Rates of 'Revision of Primary' Knee Replacement (excluding Infection)

Primary Procedure	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Prim UKR to TKR	138	1627	4246	3.3	(2.73, 3.84)
Prim TKR to TKR	81	896	2099	3.9	(3.06, 4.80)
TOTAL	**219**	**2523**	**6345**	**3.5**	**(3.01, 3.94)**

Table KR19: Yearly Cumulative Percent Revision of 'Revision of Primary' Knee Replacement (excluding Infection)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Prim UKR to TKR	3.0 (2.2, 4.0)	10.0 (8.3, 12.0)	14.6 (12.2, 17.5)		
Prim TKR to TKR	3.6 (2.5, 5.2)	11.5 (9.0, 14.6)	17.5 (13.8, 22.1)		

Figure KR7: Cumulative Percent Revision of 'Revision of Primary' Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Prim UKR to TKR	1627	1256	904	619	393	205	86	16	1
Prim TKR to TKR	896	650	432	275	181	88	37	7	1

CEMENT IN HIP AND KNEE REPLACEMENT

This section details the use of cement in both primary and revision hip and knee procedures reported to the Registry up to and including 31st December 2008.

USAGE OF CEMENT IN HIP AND KNEE REPLACEMENT

Antibiotic cement is used more frequently than plain cement in both primary hip and knee replacement. A procedure in which antibiotic cement is used for one or both components is classified as a procedure with antibiotic cement.

The use of antibiotic cement in primary total hip replacement has increased from 73.4% in 2004 to 87.0% in 2008, and in primary total knee replacement from 71.0% in 2004 to 85.5% in 2008. This trend is evident in all states for both primary total hip and knee replacement. In Tasmania antibiotic cement was used in all cemented primary total hip replacement in 2008 (Figures C1 and C2).

PRIMARY HIP REPLACEMENT

There continues to be an increase in the number of types of cement used for both femoral and acetabular fixation. The number of cement types used for femoral fixation has increased from 52 in 2007 to 57 in 2008 and from 40 to 44 for acetabular fixation (Table C1).

Simplex Tobra is the most used cement for both femoral and acetabular fixation. The ten most used cements account for 91.4% of all cemented procedures for femoral fixation, and 94.6% in acetabular fixation. Eight of the ten most used cements for the femoral component and seven for the acetabular component are antibiotic cements (Table C1).

PRIMARY KNEE REPLACEMENT

There is also an increase in the number of types of cement used for femoral, tibial and patellar fixation. The number of cement types used for femoral fixation has increased from 50 in 2007 to 54 in 2008, 50 to 53 for tibial fixation, and 48 to 52 for patellar fixation (Table C2).

CMW 1 G is the most used cement type for femoral and tibial fixation and Simplex Tobra for the patellar component. The ten most used cement types account for 90.0% for femoral and tibial fixation, and for 88.7% for the patella. Seven of the ten most used cements for all three components in primary total knee replacement are antibiotic cements (Table C2).

REVISION HIP REPLACEMENT

There are fewer cement types used for cement fixation for revision hip replacement compared to primary hip replacement, 41 for femoral and 37 for acetabular. The ten most used cement types account for 91.8% of all procedures where cement is used for femoral fixation and 94.2% for acetabular fixation (Table C3).

Antibiotic cement is used for the majority of procedures where the femoral and acetabular components are cemented. Plain cement accounts for 15.4% of cement types for the femoral component and 13.9% for the acetabular component. Simplex Tobra continues to be the most used cement type for the femoral component (36.6%) and CMW 1 G (23.9%) for the acetabular component (Table C3).

REVISION KNEE REPLACEMENT

Fewer cement types are used for revision knee replacement compared to primary knee replacement, 44 for the femoral and patellar components and 46 for the tibial component. The ten most used cement types account for 90.0% of all femoral and tibial components with cement fixation and 89.6% of patellar components (Table C4).

CMW 1 G is the most used cement in cemented revision procedures for all three components. Plain cement is used in 12.0% of cemented femoral, 13.1% of tibial and 24.1% of the patellar component (Table C4).

OUTCOMES OF PRIMARY HIP AND KNEE REPLACEMENT

The Registry has compared the outcomes of the use of cement in primary conventional total hip and primary total knee replacement.

PRIMARY CONVENTIONAL TOTAL HIP REPLACEMENT

In the first six months following surgery, plain cement has a significantly lower risk of revision compared to antibiotic cement, however from six months to one and a half years plain cement has a significantly higher risk of revision. From one and a half years onwards there is no significant difference in the risk of revision between antibiotic or plain cement (Tables C5, C6 and C7 and Figure C3). There is a difference in the risk of revision for infection accounting for 0.50% of revisions when antibiotic cement is used and 0.68% of revisions when plain cement is used. The number of revisions for loosening and lysis when antibiotic cement is used is 0.80% compared to 1.41% when plain cement is used. (Table C8).

Table C8 reports the reasons for revision following known primary procedures. The difference in revisions for loosening and lysis for the antibiotic and non-antibiotic groups may be due to a proportion of these being "missed" infections. Due to the follow up time available between primary and revision procedures these diagnoses reflects early and mid term revisions. Aseptic loosening and wear related

lysis are uncommon reasons for early and mid term revision. It is possible and perhaps probable that at least some if not most of the revisions undertaken for these two reasons are consequent to undiagnosed infection. The likelihood of this occurring is increased by the fact that Registry data are collected at the time of the operation and any infections subsequently diagnosed may be missed. The Registry is also unlikely to receive late notification of infection if it is subsequently diagnosed.

PRIMARY TOTAL KNEE REPLACEMENT

There is a higher risk of revision in primary total knee replacement when plain cement is used compared to antibiotic cement (Adj HR= 1.14; 95%CI (1.04, 1.24) p=0.004) (Tables C9, C10 and C11 and Figure C4).

There is a higher number of revisions for infection when plain cement is used (0.91%) compared to when antibiotic cement is used (0.67%). There is also a higher number of revisions for loosening and lysis when plain cement is used (1.06%) compared to when antibiotic cement is used (0.65%). There is also a higher incidence of arthrofibrosis reported when plain cement is used. These differences may be due to the reasons outlined in relation to revision hip replacement (Table C12).

Figure C1: Trends in Usage of Antibiotic Cement in Primary Conventional Total Hip Replacement by State/Territory and Year

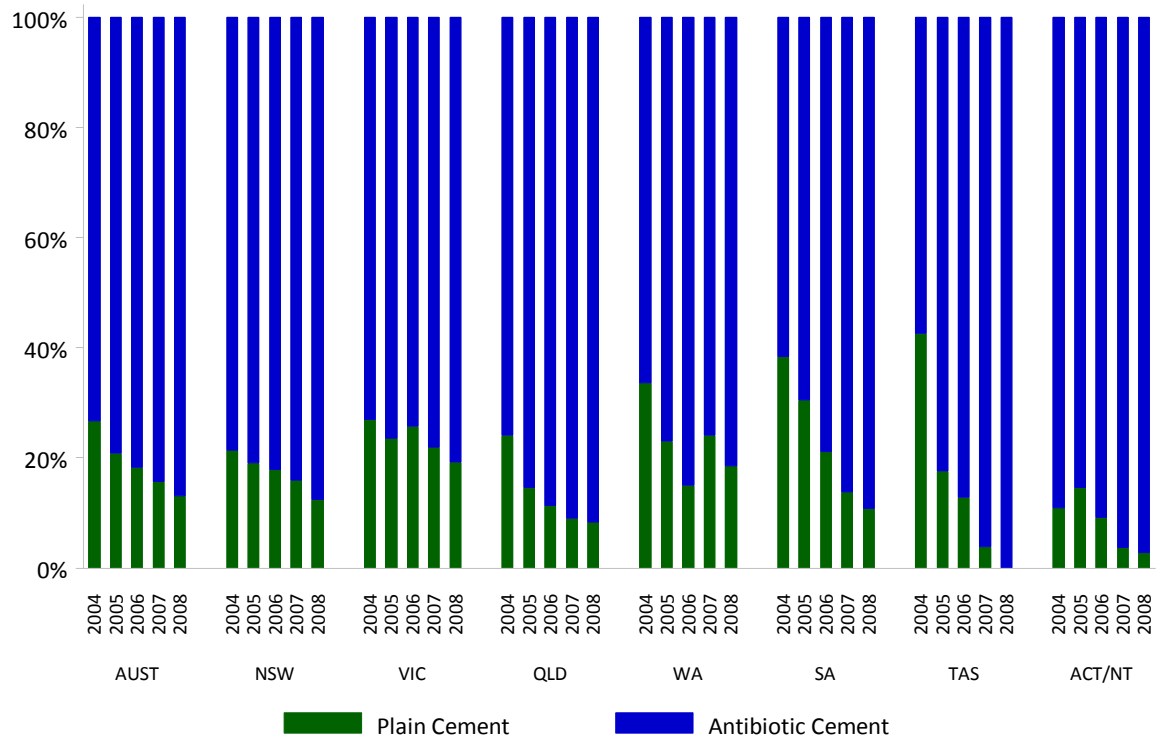


Figure C2: Trends in Usage of Antibiotic Cement in Primary Total Knee Replacement by State/Territory and Year

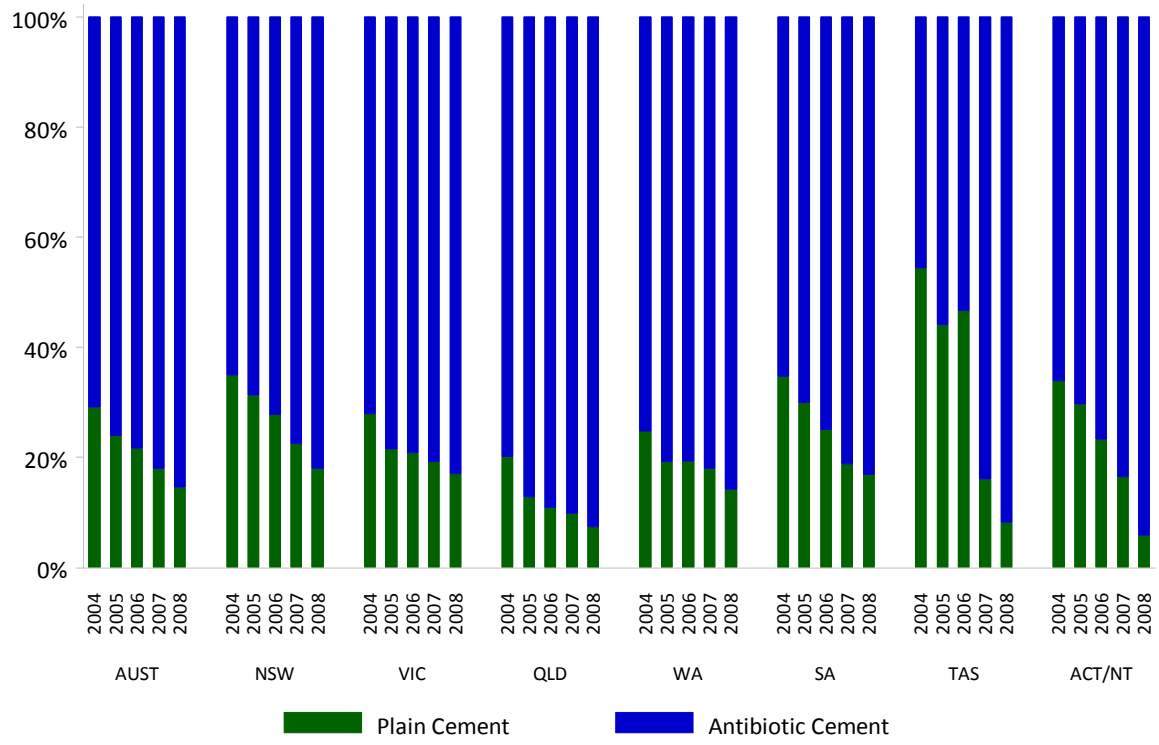


Table C1: 10 Most Used Cements in Primary Hip Replacement by Location

Femur	N	%	Acetabulum	N	%
Simplex Tobra*	28515	33.0	Simplex Tobra*	4094	22.7
Simplex P	18691	21.6	CMW 1 Plain	2428	13.5
Antibiotic Simplex*	13966	16.2	Simplex P	2293	12.7
CMW 1 G*	5366	6.2	CMW 1 G*	2272	12.6
CMW 1 Plain	3562	4.1	Antibiotic Simplex*	1536	8.5
Palacos R*	2872	3.3	Palacos R*	1521	8.4
Palamed G*	1742	2.0	CMW 2 G*	1266	7.0
Palacos R+G*	1597	1.8	CMW 2 Plain	630	3.5
CMW 3 G*	1524	1.8	Palamed G*	614	3.4
Palacos E*	1129	1.3	Palacos R+G*	378	2.1
Other types (47)	7471	8.6	Other types (34)	977	5.4
Total	**86435**	**100.0**	**Total**	**18009**	**100.0**

Note: * denotes antibiotic cement
More than one type of cement was used in some procedures.
Primary hip replacement does not include partial resurfacing, total resurfacing or thrust plates.

Palacos R was changed to a non Gentamicin cement in mid 2007. The Registry now reports the antibiotic cement as 'Palacos R*' and the plain cement as 'Palacos R'.

Table C2: 10 Most Used Cements in Primary Knee Replacement by Location

Femur	N	%	Tibia	N	%	Patella	N	%
CMW 1 G*	20405	15.7	CMW 1 G*	26304	15.2	Simplex Tobra*	12053	14.8
Simplex Tobra*	17912	13.8	Simplex Tobra*	24351	14.0	CMW 1 G*	10064	12.4
Palacos R+G*	12384	9.5	Simplex P	17471	10.1	Antibiotic Simplex*	7977	9.8
Simplex P	11748	9.0	Antibiotic Simplex*	14494	8.4	Palacos R+G*	7284	9.0
Antibiotic Simplex*	11020	8.5	CMW 2 G*	14215	8.2	Simplex P	7059	8.7
CMW 2 G*	10500	8.1	Palacos R+G*	13929	8.0	CMW 2 G*	6647	8.2
Palamed G*	9716	7.5	CMW 1 Plain	12623	7.3	CMW 2 Plain	5711	7.0
Palacos R*	8959	6.9	Palamed G*	11256	6.5	Palamed G*	5468	6.7
CMW 1 Plain	8776	6.7	CMW 2 Plain	10837	6.2	Palacos R*	4917	6.1
CMW 2 Plain	5685	4.4	Palacos R*	10674	6.2	CMW 1 Plain	4901	6.0
Other types (44)	13039	10.0	Other types (43)	17331	10.0	Other types (42)	9184	11.3
Total	**130144**	**100.0**	**Total**	**173485**	**100.0**	**Total**	**81265**	**100.0**

Note: * denotes antibiotic cement
More than one type of cement was used in some procedures.
Primary hip replacement does not include partial resurfacing, total resurfacing or thrust plates.

Palacos R was changed to a non Gentamicin cement in mid 2007. The Registry now reports the antibiotic cement as 'Palacos R*' and the plain cement as 'Palacos R'.

Table C3: 10 Most Used Cements in Revision Hip Replacement by Location

Femur	N	%	Acetabulum	N	%
Simplex Tobra*	2056	36.6	CMW 1 G*	1364	23.9
Antibiotic Simplex*	1050	18.7	Simplex Tobra*	1172	20.5
Simplex P	548	9.8	Palacos R*	637	11.2
CMW 1 G*	485	8.6	Antibiotic Simplex*	578	10.1
Palacos R*	314	5.6	CMW 2 G*	410	7.2
Palacos R+G*	193	3.4	CMW 1 Plain	304	5.3
Palamed G*	174	3.1	Palacos R+G*	288	5.0
CMW 1 Plain	147	2.6	Palamed G*	270	4.7
CMW 3 G*	95	1.7	Simplex P	246	4.3
CMW 2 G*	94	1.7	CMW 2 Plain	110	1.9
Other types (31)	461	8.2	Other types (27)	330	5.8
Total	**5617**	**100.0**	**Total**	**5709**	**100.0**

Note: * denotes antibiotic cement
More than one type of cement was used in some procedures.

Palacos R was changed to a non Gentamicin cement in mid 2007. The Registry now reports the antibiotic cement as 'Palacos R*' and the plain cement as 'Palacos R'.

Table C4: 10 Most Used Cements in Revision Knee Replacement by Location

Femur	N	%	Tibia	N	%	Patella	N	%
CMW 1 G*	2017	19.5	CMW 1 G*	2394	20.1	CMW 1 G*	1304	15.1
Simplex Tobra*	1587	15.4	Simplex Tobra*	1751	14.7	CMW 2 G*	1278	14.8
Palacos R+G*	1030	10.0	Palacos R+G*	1145	9.6	Simplex Tobra*	1036	12.0
Antibiotic Simplex*	983	9.5	CMW 2 G*	1104	9.3	CMW 2 Plain	873	10.1
Palacos R*	963	9.3	Antibiotic Simplex*	1093	9.2	Antibiotic Simplex*	668	7.7
CMW 2 G*	897	8.7	Palacos R*	1065	8.9	Palacos R*	647	7.5
Palamed G*	785	7.6	Palamed G*	872	7.3	Palacos R+G*	632	7.3
Simplex P	430	4.2	Simplex P	487	4.1	Simplex P	518	6.0
CMW 1 Plain	315	3.1	CMW 2 Plain	413	3.5	Palamed G*	471	5.4
Refobacin Plus*	286	2.8	CMW 1 Plain	404	3.4	CMW 1 Plain	326	3.8
Other types (34)	1029	10.0	Other types (36)	1196	10.0	Other types (34)	904	10.4
Total	**10322**	**100.0**	**Total**	**11924**	**100.0**	**Total**	**8657**	**100.0**

Note: * denotes antibiotic cement
More than one type of cement was used in some procedures.

Palacos R was changed to a non Gentamicin cement in mid 2007. The Registry now reports the antibiotic cement as 'Palacos R*' and the plain cement as 'Palacos R'.

Cement in Primary Conventional Total Hip Replacement

Table C5: Revision Rates of Cemented Primary Conventional Total Hip Replacement by Cement Type and Location (Primary Diagnosis OA)

Cement Femur	Cement Acetabular	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Antibiotic	Antibiotic	213	8810	33309	0.6	(0.56, 0.73)
Antibiotic	Plain	12	260	1056	1.1	(0.59, 1.98)
Plain	Antibiotic	18	723	3026	0.6	(0.35, 0.94)
Plain	Plain	152	4676	24114	0.6	(0.53, 0.74)
TOTAL		**395**	**14469**	**61506**	**0.6**	**(0.58, 0.71)**

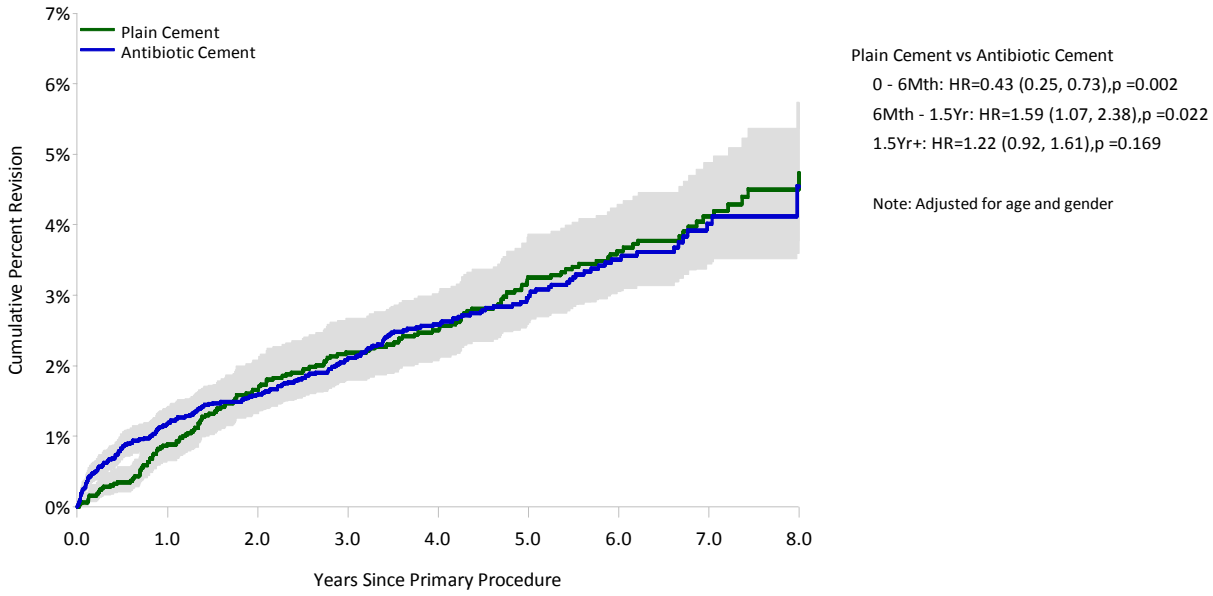
Table C6: Revision Rates of Cemented Primary Conventional Total Hip Replacement by Cement Type (Primary Diagnosis OA)

Antibiotic Status	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Plain Cement	152	4676	24114	0.6	(0.53, 0.74)
Antibiotic Cement	243	9793	37391	0.6	(0.57, 0.74)
TOTAL	**395**	**14469**	**61506**	**0.6**	**(0.58, 0.71)**

Table C7: Yearly Cumulative Percent Revision of Cemented Primary Conventional Total Hip Replacement by Cement Type (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Plain Cement	0.9 (0.6, 1.2)	2.2 (1.8, 2.7)	3.3 (2.7, 3.9)	4.1 (3.5, 4.9)	4.7 (3.9, 5.7)
Antibiotic Cement	1.2 (1.0, 1.4)	2.1 (1.8, 2.4)	3.0 (2.6, 3.4)	4.0 (3.4, 4.7)	4.5 (3.6, 5.7)

Figure C3: Cumulative Percent Revision of Cemented Primary Conventional Total Hip Replacement by Cement Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Plain Cement	4676	4365	4036	3664	3256	2730	2050	1221	415
Antibiotic Cement	9793	8452	7263	5887	4573	3227	2025	956	218

Table C8: Revision Diagnosis for Cemented Primary Conventional Total Hip Replacement by Cement Type (Primary Diagnosis OA)

Revision Diagnosis	Antibiotic Cement		Plain Cement	
	N	% Primary	N	% Primary
Loosening/Lysis	78	0.80	66	1.41
Dislocation Of Prosthesis	75	0.77	33	0.71
Infection	49	0.50	32	0.68
Fracture	30	0.31	14	0.30
Other	11	0.11	7	0.15
Total	**243**	**2.48**	**152**	**3.25**

Cement in Primary Total Knee Replacement

Table C9: Revision Rates of Cemented Primary Total Knee Replacement by Cement Type and Location (Primary Diagnosis OA)

Cement Femur	Cement Tibia	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Antibiotic	Antibiotic	1763	75599	224102	0.8	(0.75, 0.82)
Antibiotic	Plain	9	467	1995	0.5	(0.21, 0.86)
Plain	Antibiotic	11	264	1020	1.1	(0.54, 1.93)
Plain	Plain	686	20256	86582	0.8	(0.73, 0.85)
TOTAL		**2469**	**96586**	**313699**	**0.8**	**(0.76, 0.82)**

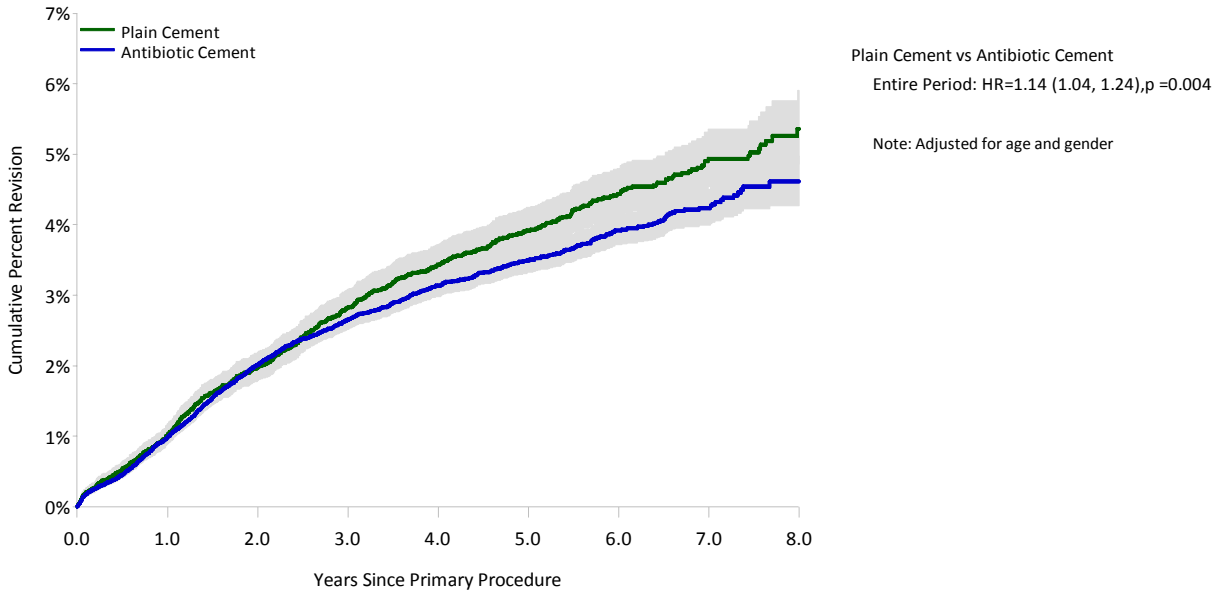
Table C10: Revision Rates of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)

Antibiotic Status	N Revised	N Total	Obs. Years	Revisions per 100 Obs. Yrs	Exact 95% CI
Plain Cement	686	20256	86582	0.8	(0.73, 0.85)
Antibiotic Cement	1783	76330	227117	0.8	(0.75, 0.82)
TOTAL	**2469**	**96586**	**313699**	**0.8**	**(0.76, 0.82)**

Table C11: Yearly Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Plain Cement	1.0 (0.9, 1.2)	2.8 (2.6, 3.1)	3.9 (3.6, 4.2)	4.9 (4.5, 5.4)	5.4 (4.9, 5.9)
Antibiotic Cement	1.0 (0.9, 1.1)	2.6 (2.5, 2.8)	3.5 (3.3, 3.7)	4.2 (4.0, 4.5)	4.6 (4.3, 5.0)

Figure C4: Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Plain Cement	20256	18145	15791	13241	10913	8547	5758	3132	889
Antibiotic Cement	76330	59913	45676	33662	23218	14666	8459	3573	779

Table C12: Revision Diagnosis for Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)

Revision Diagnosis	Antibiotic Cement		Plain Cement	
	N	% Primary	N	% Primary
Loosening/Lysis	499	0.65	215	1.06
Infection	514	0.67	185	0.91
Patello Femoral Pain	214	0.28	78	0.39
Pain	170	0.22	47	0.23
Instability	94	0.12	39	0.19
Arthrofibrosis	63	0.08	28	0.14
Other	229	0.30	94	0.46
Total	**1783**	**2.34**	**686**	**3.39**

MORTALITY FOLLOWING PRIMARY HIP AND KNEE REPLACEMENT

Mortality information has been obtained by matching all procedures reported to the Registry up and including the 31st December 2008 with the National Death Index (NDI). The NDI is the national mortality database maintained by the Australian Institute of Health and Welfare (AIHW). Access to the data required approval of a formal ethics application to AIHW.

ANALYSIS OF MORTALITY

Adjusted mortality is obtained after direct standardisation of the crude cumulative mortality data by five year age intervals and gender to the Estimated Resident Population Status based on the 2001 census.

As the total population has a younger age structure than the population of the Registry, the adjusted mortality is substantially lower than the crude mortality. By minimising the effects of age and gender differences within groups, the adjusted measure may be used to compare the mortality of different procedures and is useful when comparing mortality over time.

The rate per 100 person years has been calculated from the date of procedure to either the date of death or the end of the valid death search by the AIHW. This provides a true rate.

MORTALITY ASSOCIATED WITH PRIMARY HIP REPLACEMENT

The mortality associated with hip replacement varies depending on the type of hip replacement. As would be anticipated, crude cumulative mortality of primary partial hip replacement is high (50.9%) compared to primary total hip (8.1%). This is also reflected in the mortality rate per 100 person years, 21.9 for partial and 2.2 for primary total hip replacement. After standardising mortality for age and gender these differences are still apparent, 25.2% for partial and 2.9% for primary total hip replacement (Table M1).

Partial hip replacement has a significantly higher risk of mortality compared to primary total hip replacement. The risk varies depending on the time since surgery, and is particularly high within three months following surgery (Figure M1).

At eight years 76.2% of patients with primary partial hip replacement have died, compared to 18.8% of patients with total hip replacement (for any diagnosis) (Table M2).

Many factors may contribute to the difference in mortality between partial hip and total hip replacement including age, co-morbidities and diagnosis. As previously noted, fractured neck of femur is the major diagnosis that leads to primary partial hip replacement, whereas osteoarthritis is the major diagnosis for primary total hip replacement.

There are also differences in mortality depending on the type of primary partial hip replacement. At eight years, the mortality following bipolar and unipolar modular hip replacement is 63.4% and 67.8% respectively compared to 84.3% mortality following unipolar monoblock hip replacement (Tables M3 and M4 and Figure M2).

Although mortality is high following unipolar monoblock hip replacement, there is a small but significant difference in the risk of mortality between Austin Moore and Thompson type prostheses. The mortality at seven years when Austin Moore type prostheses is used is 81.1% and for Thompson type prostheses it is 79.2%. (Tables M5 and M6 and Figure M3).

Mortality following primary total hip replacement also varies depending on the procedure. At eight years the mortality following conventional total hip replacement is 19.9%. Resurfacing and thrust plate have a mortality of 2.7% and 4.9% respectively at eight years (Tables M3 and M4 and Figure M2).

The difference in mortality observed for the different primary, partial and total hip procedures is almost certainly due to differences in patient selection.

MORTALITY ASSOCIATED WITH PRIMARY KNEE REPLACEMENT

Mortality following primary knee replacement also varies depending on the class of the replacement. At eight years the mortality following patella/trochlear is 6.7%, unicompartmental is 10.6% and total knee is 18.2%. There were no deaths recorded for unispacer and partial resurfacing knee replacement (Table M7 and M8). After adjusting for age and gender, primary total knee replacement has a significantly higher mortality compared to unicompartmental knee replacement (Figure M4).

MORTALITY FOLLOWING PRIMARY HIP AND KNEE REPLACEMENT

1/9/1999 – 31/12/2008

Primary Hip Replacement

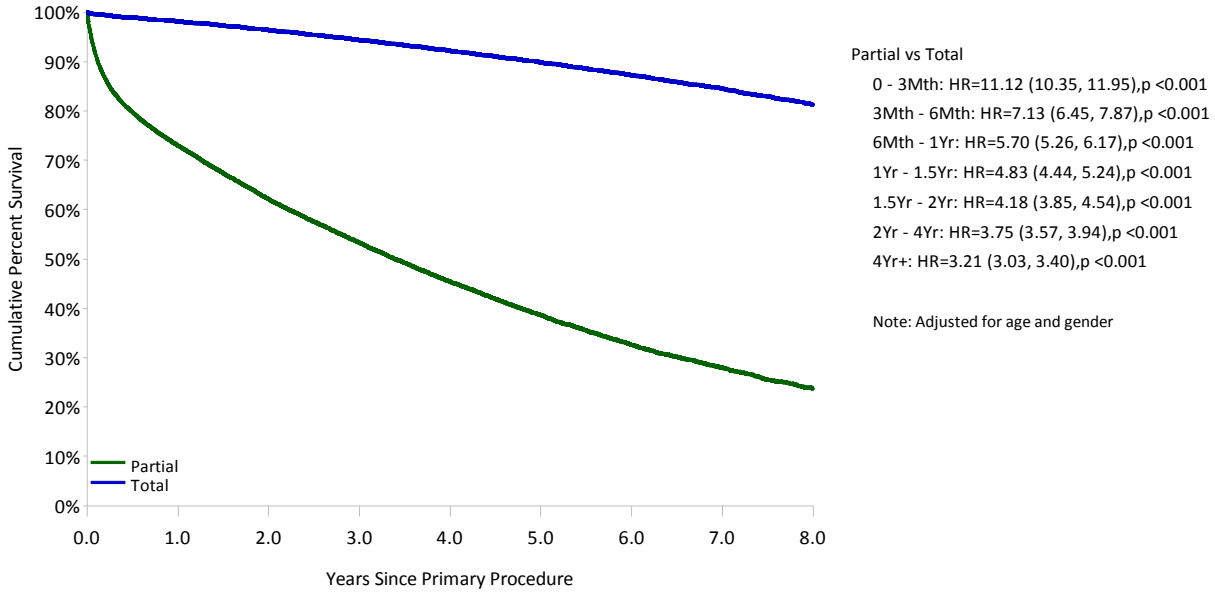
Table M1: Mortality following Primary Hip Replacement

Hip Replacement	N Death	N Patients	% Deaths	Standardised Mortality	Person Years	Rate per 100 Person Yrs	Exact 95% CI
Partial	17856	35063	50.9	25.2	81609	21.9	(21.56, 22.20)
Total	10855	133600	8.1	2.9	493418	2.2	(2.16, 2.24)
TOTAL	**28711**	**168663**	**17.0**	**4.4**	**575027**	**5.0**	**(4.94, 5.05)**

Table M2: Yearly Cumulative Percent Survival of Primary Hip Replacement Patients

CPS	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Partial	73.0 (73.4, 72.5)	53.3 (53.9, 52.7)	38.6 (39.3, 38.0)	28.0 (28.8, 27.2)	23.8 (24.8, 22.7)
Total	98.1 (98.2, 98.1)	94.4 (94.5, 94.3)	89.8 (90.0, 89.6)	84.5 (84.9, 84.2)	81.2 (81.8, 80.7)

Figure M1: Cumulative Percent Survival of Primary Hip Replacement Patients



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Partial	35063	22287	16184	11516	7743	4825	2678	1151	306
Total	133600	113266	94545	76394	58818	42218	26860	12789	3257

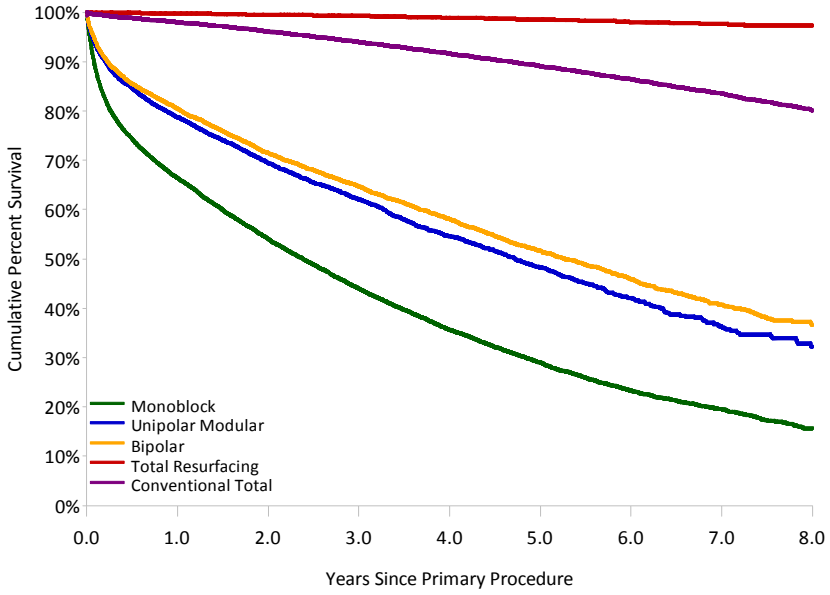
Table M3: Mortality following Primary Hip Replacement by Type

Type of Hip Replacement	N Death	N Patients	% Deaths	Standardised Mortality	Person Years	Rate per 100 Person Yrs	Exact 95% CI
Partial Resurfacing	0	10	0.0	0.0	21	0.0	(0.00, 17.64)
Monoblock	11109	17339	64.1	18.2	38967	28.5	(27.98, 29.04)
Unipolar Modular	3134	9227	34.0	17.6	17687	17.7	(17.10, 18.35)
Bipolar	3613	8487	42.6	29.6	24933	14.5	(14.02, 14.97)
Total Resurfacing	115	10238	1.1	0.6	38820	0.3	(0.24, 0.36)
Conventional Total	10736	123205	8.7	3.2	453873	2.4	(2.32, 2.41)
Thrust Plate	4	157	2.5	0.8	726	0.6	(0.15, 1.41)
TOTAL	**28711**	**168663**	**17.0**	**4.4**	**575027**	**5.0**	**(4.94, 5.05)**

Table M4: Yearly Cumulative Percent Survival of Primary Hip Replacement Patients by Type

CPS	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Partial Resurfacing	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)			
Monoblock	66.4 (67.1, 65.7)	44.0 (44.8, 43.2)	29.0 (29.8, 28.2)	19.5 (20.4, 18.7)	15.7 (16.8, 14.6)
Unipolar Modular	78.7 (79.5, 77.8)	62.0 (63.3, 60.8)	48.3 (50.0, 46.6)	36.3 (38.8, 33.9)	32.2 (35.5, 29.0)
Bipolar	80.5 (81.3, 79.6)	64.7 (65.8, 63.6)	51.7 (52.9, 50.4)	40.7 (42.3, 39.0)	36.6 (38.8, 34.4)
Total Resurfacing	99.8 (99.9, 99.7)	99.3 (99.4, 99.1)	98.6 (98.9, 98.2)	97.7 (98.1, 97.1)	97.3 (98.0, 96.5)
Conventional Total	98.0 (98.1, 97.9)	94.0 (94.1, 93.8)	89.1 (89.3, 88.9)	83.5 (83.9, 83.1)	80.1 (80.7, 79.6)
Thrust Plate	100.0 (100.0, 100.0)	99.2 (99.9, 94.6)	98.0 (99.5, 92.2)	95.1 (98.2, 87.0)	95.1 (98.2, 87.0)

Figure M2: Cumulative Percent Survival of Primary Hip Replacement Patients by Type



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Monoblock	17339	10520	7701	5525	3705	2298	1307	600	150
Unipolar Modular	9227	5515	3506	2128	1247	723	367	171	46
Bipolar	8487	6244	4973	3860	2790	1804	1004	380	110
Total Resurfacing	10238	9095	7752	6272	4740	3296	1956	698	87
Conventional Total	123205	104031	86670	70013	53985	38845	24844	12054	3156

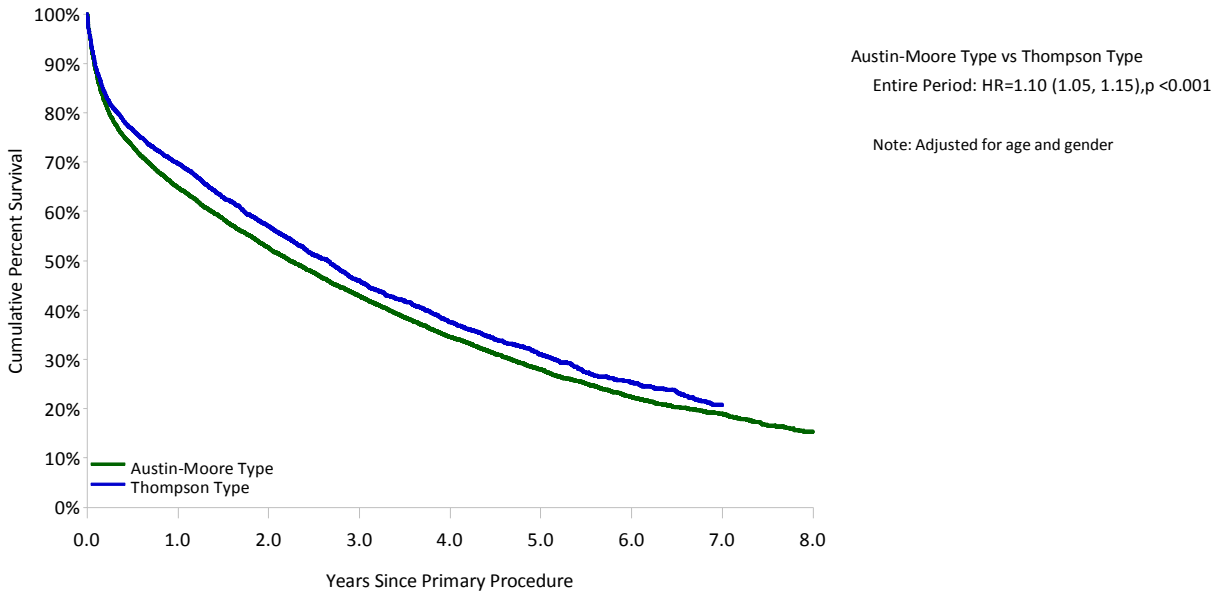
Table M5: Mortality following Primary Unipolar Monoblock Hip Replacement by Type

Monoblock	N Death	N Patients	% Deaths	Standardised Mortality	Person Years	Rate per 100 Person Yrs	Exact 95% CI
Austin-Moore Type	8364	12489	67.0	19.4	28512	29.3	(28.71, 29.97)
ETS	250	768	32.6	5.7	1069	23.4	(20.57, 26.46)
Thompson Type	2495	4082	61.1	15.3	9386	26.6	(25.55, 27.65)
TOTAL	**11109**	**17339**	**64.1**	**18.2**	**38967**	**28.5**	**(27.98, 29.04)**

Table M6: Yearly Cumulative Percent Survival of Primary Unipolar Monoblock Hip Replacement Patients by Type

CPS	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Austin-Moore Type	64.8 (65.7, 64.0)	42.8 (43.8, 41.9)	28.0 (28.9, 27.1)	18.9 (19.9, 17.9)	15.3 (16.6, 14.2)
ETS	74.7 (77.8, 71.3)	56.6 (61.4, 51.5)			
Thompson Type	69.7 (71.1, 68.2)	46.0 (47.6, 44.3)	31.1 (32.8, 29.3)	20.8 (22.7, 18.9)	

Figure M3: Cumulative Percent Survival of Primary Unipolar Monoblock Hip Replacement Patients by Type



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Austin-Moore Type	12489	7507	5582	4116	2820	1775	1000	453	111
Thompson Type	4082	2600	1904	1313	860	523	307	147	39

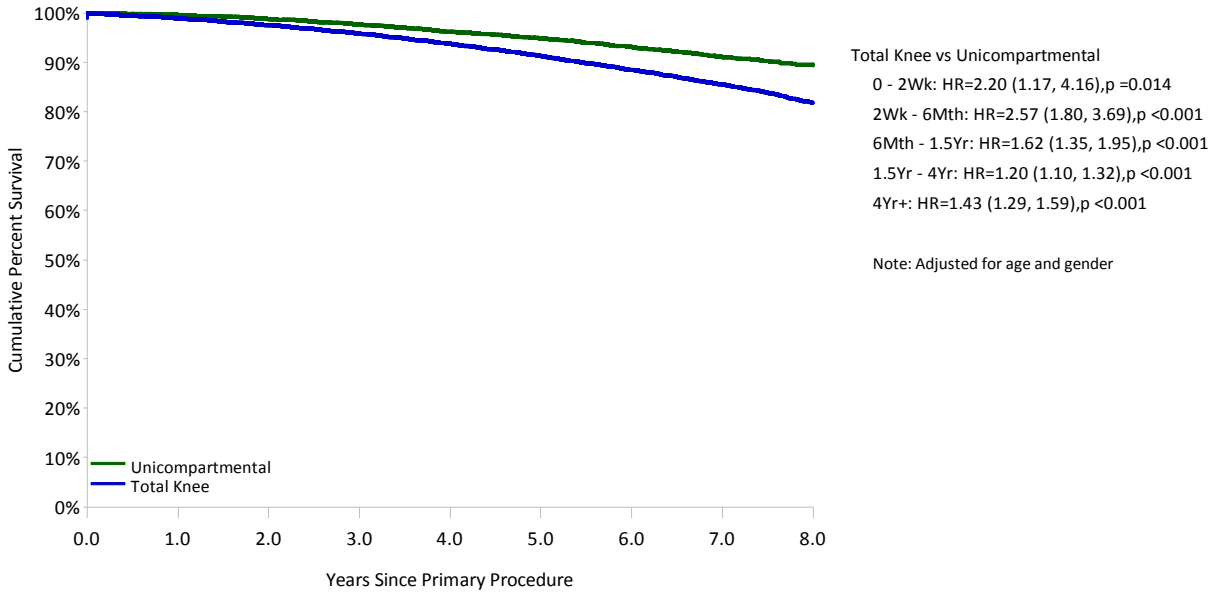
Table M7: Mortality following Primary Knee Replacement by Type

Type of Knee Replacement	N Death	N Patients	% Deaths	Standardised Mortality	Person Years	Rate per 100 Person Yrs	Exact 95% CI
Partial Resurfacing	0	105	0.0	0.0	202	0.0	(0.00, 1.83)
Unispacer	0	37	0.0	0.0	179	0.0	(0.00, 2.06)
Patella/Trochlear	26	1003	2.6	1.1	3449	0.8	(0.49, 1.10)
Unicompartmental	1038	23450	4.4	1.5	95132	1.1	(1.03, 1.16)
Bicompartmental	1	68	1.5	0.4	59	1.7	(0.04, 9.41)
Total Knee	10226	152581	6.7	9.5	548853	1.9	(1.83, 1.90)
TOTAL	**11291**	**177244**	**6.4**	**9.2**	**647875**	**1.7**	**(1.71, 1.78)**

Table M8: Yearly Cumulative Percent Survival of Primary Knee Replacement Patients by Type

CPS	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Patella/Trochlear	99.8 (99.9, 99.1)	98.2 (98.9, 96.8)	96.0 (97.4, 93.8)	93.3 (95.9, 89.2)	93.3 (95.9, 89.2)
Unicompartmental	99.6 (99.6, 99.5)	97.6 (97.9, 97.4)	94.8 (95.2, 94.5)	91.1 (91.7, 90.5)	89.4 (90.3, 88.4)
Total Knee	98.9 (98.9, 98.8)	95.8 (95.9, 95.7)	91.3 (91.4, 91.1)	85.5 (85.8, 85.2)	81.8 (82.3, 81.3)

Figure M4: Cumulative Percent Survival of Primary Knee Replacement Patients by Type



Number at Risk	0 Yr	1 Yrs	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Unicompartmental	23450	20919	18121	15176	11978	8910	5559	2425	524
Total Knee	152581	128093	105860	84697	64082	45539	28484	13272	3414

APPENDICES

APPENDIX 1

PARTICIPATING HOSPITALS & COORDINATORS

NEW SOUTH WALES

PUBLIC HOSPITALS

Name of Hospital	Registry Coordinator	
Albury Base Hospital	*Elwyn Black*	*ANUM Theatre*
Armidale Hospital	*Debbie Spokes/Cheryl Fardon*	*NUM Theatre/Theatre Clerk*
Bankstown/Lidcombe Hospital	*Mia Cabaltera, John Mati*	*Orthopaedic Resource Person/RN*
Bathurst Base Hospital	*Kylie Peers*	*NUM Theatre*
Bega District Hospital	*Pauline Blair*	*RN Theatre*
Blacktown Hospital	*Cathy Jiear/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 Talor*	*Theatre Clerks*
Fairfield Hospital	*Stella George*	*NUM Theatre*
Gosford Hospital	*Sandra Smith*	*Set up Coordinator Theatre*
Goulburn Base Hospital	*Maria Daniel/Karen Goode*	*NUM Theatre/Theatre Admin Clerk*
Hornsby & Ku-Ring-Gai Hospital	*Bessie Chu*	*CNS Theatre*
Institute of Rheumatology & Orthopaedic Surgery	*Alex Vesley*	*NUM Theatre*
John Hunter Hospital	*Felicia Bristow*	*Equipment NUM*
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	*Glennis Elliot*	*SNM Theatre*
Murwillumbah District Hospital	*Lynne Penglase*	*NUM Theatre*
Nepean Hospital	*Allan Muir*	*Equipment Officer*
Orange Health Service	*Teresa Luczak*	*Senior Nurse Manager Theatre*
Port Macquarie Base Hospital	*Pam Campbell/Joanne Wright*	*NUM Theatre/Theatre Clerk*
Royal Newcastle Centre	*Rosalee Baird*	*NUM Theatre*
Royal North Shore Hospital	*Eileen Cole*	*Research Physiotherapist/Dept Ortho*
Royal Prince Alfred Hospital	*Lisa Hatton*	*NUM Theatre*
Ryde Hospital	*Karen Jones*	*NUM Theatre*
Shoalhaven Group Hospital	*Miep Mulder*	*Senior Nurse Manager Theatre*
St George Hospital	*Simon Cheng*	*A/NUM Orthopaedic Theatre*
St Vincent's Public Hospital	*Mary Thesesa Butler*	*NUM Peri operative Services*
Sutherland Hospital	*Matthew Wood*	*RN Theatre*
Tamworth Base Hospital	*Kevin Attard*	*RN Theatre*
The Prince of Wales Hospital	*Anne-Marie Daly*	*NUM Orthopaedics*
Tweed Hospital	*Amanda Budd/Gail Bennett*	*CNS Theatre*
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*
Berkeley Vale Private Hospital	*Michelle Turner*	*QA/Education Coordinator*
Brisbane Waters Private Hospital	*Toni Hoad*	*CNS Coord Orthopaedic Theatre*
Calvary Health Care Riverina	*Seini Taufa*	*Acting Manager Health Info Services*
Campbelltown Private Hospital	*Yvonne Quinn*	*CNC Orthopaedics*
Canada Bay Hospital	*Cathy Clark*	*NUM Theatre*
Dalcross Private Hospital	*Anne Carroll*	*Deputy CEO/DON*
Delmar Private Hospital	*Julie Mitchell/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	*Julie Bate*	*NUM Theatre*
Hawkesbury Health Service	*Brigitte Lewis*	*CNS Theatre*
Holroyd Private Hospital	*Kimberly Abercrombie*	*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	*Margaret Nowak*	*NUM Theatre*
Maitland Private Hospital	*Leyanne Beavis*	*NUM Theatre*
Mayo Private Hospital	*Emma Clarke*	*NUM Theatre*
National Day Surgery Sydney	*Nancy Broer*	*Director of Nursing*
Nepean Private Hospital	*Jan Weinert*	*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*
Nowra Private Hospital	*Linda Martin*	*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 Mason*	*NUM Orthopaedics*
St Luke's Care	*Helen Ashley/Sue Bevan*	*Theatre Manager/CNSTheatre*
St Vincent's Private Hospital Bathurst	*Diane Carter*	*CNS Theatre*
St Vincent's Private Hospital Darlinghurst	*Astiness Kalach/Martina Watson*	*Health Information Manager*
St Vincent's Private Hospital Lismore	*Janelle Hospers*	*CNS, Orthopaedic Care Coord*
Strathfield Private Hospital	*Donna Reichel*	*Perioperative Manager*
Sydney Adventist Hospital	*Jill Parker/Alice Schuyers*	*CNS Ortho/CNS Orthopaedic Theatre*
Sydney Private Hospital	*Fiona Wallace*	*NUM Operating Theatres*
Sydney South West Private	*Angela Wilbow*	*CNC Orthopaedics*
Tamara Private Hospital	*Kris Wall*	*NUM Operating Theatre*
The Hills Private Hospital	*Julie Guthrie*	*Clinical Orthopaedic Manager*
The Mater Hospital	*Toni Cummins*	*CNS Theatre*
The Prince of Wales Private Hospital	*Angela Grein*	*Orthopaedic NUM*
Toronto Private Hospital	*Sonia Skelly*	*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*	*Peri operative Services Manager*
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	*Carmen Feehan/Denise Feehan*	*CNS/Pre-admission Clinic*
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	*Bernard Morskate*	*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/Liz O'Halloran/L Laverty*	*ACN/ACN/Ward Clerk*
Peninsula Health Service, Frankston Hospital	*Donna Anderson*	*ANUM Theatre*
Portland District Health	*Tersia Steyn*	*RN Theatre*
Sandringham & District Memorial Hospital	*Di David*	*Coordinator Orthopaedic Clinic*
South West Healthcare Warrnambool Campus	*Tony Kelly*	*Peri operative Services Manager*
St Vincent's Public Hospital	*Glynda Bonollo*	*ANUM Orthopaedic Theatre*
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	*Anthony Stafford*	*ANUM Orthopaedics*
The Royal Melbourne Hospital	*John Carr*	*RN Operating Theatre*
West Gippsland Healthcare Group	*Christine Evans/Bernie Notman*	*ACN Theatre/CNS*
West Wimmera Health Service	*Christine Dufty*	*NUM OR/CSSD ICP*
Western District Health Service	*Jane Sanders*	*ANUM Theatre*
Western Hospital	*Vicki Mahaljcek/Elisha Christie*	*RN Theatre/Secretary Ortho Dept*
Williamstown Hospital	*Maureen Clark*	*ANUM Theatre*
Wimmera Health Care Group	*Maree Markby/Catherine Jensen*	*NUMTheatre/ANUM Theatre*

VICTORIA

PRIVATE HOSPITALS

Name of Hospital		Registry Coordinator
Beleura Private Hospital	*Jean Leyland*	*AUM Theatre*
Bellbird Private Hospital	*Krista Monaghan*	*Orthopaedic Case Manager*
Cabrini Private Hospital, Brighton	*Jenny Salmond*	*Hospital Project Officer*
Cabrini Private Hospital, Malvern	*Jenny Salmond*	*Hospital Project Officer*
Como Private Hospital	*Maureen Nacey*	*NUM Theatre*
Cotham Private Hospital	*Michelle McCubbin*	*ANUM Ortho/Clinical Care Coord*
Epworth Hospital	*T Weerakkody/F Bartholomew*	*ANUM Orthopaedic Theatre*
Epworth Eastern Hospital	*Erin Seal*	*Orthopaedic Department*
Epworth Freemason Hospital	*Claudia Nozzolillo*	*CNS 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	*Kylie Tierney*	*Billings Officer Theatre*
Latrobe Private Hospital	*Jenny Telfer/Charm D'Cruz*	*NUM Theatre/RN Theatre*
Linacre Private Hospital	*Melissa Dillon*	*NUM Orthopaedic Theatre*
Maryvale Private Hospital	*Janine Johnston*	*A/CN Orthopaedic Theatre*
Masada Private Hospital	*Jenny Hodges*	*RN Theatre*
Melbourne Private Hospital	*Jennifer Wilson*	*Clinical Development*
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	*Victoria Daley*	*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*	*NUM Theatre/ANUM Theatre*
St Vincent's & Mercy Private Hospital, Mercy Campus	*Sue Zidziunas*	*CNS Orthopaedics*
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	*Lyn Fagan*	*NUM Perioperative Services*
Vaucluse Hospital	*Jeanette Merewether*	*NUM Theatre*
Vimy House Private Hospital	*Joy Miller*	*ANUM Theatre*
Wangaratta Private Hospital	*Janet McKie*	*ANUM Theatre*
Warringal Hospital	*Kylie Leys*	*RN Theatre*
Waverley Private Hospital	*Debra Pereira*	*ANUM Theatre*
Western Private Hospital	*Lynette Glenn*	*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	*Mary Armstrong/Meredith Bird*	*Purch Officer/Loan Set Coord*
Gold Coast Hospital, Robina Campus	*Annmarie Brooks/Helen McGuire*	*CN/RN Theatre*
Hervey Bay Hospital	*Natalie Short/Tania White*	*NUM/RN Theatre*
Ipswich Hospital	*Libby McNalty*	*NUM Theatre*
Logan Hospital	*Denise Maher*	*Director Support Orthopaedics*
Mackay Base Hospital	*Casey Rideout/Tania Laffin*	*RN Theatre/Admin Officer*
Maryborough Hospital	*Heather Zillman*	*RN Theatre*
Mater Misericordiae Public Adult's Hospital	*Simon Journeaux*	*Director of Orthopaedics*
Mater Misericordiae Public Children's Hospital	*Jess Hadley*	*ANUM Theatre*
Nambour General Hospital	*Janine Detlefson*	*NUM Theatre*
Prince Charles Hospital	*Sue Grice/Louise Hood*	*Clinical Nurse/Clinical Data Mgr*
Princess Alexandra Hospital	*Gail Brodrick*	*RN Orthopaedic Theatre*
Queen Elizabeth II Jubilee Hospital	*Donna Cal*	*EN Theatre*
Redcliffe Hospital	*Rachel Watson/G van Fleet*	*Program Coord/Snr Health Info Mgr*
Redland Public Hospital	*Trish O'Farrell*	*RN Theatre*
Rockhampton Base Hospital	*Wayne Brown/Stephen Stoddart*	*RN Orthopaedic 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	*Anne Ashton*	*Peri Operative Service Manager*
Greenslopes Private Hospital	*Kelly Williams/Jo Smith*	*CN Orthopaedic Theatre*
Hervey Bay Surgical Centre	*Natalie Short*	*RN Theatre*
Hillcrest Rockhampton Private Hospital	*Lyn Martin*	*NUM Theatre*
Holy Spirit Northside Hospital	*Mollie Harmer*	*CNC Orthopaedic Theatre*
John Flynn Hospital	*Paula Archer/Jaclyn Shaw*	*RN Orthopaedics*
Mater Misericordiae Hospital Bundaberg	*James Turner/Karen Smith*	*ANUM?CN Orthopaedic Theatre*
Mater Misericordiae Hospital Gladstone	*Judy Sayre/Alison Drinkwater*	*NUM /L2Theatre*
Mater Misericordiae Hospital Hyde Park	*Joanne Humphreys*	*CN Orthopaedic Theatre*
Mater Misericordiae Hospital Mackay	*Danell Curtis*	*Nurse Coordinator*
Mater Misericordiae Hospital Rockhampton	*Bernadette Young*	*Theatre Manager*
Mater Misericordiae Hospital Townsville	*Anna Grimley*	*CN Orthopaedic Theatre*
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	*Peta Quaife*	*Peri Operative Coordinator*
Peninsula Private Hospital	*Joan Fellowes*	*NUM Theatre*
Pindara Private Hospital	*Carli Nicolaou*	*CN Orthopaedic Theatre*

QUEENSLAND

PRIVATE HOSPITALS (continued)

Pioneer Valley Hospital	*Fleur Harmsworth*	*NUM Theatre*
St Andrew's Private Hospital	*Anika Westcott*	*RN Discharge Planning*
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	*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 District Hospital	*Jo Knappstein*	*A/CN Theatre*
Flinders Medical Centre	*Jo Drabsch*	*CN Theatre*
Gawler Health Service	*Karen McKinlay*	*CN 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	*Carole Dawson*	*RN Theatre*
Port Augusta	*Joan Jericho*	*NUM Theatre*
Port Lincoln Hospital	*Chris 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 Panach*	*CN Ortho Theatre/Dept Ortho*
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	*Connie Fung*	*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	*Linda Keech*	*CN Theatre*
Calvary Health Care Adelaide	*Maria Young*	*CN Theatre*
Calvary Wakefield Hospital	*Evelyn Carroll*	*CN Orthopaedic Theatre*
Flinders Private Hospital	*Anastasia Paffas*	*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	*Heather Crosby*	*RN Orthopaedic Theatre*
Stirling & District Hospital	*Nick Clarke/Tanya Hanlon*	*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*
Royal Perth Hospital, Shenton Park	*Christopher Sheen*	*Orthopaedic Coordinator*
Royal Perth Hospital, Wellington St	*Carmel McCormack*	*NUM Theatre*
Sir Charles Gairdner Hospital	*Sandra Miller*	*Quality Improvement Coordinator*

PRIVATE HOSPITALS

Name of Hospital	Registry Coordinator	
Bethesda Hospital	*Deborah Bell*	*Peri-operative Services Mgr*
Hollywood Private Hospital	*Judith Corbett*	*CN Theatre*
Joondalup Health Campus	*Jenni Hughes/Marlene Ingham*	*Health Information Manager/CN Ortho*
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/Judy Jasper*	*Theatre Manager/Admin Clerk*
St John of God Health Care Geraldton	*Lee McDonald*	*EN Theatre*
St John of God Health Care Murdoch	*Samantha Hunter/Paul Maloney*	*Orthopaedic Coord/Ortho Technician*
St John of God Health Care Subiaco	*Daniel Boylson*	*Clinical Coordinator Ortho*
Waikiki Private Hospital	*Gillian Payne*	*RN Theatre*

TASMANIA

PUBLIC HOSPITALS

Name of Hospital	Registry Coordinator	
Launceston General Hospital	*P van Nynanten/M Smith*	*CN Orthopaedic Theatre*
Mersey Community Hospital	*Grace Kamphuis*	*NUM Theatre*
North West Regional Hospital, Burnie Campus	*BKerr/ M Viney/R Watkins*	*Peri Op CN Ortho/ CN/ CN*
Royal Hobart Hospital	*Carolyn Douglas*	*RN Theatre*

PRIVATE HOSPITALS

Name of Hospital	Registry Coordinator	
Calvary Health Care Tasmania, St Luke's Campus	*Anne Boot/Toni Morice*	*CNC Theatre/ Theatre Ward Clerk*
Calvary Hospital	*Mark Newman/Alison Copping*	*CNS Orthopaedic/CNS Neuro*
Hobart Private Hospital	*Sarah Bird/Janine Dohnt*	*Peri-operative Services Mgr/L2 RN*
North-West Private Hospital	*Linda Wynwood*	*CN Theatre*

AUSTRALIAN CAPITAL TERRITORY

PUBLIC HOSPITALS

Name of Hospital	Registry Coordinator	
The Canberra Hospital	*Helen Boyd/Cathy Burns*	*L2 Orthopaedic Theatre*
Calvary Health Care	*Belinda Carruthers*	*RN Orthopaedic Theatre*

PRIVATE HOSPITALS

Name of Hospital	Registry Coordinator	
Calvary John James Hospital	*Phillippa Parkins*	*RN Orthopaedics*
The National Capital Private Hospital	*Theresa Moran*	*NUM Orthopaedic Theatre*
Calvary Health Care	*Belinda Carruthers*	*RN Orthopaedic Theatre*

NORTHERN TERRITORY

PUBLIC HOSPITALS

Name of Hospital	Registry Coordinator	
Alice Springs Hospital	*Maria Berridge/Ndina Chaita*	*Acting CNM/RN3 Orthopaedics*
Royal Darwin Hospital	*Tanya Anderson*	*NUM Theatre*

PRIVATE HOSPITALS

Name of Hospital	Registry Coordinator	
Darwin Private Hospital	*Barbara Kulbac*	*RN Theatre*

FORMERLY PARTICIPATING HOSPITALS – NOW CEASED JOINT REPLACEMENT

NEW SOUTH WALES

Auburn Health Service
Blue Mountains District ANZAC Memorial Hospital
MacArthur Private Hospital
Mosman Private Hospital
Sydney Hospital & Sydney Eye Hospital

QUEENSLAND

Caboolture Private Hospital
Gladstone Hospital
Logan Private Hospital
Riverview Private Hospital

VICTORIA

Hartwell Private Hospital
Repatriation Hospital, Heidelberg

SOUTH AUSTRALIA

Abergeldie Hospital
Blackwood Hospital
Northern Yorke Peninsula Hospital

TASMANIA

Calvary Health Care Tasmania St Vincent's Campus

WESTERN AUSTRALIA

Galliers 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 regression, 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 2001.

Censoring: When the outcome of interest is the time to a defined event, for example death or 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 31st December each year, and of course many prostheses will not have been revised by that time. Effectively we do not know the outcome unless the prosthesis was revised prior to 31st December. For the majority, we only know that up until 31st December they had not yet been revised. The times to revision for these prostheses are said to have been censored at 31st 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 (χ2) 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.

Confidence Interval: A set of values for a summary measure, for example a rate or a rate ratio, constructed so that this set has a specified probability of including the true value of the measure. The specified probability is called the confidence level, and the end points of the confidence interval are called the 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, more flexibly, yields 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 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 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 Ratio (adjusted for age and gender) = Adj HR. 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 Conventional Total 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

   One can show that the hazard ratio for this comparison is proportional over the entire time of observation. AVN has a significantly higher hazard (for 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

   One can show that 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 surgery to three months following surgery and three months following surgery to the end of observation. DDH has a significantly higher revision rate compared to OA in the first three months following surgery (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 times higher and 2.52 times higher than the hazard for OA. From three months following surgery 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: The cumulative number of years that a procedure is at risk of being revised. This is calculated for each procedure 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 (31/12/2008) 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 observed component years for a particular category.

For example

1. A primary total hip procedure performed on 1/1/2008 was revised on 1/7/2008. Therefore, the number of days that this procedure is at risk of being revised is 183 days. This patient 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 1/1/2008 died without being revised on 1/4/2008. This individual has 0.25 component years.

3. A primary procedure on 1/1/2008 and has not been revised. This individual has 1 component year (as observation time is censored at 31/12/2008).

Survival Curve: A plot of the proportion of subjects who have not yet experienced a defined event (for example death, 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.

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	Implant Breakage Head	*Wear and implant breakage*
9	Wear Polyethylene	
10	Wear Acetabular	
11	Implant Breakage Stem	
12	Implant Breakage Acetabular/Insert	
13	Dislocation	*Stability of prosthesis*
14	Instability	
15	Fracture (Femur/Acetabular/Neck/Periprosthetic)	*Fracture of bone*
16	Chondrolysis/Acetabular Erosion	*Progression of disease on non-operated part of joint*
17	Progression of Disease	
18	Synovitis	*New diseases occurring in association with joint replacement*
19	Avascular Necrosis	
20	Heterotopic Bone	
21	Pain	*Pain*
22	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 Tibial/Insert	*Wear and implant breakage*
9	Wear Femoral	
10	Wear Patella	
11	Implant Breakage Femoral	
12	Implant Breakage Tibial	
13	Implant Breakage Patella	
14	Bearing Dislocation	
15	Dislocation	*Stability of prosthesis*
16	Instability	
17	Patellar Maltracking	
18	Fracture (Femur/Tibia/Patella/Periprosthetic)	*Fracture of bone*
19	Progression of Disease	*Progression of disease on non-operated part of joint*
20	Patellar Erosion	
21	Synovitis	*New diseases occurring in association with joint replacement*
22	Arthrofibrosis	
23	Avascular Necrosis	
24	Heterotopic Bone	
25	Patello-femoral Pain	*Pain*
26	Pain	
27	Other	*Remaining diagnoses*

APPENDIX 4

PATIENT CONSENT AND CONFIDENTIALITY GUIDELINES

PATIENT CONSENT

The Registry obtains consent to include information from individuals undergoing joint replacement. This is done 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 contct 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, 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
Data Management & Analysis Centre 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 is 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 AOA Registry Management 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 the 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 Australian Orthopaedic Association National Joint Replacement Registry 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.

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

PRIMARY HIP

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

49312-00	Excision arthroplasty of hip (removal of prosthesis without replacement)
49324-00	Revision of total arthroplasty of hip
49327-00	Revision of total arthroplasty with bone graft to acetabulum
49330-00	Revision of total arthroplasty with bone graft to femur
49333-00	Revision of total arthroplasty with bone graft to acetabulum and femur
49339-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum
49342-00	Revision of total arthroplasty of hip with anatomic specific allograft to femur
49345-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum & femur
49346-00	Revision of partial arthroplasty hip replacement

PRIMARY TOTAL KNEE

Patellofemoral Replacement

49534-00	Total replacement arthroplasty of patellofemoral joint of knee

Unicompartmental Knee

49517-00	Hemi arthroplasty of knee

Primary Total Knee

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

49512-00	Arthrodesis with removal of prosthesis
49515-00	Removal-prostheses from knee
49527-00	Revision of total arthroplasty of knee
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

APPENDIX 8

CMBS CODES

PRIMARY HIP

Partial Hip Replacement

49315 HIP, arthroplasty of, unipolar or bipolar

47522 HIP, Femur treatment sub-capital fracture of hemiarthroplasty

Primary Total Hip Replacement

49309 HIP, arthrectomy or excision arthroplasty of, including removal of prosthesis (Austin Moore or similar (non-cement))

49318 HIP, total replacement arthroplasty of, including minor bone grafting

49319 HIP, total replacement arthroplasty of, including major bone grafting, if performed-bilateral

49321 HIP, total replacement arthroplasty of, including major bone grafting, including obtaining of graft

REVISION HIP

49312 HIP, arthrectomy or excision arthroplasty of, including removal of prosthesis (cemented, porous coated of similar)

49324 HIP, total replacement arthroplasty of, revision procedure including removal of prosthesis

49327 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to acetabulum, including obtaining of graft

49330 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to femur, including obtaining of graft

49333 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to both acetabulum and femur, including obtaining of graft

49336 HIP, revision of a fracture of the femur where revision total hip replacement is required as part of the treatment of the fracture

49339 HIP, revision total hip replacement of, requiring anatomic specific allograft of proximal femur greater than 5cm in length

49342 HIP, revision total hip replacement of, requiring anatomic specific allograft of acetabulum

49345 HIP, revision total hip replacement of, requiring anatomic specific allograft of both femur and acetabulum

49346 HIP, revision arthroplasty with replacement of acetabular liner or ceramic head, not requiring removal of femoral component or acetabular shell

PRIMARY KNEE

Patellofemoral Replacement

49534 KNEE, total replacement arthroplasty of, requiring major bone grafting to femur and tibia, including obtaining of graft

Unicompartmental Knee

49517 KNEE, hemiarthroplasty of

Total Knee

49518 KNEE, total replacement arthroplasty of,

49519 KNEE, total replacement arthroplasty of, including associated minor grafting, if performed-bilateral

49521 KNEE, total replacement arthroplasty of, requiring major bone grafting to femur or tibia, including obtaining of graft

49524 KNEE, total replacement arthroplasty of, requiring major bone grafting to femur and tibia, including obtaining of graft

REVISION KNEE

49512 KNEE, arthrodesis with removal of prosthesis

49512 KNEE, arthrodesis of, with removal of prosthesis

49515 KNEE, removal of prosthesis, cemented or uncemented, including associated cement, as the first stage of a 2 stage procedure

49527 KNEE, total replacement arthroplasty of, revision procedure, including removal of prosthesis

49530 KNEE, total replacement arthroplasty of, revision procedure, requiring bone grafting to femur or tibia, including obtaining of graft and including removal of prosthesis

49533 KNEE, total replacement arthroplasty of, revision procedure, requiring bone grafting to femur and tibia, including obtaining of graft and including removal of prosthesis

49554 KNEE, revision of total replacement of, by anatomic specific allograft of tibia or femur