Hip and Knee Arthroplasty

ANNUAL REPORT 2008

AUSTRALIAN ORTHOPAEDIC ASSOCIATION

National Joint Replacement Registry

AUSTRALIAN ORTHOPAEDIC ASSOCIATION
NATIONAL JOINT REPLACEMENT REGISTRY

ANNUAL REPORT

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ISSN 1445-3665
Suggested citation:
Australian Orthopaedic Association National Joint Replacement Registry. Annual Report. Adelaide:AOA; 2008

Australian Orthopaedic Association
National Joint Replacement Registry

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Hip and Knee Arthroplasty
September 1999 to December 2007

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EXECUTIVE SUMMARY

This executive summary is intended to highlight some of the major findings of this year's report. The information presented in this report has been reviewed prior to its release by members of the Australian Orthopaedic Association Arthroplasty Society at a two day workshop held on 2nd and 3rd August 2008. The surgeons were invited to provide feedback, comment and assist in determining the information that should be 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 hip and knee joint replacement surgery in Australia. The value of the information presented in the annual report is enhanced each year as a consequence of longer follow up time and the increasing number of procedures available for analysis.

The format of the report is largely unchanged from previous years with the exception of the analysis of data provided by State and Territory Health Departments. This information is presented as a supplementary report which is available on the Registry website www.aoa.org.au/jointregistry_pub.asp. As in previous years comprehensive demographic information on hip and knee replacement is also available on the Registry website.

In November 2007, the Registry formally commenced data collection on additional arthroplasty procedures; these include shoulder, elbow, wrist, ankle and spinal disc replacement. Demographic data on these additional joint replacements is presented in a separate report also available on the Registry website.

The number of hip and knee replacements undertaken each year continues to increase. Analysis of state and territory health department data indicates an overall increase of 2.1% in hip and knee replacement for the period 1st July 2006 to 30th June 2007 (hips 2.9% and knees 1.4%) from the previous financial year. In addition, most procedures were undertaken in private hospitals (61%).

There continues to be a changing pattern in the use of the different partial hip replacement categories previously reported by the Registry. The declining use of the Austin Moore type prostheses and increasing use of unipolar modular prostheses is again evident in 2007. Although the Austin Moore type prostheses remains the most used for arthroplasty management of fractured neck of femur, its use has halved in the last five years.

The Registry has previously identified that revision rates of primary partial hip replacement are significantly affected by the category of prosthesis used, age at time of surgery and the method of fixation. Updated data on these three factors are again presented in this report. The use of unipolar modular and bipolar procedures is associated with fewer revision procedures and the use of cement fixation for these prostheses further reduces the risk of revision. Data on the outcome of using conventional total hip replacement for the management of fractured neck of femur are presented for the first time in the general hip section of this report.

The use of total resurfacing hip replacement has declined for the second year. Presented again are the factors affecting the outcome of total resurfacing procedures, these include primary diagnosis, type of prosthesis used, gender and age. Patients having a total resurfacing for osteoarthritis are revised less frequently than patients with developmental dysplasia of the hip and avascular necrosis. Females have a significantly higher rate of revision and the risk of revision increases with age. Males also have an age related risk of revision which becomes significantly higher after the age of 65 years.

This year the Registry is reporting an additional factor that significantly affects the outcome of resurfacing hip replacement, the size of the femoral head component. There is an inverse relationship between risk of revision and size of the femoral head component. This relationship is true for both males and females, and appears to be the major cause for the difference in risk of revision between gender as previously reported. 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. The ASR and the Durom prostheses continue to be associated with an increased risk of revision.

The use of primary conventional total hip is increasing not only in terms of absolute numbers but also as a proportion of all primary total hip procedures. In 2007 the number of new femoral and acetabular prostheses combinations reported to the Registry also increased, with a further 128 new combinations recorded. For the first time the Registry is reporting the outcome of conventional hip replacement related to primary

diagnosis. The lowest rates of revision are seen in patients with osteoarthritis and developmental dysplasia of the hip. In patients with developmental dysplasia of the hip, conventional total hip replacement has four times less risk of revision compared with total resurfacing.

The use of cementless and hybrid conventional total hip replacement increased slightly in 2007. As reported last year there are differences in outcome depending on the type of fixation, these appear to be related to age. In the older age group (≥75 years) cementless fixation has over twice the risk of revision compared to cemented and over one and a half times compared to hybrid fixation. In the younger age group (<55 years) there is no difference related to the method of fixation. Hybrid fixation has a significantly lower revision rate compared to cementless fixation for the age groups 55-64 and 65-74 years. Cemented fixation in these age groups is not significantly different from either cementless or hybrid fixation.

The major new addition to assessment of primary conventional total hip replacement this year is the presentation of bearing surface data. This initial analysis is based on early data and should be interpreted with considerable caution. Metal on polyethylene are revised less often than other bearing surfaces. Metal on metal bearing surfaces are revised more often and this is most evident with larger femoral component head sizes.

Knee replacement procedures are presented slightly differently in 2008. Two new types of partial knee replacements are described and all partial knee replacements are now discussed within the same section of the report. The two new partial knee procedures are the partial resurfacing knee replacement and the bicompartmental knee replacement. Early outcomes for both of these new procedures are reported and both have a higher rate of revision than other knee replacements with the exception of unispacer procedures.

Other partial knee replacements include patella/trochlear and unicompartmental knee replacement. Patella/trochlear procedures are undertaken in small numbers (208 in 2007), however the Registry now has information on over one thousand of these procedures. The cumulative percent revision at five years for patella/trochlear replacement is 13.8%.

Unicompartmental knee replacement has continued to decrease in use for a number of years. It has a significantly higher revision rate compared to primary total knee replacement. Age at the time of surgery is a major factor affecting the outcome, the younger the patient the greater the risk of revision. Unicompartmental knee replacement has approximately twice the risk of revision compared to primary total knee replacement at any age.

The outcome of primary total knee replacement is related to age as well as a number of other factors including gender, the mobility and stability of the prostheses 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 have a significant effect on the outcome of primary total knee replacement.

The Registry also reports on the outcome of revision hip and knee replacement. If a primary total resurfacing procedure is revised then 11.1% are re-revised within five years. The risk of re-revision for a known primary conventional total hip replacement is very much dependent on the type of revision initially undertaken. More major revisions have a lower risk of revision than less extensive revision procedures. This finding of more extensive revision being associated with a smaller risk of re-revision is also evident with unicompartmental knee replacement. Revising a unicompartmental knee to a total knee rather than another unicompartmental knee is associated with significantly fewer subsequent revisions. The outcome of total knee replacement revision is not as dependent on the extent of the initial revision procedure because minor and major revisions have a similar and higher risk of re-revision.

The report also provides information on the outcome of primary and revision 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, however this difference is not evident in primary total hip replacement.

As in previous years the final section of this report is an analysis of mortality following joint replacement surgery. Survivorship data are presented for all procedure types and most procedures now have seven year data.

INTRODUCTION

This is the eighth Annual Report of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). This Report is based on the analysis of 191,673 hip and knee procedures undertaken in 209,316 patients with a procedure date up to and including 31st December 2007.

The Registry receives information from all hospitals (public and private) undertaking joint replacement. Currently this involves 292 hospitals but varies 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 at a rapid rate. The AOANJRR collected national data for a full year for the first time in 2003. The number of hip and knee joint replacements in 2007 was 19.8% higher than 2003 (hips 13.2% higher and knees 26.0% higher). 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 report which is available on the Registry website www.aoa.org.au/jointregistry_pub.asp.

There are many factors known to influence the outcome of joint replacement surgery, including age, gender and diagnosis of patients, the type of prosthesis and the surgical techniques used are just some of these. 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, the results for many of which remain uncertain.

The Australian Orthopaedic Association recognised the need to establish a National Joint Replacement Registry in 1993. At that time, the outcomes of this surgery in Australia were 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 national during 2002 (Appendix 4). The Department of Health and Ageing continues to provide funding to maintain the Registry.

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 measure of outcome is time to first revision surgery. It is an unambiguous measure of the need for further intervention. Combined with a careful analysis of the timing and reasons for revision this can be used as an accurate measure of the success or otherwise of a procedure. The Registry also monitors mortality rates. This information is used to inform surgeons, other health care professionals, governments, orthopaedic companies and the community.

Although the Registry has been in existence and fully operational for just over five years the continual monitoring process inherent in the Registry's function has established that information provided by the Registry is already influencing joint replacement in a beneficial manner. The value of the Registry will continue to increase in the longer term.

Aims of the Registry

- Determine demographic and diagnostic characteristics of patients undergoing joint replacement surgery nationally.
- Provide accurate information on the use of different types of prostheses in both primary and revision joint replacements.
- Evaluate the effectiveness of different types of joint replacement prostheses

and surgical techniques at a national level.
- Compare the Australian joint replacement experience to that of other countries.
- Provide confidential data to individual surgeons and hospitals to audit their joint replacement surgery.
- Educate Australian orthopaedic surgeons in the most effective prostheses and surgical techniques to achieve successful outcomes.

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, Registry Director, Deputy Directors and an orthopaedic surgeon from each state and territory (see inside front cover for Committee Members). The Director of the Registry is appointed by the Board and is responsible for the day-to-day management. In addition, the AOA employs a Registry Coordinator who is involved in maintaining cooperation of hospitals, surgeons, 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 analysis services for the Registry.

In 2006, the Registry established a Registry Advisory Committee, 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 including government, orthopaedic industry, health insurance industry and consumers. The committee is chaired by an independent orthopaedic surgeon and meets four times a year.

Committee members are Mr Graham Mercer (Chairman) Professor Stephen Graves (Director AOA NJRR), Ms Kerry Flanagan (Dept of Health and Ageing), Dr Michael Armitage (AHIA), Dr David Hale (PDC), Dr Graeme Harris (TGA), Mr John Cooper (MIAA), and Dr Janney Wale (Consumer representative).

Data Collection Method

Hospitals provide data on specific Registry forms. The forms are completed in theatre at the time of surgery and are returned 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 showed 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.

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 2006/7 financial year period the Registry received notification of approximately 200 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 2006/07 the Registry has identified 1,176 procedures in health department files which were not submitted to the Registry (33.6% 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 2006/07 Registry data, the initial validation resulted in almost 93% of Registry records verified against health department data. Following the retrieval of unreported records and checking of unmatched data, the Registry is able to obtain an almost complete 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 where there is a performance discrepancy.

In the *second stage*, the Director and Deputy Directors of the Registry, in conjunction with staff of the Data Management & Analysis Centre, review the findings and decide if mention of a component in the Report 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 undertakes this review. This workshop is open to all members of the Society however as there are limited positions available attendance is on a 'first come first served' basis. Participants are given the opportunity to request and view additional analyses as required. This year 10 orthopaedic surgeons together with the Chairman of the AOA 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 observed 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 Registry Report. The major reasons for not including the majority of identified prostheses are the inadequate number of procedures or the inability to exclude other contributory 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 (see Glossary, Appendix 1). The estimates are displayed on the graph until the point at which the proportion of prostheses at risk for revision is at least 10% of the initial number at risk for that category, unless this

number is greater than 100, in which case we extend the graph until the number at risk reaches 100. 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 log-rank tests and proportional hazards models 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 their appearance should not be used to infer whether overall differences in survival between prosthesis types are significant. Rather, the log-rank tests and hazard ratios reported with each curve should be used for this purpose.

When we refer to the cumulative percent revision (CPR) at a certain time, for example five years, we mean 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", also accounts for the right censoring due to death and the '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 is the report finalised and approved at that meeting. Prior to publication the report was provided to the Board of the AOA for consideration and approval.

Acknowledgements

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 list of participating hospitals and coordinators is included on the following pages.

The Registry has also continued to receive support and invaluable assistance from the Federal Government, State and Territory Health Departments and Orthopaedic Companies.

PARTICIPATING HOSPITALS & COORDINATORS

NEW SOUTH WALES

PUBLIC HOSPITALS

Albury Base Hospital	*Elwyn Black*	*ANUM Theatre*
Armidale Hospital	*Debbie Spokes*	*NUM Theatre*
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/RN Theatre*
Bowral and District Hospital	*Barbara Walsh*	*NUM Theatre*
Broken Hill Health Service	*Sue Beahl*	*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*	*NUM Theatre*
Hornsby & Ku-Ring-Gai Hospital	*Bessie Chu*	*CNS Theatre*
Institute of Rheumatology & Orthopaedic Surgery	*Alex Vesley*	*NUM Theatre*
John Hunter Hospital	*Felicia Bristow*	*Equipment Officer*
Lismore Base Hospital	*Glen Nettle*	*RN 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	*Graham 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	*Jenny Smith, Allan Muir*	*CNC Orthopaedics/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*	*Dept of Orthopaedics*
Royal Prince Alfred Hospital	*Lisa Hatton*	*NUM Theatre*
Ryde Hospital	*John Linn*	*ANUM Theatre*
Shoalhaven Group Hospital	*Miep Mulder*	*Senior Nurse Manager Theatre*
St George Hospital	*Simon Cheng*	*CNS 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	*Dana Bowker/Elizabeth Stefidas*	*RN Theatre/NUM Theatre*
Wollongong Hospital	*Jacqui McGovern*	*CNS Orthopaedic Theatre*
Wyong Hospital	*Janice Cunningham, Marilyn Randall*	*ANUM Theatre/CNS Ortho Theatre*

NEW SOUTH WALES

PRIVATE HOSPITALS

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	*Katie Callaghan*	*CNS Coord Orthopaedic Theatre*
Calvary Health Care Riverina	*Margaret Hoey*	*Manager Health Info Services*
Calvary Hurstville Community Pte Hospital	*Kathryn Boyce*	*Orthopaedic Case Manager*
Campbelltown Private Hospital	*Yvonne Quinn*	*CNC Orthopaedics*
Canada Bay Hospital	*Hayley Todd*	*Clinical EducatorTheatre*
Forster Private Hospital	*Julie Bate*	*NUM Theatre*
Dalcross Private Hospital	*Anne Carroll*	*Deputy CEO*
Delmar Private Hospital	*Julie Mitchell/Cathy Byrne*	*NUM Theatre/Medical Records*
Dubbo Private Hospital	*Gail Priest*	*NUM Theatre*
Dudley Private Hospital	*Cecelia O'Keefe/Louise Johnston*	*NUM Theatre/CNS Theatre*
Figtree Private Hospital	*Jan Goldrick*	*Theatre*
Hawkesbury Health Service	*Brigitte Lewis*	*CNS Theatre*
Holroyd Private Hospital	*Krys Maj*	*NUM Theatre*
Hunters Hill Private Hospital	*Jenny May*	*CNS Orthopaedic Theatre*
Hunter Valley Private	*Margaret Water/Michael Summerville*	*NUM Theatre/RN Theatre*
Kareena Private Hospital	*Deirdre Baulch*	*Orthopaedic Team Leader*
Lake Macquarie Private Hospital	*Robert Reddie*	*Theatre*
Lingard Private Hospital	*Nathan Foran*	*NUM Theatre*
Maitland Private Hospital	*Leanne Beavis*	*NUM Theatre*
Mayo Private Hospital	*Emma Clarke*	*NUM Theatre*
Nepean Private Hospital	*Jan Weinert*	*NUM Theatre*
Newcastle Private Hospital	*David Billings*	*RN Theatre*
North Gosford Private Hospital	*Claire Monger*	*RN Orthopaedic Theatre*
North Shore Private Hospital	*Eileen Cole*	*Dept of Orthopaedics*
Nowra Private Hospital	*Linda Martin*	*NUM Theatre*
Port Macquarie Private Hospital	*Susie Storm*	*CNS Orthopaedic Theatre*
Shellharbour Private Hospital	*Liz Quennel*	*NUM Theatre*
Southern Highlands Hospital	*Karen Cooper*	*NUM Theatre*
St George Private Hospital and Medical Centre	*Richard Ibarra*	*NUM Theatre*
St Luke's Care	*Helen Ashley/Sue Bevan*	*Theatre Manager/CNSTheatre*
St Vincent's Private Hospital Bathurst	*Diane Carter*	*RN Theatre*
St Vincent's Private Hospital Darlinghurst	*Astiness Kalach*	*Health Information Manager*
St Vincent's Private Hospital Lismore	*Janelle Hospers*	*RN Pre-admission Clinic*
Strathfield Private Hospital	*Donna Reichel*	*Perioperative Manager*
Sydney Adventist Hospital	*Jill Parker*	*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 Coordinator*
The Mater Hospital	*Toni Cummins*	*CNS Theatre*
The Prince of Wales Private Hospital	*Angela Grein*	*Specialty Team Leader Orthopaedics*
Toronto Private Hospital	*Sonia Skelly*	*Executive Assistant*
Warners Bay Private Hospital	*Annette Harrison*	*CNS Theatre*
Westmead Private Hospital	*Leonna Higgins*	*CNS Orthopaedic Theatre*

VICTORIA

PUBLIC HOSPITALS

Austin Health	*Ross Kentish*	*ANUM Orthopaedic Theatre*
Ballarat Health Services	*Amanda Bell/Kellie Livingston*	*Equipment ANUM/Equipment Nurse*
Bass Coast Regional Health/Wonthaggi Hospital	*Gail Huitema*	*NUM Theatre*
Bendigo Health Care Group	*Dot Smith*	*Assoc NUM 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*	*RN Theatre*
Djerriwarrh Health Services, Bacchus Marsh Campus	*Linda Aykens*	*NUM Theatre*
East Grampians Health Service	*Brian Lomax*	*NUM Theatre*
Echuca Regional Health	*Anne Dick*	*Associate Charge Nurse Theatre*
Goulburn Valley Health	*Denise Feehan*	*Pre-admission/Admission Clinic*
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	*Sue Rosalie*	*A/CN Orthopaedic Theatre*
Northeast Health Service Wangaratta	*Lynn Reid/Larissa Laverty*	*Orthopaedic Nurse/RN*
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*	*NUM Theatre*
St Vincent's Public Hospital	*Glynda Bonollo*	*ANUM Orthopaedic Theatre*
Stawell Regional Health	*Chris Gillmartin*	*NUM Theatre*
Sunshine Hospital	*Joy Curley*	*RN Theatre*
Swan Hill District Hospital	*Helen Wilkins*	*CNC Theatre*
The Alfred	*Caroline McMurray*	*Coordinator Orthopaedic Dept*
The Geelong Hospital, Barwon Health	*Lee Rendle*	*ANUM Theatre*
The Northern Hospital	*Siew Perry*	*AUM 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*	*ACN Theatre*
West Wimmera Health Service	*Christine Dufty*	*NUM Theatre*
Western District Health Service	*Elizabeth Munro*	*NUM Theatre*
Western Hospital	*Vicki Mahaljcek/Elisha Christie*	*RN Theatre/Secretary Ortho Dept*
Williamstown Hospital	*Maureen Clark*	*ACN Theatre*
Wimmera Health Care Group	*Maree Markby/Catherine Jensen*	*NUMTheatre/ANUM Theatre*

VICTORIA

PRIVATE HOSPTIALS

Beleura Private Hospital	*Jean Leyland*	*RN Theatre*
Bellbird Private Hospital	*Krista Monaghan*	*Orthopaedic Case Manager*
Cabrini Health, Malvern	*Jenny Salmond*	*Hospital Project Officer*
Como Private Hospital	*Maureen Nacey*	*NUM Theatre*
Cotham Private Hospital	*Michelle McCubbin*	*ANUM Orthopaedic Theatre*
Epworth Hospital	*Tilak Weerakkody*	*RN Theatre*
Epworth Easter Hospital	*Erin Seal*	*Orthopaedic Department*
Epworth Freemason Hospital	*Claudia Nozzolillo*	*CNS Orthopaedic Theatre*
Essendon Private Hospital	*Chan Leong*	*NUM Theatre*
Geelong Private Hospital	*Colin Hay*	*ANUM Orthopaedic Theatre*
Glenferrie Private Hospital	*Samantha Jervois*	*Theatre Manager*
John Fawkner Hospital	*Vera Shaw*	*AUM Orthopaedic Theatre*
Knox Private Hospital	*Sally Thomas*	*Orthopaedic Liaison Nurse*
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	*Fran Bartholomew*	*RN Orthopaedic Theatre*
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*	*Acting CNS Orthopaedic Theatre*
South Eastern Private Hospital	*Maureen Nacey*	*NUM Theatre*
St John of God Health Care, Ballarat	*Cameron Morgan*	*Resource Manager*
St John of God Health Care, Bendigo	*Jenny Dillon*	*ACN 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/CNS Theatre*
St Vincent's & Mercy Private Hospital, Mercy Campus	*Sue Zidziunas*	*CNS Orthopaedics*
St Vincent's & Mercy Private Hospital, St Vincent's	*Julie Keyte*	*CNS Orthopaedic Theatre*
The Avenue Hospital	*Annellen Watson*	*RN Theatre*
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	*Cathy Duncombe*	*CNS Orthopaedics*
Warringal Hospital	*Judy McIvor*	*RN Theatre*
Waverley Private Hospital	*Debra Pereira*	*ANUM Theatre*
Western Private Hospital	*Lynette Glenn*	*NUM Theatre*

QUEENSLAND

PUBLIC HOSPITALS

Bundaberg Base Hospital	*Gail Doherty*	*ANUM Theatre*
Cairns Base Hospital	*Debbie Norris/Rebecca Rowley*	*Dept of Orthopaedics*
Caloundra Health Service	*Raylee Callaghan*	*NUM Theatre*
Gold Coast Hospital	*Allan Davies*	*NUM Theatre*
Gold Coast Hospital, Robina Campus	*Annmarie Brooks*	*RN Theatre*
Hervey Bay Hospital	*Shane King*	*Acting CN Theatre*
Ipswich Hospital	*Libby McNaulty*	*NPC Theatre*
Logan Hospital	*Denise Maher*	*Director Support Orthopaedics*
Mackay Hospital	*Kaylene Duguid*	*RN Theatre*
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*	*Acting NUM Theatre*
Nambour General Hospital	*Janine Detlefson*	*NUM Theatre*
Prince Charles Hospital	*Sue Grice/Louise Hood*	*Clinical Res Nurse/Clinical Data Mgr*
Princess Alexandra Hospital	*Gail Brodrick*	*RN Orthopaedic Theatre*
Queen Elizabeth II Jubilee Hospital	*Marilyn Kondai*	*EN Theatre*
Redcliffe Hospital	*James Chippendale*	*Health Information Manager*
Redland Public Hospital	*Trish O'Farrell*	*RN Theatre*
Rockhampton Base Hospital	*Liz Murphy*	*CN Orthopaedic Theatre*
Royal Brisbane & Women's Hospital	*Annette Flynn*	*Dept of Orthopaedics*
Toowoomba Hospital	*Amanda Lostroh/Simon Bowly*	*RN Theatre*
Townsville Hospital	*Sharon Cooke*	*RN Orthopaedic Theatre*

PRIVATE HOSPITALS

Allamanda Private Hospital	*Margaret Law*	*NUM Theatre*
Brisbane Private Hospital	*Liz Drabble*	*Operational Manager*
Cairns Private Hospital	*Pat Warburton/Wendy Gould*	*RN Theatre*
Caloundra Private Hospital	*Christine Wells*	*CN Theatre*
Friendly Society's Hospital	*Anne Whalley*	*Theatre Receptionist*
Greenslopes Private Hospital	*Jodie Baptie/Lisa Yong*	*RN 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/Jackie Shaw*	*RN Orthopaedics*
Mater Misericordiae Hospital Bundaberg	*Monica Mooney*	*CN Orthopaedic Theatre*
Mater Misericordiae Hospital Hyde Park	*Joanne Humphreys*	*CN Orthopaedic Theatre*
Mater Misericordiae Hospital Mackay	*Paul Lanigan*	*CNC Theatre*
Mater Misericordiae Hospital Rockhampton	*Bernadette Young*	*Theatre Manager*
Mater Misericordiae Hospital Townsville	*Regina Hansen*	*CN Theatre*
Mater Misericordiae Private Hospital	*Melissa Gordon*	*RN Theatre*
Mater Private Hospital Redland	*Erina Harris*	*RN Theatre*
Nambour Selangor Private Hospital	*Yvonne Hemingway*	*RN Theatre*
Noosa Hospital	*Janet McMeekin*	*RN Theatre*
North West Private Hospital	*Justine Jones*	*NUM Theatre*
Peninsula Private Hospital	*Joan Fellowes*	*NUM Theatre*

QUEENSLAND

PRIVATE HOSPITALS (cont'd)

Pindara Private Hospital	*Carli Nicolaou*	*CN Orthopaedic Theatre*
Pioneer Valley Hospital	*Pam Barrett*	*NUM Theatre*
St Andrew's Private Hospital	*Sharon Denton*	*RN Theatre*
St Andrew's Hospital, Toowoomba	*Norma Stanley*	*Manager Peri-operative Services*
St Andrew's War Memorial Hospital	*Kathy Flanigan*	*Theatre Secretary*
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

Clare District Hospital	*Jo Knappstein*	*A/CN Theatre*
Flinders Medical Centre	*Jo Drabsch*	*CN Theatre*
Lyell McEwin Hospital	*Fiona Brinkies*	*CN Theatre*
Modbury Public Hospital	*Jan Caufield*	*CN Orthopaedic Theatre*
Mt Barker District Solders Memorial Hospital	*Emma Crowder*	*RN Theatre*
Mt Gambier Regional Hospital	*Kylie Duncan*	*CN Theatre*
Murray Bridge Soldiers Memorial Hospital	*Chris Jarvis*	*CN Theatre*
Naracoorte Health Service	*Margie Sinclair*	*CN Theatre*
Noarlunga Hospital	*Carole Dawson*	*RN Theatre*
Port Augusta	*Colleen Smith*	*NUM Theatre*
Port Lincoln Hospital	*Chris Weber*	*NUM Theatre*
Port Pirie Hospital	*Sue Wilkinson*	*NUM Theatre*
Queen Elizabeth Hospital	*Carol Saniotis*	*NUM Theatre*
Repatriation General Hospital	*Judy Jaeger*	*A/CN Theatre*
Riverland Regional Hospital	*Viv Turner/Leanne Zerna*	*RN Theatre*
Royal Adelaide Hospital	*Lisa Lewington*	*CN Orthopaedic Theatre*
South Coast District Hospital	*Judy Anderson*	*CN Theatre*
Whyalla Health Service	*Carol McSorley*	*CN Theatre*
Women's and Children's Hospital	*Connie Fung*	*CN Theatre*

PRIVATE HOSPITALS

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	*Mark Williams*	*EN Theatre*
Glenelg Community Hospital	*Jan Lewanndowski*	*CN Orthopaedic Theatre*
North Eastern Community Hospital	*Anne Sciacca*	*RN Theatre*
Parkwynd Private Hospital	*Helen Madigan*	*CN Orthopaedic Theatre*
Sportsmed SA	*Carole Portolesi*	*Medical Records*
St Andrew's Private Hospital	*Rob Davi*	*CN Orthopaedic Theatre*
Stirling & District Hospital	*Nick Clarke*	*CNC Theatre*
The Memorial Hospital	*Katrina Smith*	*Orthopaedic Liaison*
Western Hospital	*Margaret Witts*	*RN Theatre*

WESTERN AUSTRALIA

PUBLIC HOSPITALS

Albany Regional Hospital	*Heather Watson*	*RN Theatre*
Armadale Health Service	*Eleri Griffiths*	*Theatre Service Manager*
Bunbury Regional Hospital	*Brett Smith*	*Orthopaedic Technician Theatre*
Freemantle Hospital	*Steven Johnson*	*Orthopaedic Technician Theatre*
Geraldton Hospital	*Vicki Richards*	*CN Theatre*
Kalgoorlie Regional Hospital	*Nicole Hintz*	*Clinical Manager Theatre*
Kaleeya Hospital	*Letchumy Krishnasamy*	*RN Orthopaedic Theatre*
Osborne Park Hospital	*Jenny Misiewicz*	*RN 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

Bethesda Hospital	*Deborah Bell/Leanne Griffin*	*Peri-operative Services Mgr/CN Ortho*
Hollywood Private Hospital	*Judith Corbett*	*RN Theatre*
Joondalup Health Campus	*Sue-Ann Hall*	*Health Record Officer*
Mercy Hospital Mt Lawley	*Ty Masi/Stuart Meek*	*Orthopaedic Technician*
Mount Hospital	*Jacqui McDonald*	*Orthopaedic Coordinator*
Peel Health Campus	*Jan Birmingham*	*RN Orthopaedic Theatre*
South Perth Hospital	*Carrol Colquhun*	*Acting CNM Theatre*
St John of God Health Care Bunbury	*Marianne Viebke/Stephanie Dwyer*	*Administration Assistant*
St John of God Health Care Geraldton	*Ronelle Kok*	*Peri-operative Services Manager*
St John of God Health Care Murdoch	*Samantha Hunter/Paul Maloney*	*Orthopaedic Coord/Ortho Technician*
St John of God Health Care Subiaco	*Andrew Grimm*	*Orthopaedic Technician Theatre*
Waikiki Private Hospital	*Gillian Payne*	*RN Theatre*

TASMANIA

PUBLIC HOSPITALS

Launceston General Hospital	*Paul van Nynanten*	*CN Orthopaedic Theatre*
Mersey Community Hospital	*Grace Kamphuis*	*NUM Theatre*
North West Regional Hospital, Burnie Campus	*Bill Kerr*	*CN Orthopaedic Theatre*
Royal Hobart Hospital	*Carolyn Douglas*	*RN Theatre*

PRIVATE HOSPITALS

Calvary Health Care Tasmania, St Luke's Campus	*Ann Boot/Toni Morice*	*CNC Theatre/Operating Theatre Clerk*
Calvary Hospital	*Jane Walker*	*CNS Orthopaedic Theatre*
Hobart Private Hospital	*Sarah Bird*	*Peri-operative Services Manager*
North-West Private Hospital	*Linda Wynwood*	*Theatre Manager*

AUSTRALIAN CAPITAL TERRITORY

PUBLIC HOSPITALS

The Canberra Hospital	*Helen Boyd/Mary Ann Brook*	*CNS Orthopaedic Theatre*
Calvary Health Care	*Milton Jamieson*	*RN Theatre*

PRIVATE HOSPITALS

Calvary John James Hospital	*Phillippa Parkins/Helen Bustard*	*RN Orthopaedics/CNC Theatre*
The National Capital Private Hospital	*Theresa Moran*	*NUM Orthopaedic Theatre*
Calvary Health Care	*Milton Jamieson*	*RN Theatre*

NORTHERN TERRITORY

PUBLIC HOSPITALS

Alice Springs Hospital	*Samantha Arbuthnot*	*CNM Op Theatre & Day Proc Unit*
Royal Darwin Hospital	*Tanya Anderson*	*NUM Theatre*

PRIVATE HOSPITALS

Darwin Private Hospital	*Barbara Kulbac*	*RN Theatre*

FORMERLY PARTICIPATING HOSPITALS THAT HAVE 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

VICTORIA

Cabrini Private Hospital
Hartwell Private Hospital
Repatriation Hospital, Heidelberg

TASMANIA

Calvary Health Care Tasmania St Vincent's Campus

QUEENSLAND

Caboolture Private Hospital
Gladstone Hospital
Logan Private Hospital
Riverview Private Hospital

SOUTH AUSTRALIA

Abergeldie Hospital
Blackwood Hospital
Gawler Health Services
Northern Yorke Peninsula

WESTERN AUSTRALIA

Galliers Private Hospital

HIP REPLACEMENT

GENERAL INTRODUCTION

This report is based on the analysis of 191,673 primary and revision hip replacements received by the Registry with a procedure date up to and including 31st December 2007. This is an additional 31,333 hip procedures compared to the Annual Report released in 2007.

Categories of Hip Replacement

The Registry categorises hip replacements as either primary or revision procedures. Primary hip procedures are further categorised as partial or total hip replacements. Partial hips are further sub-categorised depending on the type of prostheses used; these are monoblock, unipolar modular and bipolar procedures. This year partial resurfacing has been included as an additional category of partial hip replacement. Partial resurfacing procedures involve the use of the Hemicap prosthesis, which has recently been introduced to the market in Australia. To the 31st December 2007, the Registry has recorded the use of this prosthesis in eight hip replacements. Total hip replacements are categorised as either conventional total, total resurfacing or thrust plate procedures.

Revision procedures are re-operations of hip arthroplasty. They may be primary partial, primary total or previous revisions and are categorised as 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 of this include exchange of the femoral head 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 diagnoses for each category of hip replacement is available in a supplementary report on the Registry website www.aoa.org.au/jointregistry_pub.asp.

Gender

Hip replacements are performed more frequently in females (56.7%) than males. There are also variations in gender depending on the category of hip replacement. Primary partial hips (73.7%) and primary total hips (53.1%) are undertaken more frequently in females. Total resurfacing and thrust plate procedures are undertaken more frequently in males (72.7% and 70.9% respectively). More females have revision procedures (54.1%) (Table HG1).

Since 2003 (the first year the Registry had full national coverage) there has been little change in the proportion of females having primary conventional hip replacement. There has however been a decline in females undergoing partial hip replacement (decreased from 75.4% in 2003 to 71.4% in 2007) and total resurfacing procedures (decreased from 28.8% in 2003 to 23.6% in 2007) (Figure HG1).

Age

The mean age for all hip replacement procedures is 69.9 years with females having a higher mean age compared to males (71.8 years and 67.4 years respectively). Primary partial hips are generally used in individuals much older than those receiving primary total hips (mean age 81.6 years for partials and 67.0 years for totals). Females have a higher mean age for both of these procedures (82.0 years compared to 80.6 years for males for partials, and 68.6 years compared to 65.2 years for males having primary total hips).

Total resurfacing and thrust plate procedures are generally undertaken in people younger than those having primary conventional total hip replacement (total resurfacing 53.5 years, thrust plate 56.6 years and conventional 68.1 years).

The mean age for revision procedures is 70.8 years (females is 71.5 years and males is 70.1 years).

The different types of primary partial hip replacement are rarely undertaken on individuals less than 65 years of age (4.5%) with the exception of partial resurfacing where all procedures were undertaken on individuals less than 55 years of age.

Most primary conventional hip replacements are undertaken on individuals 65 years or older but the proportion of younger than 65 years (34.3%) is much higher than for partial hip replacement. Most individuals having the other two types of primary total hip replacement are younger than 65 years (90.3% for total resurfacing procedures

and 79.7% for thrust plate). Over one quarter of revision procedures are undertaken on individuals less than 65 years of age (26.5%) (Table HG2).

There has been little change in the proportion of younger individuals (less than 65 years) receiving the different categories of primary hip replacement during the last five years (Figure HG2).

Diagnosis

The diagnosis for almost all primary partial hips is fractured neck of femur (94.0%). Osteoarthritis is the major reason for most primary conventional total hip replacements (88.3%) and total resurfacing replacements (94.0%).

The principal cause for revision of hip replacement is aseptic loosening (45.7%). The reason for revision of primary procedures recorded by the Registry is different when compared to the reason for revision of all revision procedures. This is because early to mid term revisions are compared to all revision procedures recorded by the Registry, many of which have been undertaken on procedures performed prior to the Registry collecting data. These differences are also dependent on the class of prostheses used for the primary procedure.

Dislocation (31.5%) is the most common reason for revision of known primary conventional total hip replacements. Fractured neck of femur (41.1%) is the most common reason for revision of total resurfacing hip replacement.

Use of different Categories of Hip Replacement

The most common hip procedure is a primary total hip (70.8% of all hip replacement procedures). Primary partial hip replacement accounts for 16.7% and revisions 12.4% of all hip procedures (Table HG1).

During the last five years, the proportion of primary total hip replacement has increased from 70.1% (2003) to 72.5% (2007). The proportion of primary partial hips has declined from 17.0% (2003) to 16.1% (2007). Revision procedures have also declined as a proportion of all hip replacements from 13.0% (2003) to 11.4% (2007). 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 procedures and therefore is affected by the number of other types of hip replacements undertaken.

State and Territory Variation in Use

There is variation in the number of hip replacement by state in most categories. In 2007, South Australia had the highest percentage of partial hip replacement (18.2%) and ACT/NT the lowest (12.5%). In 2007 the ACT/NT had the highest percentage of primary total hip replacement (75.3%) and Queensland the lowest (69.8%) (Figure HG3). The percentage of revision procedures also varies with Queensland having the highest percentage (12.7%) and South Australia the lowest (9.1%) in 2007 (Figure HG3). Queensland and WA were the only states that had an increase in the percentage of revision procedures from 2006 to 2007 ,however the percentage of revisions in WA remains low compared to most other states (11.7%) for 2007 (Figure HG3).

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 in both hips regardless of the type of primary hip replacement and the timing of the second primary hip procedure. Bilateral hip replacement is not uncommon with 12.5% of patients having bilateral hip replacement within five years.

The Registry has recorded 16,122 individuals having undergone bilateral primary hip replacement. The most common type of bilateral primary hip replacement is bilateral primary conventional total hip (83.4% of all bilateral procedures) followed by bilateral primary total resurfacing hip replacement (7.9%) (Table HG3).

Same day bilateral procedures are much less common in hip replacement compared to knee replacement and account for 5.4% of all bilateral hip procedures recorded by the Registry. Of those individuals who have had bilateral primary conventional total hip replacement, 4.6% were undertaken on the same day. Same day bilateral total resurfacing accounts for 18.2% of all bilateral total resurfacings (Table HG3).

General Comparison of Outcomes

The main outcome of the Registry is the time to first revision of a primary hip replacement. The outcomes of procedures are measured in two ways; using the number of revisions per 100 observed component years and using the cumulative percent revision at specified time points (see Appendix 1 for the full definition).

Primary conventional total hip replacement has the lowest revision rate compared to total resurfacing and partial hip replacement (0.8, 1.0 and 1.5 respectively) (Table HG4). This

difference is also evident when comparing the seven year cumulative percent revision for each of these procedures (4.2%, 5.4% and 5.9% 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 (172) of these procedures have been recorded by the Registry. The number of revisions per 100 observed component years for this procedure is 0.6 and the cumulative percent revision at 7 years is 3.0% (Tables HG4 and HG5).

Outcome by Primary Diagnosis

This year the Registry is presenting outcomes stratified by primary diagnosis for the first time. These analyses are presented for primary conventional and resurfacing total hip replacement only. These procedure types have been selected as enough procedures have been undertaken with a variety of different diagnoses. Primary partial hips have not been included because almost all of these have been undertaken for fractured neck of femur.

The Registry has classified 11 different primary diagnoses for primary conventional total hip replacement (Tables HG6 and HG7 and Figure HG4). 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. There is no significant difference between OA and developmental dysplasia of the hip (DDH) for conventional primary total hip replacement.

Three diagnoses were compared for primary resurfacing hip replacement (Tables HG8 and HG9 and Figure HG5). Both AVN and DDH have a significantly higher risk of revision compared to resurfacing procedures undertaken for OA. The five year cumulative percent revision for DDH is four times greater when a total resurfacing procedure is used compared to a primary conventional total hip replacement (12.0% compared to 3.0%).

HIP REPLACEMENT
1/9/1999 to 31/12/2007

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

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	%
Unipolar Monoblock	12246	74.2	4257	25.8	16503	51.4
Unipolar Modular	5428	73.3	1976	26.7	7404	23.1
Bipolar	5989	73.2	2188	26.8	8177	25.5
Partial Resurfacing	1	12.5	7	87.5	8	0.0
Primary Partial Hip	23664	73.7	8428	26.3	32092	100.0
Conventional Total	69225	55.4	55779	44.6	125004	92.1
Total Resurfacing	2898	27.3	7725	72.7	10623	7.8
Thrust Plate	50	29.1	122	70.9	172	0.1
Primary Total Hip	72173	53.1	63626	46.9	135799	100.0
Revision Hip	12860	54.1	10922	45.9	23782	100.0
Total	**108697**	**56.7**	**82976**	**43.3**	**191673**	**100.0**

Note: Table entries may not sum to totals due to rounding.

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

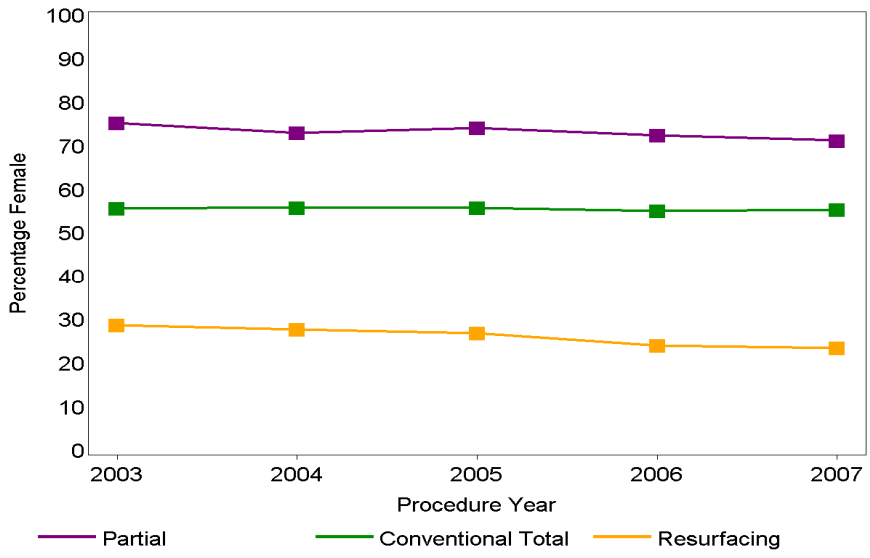


Table HG2: Number of Hip Replacements by Age

Type of Hip Replacement	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Unipolar Monoblock	38	0.2	193	1.2	1321	8.0	6793	41.2	8158	49.4	16503	51.4
Unipolar Modular	119	1.6	345	4.7	1210	16.3	3248	43.9	2482	33.5	7404	23.1
Bipolar	222	2.7	508	6.2	1450	17.7	3645	44.6	2352	28.8	8177	25.5
Partial Resurfacing	8	100.0	.	.	.	.	.	.	.	.	8	0.0
Primary Partial Hip	387	1.2	1046	3.3	3981	12.4	13686	42.6	12992	40.5	32092	100.0
Conventional Total	14784	11.8	28036	22.4	42520	34.0	33586	26.9	6078	4.9	125004	92.1
Total Resurfacing	5444	51.2	4144	39.0	973	9.2	61	0.6	1	0.0	10623	7.8
Thrust Plate	65	37.8	72	41.9	33	19.2	2	1.2	.	.	172	0.1
Primary Total Hip	20293	14.9	32252	23.7	43526	32.1	33649	24.8	6079	4.5	135799	100.0
Revision Hip	2415	10.2	3881	16.3	7143	30.0	7944	33.4	2399	10.1	23782	100.0
Total	**23095**	**12.0**	**37181**	**19.4**	**54651**	**28.5**	**55279**	**28.8**	**21467**	**11.2**	**191673**	**100.0**

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

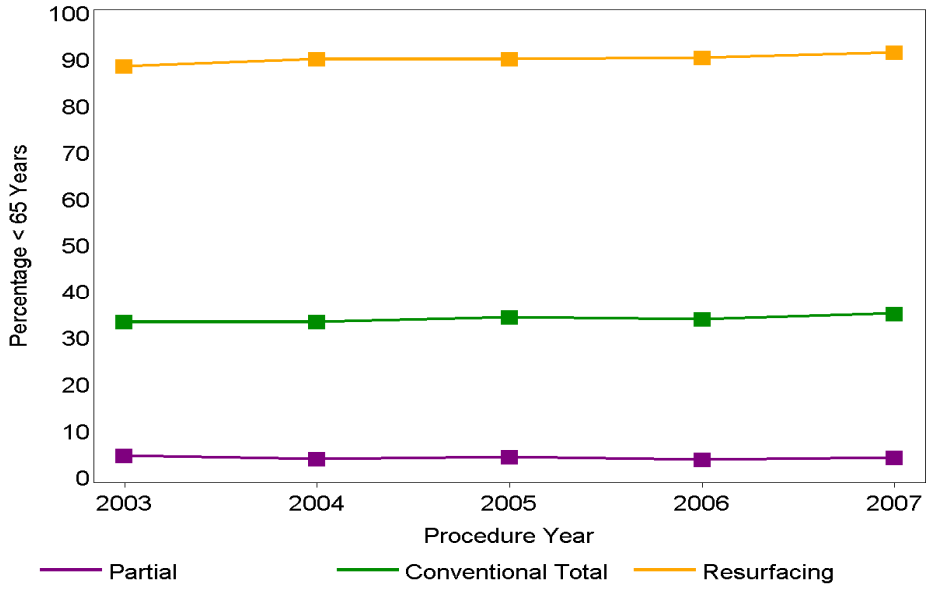


Figure HG3: Trends in Usage of Hip Replacement by State/Territory and Year

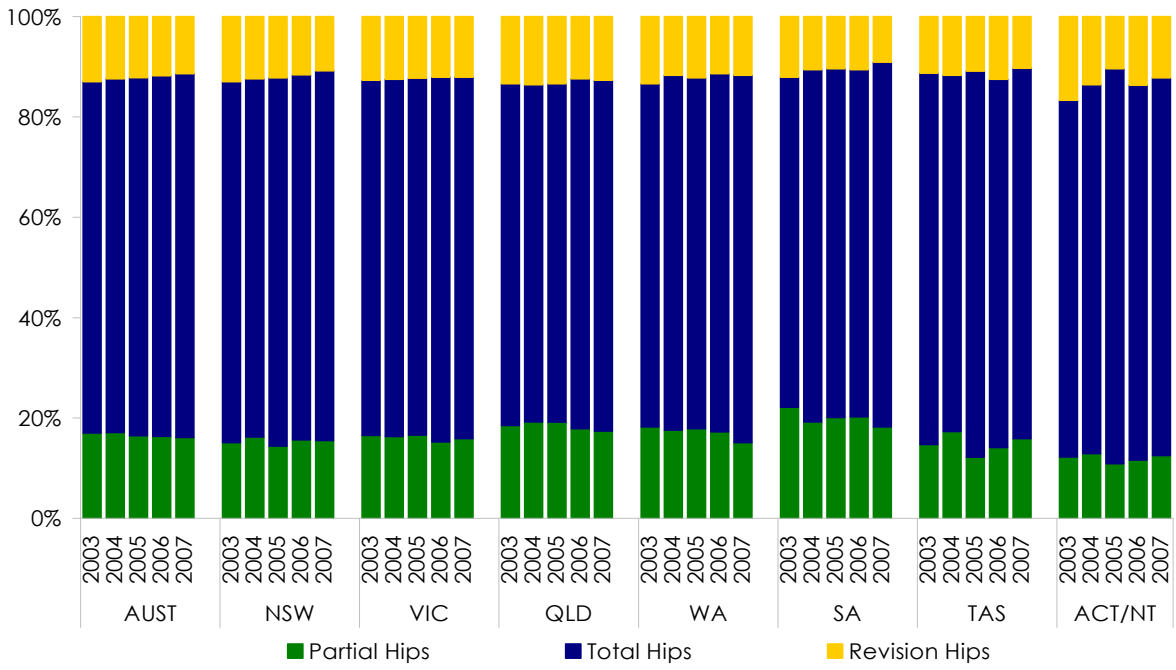


Table HG3: Time between Procedures for Bilateral Primary Hip Replacement

Bilateral Procedures	Same Day		1day-6months		≥6months		Total	
	N	%	N	%	N	%	N	%
Both Conventional Total	618	3.8	3437	21.3	9383	58.2	13438	83.4
Both Total Resurfacing	231	1.4	279	1.7	760	4.7	1270	7.9
Both Partial	13	0.1	278	1.7	566	3.5	857	5.3
Total/ Partial	2	0.0	45	0.3	232	1.4	279	1.7
Conventional Total/Other Total	7	0.0	17	0.1	227	1.4	251	1.6
Both Thrust Plate	1	0.0	8	0.0	18	0.1	27	0.2
Total	**872**	**5.4**	**4064**	**25.2**	**11186**	**69.4**	**16122**	**100.0**

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

Table HG4: Primary Hip Replacement requiring Revision

Type of Hip Replacement	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Partial Hip	970	32092	66115	1.5	(1.38, 1.56)
Unipolar Monoblock	580	16503	32729	1.8	(1.63, 1.92)
Unipolar Modular	168	7404	12742	1.3	(1.13, 1.53)
Bipolar	222	8177	20631	1.1	(0.94, 1.23)
Partial Resurfacing	0	8	12	0.0	(0.00, 30.76)
Conventional Total	3145	125004	388461	0.8	(0.78, 0.84)
Cemented	380	15864	57336	0.7	(0.60, 0.73)
Cementless	1779	66736	195750	0.9	(0.87, 0.95)
Hybrid	986	42404	135374	0.7	(0.68, 0.78)
Total Resurfacing	340	10623	32455	1.0	(0.94, 1.17)
Thrust Plate	4	172	672	0.6	(0.16, 1.52)
Total	**4459**	**167891**	**487703**	**0.9**	**(0.89, 0.94)**

Table HG5: Yearly Cumulative Percent Revision of Primary Hip Replacement

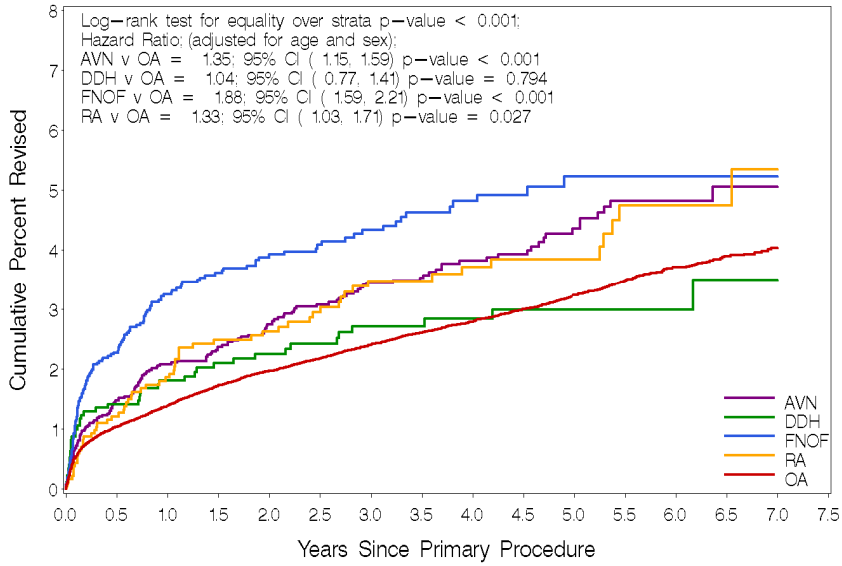
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Partial Hip	2.4 (2.3, 2.6)	3.5 (3.3, 3.7)	4.1 (3.8, 4.4)	5.2 (4.8, 5.6)	5.9 (5.4, 6.4)
Unipolar Monoblock	3.0 (2.7, 3.3)	4.3 (3.9, 4.7)	5.0 (4.6, 5.5)	6.2 (5.6, 6.8)	6.8 (6.0, 7.6)
Unipolar Modular	1.7 (1.4, 2.1)	2.7 (2.3, 3.2)	3.3 (2.7, 3.9)	5.0 (4.1, 6.2)	6.8 (5.2, 8.9)
Bipolar	2.1 (1.8, 2.4)	2.8 (2.4, 3.3)	3.1 (2.7, 3.6)	4.0 (3.4, 4.6)	4.2 (3.6, 4.9)
Partial Resurfacing	0				
Conventional Total	1.5 (1.4, 1.6)	2.1 (2.0, 2.2)	2.5 (2.5, 2.6)	3.4 (3.2, 3.5)	4.2 (4.0, 4.4)
Cemented	1.1 (1.0, 1.3)	1.6 (1.4, 1.9)	2.1 (1.9, 2.4)	3.1 (2.8, 3.5)	3.8 (3.3, 4.3)
Cementless	1.7 (1.6, 1.8)	2.3 (2.2, 2.5)	2.8 (2.7, 3.0)	3.6 (3.4, 3.8)	4.4 (4.1, 4.8)
Hybrid	1.4 (1.3, 1.5)	1.9 (1.8, 2.0)	2.3 (2.1, 2.5)	3.1 (2.9, 3.3)	3.9 (3.6, 4.2)
Total Resurfacing	1.9 (1.7, 2.2)	2.6 (2.3, 2.9)	3.1 (2.8, 3.5)	4.4 (3.9, 5.0)	5.4 (4.6, 6.2)
Thrust Plate	1.2 (0.3, 4.7)	1.2 (0.3, 4.7)	1.9 (0.6, 6.0)	3.0 (1.1, 7.9)	3.0 (1.1, 7.9)

Note: Cumulative Percent Revision equal to zero indicates that the procedure type has been followed up to this time with no revisions recorded.

Table HG6: Primary Conventional Total Hip Replacement requiring Revision by Primary Diagnosis

Primary Diagnosis	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Avascular Necrosis	163	4882	15828	1.0	(0.88, 1.20)
Developmental Dysplasia	45	1715	5799	0.8	(0.57, 1.04)
Fractured Neck of Femur	153	4079	9842	1.6	(1.32, 1.82)
Osteoarthritis	2654	110403	345319	0.8	(0.74, 0.80)
Rheumatoid Arthritis	63	1861	6457	1.0	(0.75, 1.25)
Other (6)	67	2064	5217	1.3	(1.00, 1.63)
Total	**3145**	**125004**	**388461**	**0.8**	**(0.78, 0.84)**

Figure HG4: Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Avascular Necrosis	4882	4006	3274	2495	1833	1150	581	159
Developmental Dysplasia	1715	1450	1185	943	679	441	225	61
Fractured Neck of Femur	4079	2849	2023	1411	925	520	229	51
Rheumatoid Arthritis	1861	1601	1310	1026	773	511	264	86
Osteoarthritis	110403	90027	71532	54163	38169	23881	11204	2873

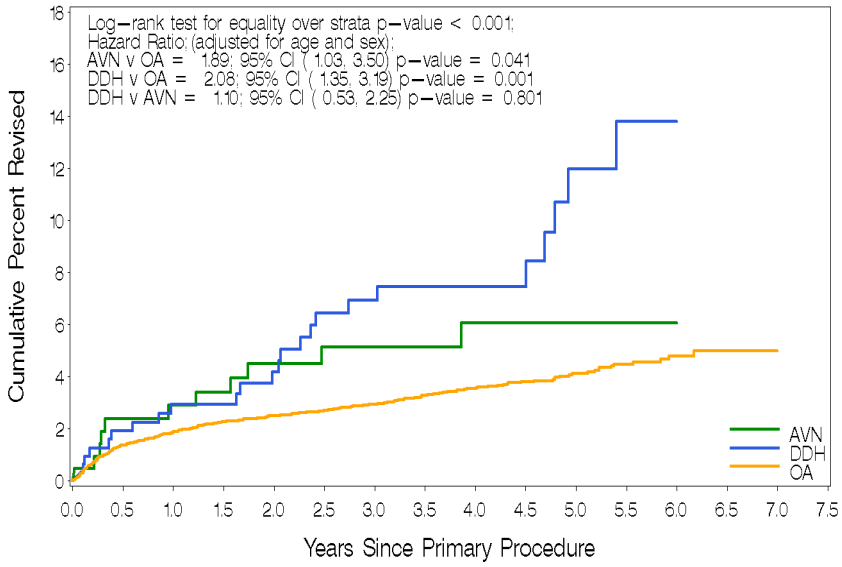
Table HG7: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Primary Diagnosis

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Avascular Necrosis	2.1 (1.7, 2.5)	2.7 (2.3, 3.3)	3.4 (2.9, 4.1)	4.4 (3.7, 5.1)	5.1 (4.2, 6.1)
Developmental Dysplasia	1.8 (1.3, 2.6)	2.3 (1.6, 3.1)	2.7 (2.0, 3.7)	3.0 (2.2, 4.1)	3.5 (2.4, 5.1)
Fractured Neck of Femur	3.3 (2.7, 3.9)	3.9 (3.3, 4.6)	4.3 (3.7, 5.1)	5.2 (4.4, 6.3)	5.2 (4.4, 6.3)
Osteoarthritis	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.4 (2.3, 2.5)	3.2 (3.1, 3.4)	4.0 (3.8, 4.3)
Rheumatoid Arthritis	1.9 (1.3, 2.6)	2.6 (2.0, 3.5)	3.5 (2.7, 4.5)	3.8 (3.0, 5.0)	5.4 (3.8, 7.4)
Other (6)	2.3 (1.7, 3.1)	2.9 (2.2, 3.8)	3.4 (2.6, 4.5)	4.6 (3.5, 6.0)	

Table HG8: Primary Total Resurfacing Hip Replacement requiring Revision by Primary Diagnosis

Primary Diagnosis	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Avascular Necrosis	11	217	771	1.4	(0.71, 2.55)
Developmental Dysplasia	24	321	1047	2.3	(1.47, 3.41)
Osteoarthritis	299	9983	30299	1.0	(0.88, 1.11)
Other Inflammatory Arthritis	3	48	177	1.7	(0.35, 4.95)
Rheumatoid Arthritis	3	45	132	2.3	(0.47, 6.67)
Other (4)	0	9	29	0.0	(0.00, 12.74)
Total	**340**	**10623**	**32455**	**1.0**	**(0.94, 1.17)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Avascular Necrosis	217	189	171	134	97	56	17	2
Developmental Dysplasia	321	278	220	179	121	69	18	4
Osteoarthritis	9983	8252	6551	4822	3283	1901	679	83

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Avascular Necrosis	2.9 (1.3, 6.3)	4.5 (2.4, 8.5)	5.1 (2.8, 9.3)	6.1 (3.3, 10.9)	
Developmental Dysplasia	2.9 (1.5, 5.6)	4.2 (2.4, 7.3)	6.9 (4.4, 10.8)	12.0 (7.6, 18.6)	
Osteoarthritis	1.9 (1.6, 2.2)	2.5 (2.2, 2.8)	2.9 (2.6, 3.3)	4.1 (3.6, 4.7)	5.0 (4.2, 5.8)
Other Inflammatory Arthritis	2.2 (0.3, 14.4)	2.2 (0.3, 14.4)	2.2 (0.3, 14.4)	7.1 (1.6, 27.8)	
Rheumatoid Arthritis	4.7 (1.2, 17.4)	7.9 (2.6, 23.1)	7.9 (2.6, 23.1)	7.9 (2.6, 23.1)	

PRIMARY PARTIAL HIP REPLACEMENT

The report for 2008 is based on analysis of 32,092 primary partial hip replacements recorded by the Registry up to and including 31st December 2007. This section includes the analysis of 16,503 unipolar monoblock, 7,404 unipolar modular and 8,177 bipolar procedures. The eight primary partial resurfacing procedures are not included in the following analyses.

Usage

The vast majority of all primary partial hip prostheses are used for treating fractures of the femoral neck (94%). The proportion of primary partial hip replacements compared to total and revision hip procedures has remained constant over the last five years. In 2007 they accounted for 16.1% of all hip procedures (Figure HG3). There continues to be an increase in the use of unipolar modular prostheses at the expense of both unipolar monoblock and bipolar prostheses. Unipolar modular prostheses now account for 23.1% of all partial hip replacements recorded in the Registry and their use has increased by 9.5% from last year (Figure HP1)

Unipolar modular prostheses are the most common partial hip replacements in Western Australia, South Australia, Tasmania and for the first time New South Wales. Bipolar prostheses remain the most common partial hip replacement used in the ACT/NT (Figure HP1).

Unipolar Monoblock

There are only three different prosthesis types in the unipolar monoblock category. These are the Austin Moore type, Thompson type and Exeter Trauma System (ETS) prostheses. The decline in the use of unipolar monoblock procedures is largely the result of the reduction in the use of the Austin Moore type prostheses. Although this type of prosthesis still remains the most commonly used prosthesis in this category, in terms of absolute numbers the use has declined from a peak use of 1,988 in 2003 to 1,102 in 2007, a reduction of over 45% in four years.

The absolute numbers of Thompson type prostheses have also reduced from a high of 636 in 2004 to 445 in 2007. The ETS has gradually increased its use, 231 were implanted in 2007 which is 13% of all unipolar monoblock procedures in 2007 (Table HP1 and Figure HP2).

Unipolar Modular

In 2007 there were 21 different types of unipolar modular heads implanted, which was an increase of four, compared to 2006. There were 37 different types of femoral stems used in primary unipolar modular hip replacements. The Registry has data on 98 head and stem combinations.

The Unitrax remains the most frequently used unipolar head in 2007 and accounts for 29.6% of all unipolar heads used. The Unipolar Head (Smith & Nephew) remains the next most common and its use has increased from 399 in 2006 to 594 in 2007. The top ten unipolar heads account for 97.9% of all cases (Table HP2 and Figure HP3).

The Exeter V40 remains the most frequently used femoral stem with unipolar modular heads. The top ten stems account for 91.7% of all stems used in 2007 and there was no change in the number of different stems used (Table HP3 and Figure HP4).

Bipolar

There were 12 bipolar heads used in 2007 compared with 18 used in 2006. In 2007 the UHR was again the most frequently used bipolar head (48.7%) and the top ten bipolar heads were used in 99.7% of all procedures. The Exeter V40 stem was again the most common stem used in combination with bipolar heads but its use has been declining. The Registry now has information on 175 different combinations of bipolar head and femoral stem (Tables HP4 and HP5 and Figures HP5 and HP6).

Six of the 2007 top ten femoral stems used in combination with bipolar heads were also in the top ten stems used with unipolar modular heads.

Changes in use with Gender and Age

Females continue to be more likely to undergo partial hip replacement than males (71.4% in 2007) but there is a small increase in the use of partial hip replacement in males increasing from 24.6% in 2003 to 28.6% in 2007 (Table HP6). The proportion of females and males is similar for unipolar monoblock, unipolar modular and bipolar partial hip replacement and the small increase in use in males is evident in all three categories (Tables HP7, HP8 and HP9).

Most patients undergoing partial hip replacement are 75 years or older, in 2007 this group accounted for 83.7% of all partial hip replacements (Table HP10). Unipolar monoblock prostheses are used more often in older individuals compared to unipolar modular and bipolar prostheses. Of all patients receiving unipolar monoblock prostheses 91.5% were aged 75 years or older and 54.1% were aged 85 years and older.

The use of monoblock prostheses in older individuals continues to decline. The number of patients 85 years or older receiving a unipolar monoblock prosthesis has decreased by 25% since 2003. Bipolar hip procedures have also decreased slightly (9%), however the use of unipolar modular has increased by 280% in this age group (Tables HP11, HP12 and HP13).

Fixation

In partial hip replacement the mode of fixation refers to fixation of the femoral stem. Just over half (52.6%) of all primary partial hip replacement are cemented. The prosthesis fixation varies with the type of partial hip replacement. In 2007 cemented prostheses were used in 39.1% of monoblock, 73.4% of unipolar modular and 77.8% of bipolar procedures (Table HP14 and Figures HP7-HP9).

There continues to be state and territory variation in the use of fixation. Nationally in 2007, there has been a slight decline in the proportion of monoblock prostheses using cement fixation, a small increase in the proportion in use of cement for unipolar modular prostheses and no change in the proportion of cement fixation in the bipolar group (Figures HP7-HP9).

Outcomes in Primary Partial Hip Replacement

Of the 32,092 primary partial hip replacements analysed by the Registry 970 have been revised which is 1.5 revisions per 100 observed component years. At one year the cumulative percent revision is 2.4% and at seven years is 5.9% (Tables HG4 and HG5). The following analyses only include procedures with a primary diagnosis of fractured neck of femur.

Age and Gender

Age continues to have a significant effect on the revision rate of partial hip replacements. The effect of age continues to be most evident in the unipolar monoblock procedure, with those less than 75 years having a five year cumulative percent revision of 11.9% compared to 3.4% for those aged 85 years or older (Table HP16 and Figure HP10). Similarly for unipolar modular procedures the five year cumulative percent revision for <75 years is 7.8%, 75 to 84 years is 4.3% and ≥85 years is 1.0% (Table HP18 and Figure HP11). This age effect is not as apparent for bipolar procedures as the only age group where there is a significant difference is between the <75 years and the 75 to 84 years (Tables HP19 and HP20 and Figure HP12).

In general, males are revised more frequently in all age groups for all categories of primary partial hip replacements with the exception of unipolar monoblock procedures. Although not significant, females aged <75 years have a higher revision rate compared to males of the same age receiving monoblock procedures. (Tables HP21, HP22 and HP23).

Fixation

Cement fixation of the femoral stem significantly reduces the risk of revision for all categories of partial hip replacement.

Unipolar Monoblock

Cementless unipolar monoblock procedures have twice the risk of revision compared to cemented monoblock procedures (hazard ratio adjusted for age and sex (Adj HR)=2.08; 95% CI (1.64, 2.64) p<0.001). The three year cumulative percent revision for cemented is 2.3% and for cementless is 5.4%, and the five year cumulative percent revision is 4.8% and 6.1% respectively (Tables HP24 and HP25 and Figure HP13).

It is important to appreciate that the mortality following these procedures is high with almost 70% of individuals having died within five years (Table M6). Consequently, the revision risk in the first few years is a major consideration in determining appropriate prosthesis selection and fixation for the management of fractured neck of femur.

Unipolar Modular

Similarly in unipolar modular procedures cementless fixation has twice the risk of revision compared to cemented (Adj HR= 2.28; 95% CI (1.59, 3.27) p<0.001). The follow up period for cementless unipolar modular procedures is shorter than for the cemented group, as the use of cementless unipolar prostheses has only been undertaken in significant numbers in the last two to three years. The one year cumulative percent revision is 2.7% for cementless compared to 0.8% for cemented procedures. At three years, the cumulative percent revision is 3.8% and 2.4% respectively (Tables HP26 and HP27 and Figure HP14).

Bipolar

Bipolar procedures also have a greater risk of revision when they are used with cementless stems compared to cemented (Adj HR=1.75; 95% CI (1.22, 2.51) p=0.002). The five year cumulative percent revision is 4.3% for cementless compared to 2.8% for cemented (Tables HP28 and HP29 and Figure HP 15).

Outcomes of Specific Prostheses

Unipolar Monoblock

This analysis considers three different prostheses, the Austin Moore type, Thompson type and the ETS. Austin Moore type and

Thompson type used with and without cement are considered separately. As mentioned in previous reports there is a variety of different manufacturers of both the Austin Moore type and Thompson type prostheses. Due to the similarity of these designs, the Registry has elected not to undertake a manufacturer specific analysis but has grouped together the various Austin Moore type and Thompson type prostheses and reported on the overall revision rates.

For a number of years the Registry has reported a significant increase in early revision for the cementless Austin Moore type prosthesis compared to the cemented Thompson type. As almost all Austin Moore type prostheses are undertaken without cement and Thompson type prostheses are used with cement this analysis is almost identical to the comparison of fixation for monoblock procedures (Tables HP30 and HP31 and Figure HP16).

The cemented Austin Moore type has an almost identical outcome to a cemented Thompson type procedure (three year cumulative percent revision of the Austin Moore type cemented is 2.7% and for Thompson type cemented is 2.9%). Thompson type prostheses implanted without cement, have the highest rate of revision of all monoblock procedures (five year cumulative percent revision is 10.8%).

There is a limited follow up for the ETS (1.2 revisions per 100 observed component years) and a three year cumulative percent revision of 1.9% (Tables HP30 and HP31).

Unipolar Modular

The revision rate of unipolar modular procedures varies according to the stem with which it is combined. The revision rates and yearly cumulative percent revision for stem/head combinations with greater than 50 procedures recorded by the Registry are presented in Tables HP32 and HP33.

Individual unipolar modular prostheses were analysed using the Registry algorithm to identify prostheses and combinations with a higher than anticipated rate of revision. This year the Registry identified two combinations, one of which has been previously identified. Both have a higher than anticipated rate of revision largely as a consequence of revisions related to the cementless stem (Tables HP36-HP39 and Figures HP17 and HP18).

The first combination is the Taperloc stem and Endo II unipolar head. The Registry identified this combination in the previous two reports as having a higher than anticipated rate of revision. This combination was used only six times in 2007. At three years, the cumulative percent revision is 6.9%.

For the first time the Registry has identified the Modular Cathcart unipolar head with the Corail stem (Adj HR=2.5; 95% CI (1.17, 5.38) p=0.018). There have been seven revisions out of 229 procedures using this combination and the two year cumulative percent revision is 4.1%. Five of the revisions have been undertaken for fracture of the femur (data not shown).

Bipolar

The revision rates and yearly cumulative percent revision for stem/bipolar head combinations with greater than 50 procedures recorded by the Registry are presented in Tables HP34 and HP35. There are two combinations of stem and bipolar head and one bipolar prosthesis identified as having a higher than anticipated rate of revision. (Tables HP39-HP41 and Figures HP19-HP21).
The Registry has previously identified the UHR/Omnifit and the Biomet bipolar head. These prostheses have continued to be used in 2007, the UHR/Omnifit combination was used on 11 occasions and the Biomet Bipolar Head on 18 occasions. The UHR/Omnifit combination has almost twice the risk of revision compared to other bipolar head combinations (Adj HR=1.99; 95% CI (1.23, 3.22) p=0.005). The Biomet bipolar prosthesis has been used with a variety of different stems. It has 2.6 times the risk of revision compared to other bipolar prostheses (Adj HR=2.57; 95% CI (1.27, 5.22) p=0.009).

For the first time the Registry has identified the UHR/ABGII combination as having a higher than anticipated revision rate (Adj HR=2.16; 95% CI (1.06, 4.37) p=0.033). There have been eight revisions out of a total of 144 and a five year cumulative percent revision of 9.9%.

PRIMARY PARTIAL HIP REPLACEMENT
1/9/1999 to 31/12/2007

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

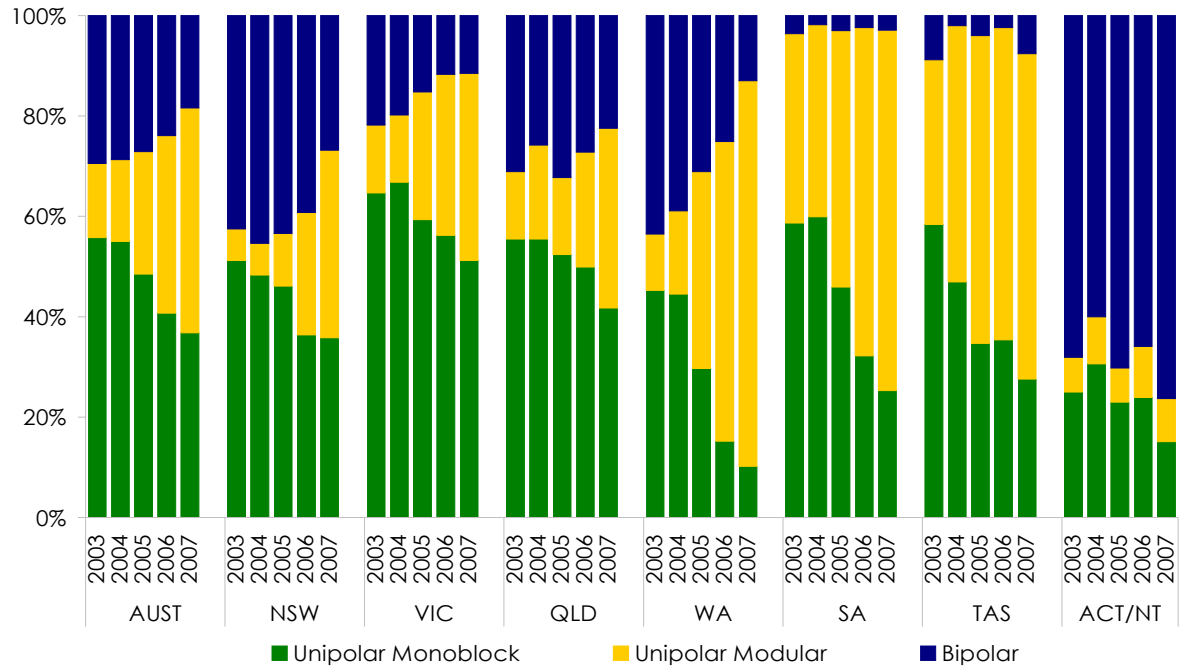


Table HP1: 3 Most Common Unipolar Monoblock Prostheses used in Primary Unipolar Monoblock Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Austin-Moore Type (1988)	Austin-Moore Type (1969)	Austin-Moore Type (1587)	Austin-Moore Type (1208)	Austin-Moore Type (1102)
2	Thompson Type (526)	Thompson Type (636)	Thompson Type (625)	Thompson Type (576)	Thompson Type (445)
3		ETS (41)	ETS (119)	ETS (196)	ETS (231)
Top 3 Usage	100%	100%	100%	100%	100%
Total Procedures	2514	2646	2331	1980	1778
N Prosthesis Types	2	3	3	3	3

Figure HP2: 5 Most Common Unipolar Monoblock Prostheses used in Primary Unipolar Monoblock Hip Replacement

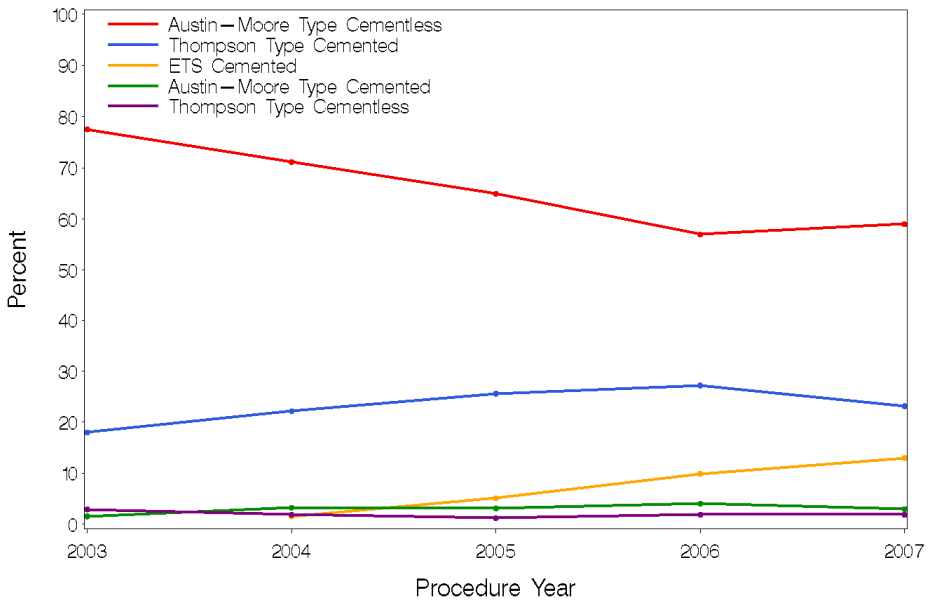


Table HP2: 10 Most Common Unipolar Modular Heads used in Primary Unipolar Modular Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Unitrax (193)	Unitrax (197)	Unitrax (334)	Unitrax (500)	Unitrax (641)
2	Unipolar (Sulzer) (114)	Unipolar (S&N) (148)	Unipolar (S&N) (254)	Unipolar (S&N) (399)	Unipolar (S&N) (594)
3	Unipolar (S&N) (90)	Hemi (Mathys) (110)	VerSys Endo (159)	VerSys Endo (191)	VerSys Endo (313)
4	VerSys Endo (75)	Unipolar (Sulzer) (102)	Hemi (Mathys) (119)	Unipolar (Corin) (184)	Modular Cathcart (137)
5	Hemi (Mathys) (64)	VerSys Endo (88)	Unipolar (Zimmer) (102)	Unipolar (Zimmer) (147)	Unipolar (Corin) (137)
6	Hemi (Depuy) (46)	Unipolar (Plus) (65)	Unipolar (Plus) (68)	Modular Cathcart (84)	Unipolar (Zimmer) (133)
7	Unipolar (Plus) (38)	Endo II (22)	Endo II (42)	Hemi (Mathys) (64)	Unipolar (Plus) (86)
8	Unipolar (Zimmer) (28)	Modular Endo (14)	Unipolar (Corin) (28)	Unipolar (Plus) (62)	Hemi (Mathys) (40)
9	Ultima (16)	Hemi (Depuy) (12)	Unipolar (Sulzer) (21)	Endo II (36)	Metasul (28)
10	Metasul (1)	Unipolar (Zimmer) (12)	Modular Cathcart (20)	Hemi (Depuy) (15)	Pharo (13)
Top 10 Usage	99.8%	98.2%	97.9%	98%	97.9%
Total Procedures	666	784	1172	1717	2168
N Prosthesis Types	11	13	15	17	21

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

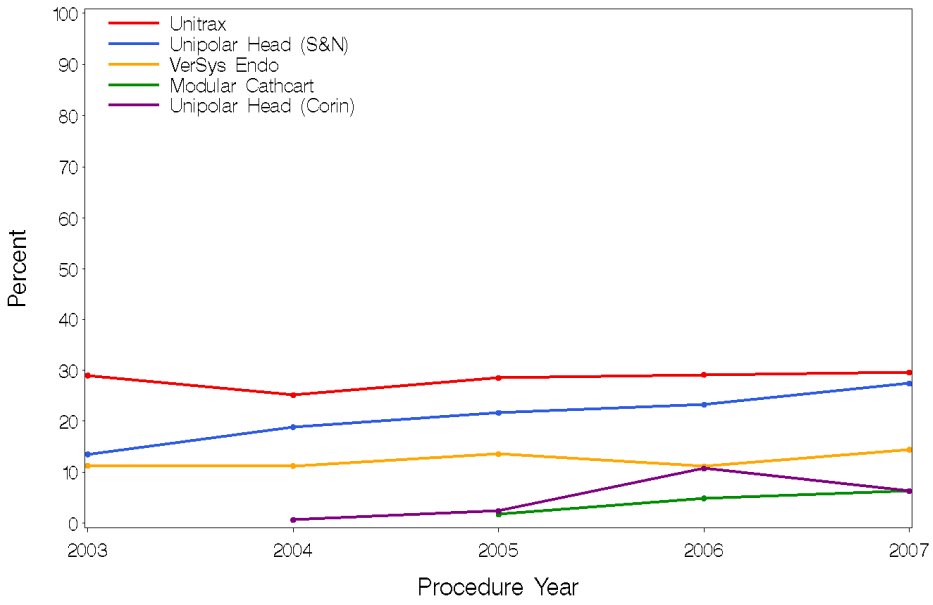


Table HP3: 10 Most Common Femoral Stems used in Primary Unipolar Modular Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Exeter V40 (179)	Exeter V40 (179)	Exeter V40 (317)	Exeter V40 (476)	Exeter V40 (610)
2	Alloclassic (111)	Spectron EF (127)	Spectron EF (162)	Spectron EF (199)	CPT (293)
3	CPT (91)	Alloclassic (111)	CPT (133)	CPT (174)	Spectron EF (273)
4	Spectron EF (89)	CPT (73)	Alloclassic (102)	CPCS (169)	CPCS (269)
5	Fullfix Stem (49)	Fullfix Stem (68)	CPCS (92)	Alloclassic (129)	Alloclassic (156)
6	SL-Plus (38)	SL-Plus (64)	CCA (78)	Trifit (124)	Corail (137)
7	Elite Plus (33)	CCA (37)	SL-Plus (68)	Corail (82)	SL-Plus (86)
8	CCA (15)	Taperloc (31)	Fullfix Stem (36)	SL-Plus (61)	Trifit (74)
9	Thompson Modular (15)	CPCS (17)	Corail (29)	Taper Fit (60)	Taper Fit (59)
10	C-Stem (13)	VerSys (15)	Taperloc (29)	CCA (40)	Platform (30)
Top 10 Usage	95%	92.1%	89.2%	88.2%	91.7%
Total Procedures	666	784	1172	1717	2168
N Prosthesis Types	21	34	33	37	37

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

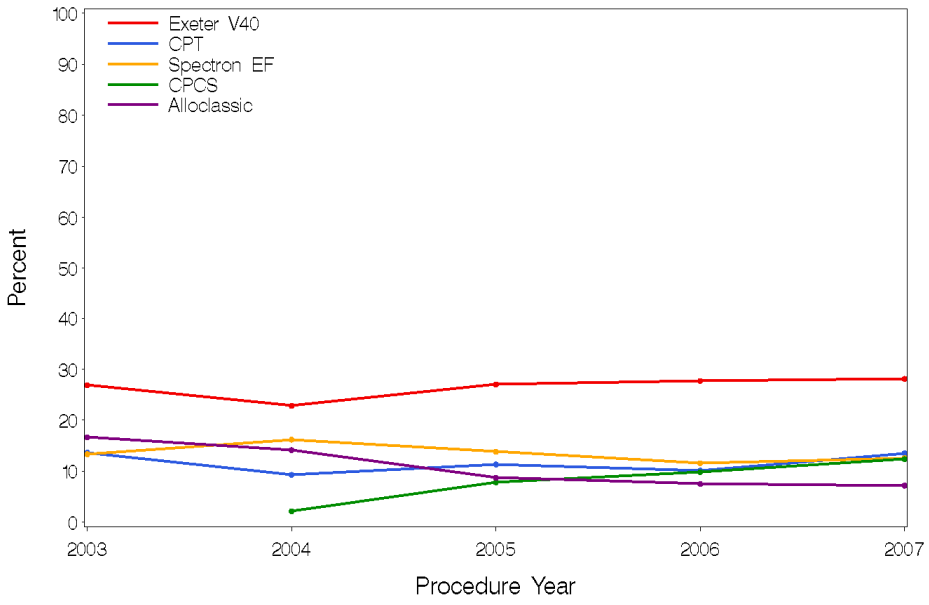


Table HP4: 10 Most Common Bipolar Heads used in Primary Bipolar Hip Replacement

Rank	2003	2004	2005	2006	2007
1	UHR (747)	UHR (654)	UHR (617)	UHR (552)	UHR (434)
2	Hastings (140)	Convene (194)	Tandem (132)	Tandem (219)	Tandem (166)
3	Convene (115)	Hastings (138)	Convene (109)	Multipolar Bipolar (101)	Multipolar Bipolar (142)
4	Bipolar (Sulzer) (91)	Endo Cup (Depuy) (114)	Multipolar Bipolar (102)	Endo Cup (Depuy) (64)	Hastings (64)
5	Endo Cup (Depuy) (82)	Bipolar (Sulzer) (101)	Hastings (96)	Hastings (58)	Endo Cup (Depuy) (49)
6	Multipolar Bipolar (59)	Multipolar Bipolar (91)	Endo Cup (Depuy) (87)	Convene (41)	Bipolar (Biomet) (18)
7	Bipolar (Mathys) (39)	Bipolar (Mathys) (21)	Bipolar (Sulzer) (80)	Bipolar (Zimmer) (38)	UHL (6)
8	Bipolar (Biomet) (19)	Bipolar (Biomet) (20)	Bipolar (Mathys) (24)	Bipolar (Sulzer) (32)	Bipolar (Eska) (5)
9	Bipolar (Lima) (19)	UHL (11)	Bipolar (Biomet) (16)	Bipolar (Biomet) (19)	Bipolar (Lima) (3)
10	Self-Centering (5)	Bipolar (Lima) (10)	Bipolar (Zimmer) (14)	Bipolar (Mathys) (7)	Bipolar (Plus) (2)
Top 10 Usage	99.1%	98%	98.1%	97.2%	99.7%
Total Procedures	1328	1381	1302	1163	892
N Prosthesis Types	13	17	17	18	12

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

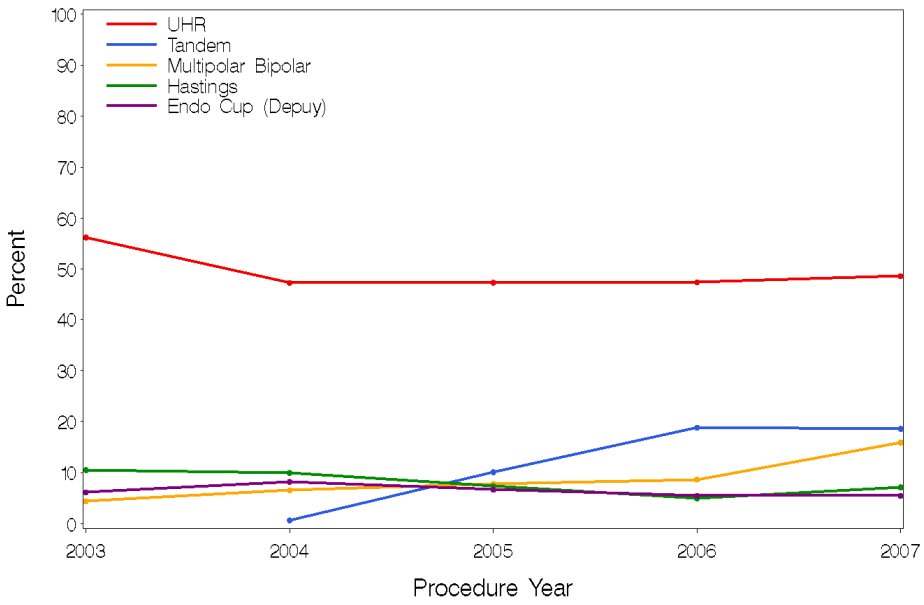


Table HP5: 10 Most Common Femoral Stems used in Primary Bipolar Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Exeter V40 (621)	Exeter V40 (557)	Exeter V40 (545)	Exeter V40 (482)	Exeter V40 (368)
2	Elite Plus (94)	CPCS (151)	CPCS (175)	CPCS (221)	CPCS (127)
3	Alloclassic (75)	Elite Plus (100)	Alloclassic (85)	Alloclassic (78)	Corail (62)
4	CPCS (65)	Alloclassic (96)	Elite Plus (77)	Corail (58)	CPT (55)
5	C-Stem (61)	C-Stem (61)	VerSys (73)	VerSys (57)	VerSys (46)
6	Omnifit (59)	VerSys (56)	Corail (52)	CPT (29)	Alloclassic (32)
7	VerSys (45)	Omnifit (43)	ABGII (34)	Spectron EF (28)	Spectron EF (31)
8	Spectron EF (30)	ABGII (36)	Omnifit (31)	Accolade (24)	Accolade (28)
9	ABGII (26)	Corail (31)	Spectron EF (30)	Omnifit (24)	C-Stem (19)
10	CCA (25)	CPT (28)	C-Stem (19)	Elite Plus (20)	ABGII (14)
Top 10 Usage	82.9%	83.9%	86.1%	87.8%	87.7%
Total Procedures	1328	1381	1302	1163	892
N Prosthesis Types	52	54	44	48	35

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

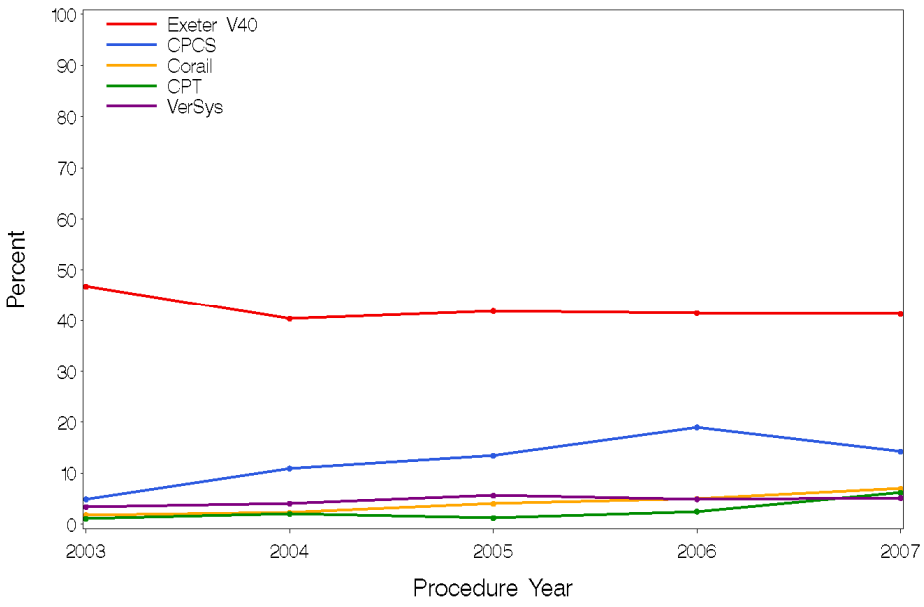


Table HP6: Primary Partial Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N		N	%
2003	3398	75.4	1110	24.6	4508	100.0
2004	3518	73.1	1293	26.9	4811	100.0
2005	3574	74.4	1231	25.6	4805	100.0
2006	3527	72.6	1333	27.4	4860	100.0
2007	3456	71.4	1382	28.6	4838	100.0

Table HP7: Primary Unipolar Monoblock Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	1905	75.8	609	24.2	2514	100.0
2004	1937	73.2	709	26.8	2646	100.0
2005	1748	75.0	583	25.0	2331	100.0
2006	1406	71.0	574	29.0	1980	100.0
2007	1275	71.7	503	28.3	1778	100.0

Table HP8: Primary Unipolar Modular Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	507	76.1	159	23.9	666	100.0
2004	585	74.6	199	25.4	784	100.0
2005	880	75.1	292	24.9	1172	100.0
2006	1254	73.0	463	27.0	1717	100.0
2007	1543	71.2	625	28.8	2168	100.0

Table HP9: Primary Bipolar Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	986	74.2	342	25.8	1328	100.0
2004	996	72.1	385	27.9	1381	100.0
2005	946	72.7	356	27.3	1302	100.0
2006	867	74.5	296	25.5	1163	100.0
2007	638	71.5	254	28.5	892	100.0

Table HP10: Primary Partial Hip Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	62	1.4	161	3.6	549	12.2	1899	42.1	1837	40.7	4508	100.0
2004	53	1.1	151	3.1	617	12.8	2060	42.8	1930	40.1	4811	100.0
2005	56	1.2	164	3.4	610	12.7	2067	43.0	1908	39.7	4805	100.0
2006	48	1.0	149	3.1	546	11.2	2088	43.0	2029	41.7	4860	100.0
2007	54	1.1	158	3.3	577	11.9	1963	40.6	2086	43.1	4838	100.0

Table HP11: Primary Unipolar Monoblock Hip Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	7	0.3	35	1.4	187	7.4	1005	40.0	1280	50.9	2514	100.0
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	957	41.1	1158	49.7	2331	100.0
2006	0	0.0	27	1.4	139	7.0	810	40.9	1004	50.7	1980	100.0
2007	4	0.2	12	0.7	135	7.6	665	37.4	962	54.1	1778	100.0

Table HP12: Primary Unipolar Modular Hip Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	11	1.7	30	4.5	108	16.2	304	45.6	213	32.0	666	100.0
2004	15	1.9	44	5.6	140	17.9	344	43.9	241	30.7	784	100.0
2005	18	1.5	63	5.4	223	19.0	521	44.5	347	29.6	1172	100.0
2006	25	1.5	69	4.0	258	15.0	761	44.3	604	35.2	1717	100.0
2007	26	1.2	97	4.5	312	14.4	923	42.6	810	37.4	2168	100.0

Table HP13: Primary Bipolar Hip Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	44	3.3	96	7.2	254	19.1	590	44.4	344	25.9	1328	100.0
2004	32	2.3	83	6.0	262	19.0	610	44.2	394	28.5	1381	100.0
2005	30	2.3	73	5.6	207	15.9	589	45.2	403	31.0	1302	100.0
2006	23	2.0	53	4.6	149	12.8	517	44.5	421	36.2	1163	100.0
2007	24	2.7	49	5.5	130	14.6	375	42.0	314	35.2	892	100.0

Table HP14: Primary Partial Hip Replacement by Fixation

Fixation	Unipolar Monoblock		Unipolar Modular		Bipolar		Total	
	Number	%	Number	%	Number	%	Number	%
Cemented	4579	14.3	5573	17.4	6712	20.9	16864	52.6
Cementless	11924	37.2	1831	5.7	1465	4.6	15220	47.4
Total	**16503**	**51.4**	**7404**	**23.1**	**8177**	**25.5**	**32084**	**100.0**

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

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

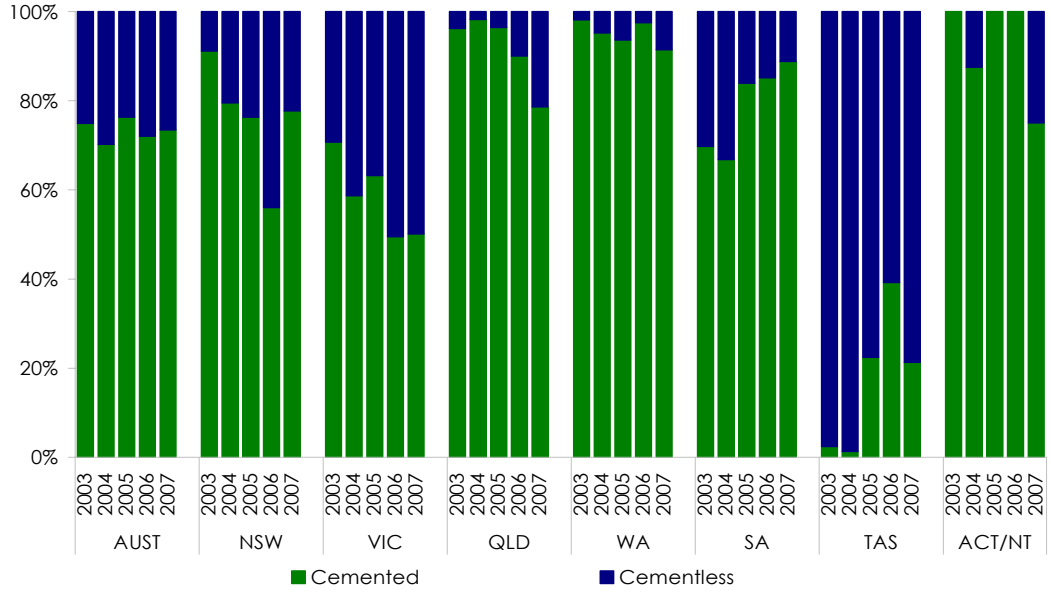


Figure HP9: Trends in Fixation of Bipolar Hip Replacement by State/Territory and Year

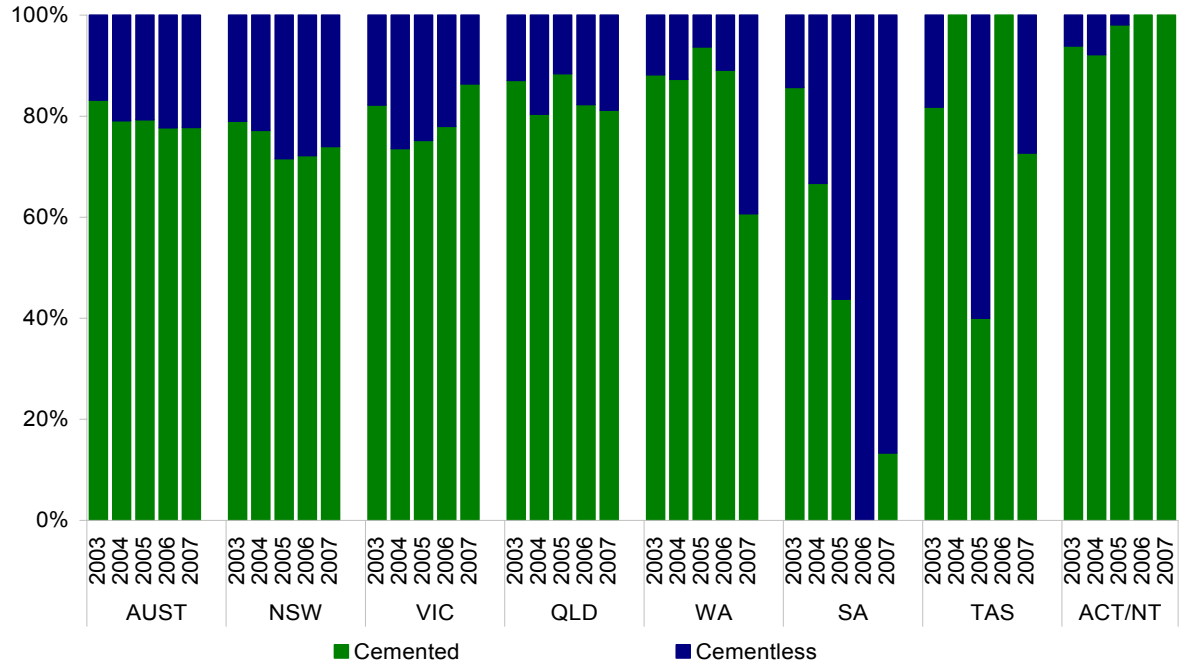
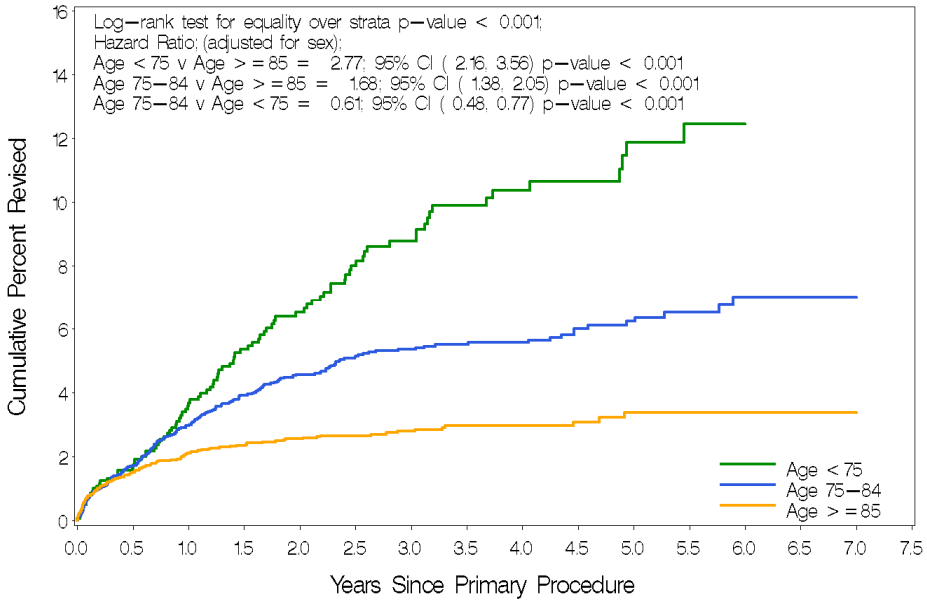


Table HP15: Primary Unipolar Monoblock Hip Replacement requiring Revision by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<75	100	1487	3563	2.8	(2.28, 3.41)
75-84	252	6588	14227	1.8	(1.56, 2.00)
≥85	159	7936	14159	1.1	(0.96, 1.31)
Total	**511**	**16011**	**31948**	**1.6**	**(1.46, 1.74)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
< 75	1487	988	733	517	339	201	104	31
75-84	6588	4097	2961	2010	1259	738	315	75
≥ 85	7936	4319	2929	1864	1089	549	217	46

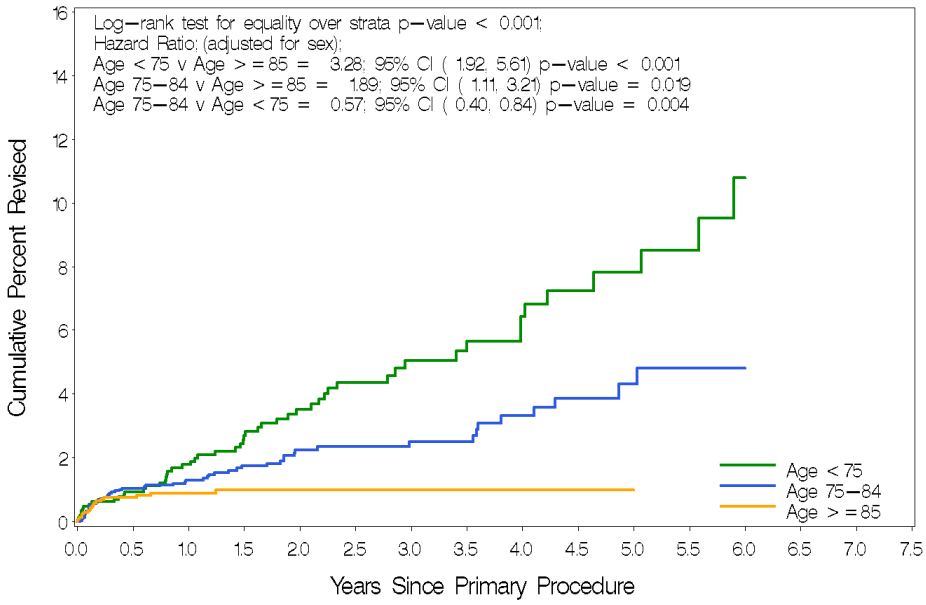
Table HP16: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<75	3.6 (2.7, 4.8)	6.5 (5.2, 8.2)	8.8 (7.1, 10.8)	11.9 (9.6, 14.7)	
75-84	3.0 (2.6, 3.5)	4.6 (4.0, 5.2)	5.4 (4.7, 6.1)	6.2 (5.4, 7.2)	7.0 (5.9, 8.3)
≥85	2.1 (1.8, 2.5)	2.6 (2.2, 3.0)	2.8 (2.4, 3.3)	3.4 (2.8, 4.2)	3.4 (2.8, 4.2)

Table HP17: Primary Unipolar Modular Hip Replacement requiring Revision by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<75	54	1495	3128	1.7	(1.30, 2.25)
75-84	56	2989	5544	1.0	(0.76, 1.31)
≥85	18	2288	3181	0.6	(0.34, 0.89)
Total	**128**	**6772**	**11852**	**1.1**	**(0.90, 1.28)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
< 75	1495	966	630	393	240	136	65	22
75-84	2989	1787	1076	657	390	193	99	22
≥ 85	2288	1124	590	322	154	73	24	7

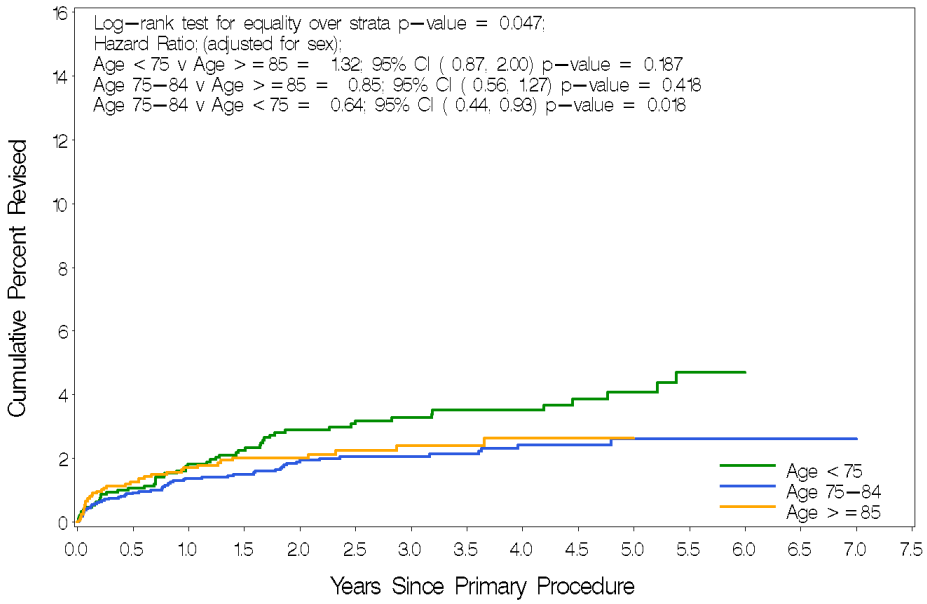
Table HP18: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<75	1.8 (1.2, 2.7)	3.5 (2.5, 4.9)	5.0 (3.7, 6.9)	7.8 (5.6, 10.9)	
75-84	1.3 (0.9, 1.8)	2.2 (1.7, 3.0)	2.5 (1.8, 3.4)	4.3 (3.0, 6.2)	
≥85	0.9 (0.6, 1.4)	1.0 (0.6, 1.6)	1.0 (0.6, 1.6)	1.0 (0.6, 1.6)	

Table HP19: Primary Bipolar Hip Replacement requiring Revision by Age (Primary Diagnosis Fractured NOF excluding Infection)

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<75	54	1796	5466	1.0	(0.74, 1.29)
75-84	59	3306	8842	0.7	(0.51, 0.86)
≥85	39	2159	4397	0.9	(0.63, 1.21)
Total	**152**	**7261**	**18705**	**0.8**	**(0.69, 0.95)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
< 75	1796	1402	1145	891	619	377	158	45
75-84	3306	2493	1900	1363	876	496	182	49
≥ 85	2159	1366	941	600	354	154	43	11

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<75	1.8 (1.3, 2.6)	2.9 (2.1, 3.9)	3.3 (2.5, 4.4)	4.1 (3.1, 5.4)	
75-84	1.4 (1.0, 1.9)	1.9 (1.4, 2.5)	2.1 (1.6, 2.7)	2.6 (2.0, 3.5)	2.6 (2.0, 3.5)
≥85	1.7 (1.2, 2.4)	2.0 (1.4, 2.8)	2.4 (1.7, 3.3)	2.6 (1.8, 3.7)	

Table HP21: Primary Unipolar Monoblock Hip Replacement requiring Revision by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	<75	22	486	941	2.3	(1.47, 3.54)
Male	75-84	53	1779	2709	2.0	(1.47, 2.56)
Male	≥85	44	1859	2232	2.0	(1.43, 2.65)
Female	<75	78	1001	2622	3.0	(2.35, 3.71)
Female	75-84	199	4809	11518	1.7	(1.50, 1.99)
Female	≥85	115	6077	11927	1.0	(0.80, 1.16)
Total		**511**	**16011**	**31948**	**1.6**	**(1.46, 1.74)**

Table HP22: Primary Unipolar Modular Hip Replacement requiring Revision by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	<75	16	448	812	2.0	(1.13, 3.20)
Male	75-84	18	795	1186	1.5	(0.90, 2.40)
Male	≥85	3	552	592	0.5	(0.10, 1.48)
Female	<75	38	1047	2316	1.6	(1.16, 2.25)
Female	75-84	38	2194	4357	0.9	(0.62, 1.20)
Female	≥85	15	1736	2589	0.6	(0.32, 0.96)
Total		**128**	**6772**	**11852**	**1.1**	**(0.90, 1.28)**

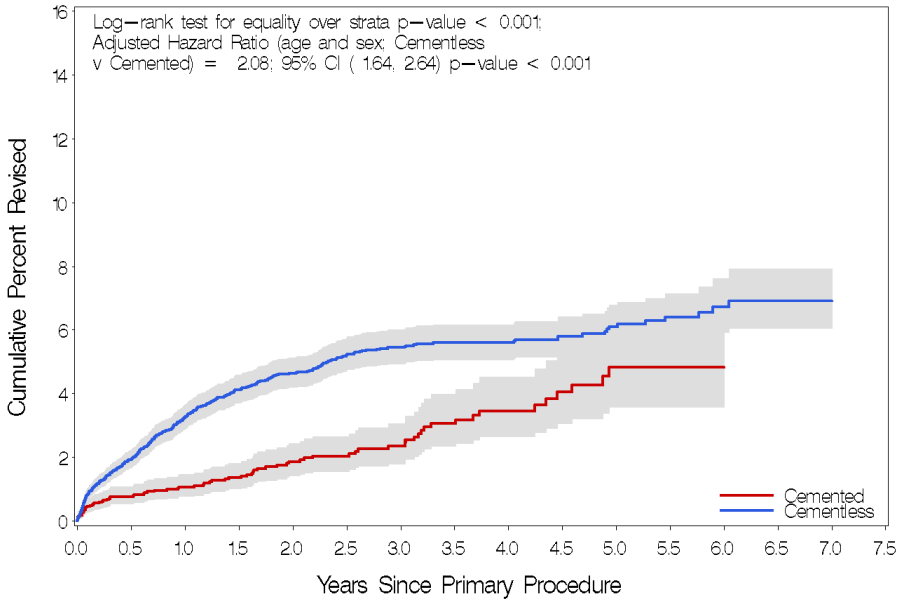
Table HP23: Primary Bipolar Hip Replacement requiring Revision by Gender and Age (Primary Diagnosis Fractured NOF excluding Infection)

Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	<75	18	510	1357	1.3	(0.79, 2.10)
Male	75-84	20	830	1889	1.1	(0.65, 1.63)
Male	≥85	9	556	903	1.0	(0.46, 1.89)
Female	<75	36	1286	4110	0.9	(0.61, 1.21)
Female	75-84	39	2476	6952	0.6	(0.40, 0.77)
Female	≥85	30	1603	3494	0.9	(0.58, 1.23)
Total		**152**	**7261**	**18705**	**0.8**	**(0.69, 0.95)**

Table HP24: Primary Unipolar Monoblock Hip Replacement requiring Revision by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Fixation	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Cementless	432	11575	23582	1.8	(1.66, 2.01)
Cemented	79	4436	8366	0.9	(0.75, 1.18)
Total	**511**	**16011**	**31948**	**1.6**	**(1.46, 1.74)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	4436	2641	1738	1061	594	330	158	42
Cementless	11575	6763	4885	3330	2093	1158	478	110

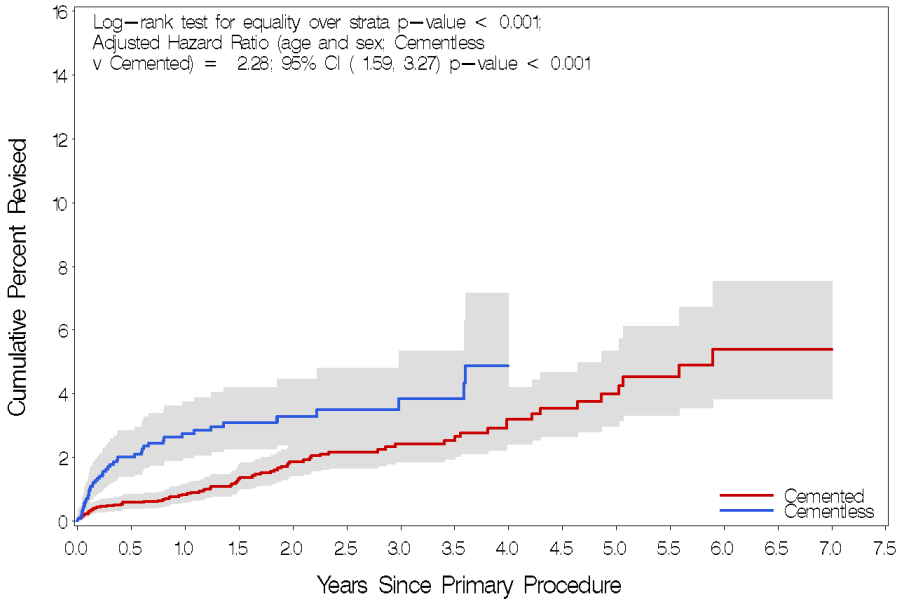
Table HP25: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cementless	3.3 (2.9, 3.6)	4.6 (4.2, 5.1)	5.4 (4.9, 6.0)	6.1 (5.5, 6.8)	6.9 (6.0, 7.9)
Cemented	1.1 (0.8, 1.5)	1.9 (1.4, 2.4)	2.3 (1.8, 3.1)	4.8 (3.6, 6.5)	

Table HP26: Primary Unipolar Modular Hip Replacement requiring Revision by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Fixation	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years s	Exact 95% CI
Cementless	48	1712	2570	1.9	(1.38, 2.48)
Cemented	80	5060	9282	0.9	(0.68, 1.07)
Total	**128**	**6772**	**11852**	**1.1**	**(0.90, 1.28)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	5060	2952	1807	1084	664	368	183	51
Cementless	1712	925	489	288	120	34	5	0

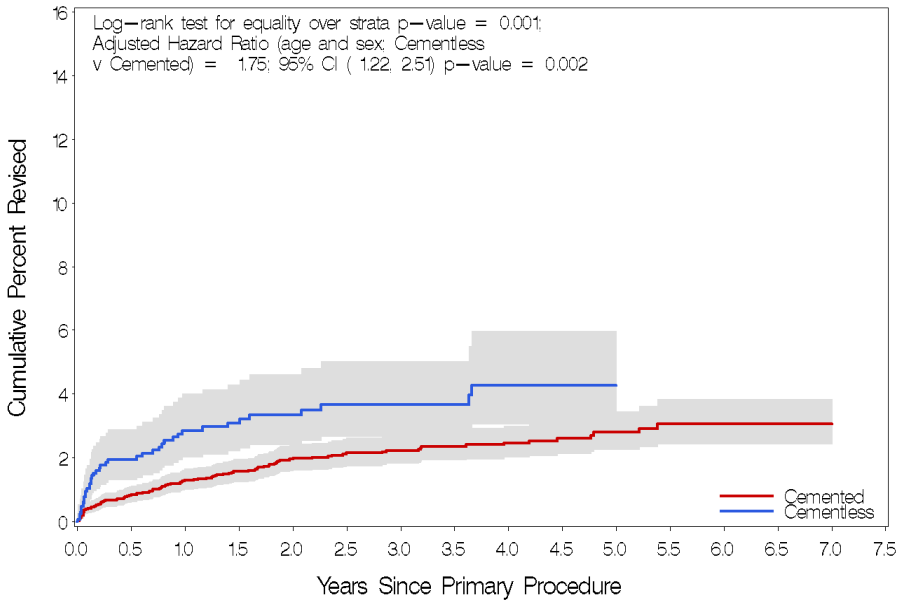
Table HP27: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cementless	2.7 (2.0, 3.7)	3.3 (2.4, 4.5)	3.8 (2.7, 5.3)		
Cemented	0.8 (0.6, 1.2)	1.9 (1.4, 2.4)	2.4 (1.9, 3.1)	4.0 (3.0, 5.3)	5.4 (3.8, 7.6)

Table HP28: Primary Bipolar Hip Replacement requiring Revision by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

Femoral Fixation	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Cementless	41	1309	2978	1.4	(0.99, 1.87)
Cemented	111	5952	15727	0.7	(0.58, 0.85)
Total	**152**	**7261**	**18705**	**0.8**	**(0.69, 0.95)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	5952	4353	3338	2415	1608	914	347	93
Cementless	1309	908	648	439	241	113	36	12

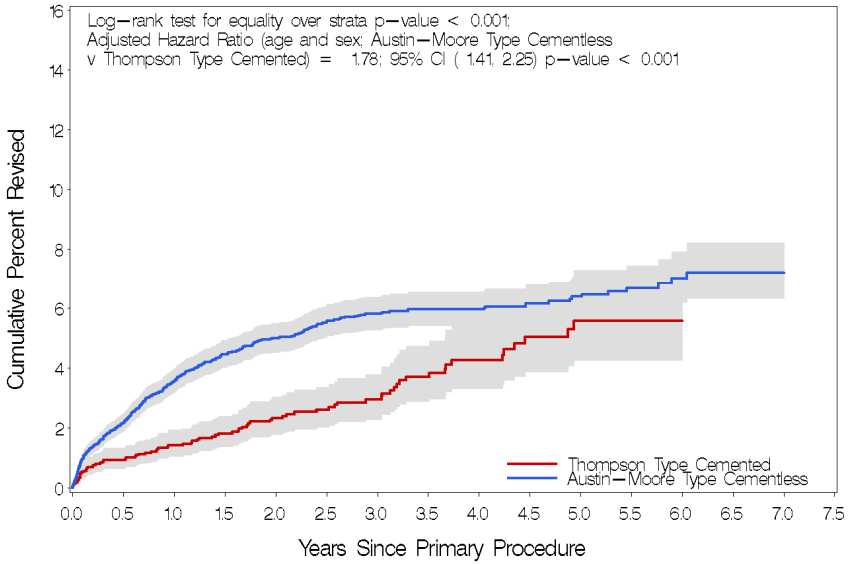
Table HP29: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cementless	2.9 (2.0, 4.0)	3.3 (2.4, 4.6)	3.7 (2.7, 5.0)	4.3 (3.1, 6.0)	
Cemented	1.3 (1.0, 1.7)	2.0 (1.6, 2.4)	2.2 (1.8, 2.7)	2.8 (2.3, 3.4)	3.1 (2.4, 3.8)

Table HP30: Primary Unipolar Monoblock Hip Replacement requiring Revision

Unipolar Monoblock	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Austin-Moore Type Cemented	7	389	613	1.1	(0.46, 2.35)
Austin-Moore Type Cementless	463	11593	23413	2.0	(1.80, 2.17)
ETS Cemented	8	587	650	1.2	(0.53, 2.43)
Thompson Type Cemented	84	3603	7327	1.1	(0.91, 1.42)
Thompson Type Cementless	18	331	728	2.5	(1.46, 3.91)
Total	**580**	**16503**	**32731**	**1.8**	**(1.63, 1.92)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Thompson Type Cemented	3603	2233	1531	982	574	328	156	41
Austin-Moore Type Cementless	11593	6725	4836	3294	2066	1156	477	109

Table HP31: Yearly Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Austin-Moore Type Cemented	1.3 (0.5, 3.6)	2.7 (1.1, 6.2)	2.7 (1.1, 6.2)		
Austin-Moore Type Cementless	3.6 (3.2, 4.0)	5.0 (4.5, 5.5)	5.8 (5.3, 6.4)	6.4 (5.8, 7.1)	7.2 (6.3, 8.2)
ETS Cemented	1.4 (0.7, 2.9)	1.9 (0.9, 4.1)	1.9 (0.9, 4.1)		
Thompson Type Cemented	1.4 (1.1, 1.9)	2.3 (1.8, 3.0)	2.9 (2.3, 3.8)	5.6 (4.3, 7.3)	
Thompson Type Cementless	4.6 (2.6, 8.0)	5.2 (3.0, 8.9)	7.4 (4.5, 12.0)	10.8 (6.0, 19.1)	

Table HP32: Primary Unipolar Modular Hip Replacement requiring Revision

Unipolar Head		Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Endo II	Taperloc	4	62	114	3.5	(0.96, 8.99)
Hemi Head (Depuy)	C-Stem	4	56	193	2.1	(0.57, 5.32)
Hemi Head (Depuy)	Elite Plus	1	76	192	0.5	(0.01, 2.90)
Hemi Head (Mathys)	CCA	7	348	928	0.8	(0.30, 1.55)
Hemi Head (Mathys)	Fullfix Stem	4	222	498	0.8	(0.22, 2.06)
Modular Cathcart	Corail	7	229	172	4.1	(1.64, 8.41)
Ultima	Thompson Modular	1	126	445	0.2	(0.01, 1.25)
Unipolar Head (Corin)	Taper Fit	2	139	138	1.5	(0.18, 5.25)
Unipolar Head (Corin)	Trifit	3	211	197	1.5	(0.31, 4.46)
Unipolar Head (Plus)	SL-Plus	10	316	553	1.8	(0.87, 3.32)
Unipolar Head (S&N)	CPCS	4	547	513	0.8	(0.21, 1.99)
Unipolar Head (S&N)	Spectron EF	20	971	1800	1.1	(0.68, 1.72)
Unipolar Head (Sulzer)	Alloclassic	13	308	865	1.5	(0.80, 2.57)
Unipolar Head (Zimmer)	Alloclassic	5	331	385	1.3	(0.42, 3.03)
Unipolar Head (Zimmer)	CPT	6	147	635	0.9	(0.35, 2.06)
Unipolar Head (Zimmer)	MS 30	0	55	83	0.0	(0.00, 4.47)
Unitrax	Accolade	3	59	82	3.7	(0.75, 10.69)
Unitrax	Exeter V40	44	1915	3099	1.4	(1.03, 1.91)
Unitrax	Omnifit	3	52	144	2.1	(0.43, 6.10)
VerSys Endo	CPT	11	728	1011	1.1	(0.54, 1.95)
VerSys Endo	VerSys	2	92	138	1.4	(0.18, 5.23)
Other (77)	-	14	414	559	2.5	(1.37, 4.21)
Total		**168**	**7404**	**12742**	**1.3**	**(1.13, 1.53)**

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

Table HP33: Yearly Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement

Unipolar Head	Femoral Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
Endo II	Taperloc	6.9 (2.6, 17.3)	6.9 (2.6, 17.3)	6.9 (2.6, 17.3)		
Hemi Head (Depuy)	C-Stem	2.0 (0.3, 13.6)	2.0 (0.3, 13.6)	2.0 (0.3, 13.6)	5.3 (1.3, 20.3)	
Hemi Head (Depuy)	Elite Plus	0	0	0	0	
Hemi Head (Mathys)	CCA	1.0 (0.3, 3.1)	2.3 (1.0, 5.1)	2.9 (1.4, 6.1)	2.9 (1.4, 6.1)	
Hemi Head (Mathys)	Fullfix Stem	1.0 (0.3, 4.0)	2.4 (0.9, 6.4)	2.4 (0.9, 6.4)	2.4 (0.9, 6.4)	
Modular Cathcart	Corail	4.1 (1.9, 8.5)	4.1 (1.9, 8.5)			
Ultima	Thompson Modular	0.8 (0.1, 5.8)	0.8 (0.1, 5.8)	0.8 (0.1, 5.8)	0.8 (0.1, 5.8)	0.8 (0.1, 5.8)
Unipolar Head (Corin)	Taper Fit	1.6 (0.4, 6.3)	1.6 (0.4, 6.3)			
Unipolar Head (Corin)	Trifit	1.5 (0.5, 4.6)	1.5 (0.5, 4.6)			
Unipolar Head (Plus)	SL-Plus	2.0 (0.9, 4.5)	3.2 (1.6, 6.6)	5.5 (2.7, 10.9)		
Unipolar Head (S&N)	CPCS	0.7 (0.2, 2.0)	1.2 (0.4, 3.6)			
Unipolar Head (S&N)	Spectron EF	1.5 (0.8, 2.7)	2.6 (1.6, 4.4)	3.8 (2.3, 6.2)		
Unipolar Head (Sulzer)	Alloclassic	3.4 (1.8, 6.4)	3.8 (2.1, 7.0)	3.8 (2.1, 7.0)	6.5 (3.6, 11.6)	
Unipolar Head (Zimmer)	Alloclassic	1.8 (0.8, 4.4)	1.8 (0.8, 4.4)			
Unipolar Head (Zimmer)	CPT	0.8 (0.1, 5.3)	2.3 (0.7, 7.0)	3.2 (1.2, 8.3)	5.4 (2.4, 11.9)	5.4 (2.4, 11.9)
Unipolar Head (Zimmer)	MS 30	0	0			
Unitrax	Accolade	0	12.2 (4.0, 33.7)	12.2 (4.0, 33.7)		
Unitrax	Exeter V40	1.2 (0.8, 1.9)	2.8 (2.0, 4.1)	3.5 (2.4, 5.0)	7.8 (5.1, 11.9)	
Unitrax	Omnifit	6.7 (2.2, 19.8)	6.7 (2.2, 19.8)	6.7 (2.2, 19.8)	6.7 (2.2, 19.8)	
VerSys Endo	CPT	1.5 (0.8, 2.9)	1.9 (1.0, 3.6)	2.4 (1.2, 4.7)		
VerSys Endo	VerSys	3.7 (0.9, 14.0)	3.7 (0.9, 14.0)	3.7 (0.9, 14.0)		
Other (77)	-	3.8 (2.1, 6.7)	3.8 (2.1, 6.7)	3.8 (2.1, 6.7)		

Note: Cumulative Percent Revision equal to zero indicates that the prosthesis combination has been followed up to this time with no revisions recorded.

Table HP34: Primary Bipolar Hip Replacement requiring Revision

Bipolar Head	Femoral Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Bipolar Ballhead (Sulzer)	Alloclassic	7	308	890	0.8	(0.32, 1.62)
Bipolar Ballhead (Sulzer)	MS 30	1	58	216	0.5	(0.01, 2.58)
Bipolar Head (Mathys)	CCA	2	87	270	0.7	(0.09, 2.67)
Bipolar Head (Zimmer)	Alloclassic	0	50	75	0.0	(0.00, 4.93)
Centrax	Exeter	5	202	910	0.5	(0.18, 1.28)
Centrax	Exeter V40	0	64	282	0.0	(0.00, 1.31)
Convene	CPCS	12	345	873	1.4	(0.71, 2.40)
Convene	Spectron EF	7	165	531	1.3	(0.53, 2.72)
Endo Cup (Depuy)	C-Stem	1	105	277	0.4	(0.01, 2.01)
Endo Cup (Depuy)	Corail	3	88	121	2.5	(0.51, 7.24)
Endo Cup (Depuy)	Elite Plus	1	227	697	0.1	(0.00, 0.80)
Hastings	C-Stem	6	142	472	1.3	(0.47, 2.77)
Hastings	Charnley	3	80	192	1.6	(0.32, 4.58)
Hastings	Corail	3	141	255	1.2	(0.24, 3.44)
Hastings	Elite Plus	12	298	984	1.2	(0.63, 2.13)
Hastings	Summit	1	51	84	1.2	(0.03, 6.65)
Multipolar Bipolar	Alloclassic	0	55	58	0.0	(0.00, 6.33)
Multipolar Bipolar	CPT	4	136	180	2.2	(0.60, 5.68)
Multipolar Bipolar	VerSys	0	279	481	0.0	(0.00, 0.77)
Tandem	CPCS	9	409	455	2.0	(0.90, 3.76)
Tandem	Spectron EF	4	78	96	4.2	(1.14, 10.72)
UHR	ABGII	8	144	345	2.3	(1.00, 4.57)
UHR	Accolade	3	61	59	5.1	(1.04, 14.77)
UHR	Exeter	8	204	861	0.9	(0.40, 1.83)
UHR	Exeter V40	66	3041	7166	0.9	(0.71, 1.17)
UHR	Omnifit	18	312	1017	1.8	(1.05, 2.80)
Other (149)	-	38	1047	2784	1.4	(0.97, 1.87)
Total		**222**	**8177**	**20631**	**1.1**	**(0.94, 1.23)**

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

Table HP35: Yearly Cumulative Percent Revision of Primary Bipolar Hip Replacement

Bipolar Head	Femoral Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
Bipolar Ballhead (Sulzer)	Alloclassic	1.1 (0.3, 3.3)	2.3 (1.0, 5.0)	2.3 (1.0, 5.0)	3.6 (1.5, 8.7)	
Bipolar Ballhead (Sulzer)	MS 30	1.9 (0.3, 12.4)	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)	2.7 (0.7, 10.3)	
Bipolar Head (Zimmer)	Alloclassic	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)	2.7 (1.1, 6.5)
Centrax	Exeter V40	0	0	0	0	
Convene	CPCS	2.2 (1.1, 4.6)	3.3 (1.8, 6.1)	3.3 (1.8, 6.1)		
Convene	Spectron EF	2.0 (0.6, 6.0)	2.8 (1.1, 7.4)	3.8 (1.6, 9.0)	6.3 (3.0, 13.3)	
Endo Cup (Depuy)	C-Stem	0	1.3 (0.2, 8.8)	1.3 (0.2, 8.8)	1.3 (0.2, 8.8)	
Endo Cup (Depuy)	Corail	3.7 (1.2, 11.0)	3.7 (1.2, 11.0)	3.7 (1.2, 11.0)		
Endo Cup (Depuy)	Elite Plus	0	0.6 (0.1, 4.2)	0.6 (0.1, 4.2)	0.6 (0.1, 4.2)	
Hastings	C-Stem	2.2 (0.7, 6.8)	4.2 (1.8, 9.9)	5.3 (2.4, 11.6)	5.3 (2.4, 11.6)	
Hastings	Charnley	0	4.4 (1.1, 16.5)	4.4 (1.1, 16.5)	7.6 (2.5, 22.2)	
Hastings	Corail	2.4 (0.8, 7.1)	2.4 (0.8, 7.1)	2.4 (0.8, 7.1)		
Hastings	Elite Plus	1.9 (0.8, 4.6)	3.3 (1.6, 6.4)	4.4 (2.4, 8.1)	5.3 (2.9, 9.5)	
Hastings	Summit	2.9 (0.4, 18.6)	2.9 (0.4, 18.6)	2.9 (0.4, 18.6)		
Multipolar Bipolar	Alloclassic	0	0			
Multipolar Bipolar	CPT	2.6 (0.9, 8.0)	5.5 (1.7, 16.6)	5.5 (1.7, 16.6)		
Multipolar Bipolar	VerSys	0	0	0		
Tandem	CPCS	2.7 (1.4, 5.5)	3.2 (1.7, 6.2)			
Tandem	Spectron EF	2.7 (0.7, 10.4)	13.0 (4.3, 35.6)			
UHR	ABGII	3.9 (1.6, 9.1)	3.9 (1.6, 9.1)	5.1 (2.3, 11.3)	9.9 (4.5, 20.7)	
UHR	Accolade	5.6 (1.3, 22.2)	17.4 (4.4, 55.4)			
UHR	Exeter	1.6 (0.5, 5.0)	2.2 (0.8, 5.8)	3.5 (1.6, 7.7)	5.1 (2.5, 10.0)	5.1 (2.5, 10.0)
UHR	Exeter V40	1.8 (1.4, 2.4)	2.3 (1.8, 3.0)	2.5 (1.9, 3.2)	3.3 (2.5, 4.5)	
UHR	Omnifit	5.2 (3.2, 8.4)	5.6 (3.5, 9.0)	5.6 (3.5, 9.0)	6.2 (3.9, 9.9)	
Other (149)	-	3.2 (2.2, 4.6)	3.6 (2.6, 5.1)	4.3 (3.1, 5.9)	4.6 (3.3, 6.3)	

Note: Cumulative Percent Revision equal to zero indicates that the prosthesis combination has been followed up to this time with no revisions recorded.

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

Table HP36: Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

Unipolar Head/ Femoral Component	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and still used						
Endoll/Taperloc	62	114	3.51	3.428	0.0154	(1.27, 9.29)
Newly Identified						
Modular Cathcart/Corail	229	172	4.08	2.509	0.0181	(1.17, 5.38)

Note: All components have been compared to all other unipolar modular components.

Table HP37: Yearly Cumulative Percent Revision of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

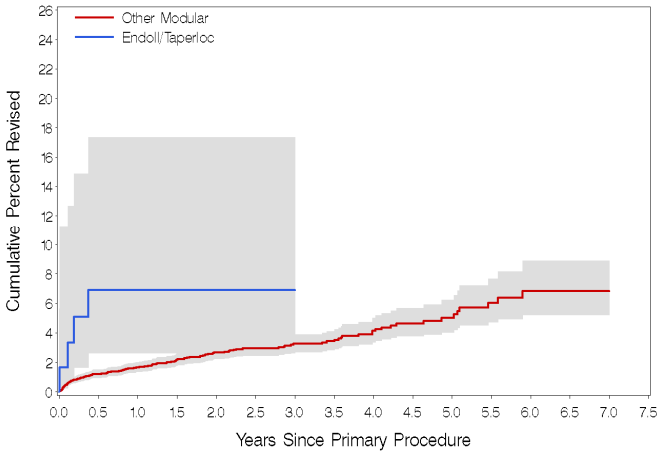
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and still used					
Endoll/Taperloc	6.9 (2.6, 17.3)	6.9 (2.6, 17.3)	6.9 (2.6, 17.3)		
Newly Identified					
Modular Cathcart/Corail	4.1 (1.9, 8.5)	4.1 (1.9, 8.5)			

Table HP38: Yearly Usage of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

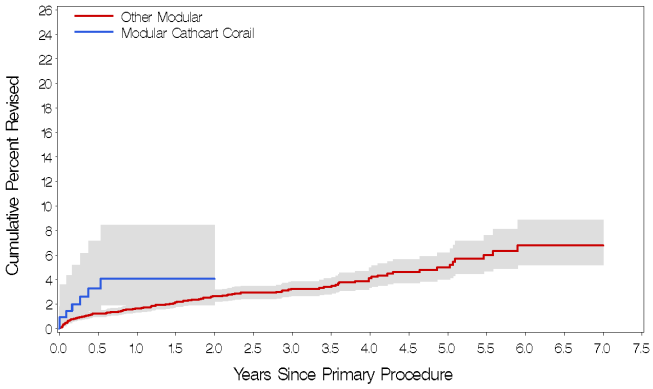
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and still used									
Endoll/Taperloc	0	0	0	0	0	17	27	12	6
Newly Identified									
Modular Cathcart/Corail	0	0	0	0	0	0	20	79	130

Figure HP17-18: Cumulative Percent Revision of Individual Primary Unipolar Modular Hip Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used



Newly Identified



Primary Bipolar Hip Replacement Prostheses with a higher than anticipated Revision Rate

Table HP39: Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

Bipolar Head/ Femoral Component	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and still used						
UHR/Omnifit	312	1017	1.77	1.986	0.0053	(1.23, 3.22)
*Bipolar Head (Biomet)	118	272	2.95	2.572	0.0089	(1.27, 5.22)
Newly Identified						
UHR/ABGII	144	345	2.32	2.156	0.0329	(1.06, 4.37)

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

Table HP40: Yearly Cumulative Percent Revision of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

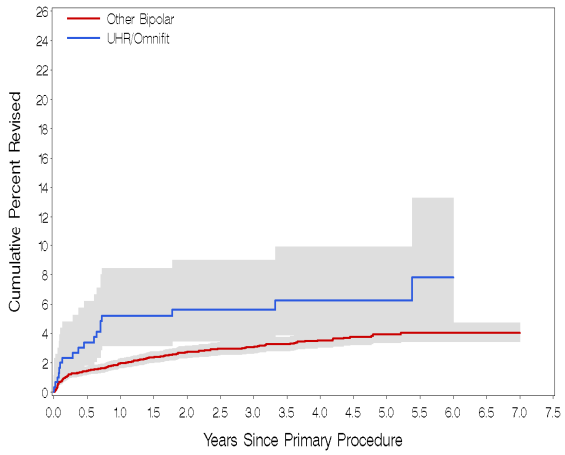
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and still used					
UHR/Omnifit	5.2 (3.2, 8.4)	5.6 (3.5, 9.0)	5.6 (3.5, 9.0)	6.2 (3.9, 9.9)	
*Bipolar Head (Biomet)	6.3 (3.0, 12.8)	7.6 (3.8, 14.8)	7.6 (3.8, 14.8)	7.6 (3.8, 14.8)	
Newly Identified					
UHR/ABGII	3.9 (1.6, 9.1)	3.9 (1.6, 9.1)	5.1 (2.3, 11.3)	9.9 (4.5, 20.7)	

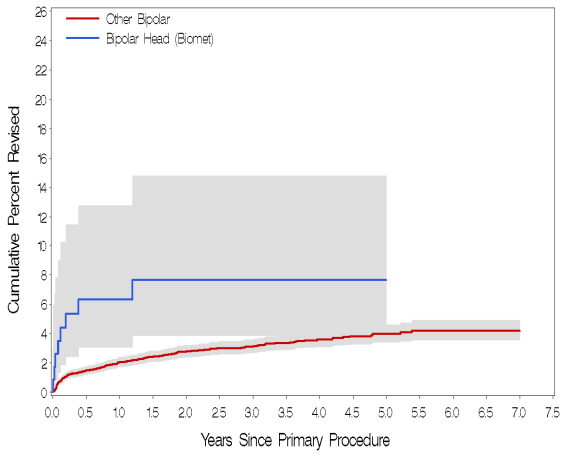
Table HP41: Yearly Usage of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and still used									
UHR/Omnifit	5	25	47	68	59	42	31	24	11
*Bipolar Head (Biomet)	1	3	6	16	19	20	16	19	18
Newly Identified									
UHR/ABGII	0	0	1	24	25	36	34	10	14

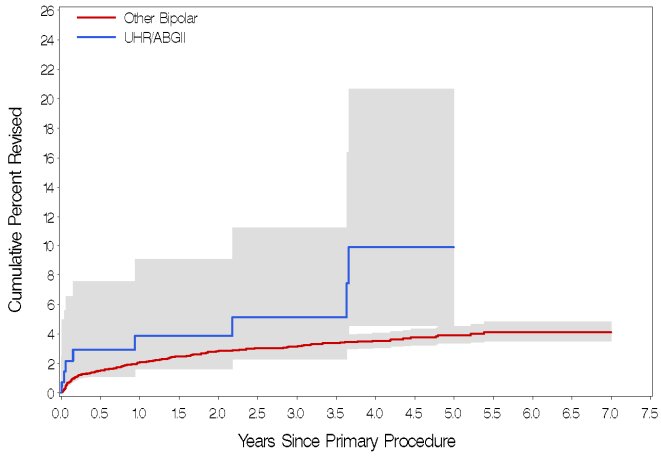
Figure HP19-21: Cumulative Percent Revision of Individual Primary Bipolar Hip Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used





Newly Identified



PRIMARY TOTAL HIP REPLACEMENT

The analysis for this Report is based on 135,799 primary total hip replacements reported to the Registry up to and including 31st December 2007. This is an increase of 22,472 primary total hip procedures reported in the 2007 Annual Report. In this category of hip replacement there are 125,004 conventional total hip replacements, 10,623 total resurfacing hip replacements and 172 thrust plate hip replacements.

A complete breakdown of age, gender, primary diagnosis and revision diagnoses for each category of hip replacement is available in a supplementary report on the Registry website www.aoa.org.au/jointregistry_pub.asp.

Diagnosis

Osteoarthritis is the most common diagnosis associated with primary total hip replacement (88.8% of all procedures, 88.3% of conventional total, 94.0% of total resurfacing and 94.2% of thrust plate procedures). Avascular necrosis (3.8%), fractured neck of femur (3.0%), developmental dysplasia (1.5%) and rheumatoid arthritis (1.4%) account for the majority of other diagnoses for primary total hip replacement. There is some variation in the percentage of these diagnoses depending on the type of primary total hip replacement. Conventional total hip replacement is the only primary total hip procedure used for the treatment of fractured neck of femur (3.0% of all primary conventional total hip replacements).

Usage

Conventional primary total hip replacement is the most common type of primary total hip replacement and accounts for 92.1% of all primary total hips recorded by the Registry. Total resurfacing accounts for 7.8% and thrust plate for 0.1% of all primary total hip replacement (Table HT1).

Last year the Registry reported a decrease in the proportion of total resurfacing procedures from 8.8% of all primary total hip replacements in 2005 to 8.3% in 2006. In 2007 total resurfacing replacements further declined to 7.4% of all primary total hip replacements (Figure HT1). Although there remains considerable regional variation in the use of total resurfacing procedures, all states have shown a reduction in the use of this procedure. Western Australia and Tasmania remain the states with the lowest use (1.4% and 1.9% respectively) (Figure HT1).

The number of thrust plate hip replacement remains small, with an additional 24 procedures reported to the Registry in 2007.

Primary Conventional Total Hip Replacement

In the last five years the Exeter V40 stem has been the most commonly used femoral stem for primary conventional total hip replacement in Australia (Table HT6 and Figure HT4). In 2007 the Corail stem had the second highest usage followed by the Accolade stem. Four of the five most frequently used femoral stems are cementless stems. The percentage of procedures using the top ten femoral stems has increased from 63.2% in 2003 to 67.4% in 2007. This is despite an increase in the number of femoral stems used each year during that period (Table HT6). The ten most used cemented and cementless femoral stems are listed separately in Tables HT7 and HT8.

For the fifth consecutive year the Trident remains the most frequently used acetabular prosthesis (Table HT9 and Figure HT7). In 2007 the next most frequently used acetabular prostheses are the Reflection, Pinnacle and Trilogy and this has remained unchanged for the last three years. The top ten acetabular prostheses were used in 80.9% of all primary conventional total hip replacement in 2007. There has been no change in the number of different types of acetabular prostheses used in 2007 compared to 2006. The ten most frequently used cemented and cementless acetabular prostheses are listed separately in Tables HT10 and HT11.

Primary Total Resurfacing Hip Replacement

For the second consecutive year the number of total resurfacing hip replacements has not only declined as a proportion of all hip procedures but also in terms of the absolute number. There was no change in the number of different types of total resurfacing prostheses used in 2007 compared to 2006. The 10 most frequently used total resurfacing prostheses were used in 99.7% of all procedures in 2007.

The BHR remains the most used prosthesis accounting for 54.5% of all total resurfacing procedures in 2007. The number of procedures using this prosthesis has declined in recent years as a consequence of increased use of other total resurfacing systems. The Mitch TRH is now the second most used total resurfacing system and is one of the few that has increased in usage. The

ASR, Durom and Adept total resurfacing systems make up the top five in 2007 and have all declined in use since 2006 (Table HT12 and Figure HT10).

Changes in use with Gender and Age

There are differences in gender and age between primary conventional and total resurfacing hip replacements. In 2007 primary conventional total hip replacement was more common in females (55.6%) than males (44.4%). Most primary conventional total hip replacements are undertaken on individuals 65 years or older (64.6% in 2007) (Tables HT2 and HT4). The use of primary total resurfacing procedures in females declined from 28.8% of all total resurfacing procedures in 2003 to 23.6% in 2007 (Table HT3). Most total resurfacing procedures are undertaken in patients less than 65 years of age (91.9% in 2007) (Table H5).

Fixation

There continues to be variation in the use of cementless, hybrid and cemented conventional primary total hip replacements by state/territory. In recent years there has been a trend towards increasing use of cementless hip prostheses but this trend has slowed in 2007 (Figure HT2).

In 2007, 95.1% of total resurfacing procedures used hybrid fixation, this has declined from 97.5% in 2003. Cementless fixation, although uncommon has increased from 2.3% to 4.7% over the same period. Cement fixation is rarely used and accounted for only 0.2% of primary total resurfacing procedures in 2007 (Figure HT3).

Outcome of Primary Total Hip Replacement

Total resurfacing hip replacement has a significantly higher revision rate compared to conventional total hip replacement (hazard ratio (adjusted for sex and age) (Adj HR)= 1.42; 95% CI (1.24, 1.63) p<0.001). At seven years the cumulative percent revision is 4.6% for total resurfacing hip replacement compared to 3.4% for conventional total hip replacement (Table s HT13 and HT14 and Figure HT11).

Outcome of Conventional Total Hip Replacement

Effect of Age and Gender

There is no significant difference in the risk of revision for primary conventional hip replacement with respect to age. The seven year cumulative percent revision for each of the age groups is 3.6% for <55, 3.9% for 55-64, 3.4% for 65-74 and 3.1% for ≥ 75 years (Table HT16 and Figure HT12). There is also no significant difference in the risk of revision for primary conventional hip replacement with respect to gender (Table HT18 and Figure HT13).

There continues however to be a difference in the risk of revision between the age groups within gender. Females under 55 years have a significantly higher revision rate compared to females who are 75 years or older (HR=1.40; 95% CI (1.15, 1.71) p=0.001) (Figure HT14). The reverse is true for males with under 55 years having a significantly lower revision rate compared to those 75 years or older (HR=0.75; 95% CI (0.60, 0.94) p=0.013) (Figure HT15).

At seven years the cumulative percent revision for females decreases with increasing age from 4.6% for <55 to 2.8% for ≥ 75 years. At seven years the cumulative percent revision for males increases with age from 2.8% for <55 years to 3.6% for ≥75 years (Table HT20).

Effect of Fixation

There is no difference in the risk of revision for cemented and hybrid conventional total hip replacement. There is however, a significantly higher risk of revision for cementless compared to hybrid (Adj HR=1.43; 95% CI (1.30, 1.58) p<0.001) and cementless compared to cemented conventional total hip replacement (Adj HR=1.46; 95% CI (1.27, 1.68) p<0.001) (Figure HT16). At seven years the cumulative percent revision is 3.0% for both hybrid and cemented conventional hip replacement and 3.9% for cementless primary conventional hip replacement (Table HT22).

The differences in the risk of revision between cement fixation is dependent on age. For those individuals <55 years there is no significant difference between cementless, cemented or hybrid fixation (Figure HT17). For patients between 55 and 64 years and 65 and 74 years cementless fixation has a significantly higher risk of revision compared to hybrid fixation, but is not significantly different from cemented fixation (Figures HT18 and HT19).

The difference between cementless and cemented or hybrid fixation is most apparent in the greater than 75 years age group. The risk of revision for cementless fixation is significantly higher than both hybrid and cemented fixation (Figure HT20). It is only in those patients greater than 75 years of age that cemented fixation has the lowest cumulative percent revision at seven years (2.2%) compared to hybrid (2.8%) and cementless (3.8%) (Table HT24).

Effect of Bearing Surface

For the first time the Registry is reporting the effect of bearing surface on the early to mid term outcomes of primary conventional total hip replacement.

The Registry would advise caution in the interpretation of these initial analyses. The relationship between bearing surface and other factors known to be important to the outcome of joint replacement is complex. The current period of follow up is short and the Registry is yet to examine many of these factors.

The Registry has classified bearing surface into four categories; ceramic on polyethylene, ceramic on ceramic, metal on polyethylene and metal on metal. There is a fifth category that relates to a small number of procedures where the bearing surface is yet to be classified by the Registry. This type of generic analysis is dependent on the Registry being able to define the required feature (attribute) of each individual prosthesis. The Registry is working to classify the remaining prostheses to complete this process, however it is labour intensive and takes time, particularly for those prostheses that are no longer used. As the majority of prostheses have been classified and the outcome of the unclassified group does not vary considerably from the defined categories, it was decided to present these initial analyses rather than wait until classification has been completed.

The bearing surface with the highest seven year cumulative percent revision is metal on metal (4.4%), followed by ceramic on polyethylene (3.5%), metal on polyethylene (3.3%) and ceramic on ceramic (3.1%). After adjusting for age and gender metal on polyethylene bearing surface has a significantly lower risk of revision compared to the other three bearing surfaces (Tables HT25 and HT26 and Figure HT21).

Bearing surfaces have differences in the risk of revision depending on head size. For femoral component head size less than or equal to 28mm, metal on polyethylene has the lowest cumulative percent revision at seven years (3.4%). Compared to metal on polyethylene, ceramic on polyethylene and ceramic on ceramic have a significantly higher risk of revision, however metal on metal is not significantly different (Tables HT27 and HT28 and Figure HT22).

For femoral component head sizes greater than 28mm, metal on polyethylene and ceramic on polyethylene have the lowest cumulative percent revision at three years (1.4% and 1.3% respectively). Metal on metal has a significantly higher revision rate compared to the other three bearing surfaces. Ceramic on ceramic has a significantly higher revision rate compared to metal on polyethylene and ceramic on polyethylene (Tables HT27 and HT28 and Figure HT23).

The Registry has also compared revision rates by femoral component head size for each bearing surface. Femoral components greater than 28mm have significantly lower revision rates compared to femoral components less than or equal to 28mm for all bearing surfaces with the exception of metal on metal. For metal/metal bearing surfaces there is no significant difference in the rate of revision between femoral component head sizes (Figures HT24-HT27).

Prosthesis Specific Outcomes

The outcomes of the most commonly used stem and acetabular combinations for primary conventional total hip replacement are listed in Tables HT29-HT34. There are two tables for cemented, cementless and hybrid (femoral cemented) prosthesis combinations with over 300 procedures. The first table provides information on the number of procedures, the number of revisions and the revisions per 100 observed component years. The second table provides the yearly cumulative percent revision. It is not possible or meaningful to present the outcomes of all recorded combinations as many combinations involve small numbers of procedures. There are 1,249 combinations for primary conventional total hip replacement recorded by the Registry (128 more combinations than recorded last year). Of these, 69 stem and acetabular combinations have over 300 procedures reported. Although the listed combinations are only a small proportion of the possible combinations, they represent 77.9% of all primary conventional total hip replacements.

These tables allow comparison of outcomes for the most commonly used combinations by Australian surgeons. It is worthwhile noting that the group 'other' is the combined outcome of all prosthesis combinations with less than 300 procedures.

There are 11 primary conventional total hip stem/acetabular combinations with greater than 300 procedures using cement fixation. All have over 1,000 observed component years and the number of revisions per 100 observed component years varies from 0.1 to 0.9 (Table HT29). Of those with a seven year cumulative percent revision the least revised combinations are the MS 30/Low Profile Cup (0.8%), the Exeter/Exeter (3.0%) and the Spectron EF/Reflection (3.0%) (Table HT30). Regardless of fixation, the MS 30/Low Profile cup has the lowest seven year

cumulative percent revision (0.8%) of all stem and acetabular combinations.

There are 36 cementless primary conventional total hip stem/acetabular combinations listed with 33 having over 1,000 observed component years. The number of revisions per 100 observed component years varies from 0.4 to 2.1 revisions, which is a wider range than for both cemented and hybrid combinations. Four cementless combinations have less than or equal to 0.5 revisions per 100 observed component years. These are the Citation/ Vitalock, Natural Hip/Fitmore, Secure-Fit Plus/Trident and the Summit/Pinnacle. At seven years the Citation/Vitalock and Secure-Fit/Trident have the lowest cumulative percent revision for cementless combinations (2.2%) (Tables HT31 and HT32).

There are 22 combinations using hybrid fixation where the femoral component is cemented and the acetabular component is cementless. There are 18 combinations with over 1,000 observed component years. The rate of revision per 100 observed component years varies from 0.2 to 1.4 revisions (Table HT33). There are three combinations with 0.2 revisions per 100 component years, the Definition/Vitalock, Exeter/Mallory-Head and the MS 30/Fitmore. The Definition/Vitalock and the Exeter/Mallory-Head have the lowest cumulative revision rate at seven years (1.3%) (Table HT34).

Outcome of Total Resurfacing Hip Replacement

Effect of Age and Gender

The cumulative percentage revision for resurfacing hip replacement increases with increasing age (Figure HT28). At five years the cumulative percent revision for patients aged <55 years is 3.1%, 55-64 years is 4.1%, 65-74 years is 5.0% and ≥75 years is 9.9% (Table HT36). At five years the cumulative percent revision for females (6.5%) is two and half times higher than males (2.6%) (Table HT38).

As there are only a small number of total resurfacing procedures in the older age group the Registry has combined those aged 65 and older into one age group (≥65) to analyse differences between age and gender. Both genders demonstrate an increased revision rate with age. Males have a lower risk of revision per 100 observed component years compared to females in each of the three age groups (Table HT39). The five year cumulative percent revision for females aged <55 years is 5.2% increasing to 9.2% for females ≥65 years. Males <55 years of age have a five year cumulative percent revision of 2.2% increasing to 4.7% for males ≥65 years (Table HT40 and Figures HT30 and HT31).

Effect of Fixation

No comparative data are presented for the outcome of total resurfacing hip replacement by fixation as most procedures use hybrid fixation. There are a number of prostheses that utilize cementless femoral component fixation, the outcomes of the individual resurfacing systems are listed in Tables HT45 and HT46. The most commonly used cementless resurfacing system is the Cormet, which has three varieties, one of which is no longer used. The other major cementless resurfacing system is the Bionik.

Effect of Femoral Component Head Size

For the first time, the Registry is reporting the relationship between femoral component head size and risk of revision for total resurfacing hip replacement. There is an inverse relationship between femoral component head size and the risk of revision. As the head size of the femoral component increases the five year cumulative percent revision decreases (≤44mm is 9.0%, 45-49mm is 5.7%, 50-54mm is 2.2% and ≥55mm is 1.7%). The risk of revision for femoral component head size ≤44mm is over five times higher than the risk for femoral components ≥55mm (Adj HR=5.09; 95% CI (2.20,11.80) p<0.001) (Tables HT41 and HT42 and Figure HT32).

The effect of femoral component head size is evident in both males and females. There is no significant difference in the risk of revision between males and females after adjusting for femoral component head size.

Males and females with a femoral component head size greater than 50mm have a similar seven year cumulative percent revision (2.1% and 2.0% respectively). The same is seen for males and females with a femoral component head size less than 50mm (seven year cumulative percent revision is 5.5% and 7.3% respectively). The risk of revision for females with a femoral component head size less than 50mm is significantly higher than for females with a femoral component head size greater than 50mm ((age adjusted) HR=3.22; 95% CI (2.47, 4.21) p<0.001). A similar situation applies to males with a femoral component head size less than 50mm having a significantly higher revision rate compared to males with a femoral component head size greater than 50mm ((age adjusted) HR=2.69; 95% CI (1.91, 3.79) p<0.001) (Tables HT43 and HT44 and Figure HT33).

Prosthesis Specific Outcomes

All total resurfacing systems recorded in the Registry are listed in Tables HT45 and HT46. Many have been used in small numbers or for short periods of time. The Cormet 2000 HAP/Cormet2000 combination has not been used

since 2004. The three total resurfacing systems with over 1,000 observed component years are the BHR, ASR and Durom. The number of revisions per 100 observed component years for BHR is 0.8, for ASR is 2.6 and for Durom is 2.3. The three year cumulative percent revision for BHR is 2.5% and for ASR is 6.0% and for Durom is 5.8%. This year the Registry is able to report a seven year cumulative percent revision for the BHR (4.6%) (Table HT46).

Hip Prostheses with a higher than anticipated Revision Rate

Individual femoral stems or acetabular components or combination of femoral and acetabular components are provisionally identified as having a higher than anticipated rate of revision when the revisions per 100 observed component years exceeds twice that of all other prostheses in its category combined. The majority of combinations and individual prostheses that fit these criteria however are not identified in the report. It is only those combinations or individual prostheses which after further extensive analysis and review by a panel of orthopaedic surgeons are considered to have a higher than anticipated rate of revision.

Prostheses identified in the report are considered to have a higher than anticipated rate of revision due to factors specific to the prosthesis or prostheses combination.

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 (1,249 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 hip replacement is in part dependent on the interaction between the different components used.

The practice of mixing and matching individual stems and acetabular components to form what in many cases are untried and unproven combinations is continuing to increase. In 2007, Australian surgeons used 128 combinations not previously used. This is despite the availability of well established combinations shown to have outstanding results, some of which it could be argued are unlikely to be further improved, particularly when used in older individuals.

As mentioned, a femoral stem or acetabular component may have a higher than anticipated rate of revision independent of the component with which it is combined or it may depend on a particular combination of components. The Registry is able to identify stem and acetabular combinations as well as individual femoral and acetabular components that have a higher than anticipated revision rate. When an individual component is identified it is because it has a higher than anticipated revision rate independent of any component it is combined with. The large number of different femoral stem and acetabular component combinations makes comparative analysis of many of these combinations difficult as many have been used in small numbers.

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 checked 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. There are five femoral and acetabular combinations, six femoral stems and six acetabular components that have been identified as having a higher than anticipated revision rate. These have been divided into three groups. The first group includes individual prostheses or combinations that have no usage recorded by the Registry in 2007. The two remaining groups include prostheses or combinations with reported use in 2007 but are subdivided into those that have been identified in previous reports as having a higher than anticipated rate of revision and those that are being identified for the first time. The revisions per 100 observed component years, hazard ratio and p-values, cumulative percent revision, and usage per year are listed in Tables HT47, HT48 and HT49.

The hybrid combination of C-Stem/Pinnacle was identified in the 2007 Annual Report as having a higher than anticipated revision rate compared to all other hybrid conventional total hip

replacement, however this combination has not been re-identified in this report.

The largest group is the "Re-identified and no longer used" group which contains three prostheses combinations, three acetabular components and one femoral stem (Tables HT47-HT49). Although the Margron stem was used in 2007 it was included in this group as the company notified the Registry early in 2008 that the prosthesis was no longer available.

One prosthesis combination and three individual components (one stem and two acetabular components) have been re-identified by the Registry as having a higher than anticipated revision rate and are still being used. These are the F2L Multineck/Delta stem/acetabular combination, Profemur Z stem and the MBA and SPH-Blind acetabular components (Tables HT47-HT49). Over recent years the use of each of these prostheses has decreased considerably. Graphs of the cumulative percent revision comparing these 're-identified and still used' prostheses to all other conventional total hip procedures are presented in Figures HT34-HT37.

Prostheses and prostheses combinations that are being identified for the first time include the Corail/ASR femoral/acetabular combination, Adapter (cemented), Anca Fit, Hayes Consensus and Lyderic II (cemented) femoral stems and the Bionik acetabular component (Tables HT47-HT49 and Figures HT38-43).

The stems identified for the first time this year have exchangeable necks, as with the re-identified Margron, Profemur Z and the F2L Multineck stems. The Registry links a neck exchange to the stem even if the intraosseous component of the stem is not revised. The Registry is able to distinguish these two different types of stem revision.

It could be argued that revisions involving neck exchange but not the intraosseous component of a stem may unfairly identify that particular stem as having a higher revision rate than a stem which does not have the capacity to exchange the neck. This is particularly so if neck exchange was undertaken simply to alter neck orientation, increase length or gain access to acetabular components. It remains Registry policy to attribute revision to all components rather than a single component used in the primary procedure. For example, in the instance of an acetabular only revision, the revision is linked to both the original acetabular and femoral components. The reason for this is to take into account the potential for adverse outcomes occurring from the interaction of the individual components.

The Registry has and will continue to identify single components when the analysis clearly demonstrates the component has a higher than anticipated rate of revision no matter what other components it is combined with. This is true for each of the individual stems identified.

The Registry has information on over 20 different femoral stems that have exchangeable necks. Many have been used in quite large numbers and the majority of these prostheses have not been identified as having a higher than anticipated rate of revision. The identification of this number of stems with the capacity for neck exchange must raise the question as to whether this approach to prosthesis design has the potential to increase the risk of revision.

The Adapter femoral stem has a cemented and a cementless version. The Registry has identified the cemented Adapter stem as having a higher than anticipated rate of revision (Adj HR=3.60; 95% CI (1.50, 8.66) p=0.0042). The two year cumulative percent revision is 7.1%. The period of follow up for this prosthesis is short with only 100 procedures recorded using this stem and most of these were in 2007.

The Anca Fit stem has had limited use both in terms of number and location and most procedures using this prosthesis were undertaken in 2007. It has however been identified as having a higher than anticipated rate of revision (Adj HR=3.00; 95% CI (1.43, 6.30) p=0.0037).

The Hayes Consensus femoral stem has 2.2 revisions per 100 component years (Adj HR=2.3; 95% CI (1.19, 4.38) p=0.0135). There have been 189 prostheses implanted with nine revisions, three for dislocation and four for loosening. The three year cumulative revision is 4.6%.

The Lyderic II femoral stem is an infrequently used prosthesis. It has a cemented (Lyderic II) and a cementless (Lyderic II HAP) version. The cemented version, Lyderic II, has been identified as having a higher than anticipated revision rate (Adj HR=2.99; 95% CI (1.23, 7.14) p=0.0151). Lyderic II has 2.54 revisions per 100 observed component years and a three year cumulative percent revision of 8.5%.

The ASR cup is used for total resurfacing and conventional primary total hip replacement. It has been re-identified in this report as having a higher than anticipated rate of revision when used in total resurfacing procedures. This year the Registry has also identified the ASR cup as having a higher than anticipated rate of revision in conventional total hip replacement when combined with the Corail stem. The Corail/ASR

combination has been used in 1,649 procedures, with 2.1 revisions per 100 observed component years and a cumulative percent revision of 4.5% at three years. The risk of revision is almost 60% higher than all other conventional primary total hips (Adj HR=1.59; 95% CI (1.16, 2.18) p=0.0036).

The Bionik acetabular component is used in both conventional and total resurfacing hip replacement. The Registry is identifying it as a prosthesis with a higher than anticipated rate of revision only when it is used in conventional total hip replacement (Adj HR=2.06; 95% CI (1.07, 3.97) p=0.0300). There have been nearly 300 procedures using the Bionik acetabular component in primary conventional hip replacement, with over 95% performed in the last two years. The Bionik has 2.95 revisions per 100 observed component years and a two year cumulative percent revision of 4.2%.

Total Resurfacing Hip Replacement

In the 2007 Annual Report the Registry identified the ASR, Cormet 2000 HAP and the Durom as having a higher than anticipated rate of revision. The same three prostheses have been re-identified this year. The Cormet 2000 HAP is no longer used, however the ASR and Durom continue to be used, although the number is declining. All three prostheses have more than twice the risk of revision compared to all other total resurfacing prostheses combined (Tables HT50-HT52 and Figures HT44 and HT45).

PRIMARY TOTAL HIP REPLACEMENT
1/9/1999 – 31/12/2007

Table HT1: Primary Total Hip Replacement by State/Territory

State/Territory	Conventional Total						Total Resurfacing		Thrust Plate		Total	
	Cemented		Cementless		Hybrid							
	N	%	N	%	N	%	N	%	N	%	N	%
ACT/NT	76	2.4	1811	56.5	902	28.1	416	13.0	.	.	3205	100.0
NSW	1743	4.4	23193	58.6	11436	28.9	3197	8.1	11	0.0	39580	100.0
QLD	5675	26.2	6545	30.2	7764	35.8	1702	7.8	.	.	21686	100.0
SA	2321	16.3	5330	37.3	5632	39.4	997	7.0	.	.	14280	100.0
TAS	426	9.1	3730	79.9	431	9.2	71	1.5	10	0.2	4668	100.0
VIC	4684	12.4	17415	46.2	11647	30.9	3944	10.5	1	0.0	37691	100.0
WA	939	6.4	8712	59.3	4592	31.3	296	2.0	150	1.0	14689	100.0
Australia	**15864**	**11.7**	**66736**	**49.1**	**42404**	**31.2**	**10623**	**7.8**	**172**	**0.1**	**135799**	**100.0**

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

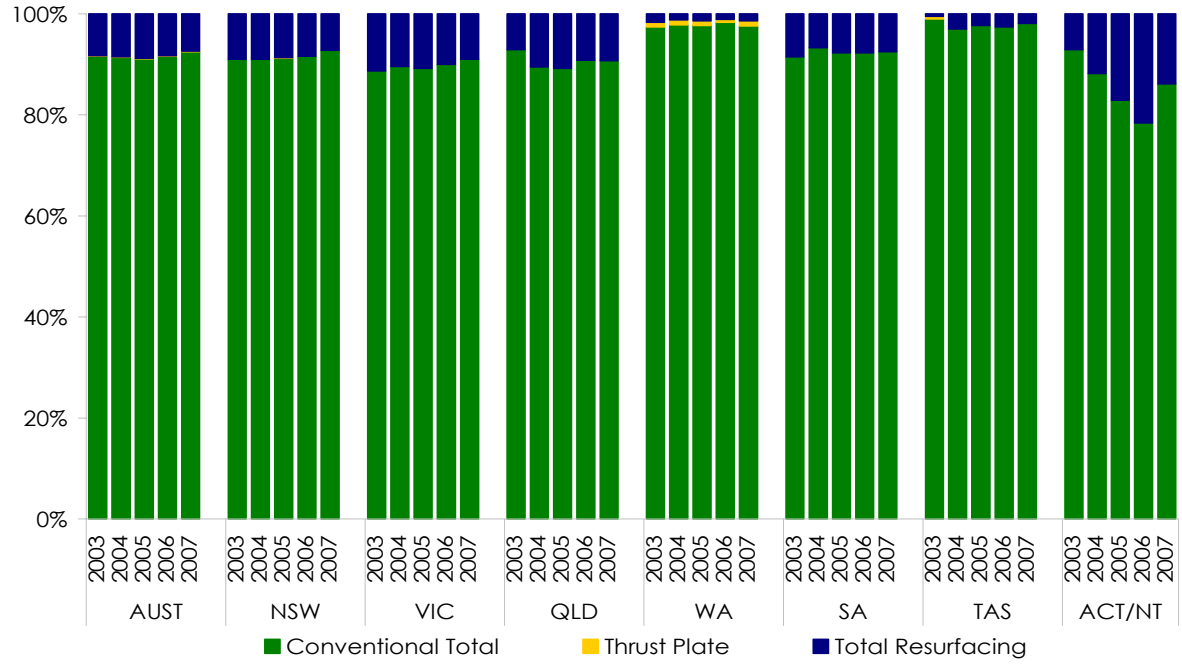


Table HT2: Primary Conventional Total Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	9526	55.8	7535	44.2	17061	100.0
2004	10155	56.0	7978	44.0	18133	100.0
2005	10590	55.9	8358	44.1	18948	100.0
2006	10807	55.2	8773	44.8	19580	100.0
2007	11197	55.6	8952	44.4	20149	100.0

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

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	445	28.8	1100	71.2	1545	100.0
2004	468	27.8	1217	72.2	1685	100.0
2005	495	27.0	1336	73.0	1831	100.0
2006	428	24.2	1341	75.8	1769	100.0
2007	382	23.6	1238	76.4	1620	100.0

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

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	1991	11.7	3741	21.9	5967	35.0	4551	26.7	811	4.8	17061	100.0
2004	1984	10.9	4109	22.7	6188	34.1	4984	27.5	868	4.8	18133	100.0
2005	2208	11.7	4345	22.9	6412	33.8	5091	26.9	892	4.7	18948	100.0
2006	2304	11.8	4375	22.3	6568	33.5	5314	27.1	1019	5.2	19580	100.0
2007	2384	11.8	4745	23.5	6612	32.8	5403	26.8	1005	5.0	20149	100.0

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

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	805	52.1	568	36.8	157	10.2	15	1.0	0	0.0	1545	100.0
2004	855	50.7	669	39.7	151	9.0	10	0.6	0	0.0	1685	100.0
2005	898	49.0	758	41.4	169	9.2	6	0.3	0	0.0	1831	100.0
2006	924	52.2	679	38.4	161	9.1	4	0.2	1	0.1	1769	100.0
2007	818	50.5	670	41.4	123	7.6	9	0.6	0	0.0	1620	100.0

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

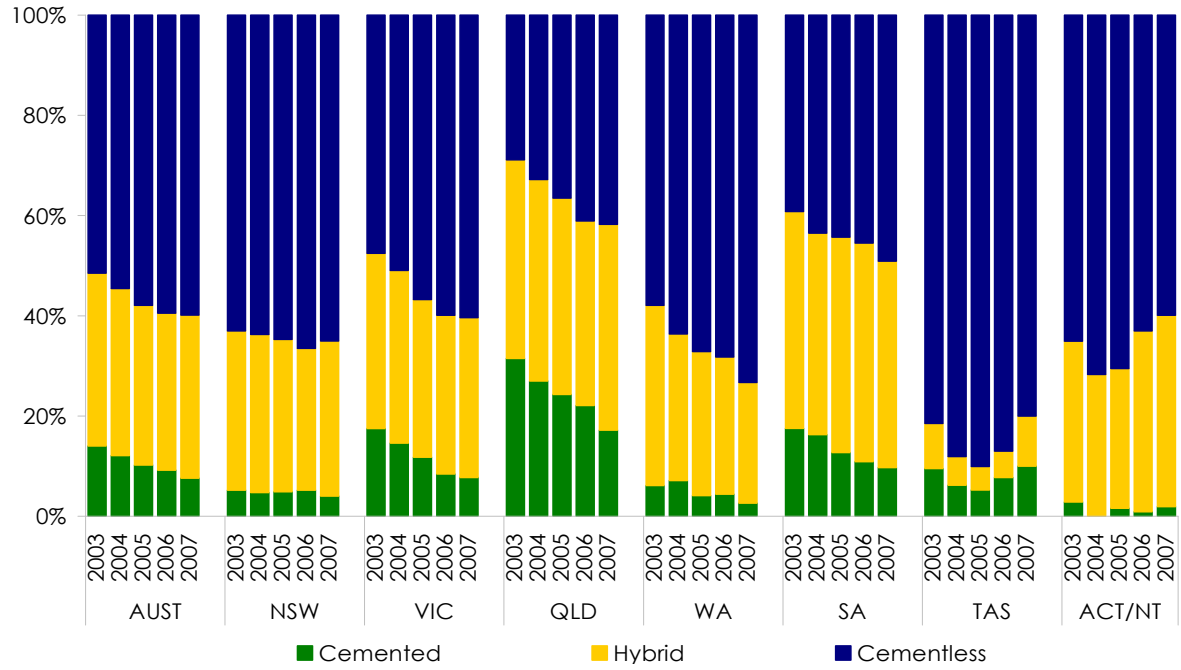


Figure HT3: Trends in Fixation of Primary Total Resurfacing Hip Replacement by State/Territory and Year

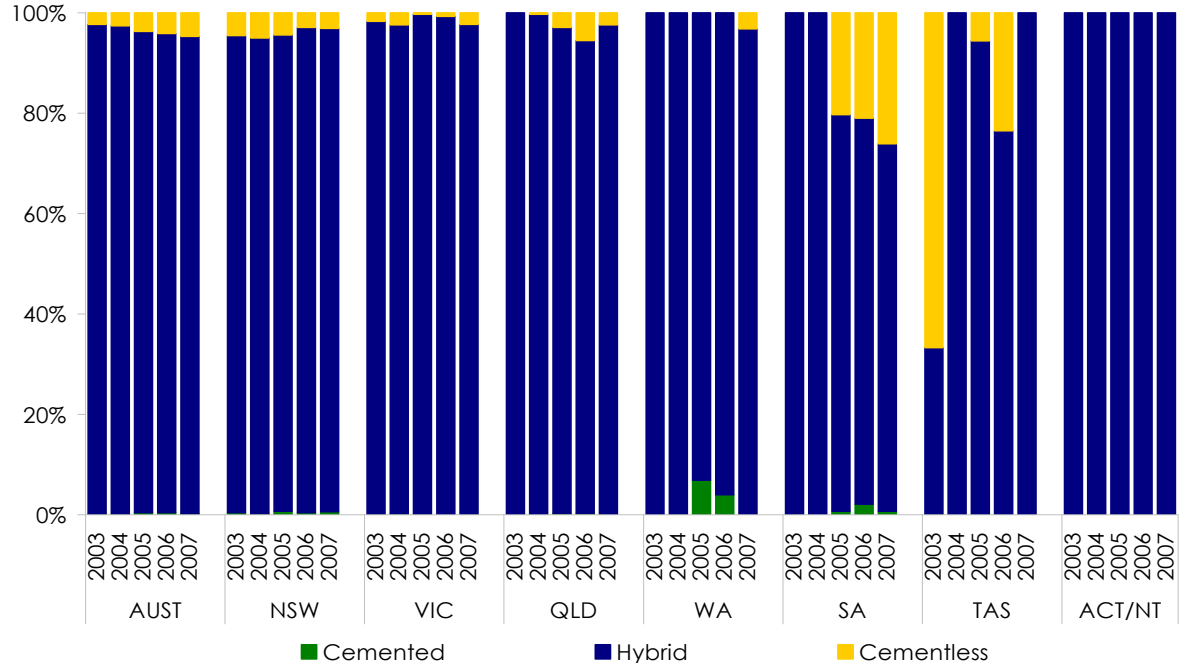


Table HT6: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Exeter V40 (3900)	Exeter V40 (4205)	Exeter V40 (4425)	Exeter V40 (4468)	Exeter V40 (4643)
2	ABGII (1028)	Synergy (1369)	Synergy (1260)	Corail (1427)	Corail (2039)
3	Synergy (998)	Alloclassic (997)	Alloclassic (1221)	Synergy (1404)	Accolade (1553)
4	VerSys (885)	ABGII (906)	Accolade (946)	Accolade (1347)	Synergy (1100)
5	Alloclassic (819)	Spectron EF (809)	Corail (939)	Alloclassic (1059)	Alloclassic (1070)
6	Spectron EF (783)	Secur-Fit Plus (764)	ABGII (764)	Spectron EF (812)	Spectron EF (807)
7	Secur-Fit Plus (712)	VerSys (692)	Spectron EF (727)	Summit (622)	CPT (719)
8	Omnifit (618)	Accolade (579)	VerSys (680)	VerSys (591)	SL-Plus (562)
9	C-Stem (563)	CPT (553)	Secur-Fit Plus (665)	CPT (552)	Summit (562)
10	S-Rom (484)	Omnifit (520)	Summit (550)	ABGII (518)	VerSys (517)
Top 10 Usage	63.2%	62.8%	64.3%	65.4%	67.4%
Total Procedures	17061	18133	18948	19580	20149
N Prosthesis Types	79	82	99	100	106

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

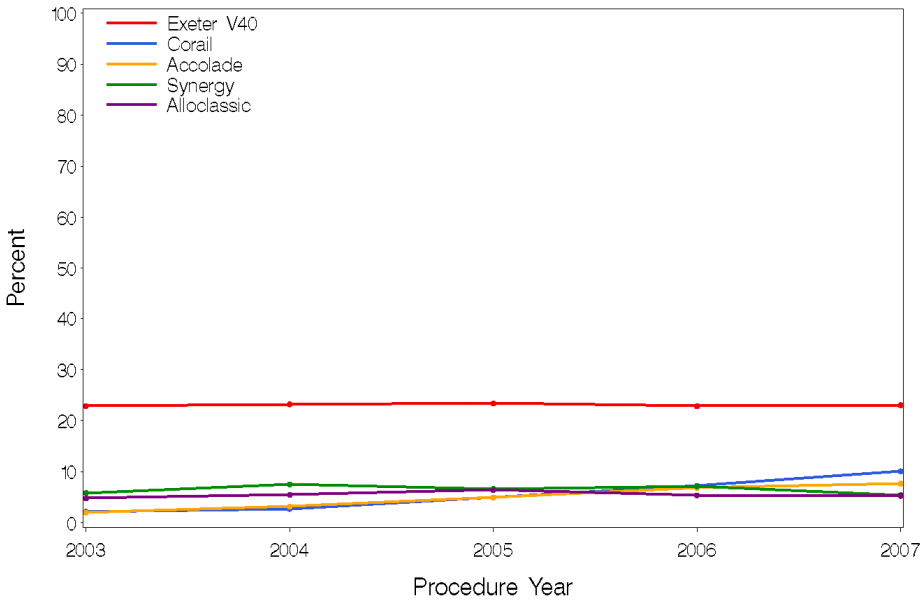


Table HT7: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cement Fixation

Rank	2003	2004	2005	2006	2007
1	Exeter V40 (3900)	Exeter V40 (4204)	Exeter V40 (4423)	Exeter V40 (4465)	Exeter V40 (4642)
2	Spectron EF (783)	Spectron EF (809)	Spectron EF (726)	Spectron EF (812)	Spectron EF (807)
3	C-Stem (563)	CPT (553)	CPT (505)	CPT (552)	CPT (719)
4	CPT (476)	C-Stem (455)	C-Stem (379)	CPCS (510)	CPCS (487)
5	Elite Plus (445)	CPCS (377)	CPCS (364)	C-Stem (350)	C-Stem (379)
6	MS 30 (359)	Elite Plus (352)	MS 30 (297)	MS 30 (262)	MS 30 (193)
7	Omnifit (339)	Omnifit (284)	Elite Plus (248)	Omnifit (164)	Omnifit (162)
8	Charnley (320)	MS 30 (276)	Omnifit (224)	Charnley (147)	VerSys (128)
9	CPCS (244)	Charnley (202)	Charnley (218)	Elite Plus (112)	Charnley (107)
10	VerSys (146)	VerSys (115)	VerSys (119)	VerSys (111)	Adapter (53)
Top 10 Usage	91.8%	92.8%	94.4%	94.9%	95.2%
Total Procedures	8250	8218	7944	7890	8066
N Prosthesis Types	44	38	41	43	37

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

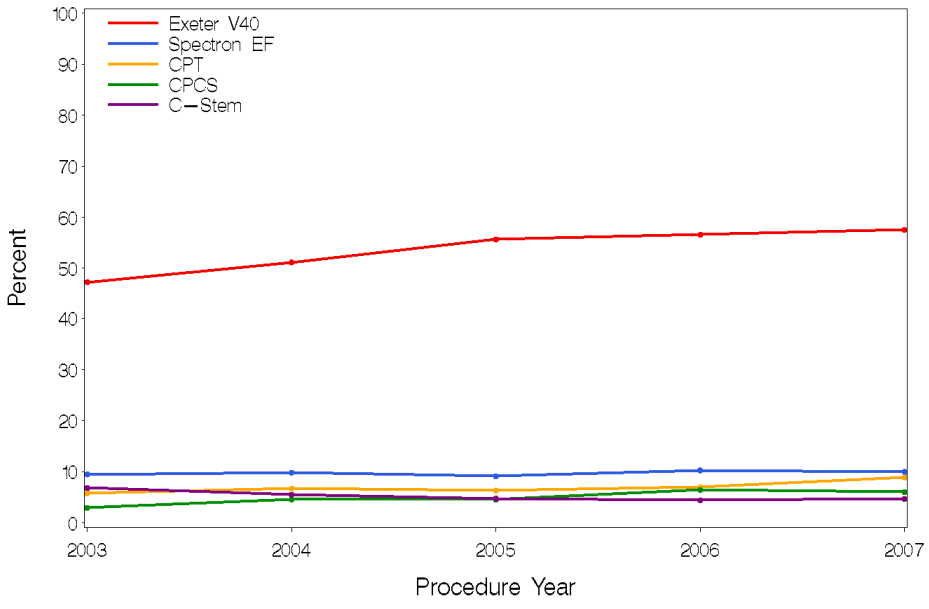


Table HT8: 10 Most Common Femoral Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

Rank	2003	2004	2005	2006	2007
1	ABGII (1025)	Synergy (1359)	Synergy (1246)	Corail (1426)	Corail (2039)
2	Synergy (977)	Alloclassic (994)	Alloclassic (1221)	Synergy (1398)	Accolade (1551)
3	Alloclassic (819)	ABGII (906)	Accolade (944)	Accolade (1347)	Synergy (1088)
4	VerSys (739)	Secur-Fit Plus (762)	Corail (939)	Alloclassic (1057)	Alloclassic (1070)
5	Secur-Fit Plus (711)	Accolade (577)	ABGII (762)	Summit (621)	SL-Plus (562)
6	S-Rom (483)	VerSys (577)	Secur-Fit Plus (664)	ABGII (518)	Summit (557)
7	Secur-Fit (482)	Corail (499)	VerSys (561)	Secur-Fit (503)	Anthology (502)
8	Corail (376)	S-Rom (497)	Summit (550)	VerSys (480)	Secur-Fit (488)
9	Accolade (333)	Secur-Fit (448)	Secur-Fit (507)	SL-Plus (475)	S-Rom (467)
10	Mallory-Head (329)	Summit (407)	S-Rom (461)	S-Rom (435)	ABGII (428)
Top 10 Usage	71.2%	70.9%	71.4%	70.7%	72.4%
Total Procedures	8811	9915	11004	11690	12083
N Prosthesis Types	58	62	75	78	84

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

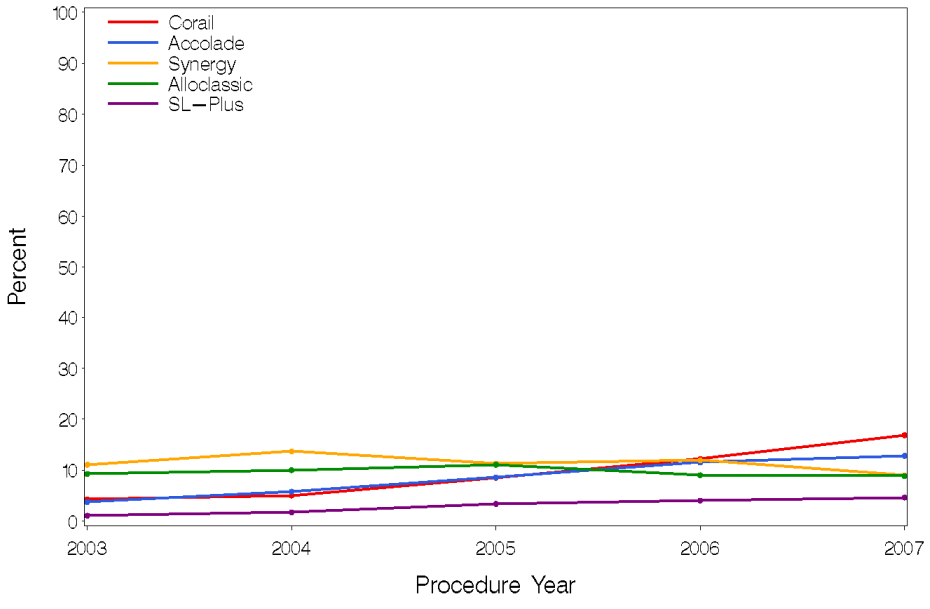


Table HT9: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement

Rank	2003	2004	2005	2006	2007
1	Trident (3984)	Trident (4746)	Trident (5464)	Trident (5725)	Trident (5998)
2	Reflection (1996)	Reflection (2439)	Reflection (2128)	Reflection (2520)	Reflection (2486)
3	Trilogy (1523)	Trilogy (1386)	Pinnacle (1390)	Pinnacle (1721)	Pinnacle (2131)
4	Vitalock (954)	Pinnacle (1094)	Trilogy (1351)	Trilogy (1295)	Trilogy (1343)
5	Duraloc (904)	Allofit (880)	Allofit (956)	Allofit (982)	ASR (1178)
6	ABGII (826)	Contemporary (796)	Contemporary (910)	ASR (954)	Allofit (887)
7	Allofit (793)	ABGII (748)	Mallory-Head (647)	Contemporary (901)	Contemporary (796)
8	Contemporary (766)	Duraloc (629)	ASR (583)	BHR (547)	BHR (578)
9	Mallory-Head (729)	Mallory-Head (599)	Fitmore (497)	Mallory-Head (432)	Trabecular Metal Shell (481)
10	Pinnacle (537)	Fitmore (588)	ABGII (452)	EPF-Plus (408)	EPF-Plus (430)
Top 10 Usage	76.3%	76.7%	75.9%	79.1%	80.9%
Total Procedures	17061	18133	18948	19580	20149
N Prosthesis Types	76	73	89	87	87

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

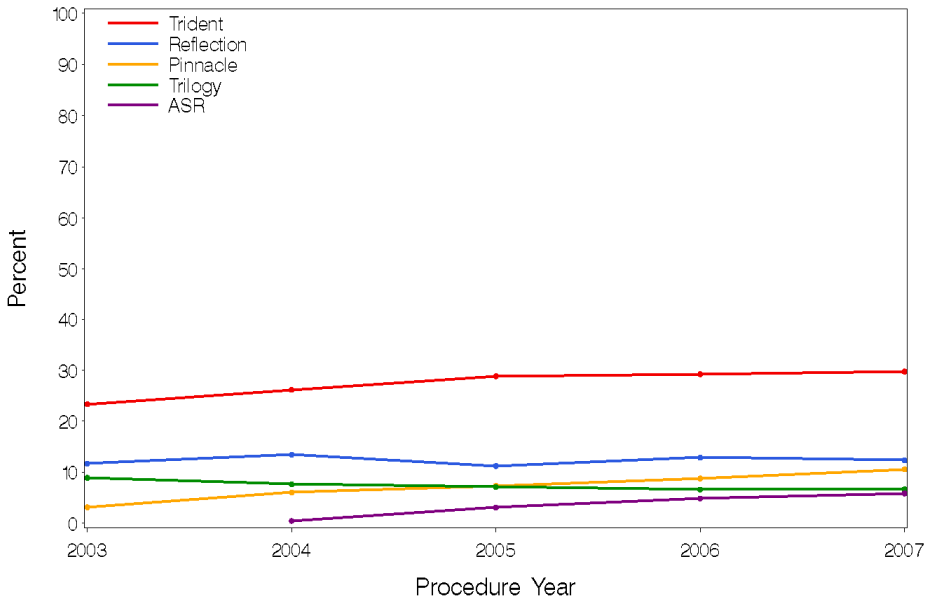


Table HT10: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cement Fixation

Rank	2003	2004	2005	2006	2007
1	Contemporary (766)	Contemporary (796)	Contemporary (910)	Contemporary (900)	Contemporary (795)
2	Exeter (256)	Reflection (321)	Reflection (224)	Reflection (230)	Reflection (220)
3	Reflection (256)	Exeter (224)	Exeter (136)	Exeter (133)	Exeter (109)
4	Charnley Ogee (199)	Charnley Ogee (191)	Charnley Ogee (96)	Elite Plus LPW (86)	Brunswick (66)
5	Elite Plus LPW (149)	Elite Plus Ogee (117)	Charnley (74)	Brunswick (78)	ZCA (59)
6	Low Profile Cup (130)	ZCA (96)	Elite Plus Ogee (71)	CCB (67)	Charnley (55)
7	Elite Plus Ogee (110)	Low Profile Cup (95)	Low Profile Cup (66)	Charnley Ogee (65)	CCB (52)
8	Charnley (102)	Elite Plus LPW (51)	ZCA (66)	ZCA (56)	Elite Plus LPW (41)
9	ZCA (90)	Brunswick (41)	Elite Plus LPW (65)	Elite Plus Ogee (50)	Low Profile Cup (36)
10	Brunswick (63)	Charnley (40)	Brunswick (63)	Charnley (48)	Elite Plus Ogee (31)
Top 10 Usage	87%	87.6%	88.6%	90.3%	91.4%
Total Procedures	2439	2251	2000	1897	1602
N Prosthesis Types	43	41	43	36	36

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

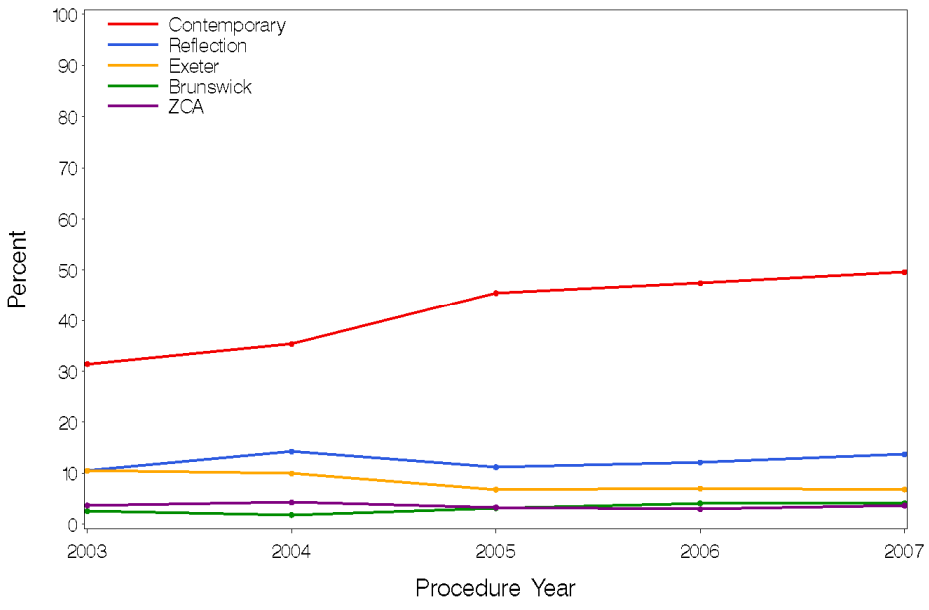


Table HT11: 10 Most Common Acetabular Components used in Primary Conventional Total Hip Replacement with Cementless Fixation

Rank	2003	2004	2005	2006	2007
1	Trident (3981)	Trident (4733)	Trident (5450)	Trident (5712)	Trident (5982)
2	Reflection (1740)	Reflection (2118)	Reflection (1904)	Reflection (2290)	Reflection (2266)
3	Trilogy (1523)	Trilogy (1384)	Pinnacle (1389)	Pinnacle (1720)	Pinnacle (2129)
4	Vitalock (953)	Pinnacle (1092)	Trilogy (1350)	Trilogy (1294)	Trilogy (1341)
5	Duraloc (899)	Allofit (878)	Allofit (954)	Allofit (978)	ASR (1178)
6	ABGII (825)	ABGII (746)	Mallory-Head (646)	ASR (954)	Allofit (885)
7	Allofit (786)	Duraloc (629)	ASR (582)	BHR (547)	BHR (575)
8	Mallory-Head (728)	Mallory-Head (598)	Fitmore (493)	Mallory-Head (432)	Trabecular Metal Shell (471)
9	Pinnacle (536)	Fitmore (587)	ABGII (452)	EPF-Plus (408)	EPF-Plus (430)
10	Fitmore (520)	Vitalock (579)	Duraloc (445)	Durom (322)	Mallory-Head (390)
Top 10 Usage	85.4%	84%	80.6%	82.9%	84.4%
Total Procedures	14622	15882	16948	17683	18547
N Prosthesis Types	51	48	61	62	66

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

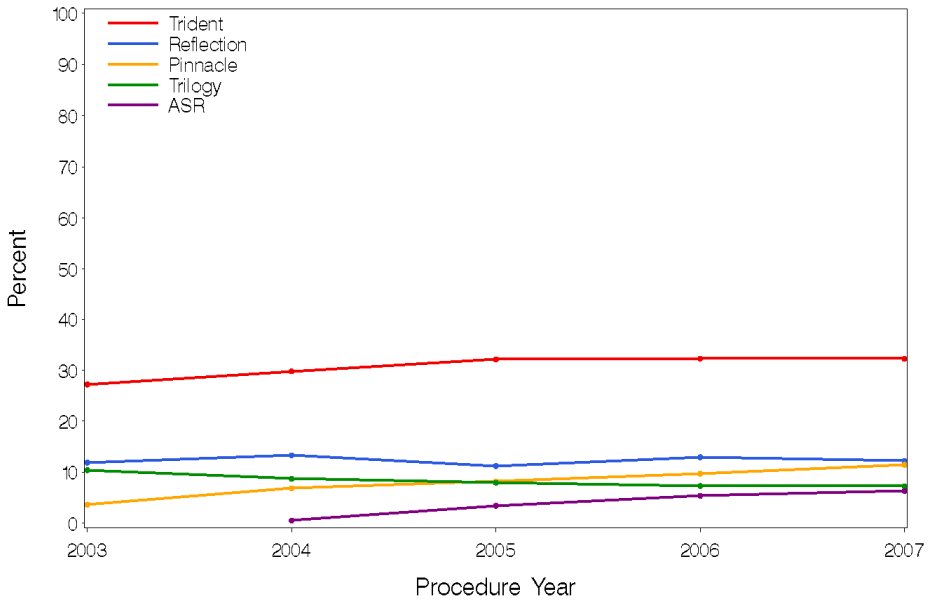
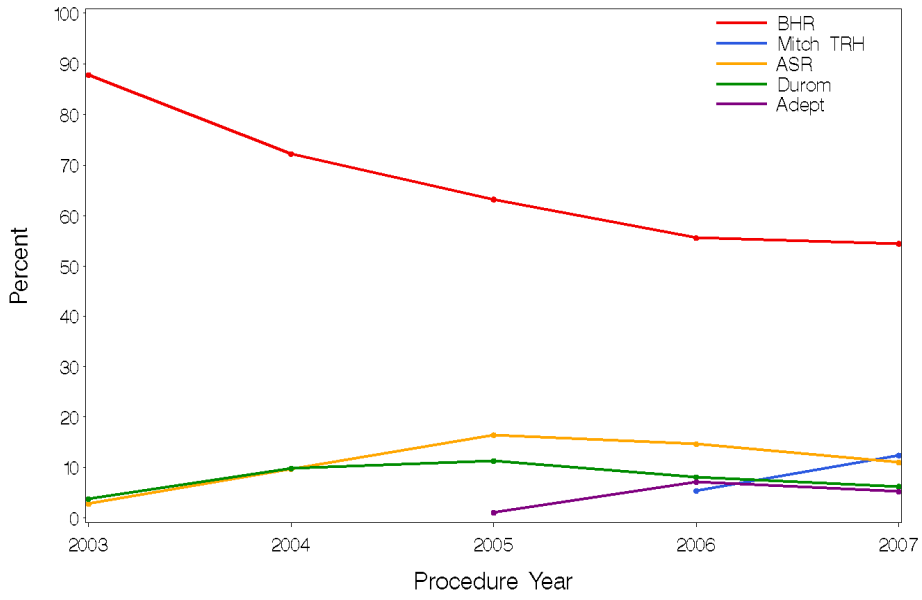


Table HT12: 10 Most Common Primary Total Resurfacing Hip Replacement

Rank	2003	2004	2005	2006	2007
1	BHR (1357)	BHR (1217)	BHR (1158)	BHR (984)	BHR (883)
2	Durom (58)	Durom (165)	ASR (301)	ASR (259)	Mitch TRH (201)
3	ASR (43)	ASR (164)	Durom (207)	Durom (143)	ASR (178)
4	Cormet (42)	Cormet (47)	Cormet 2000 (67)	Adept (126)	Durom (101)
5	Cormet 2000 HAP (38)	Cormet 2000 HAP (39)	Adept (19)	Mitch TRH (95)	Adept (85)
6	Conserve Plus (7)	Recap (27)	Cormet (18)	Cormet 2000 (62)	Cormet 2000 (60)
7		Conserve Plus (18)	Icon (18)	Bionik (33)	Recap (41)
8		Icon (4)	Conserve Plus (15)	Icon (31)	Bionik (27)
9		Cormet 2000 HAP (3)	Recap (14)	Cormet (12)	Icon (24)
10		Conserve (1)	Bionik (12)	Conserve Plus (11)	Cormet (15)
Top 10 Usage	100%	100%	99.9%	99.3%	99.7%
Total Procedures	1545	1685	1831	1769	1620
N Prosthesis Types	6	10	11	12	12

Figure HT10: 5 Most Common Primary Total Resurfacing Hip Replacement

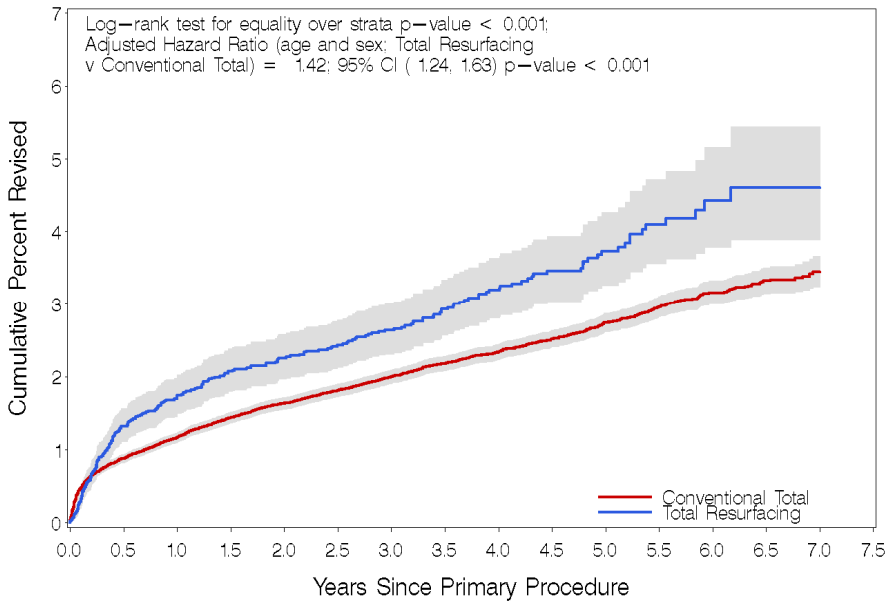


Outcomes of Primary Conventional Total and Total Resurfacing Hip Replacement

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

Procedure Type	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Total Resurfacing	272	9956	30260	0.9	(0.80, 1.01)
Conventional Total	2223	109972	344760	0.6	(0.62, 0.67)
Total	**2495**	**119928**	**375020**	**0.7**	**(0.64, 0.69)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Total Resurfacing	9956	8237	6544	4819	3282	1901	679	83
Conventional Total	109972	89830	71430	54112	38141	23868	11201	2873

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

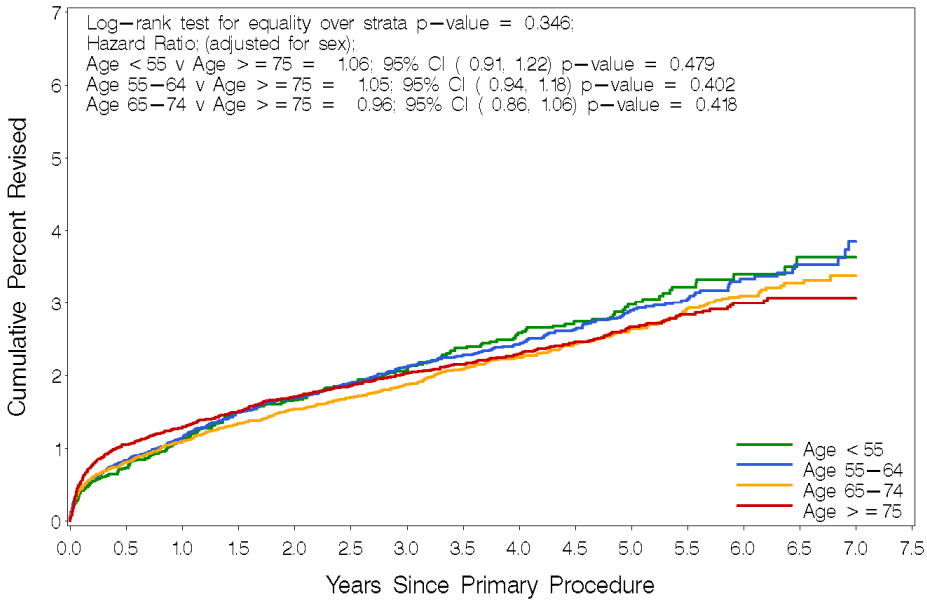
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Total Resurfacing	1.7 (1.5, 2.0)	2.3 (2.0, 2.6)	2.6 (2.3, 3.0)	3.7 (3.3, 4.3)	4.6 (3.9, 5.4)
Conventional Total	1.2 (1.1, 1.2)	1.6 (1.6, 1.7)	2.0 (1.9, 2.1)	2.7 (2.6, 2.9)	3.4 (3.2, 3.7)

Primary Conventional Total Hip Replacement

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

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	237	10952	35293	0.7	(0.59, 0.76)
55-64	536	25175	79677	0.7	(0.62, 0.73)
65-74	768	39149	125538	0.6	(0.57, 0.66)
≥75	682	34696	104252	0.7	(0.61, 0.71)
Total	**2223**	**109972**	**344760**	**0.6**	**(0.62, 0.67)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
< 55	10952	8981	7161	5522	4065	2662	1301	361
55-64	25175	20518	16457	12504	8859	5605	2745	752
65-74	39149	32384	25970	19890	14166	8874	4129	1060
≥ 75	34696	27947	21842	16196	11051	6727	3026	700

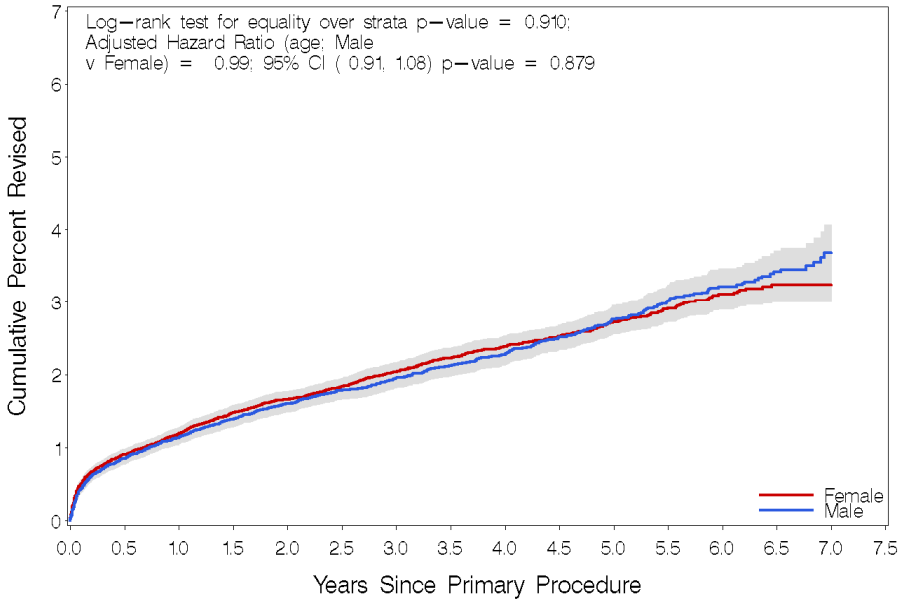
Table HT16: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Age (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	1.1 (0.9, 1.4)	1.7 (1.4, 1.9)	2.1 (1.8, 2.4)	3.0 (2.6, 3.4)	3.6 (3.1, 4.3)
55-64	1.1 (1.0, 1.3)	1.7 (1.5, 1.9)	2.1 (1.9, 2.3)	2.9 (2.6, 3.2)	3.9 (3.4, 4.4)
65-74	1.1 (1.0, 1.2)	1.5 (1.4, 1.7)	1.9 (1.7, 2.0)	2.6 (2.4, 2.9)	3.4 (3.1, 3.7)
≥75	1.3 (1.2, 1.4)	1.7 (1.6, 1.9)	2.0 (1.9, 2.2)	2.7 (2.4, 2.9)	3.1 (2.8, 3.4)

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

Gender	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	1205	59490	186443	0.6	(0.61, 0.68)
Male	1018	50482	158317	0.6	(0.60, 0.68)
Total	**2223**	**109972**	**344760**	**0.6**	**(0.62, 0.67)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Female	59490	48633	38809	29355	20579	12765	5938	1541
Male	50482	41197	32621	24757	17562	11103	5263	1332

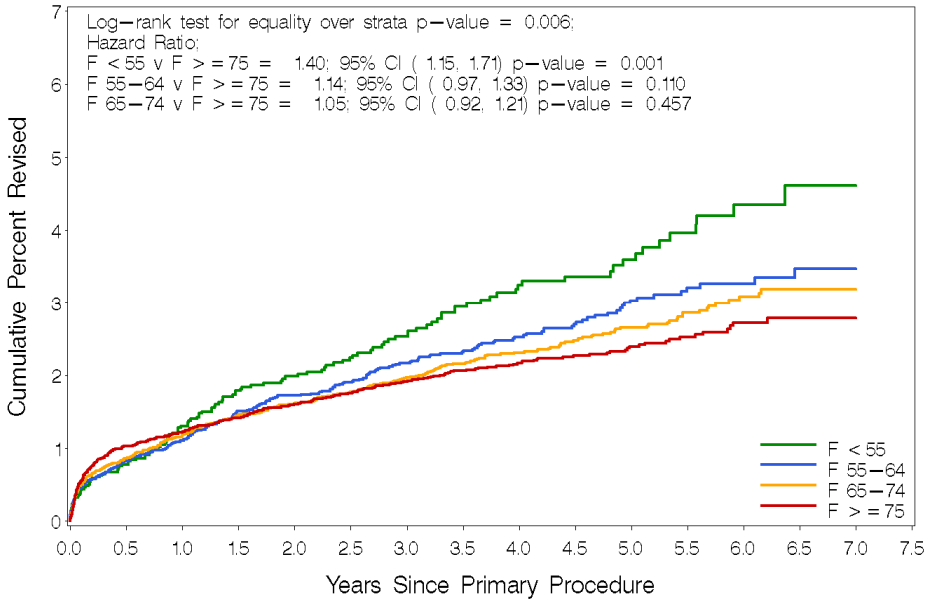
Table HT18: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	1.2 (1.1, 1.3)	1.7 (1.6, 1.8)	2.0 (1.9, 2.2)	2.7 (2.6, 2.9)	3.2 (3.0, 3.5)
Male	1.1 (1.0, 1.2)	1.6 (1.5, 1.7)	2.0 (1.8, 2.1)	2.8 (2.6, 3.0)	3.7 (3.3, 4.1)

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

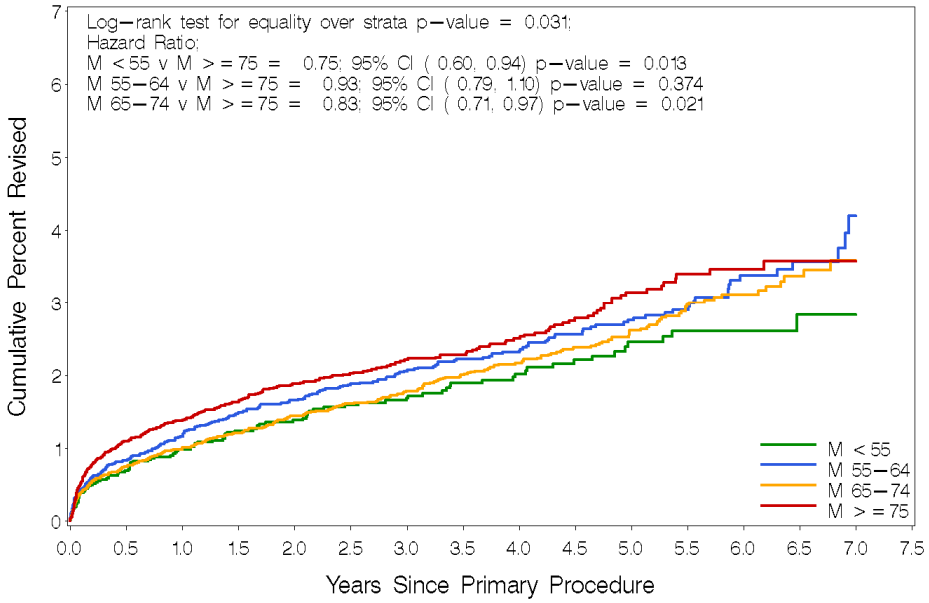
Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	<55	133	5033	15964	0.8	(0.70, 0.99)
	55-64	265	12555	38927	0.7	(0.60, 0.77)
	65-74	409	20416	65538	0.6	(0.57, 0.69)
	≥75	398	21486	66014	0.6	(0.55, 0.67)
Male	<55	104	5919	19329	0.5	(0.44, 0.65)
	55-64	271	12620	40750	0.7	(0.59, 0.75)
	65-74	359	18733	59999	0.6	(0.54, 0.66)
	≥75	284	13210	38238	0.7	(0.66, 0.83)
Total		**2223**	**109972**	**344760**	**0.6**	**(0.62, 0.67)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
F < 55	5033	4109	3282	2483	1812	1169	559	145
F 55-64	12555	10164	8115	6089	4216	2623	1272	372
F 65-74	20416	16884	13593	10417	7417	4605	2117	565
F ≥ 75	21486	17476	13819	10366	7134	4368	1990	459

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
M < 55	5919	4872	3879	3039	2253	1493	742	216
M 55-64	12620	10354	8342	6415	4643	2982	1473	380
M 65-74	18733	15500	12377	9473	6749	4269	2012	495
M ≥ 75	13210	10471	8023	5830	3917	2359	1036	241

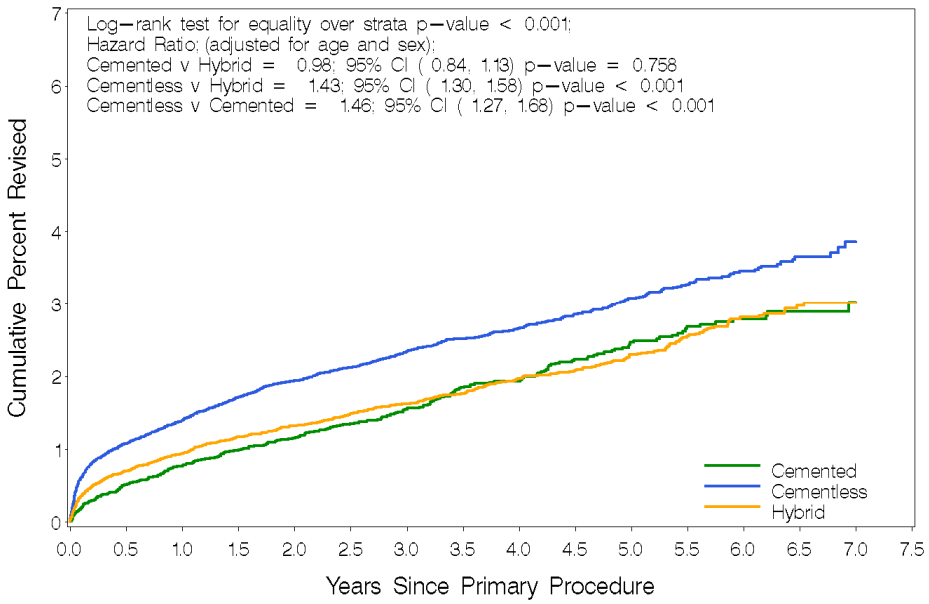
Table HT20: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Gender and Age (Primary Diagnosis OA excluding Infection)

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	<55	1.3 (1.0, 1.7)	2.0 (1.6, 2.4)	2.5 (2.1, 3.1)	3.6 (3.0, 4.3)	4.6 (3.7, 5.7)
	55-64	1.1 (0.9, 1.3)	1.7 (1.5, 2.0)	2.2 (1.9, 2.5)	3.0 (2.7, 3.5)	3.5 (3.0, 4.1)
	65-74	1.2 (1.0, 1.3)	1.6 (1.4, 1.8)	2.0 (1.8, 2.2)	2.7 (2.4, 3.0)	3.2 (2.8, 3.6)
	≥75	1.2 (1.1, 1.4)	1.6 (1.4, 1.8)	1.9 (1.7, 2.1)	2.4 (2.1, 2.7)	2.8 (2.5, 3.2)
Male	<55	1.0 (0.8, 1.3)	1.4 (1.1, 1.7)	1.7 (1.4, 2.1)	2.5 (2.0, 3.0)	2.8 (2.2, 3.6)
	55-64	1.2 (1.0, 1.4)	1.7 (1.4, 1.9)	2.1 (1.8, 2.4)	2.8 (2.4, 3.2)	4.2 (3.4, 5.2)
	65-74	1.0 (0.9, 1.2)	1.4 (1.3, 1.6)	1.8 (1.6, 2.0)	2.6 (2.3, 2.9)	3.6 (3.1, 4.2)
	≥75	1.4 (1.2, 1.6)	1.9 (1.6, 2.1)	2.2 (1.9, 2.5)	3.1 (2.7, 3.6)	3.6 (3.1, 4.2)

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

Fixation	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Cemented	247	13167	49629	0.5	(0.44, 0.56)
Cementless	1336	59578	174993	0.8	(0.72, 0.81)
Hybrid	640	37227	120137	0.5	(0.49, 0.58)
Total	**2223**	**109972**	**344760**	**0.6**	**(0.62, 0.67)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	13167	11612	9898	8129	6233	4290	2302	680
Cementless	59578	47627	36844	26973	18301	10876	4669	1069
Hybrid	37227	30591	24688	19010	13607	8702	4230	1124

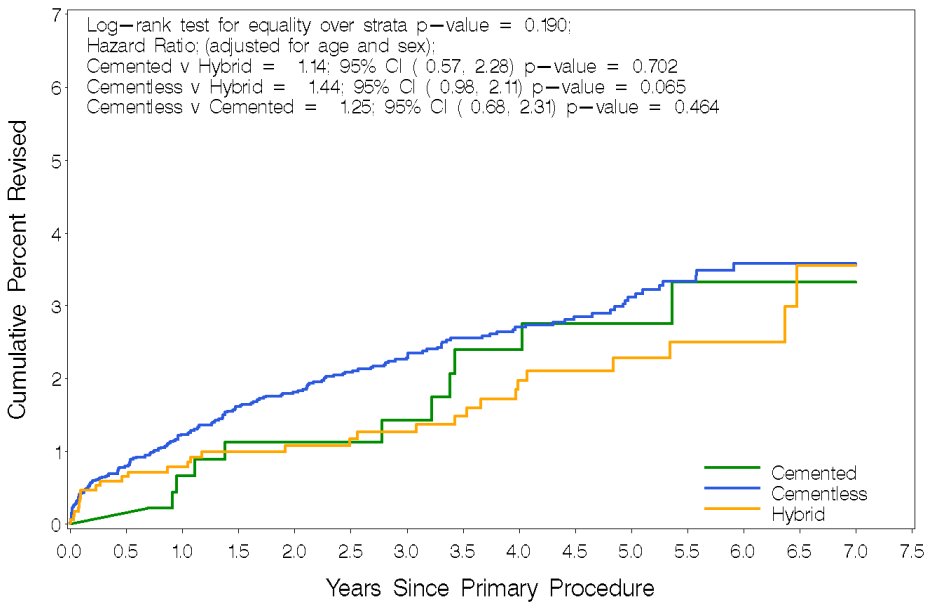
Table HT22: Yearly Cumulative Percent Revision of Primary Conventional Total Hip Replacement by Fixation (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cemented	0.8 (0.6, 0.9)	1.2 (1.0, 1.4)	1.5 (1.3, 1.8)	2.5 (2.2, 2.8)	3.0 (2.6, 3.5)
Cementless	1.4 (1.3, 1.5)	1.9 (1.8, 2.1)	2.3 (2.2, 2.5)	3.1 (2.9, 3.3)	3.9 (3.5, 4.2)
Hybrid	0.9 (0.8, 1.1)	1.3 (1.2, 1.5)	1.6 (1.5, 1.8)	2.3 (2.1, 2.5)	3.0 (2.7, 3.3)

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

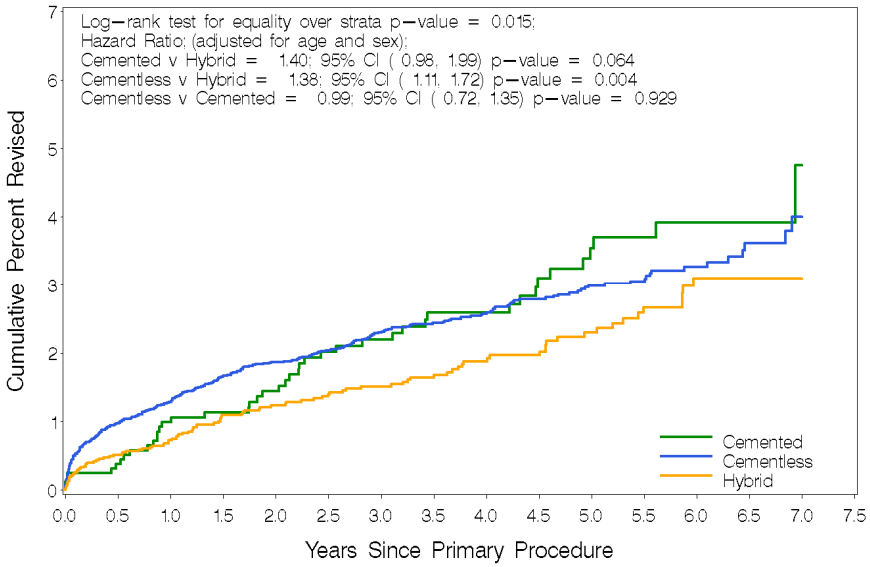
Age	Fixation	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	Cemented	11	500	2000	0.6	(0.27, 0.98)
	Cementless	196	8721	27198	0.7	(0.62, 0.83)
	Hybrid	30	1731	6095	0.5	(0.33, 0.70)
55-64	Cemented	44	1602	6415	0.7	(0.50, 0.92)
	Cementless	391	17733	53650	0.7	(0.66, 0.80)
	Hybrid	101	5840	19612	0.5	(0.42, 0.63)
65-74	Cemented	95	4646	18214	0.5	(0.42, 0.64)
	Cementless	420	20606	60817	0.7	(0.63, 0.76)
	Hybrid	253	13897	46506	0.5	(0.48, 0.62)
≥75	Cemented	97	6419	23000	0.4	(0.34, 0.51)
	Cementless	329	12518	33328	1.0	(0.88, 1.10)
	Hybrid	256	15759	47923	0.5	(0.47, 0.60)
Total		**2223**	**109972**	**344760**	**0.6**	**(0.62, 0.67)**

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



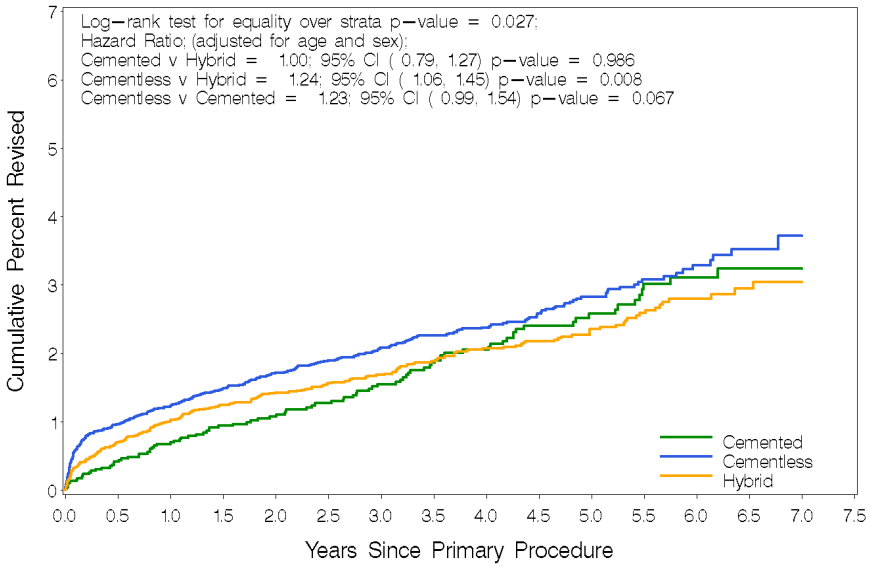
Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	500	447	382	318	269	197	110	33
Cementless	8721	7101	5597	4230	3045	1953	901	226
Hybrid	1731	1433	1182	974	751	512	290	102

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



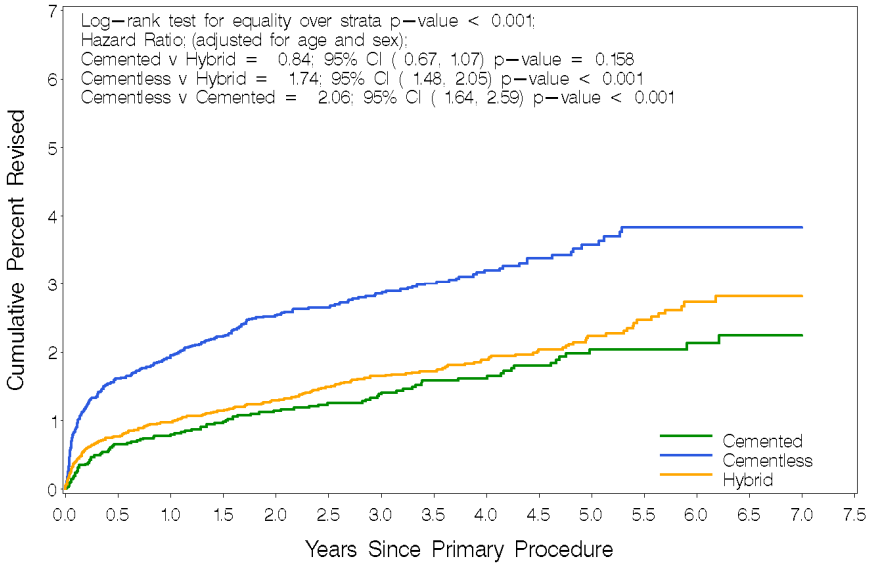
Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	1602	1434	1236	1043	843	616	337	107
Cementless	17733	14255	11255	8374	5762	3473	1584	400
Hybrid	5840	4829	3966	3087	2254	1516	824	245

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	4646	4173	3634	3026	2344	1631	868	249
Cementless	20606	16548	12870	9431	6376	3736	1552	330
Hybrid	13897	11663	9466	7433	5446	3507	1709	481

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	6419	5558	4646	3742	2777	1846	987	291
Cementless	12518	9723	7122	4938	3118	1714	632	113
Hybrid	15759	12666	10074	7516	5156	3167	1407	296

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

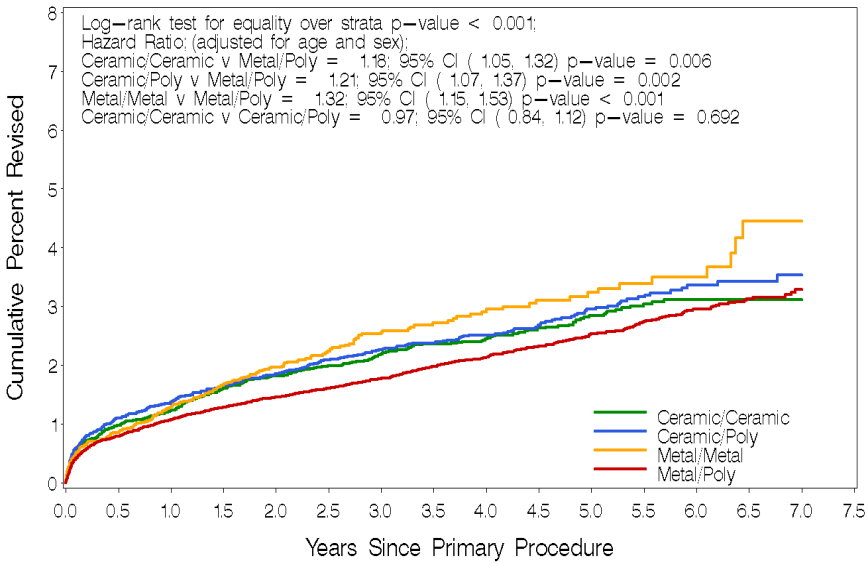
	CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	Cemented	0.7 (0.2, 2.0)	1.1 (0.5, 2.7)	1.4 (0.6, 3.2)	2.8 (1.5, 5.1)	3.3 (1.8, 6.1)
	Cementless	1.2 (1.0, 1.5)	1.8 (1.5, 2.1)	2.3 (2.0, 2.7)	3.1 (2.7, 3.7)	3.6 (3.0, 4.2)
	Hybrid	0.8 (0.5, 1.3)	1.1 (0.7, 1.7)	1.3 (0.8, 2.0)	2.3 (1.5, 3.4)	3.6 (2.2, 5.8)
55-64	Cemented	1.0 (0.6, 1.6)	1.4 (0.9, 2.2)	2.2 (1.5, 3.1)	3.5 (2.6, 4.9)	4.8 (3.1, 7.3)
	Cementless	1.3 (1.1, 1.5)	1.9 (1.7, 2.1)	2.3 (2.1, 2.6)	3.0 (2.7, 3.3)	4.0 (3.3, 4.8)
	Hybrid	0.7 (0.5, 1.0)	1.2 (1.0, 1.6)	1.5 (1.2, 1.9)	2.3 (1.8, 2.9)	3.1 (2.4, 3.9)
65-74	Cemented	0.7 (0.5, 1.0)	1.1 (0.8, 1.4)	1.5 (1.2, 2.0)	2.6 (2.1, 3.2)	3.2 (2.6, 4.0)
	Cementless	1.2 (1.1, 1.4)	1.7 (1.5, 1.9)	2.1 (1.9, 2.3)	2.8 (2.5, 3.2)	3.7 (3.1, 4.4)
	Hybrid	1.0 (0.9, 1.2)	1.4 (1.2, 1.7)	1.7 (1.5, 1.9)	2.4 (2.1, 2.7)	3.0 (2.6, 3.6)
≥75	Cemented	0.8 (0.6, 1.0)	1.1 (0.9, 1.4)	1.4 (1.1, 1.7)	2.0 (1.6, 2.5)	2.2 (1.8, 2.8)
	Cementless	1.9 (1.7, 2.2)	2.5 (2.3, 2.8)	2.9 (2.5, 3.2)	3.6 (3.2, 4.1)	3.8 (3.4, 4.4)
	Hybrid	1.0 (0.8, 1.1)	1.3 (1.1, 1.5)	1.6 (1.4, 1.9)	2.2 (1.9, 2.6)	2.8 (2.4, 3.3)

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

Bearing Surface	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Ceramic/Ceramic	431	20573	63281	0.7	(0.62, 0.75)
Ceramic/Polyethylene	330	13938	48450	0.7	(0.61, 0.76)
Metal/Metal	243	12166	28188	0.9	(0.76, 0.98)
Metal/Polyethylene	1172	62173	200563	0.6	(0.55, 0.62)
Unknown	18	962	3354	0.5	(0.32, 0.85)
Total	**2194**	**109812**	**343836**	**0.6**	**(0.61, 0.67)**

Note: Artek Metal Cup has been excluded from analysis as it has a higher than anticipated revision rate.

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Ceramic/Ceramic	20573	16765	13446	10101	6953	4126	1657	294
Ceramic/Poly	13938	11877	9779	7869	5853	3786	1942	582
Metal/Metal	12166	8714	5757	3600	2270	1379	604	100
Metal/Poly	62173	51496	41595	31824	22567	14233	6764	1803

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

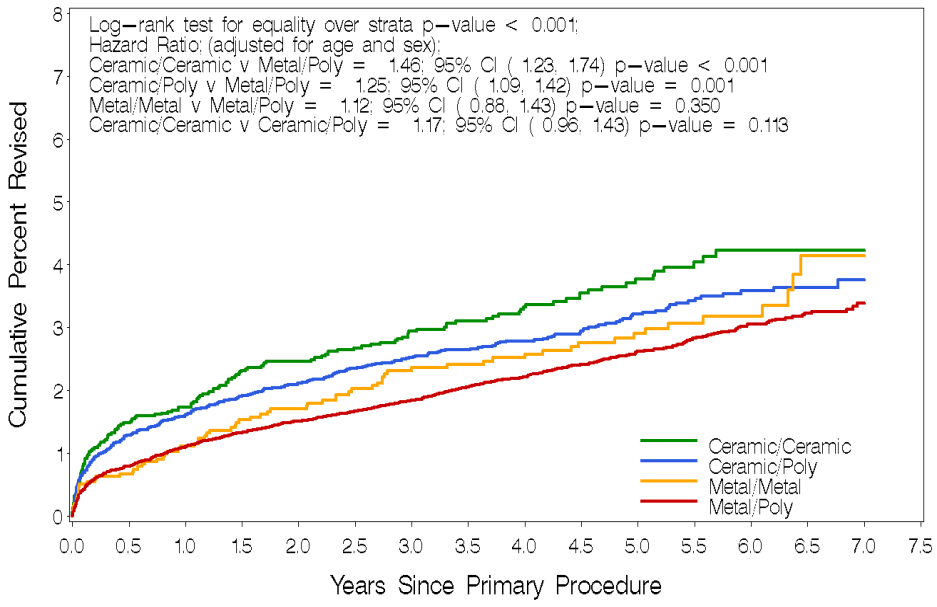
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Ceramic/Ceramic	1.2 (1.1, 1.4)	1.8 (1.6, 2.0)	2.2 (2.0, 2.4)	2.8 (2.6, 3.2)	3.1 (2.8, 3.5)
Ceramic/Polyethylene	1.4 (1.2, 1.6)	1.9 (1.6, 2.1)	2.3 (2.0, 2.5)	3.0 (2.6, 3.3)	3.5 (3.1, 4.1)
Metal/Metal	1.3 (1.1, 1.5)	2.0 (1.7, 2.3)	2.6 (2.2, 2.9)	3.2 (2.8, 3.8)	4.4 (3.5, 5.7)
Metal/Polyethylene	1.1 (1.0, 1.2)	1.5 (1.4, 1.6)	1.8 (1.7, 1.9)	2.5 (2.4, 2.7)	3.3 (3.0, 3.6)
Unknown	1.5 (0.9, 2.6)	1.8 (1.1, 2.9)	1.9 (1.2, 3.1)	2.2 (1.3, 3.5)	2.2 (1.3, 3.5)

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

Bearing Surface by Femoral Component Size		Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Ceramic/Ceramic	≤28mm	154	4711	18521	0.8	(0.71, 0.97)
Ceramic/Ceramic	>28mm	277	15862	44759	0.6	(0.55, 0.70)
Ceramic/Polyethyle	≤28mm	301	10480	42912	0.7	(0.62, 0.79)
Ceramic/Polyethyle	>28mm	29	3458	5537	0.5	(0.35, 0.75)
Metal/Metal	≤28mm	72	2560	11562	0.6	(0.49, 0.78)
Metal/Metal	>28mm	171	9606	16625	1.0	(0.88, 1.19)
Metal/Polyethylene	≤28mm	1014	47647	174860	0.6	(0.54, 0.62)
Metal/Polyethylene	>28mm	158	14526	25704	0.6	(0.52, 0.72)
Total		**2176**	**108850**	**340482**	**0.6**	**(0.61, 0.67)**

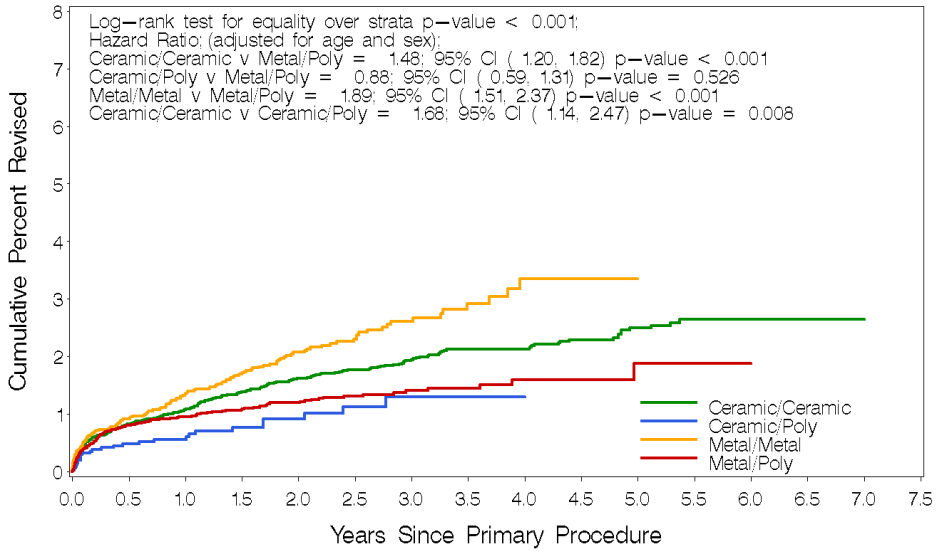
Note: Artek Metal Cup has been excluded from analysis as it has a higher than anticipated revision rate.

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Ceramic/Ceramic	4711	4263	3826	3199	2440	1627	708	151
Ceramic/Poly	10480	9720	8689	7383	5681	3733	1936	582
Metal/Metal	2560	2401	2206	1978	1715	1286	601	100
Metal/Poly	47647	42192	36151	29072	21475	13902	6712	1795

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Ceramic/Ceramic	15862	12502	9620	6902	4513	2499	949	143
Ceramic/Poly	3458	2157	1090	486	172	53	6	0
Metal/Metal	9606	6313	3551	1622	555	93	3	0
Metal/Poly	14526	9304	5444	2752	1092	331	52	8

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 by Femoral Component Size		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Ceramic/Ceramic	≤28mm	1.7 (1.4, 2.1)	2.5 (2.1, 3.0)	2.9 (2.5, 3.5)	3.8 (3.2, 4.4)	4.2 (3.6, 5.0)
Ceramic/Ceramic	>28mm	1.1 (0.9, 1.3)	1.6 (1.4, 1.9)	1.9 (1.7, 2.2)	2.5 (2.2, 2.9)	2.6 (2.3, 3.0)
Ceramic/Polyethylene	≤28mm	1.6 (1.4, 1.9)	2.1 (1.9, 2.4)	2.5 (2.2, 2.9)	3.2 (2.9, 3.6)	3.8 (3.3, 4.3)
Ceramic/Polyethylene	>28mm	0.6 (0.4, 0.9)	0.9 (0.6, 1.4)	1.3 (0.8, 2.0)		
Metal/Metal	≤28mm	1.1 (0.8, 1.6)	1.7 (1.3, 2.3)	2.4 (1.8, 3.1)	2.9 (2.3, 3.7)	4.1 (3.1, 5.6)
Metal/Metal	>28mm	1.4 (1.1, 1.6)	2.1 (1.8, 2.4)	2.6 (2.2, 3.1)	3.3 (2.7, 4.2)	
Metal/Polyethylene	≤28mm	1.1 (1.0, 1.2)	1.5 (1.4, 1.6)	1.8 (1.7, 2.0)	2.6 (2.4, 2.8)	3.4 (3.1, 3.7)
Metal/Polyethylene	>28mm	0.9 (0.8, 1.1)	1.2 (1.0, 1.4)	1.4 (1.2, 1.7)	1.9 (1.3, 2.7)	

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

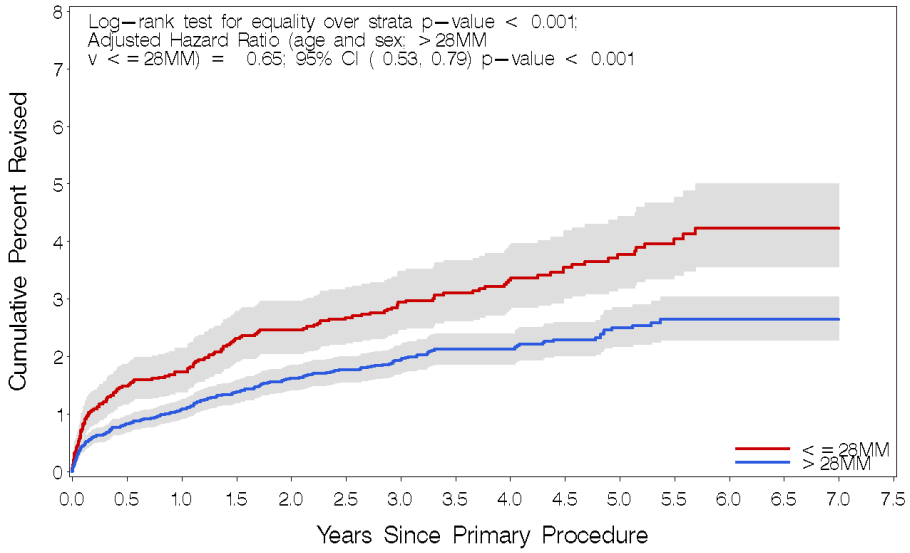


Figure HT25: Cumulative Percent Revision of Ceramic/Polyethylene Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

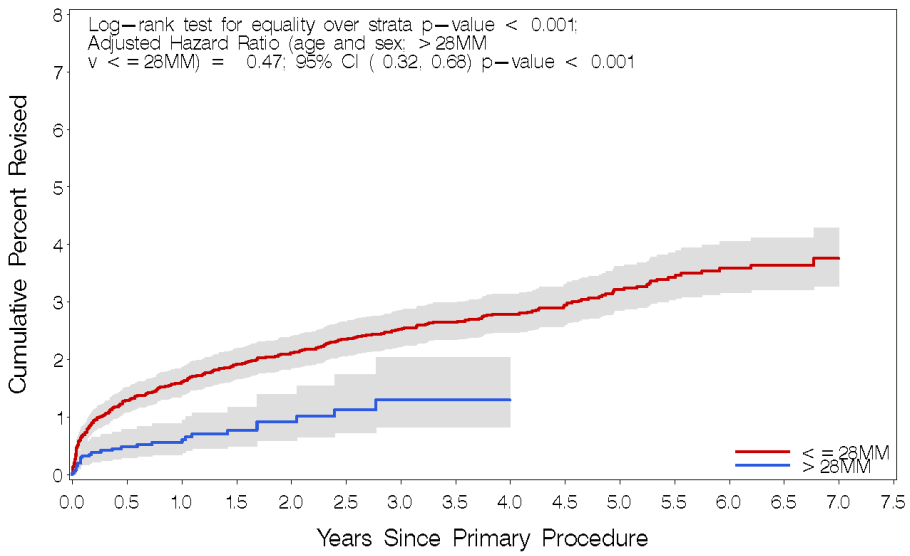


Figure HT26: Cumulative Percent Revision of Metal/Metal Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

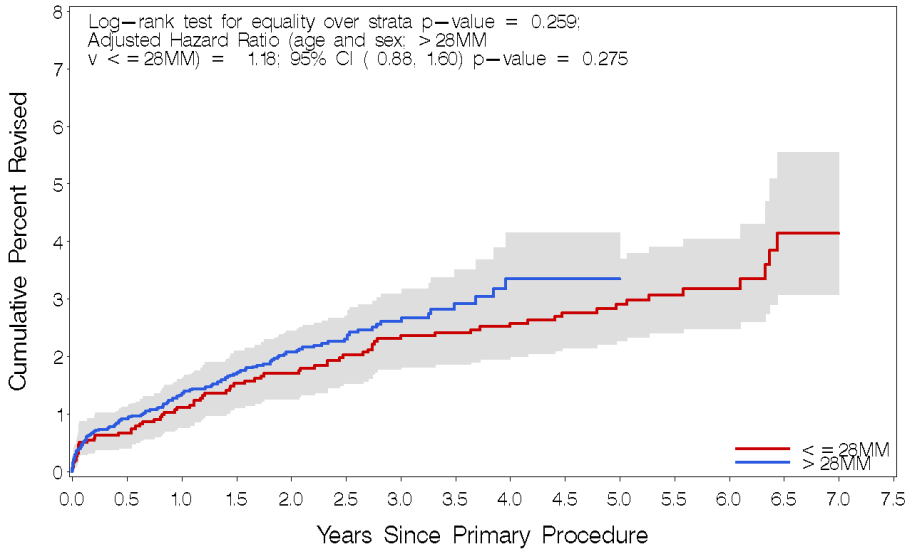


Figure HT27: Cumulative Percent Revision of Metal/Polyethylene Conventional Total Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

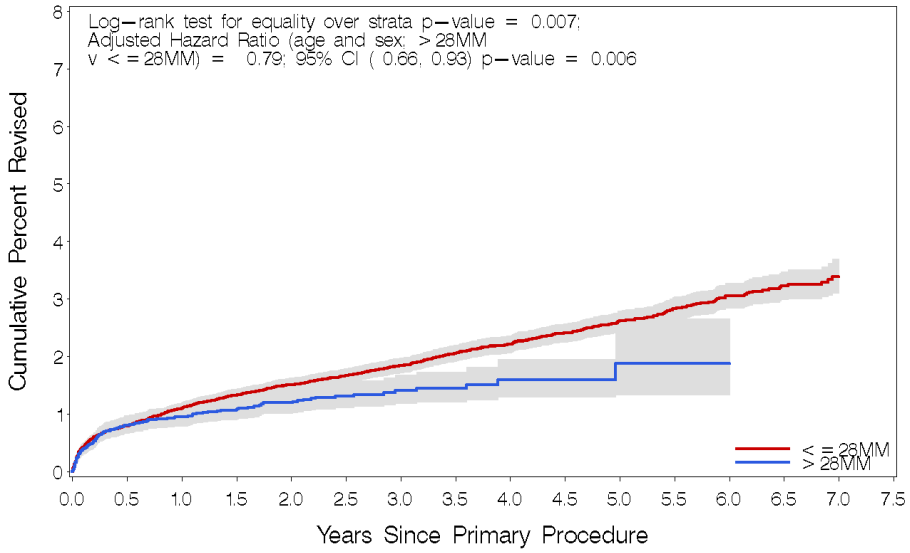


Table HT29: Primary Conventional Total Hip Replacement with Cement Fixation requiring Revision

Femoral Component	Acetabular Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
C-Stem	Elite Plus LPW	5	377	1299	0.4	(0.13, 0.90)
CPCS	Reflection	12	499	1349	0.9	(0.46, 1.55)
CPT	ZCA	11	434	1855	0.6	(0.30, 1.06)
Charnley	Charnley	9	461	1773	0.5	(0.23, 0.96)
Charnley	Charnley Ogee	21	643	2543	0.8	(0.51, 1.26)
Exeter	Contemporary	24	514	2886	0.8	(0.53, 1.24)
Exeter	Exeter	11	419	2508	0.4	(0.22, 0.78)
Exeter V40	Contemporary	100	4733	13164	0.8	(0.62, 0.92)
Exeter V40	Exeter	30	1331	4926	0.6	(0.41, 0.87)
MS 30	Low Profile Cup	4	604	2710	0.1	(0.04, 0.38)
Spectron EF	Reflection	24	1256	4780	0.5	(0.32, 0.75)
Other (231)	-	129	4593	17544	0.7	(0.61, 0.87)
Total		**380**	**15864**	**57336**	**0.7**	**(0.60, 0.73)**

Note: Some cementless components have been cemented.
Only prostheses with over 300 procedures have been listed.

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

Femoral Component	Acetabular Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
C-Stem	Elite Plus LPW	0.6 (0.1, 2.4)	1.0 (0.3, 3.0)	1.0 (0.3, 3.0)	2.2 (0.9, 5.7)	
CPCS	Reflection	1.3 (0.6, 2.8)	1.5 (0.7, 3.2)	3.0 (1.7, 5.5)	3.5 (2.0, 6.3)	
CPT	ZCA	0.7 (0.2, 2.2)	1.0 (0.4, 2.6)	2.1 (1.1, 4.2)	2.9 (1.5, 5.3)	5.4 (2.0, 13.7)
Charnley	Charnley	0.5 (0.1, 1.9)	1.0 (0.4, 2.7)	1.3 (0.6, 3.2)	3.1 (1.6, 5.9)	3.1 (1.6, 5.9)
Charnley	Charnley Ogee	1.1 (0.5, 2.3)	2.0 (1.1, 3.5)	2.6 (1.6, 4.3)	3.8 (2.4, 6.0)	4.8 (3.0, 7.7)
Exeter	Contemporary	1.8 (0.9, 3.4)	2.8 (1.7, 4.7)	3.7 (2.3, 5.8)	4.4 (2.9, 6.7)	5.2 (3.5, 7.7)
Exeter	Exeter	1.0 (0.4, 2.6)	1.2 (0.5, 2.9)	1.2 (0.5, 2.9)	2.3 (1.2, 4.5)	3.0 (1.7, 5.3)
Exeter V40	Contemporary	1.3 (1.0, 1.6)	1.9 (1.5, 2.3)	2.4 (1.9, 3.0)	3.0 (2.4, 3.7)	
Exeter V40	Exeter	0.7 (0.4, 1.4)	1.2 (0.7, 2.0)	1.8 (1.2, 2.8)	2.9 (1.9, 4.2)	
MS 30	Low Profile Cup	0.3 (0.1, 1.3)	0.3 (0.1, 1.3)	0.6 (0.2, 1.7)	0.8 (0.3, 2.2)	0.8 (0.3, 2.2)
Spectron EF	Reflection	0.8 (0.4, 1.5)	1.0 (0.5, 1.7)	1.5 (0.9, 2.5)	2.7 (1.7, 4.0)	3.0 (1.9, 4.6)
Other (231)	-	1.3 (1.0, 1.7)	1.9 (1.6, 2.4)	2.3 (1.9, 2.8)	3.5 (2.9, 4.2)	4.1 (3.4, 5.1)

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

Femoral Component	Acetabular Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
ABGII	ABGII	99	2632	10827	0.9	(0.74, 1.11)
ABGII	ABGII (shell & insert)	13	666	2092	0.6	(0.33, 1.06)
ABGII	Trident	54	1447	3959	1.4	(1.02, 1.78)
Accolade	Trident	91	4278	8059	1.1	(0.91, 1.39)
Alloclassic	Allofit	69	3312	9335	0.7	(0.58, 0.94)
Alloclassic	Durom	13	454	785	1.7	(0.88, 2.83)
Alloclassic	Fitmore	47	1269	4295	1.1	(0.80, 1.46)
Alloclassic	Morscher	12	407	1907	0.6	(0.33, 1.10)
Anthology	Reflection	3	513	357	0.8	(0.17, 2.45)
CLS	Allofit	12	533	1695	0.7	(0.37, 1.24)
CLS	Fitmore	19	467	1994	1.0	(0.57, 1.49)
Citation	Trident	21	853	2289	0.9	(0.57, 1.40)
Citation	Vitalock	11	555	2623	0.4	(0.21, 0.75)
Corail	ASR	40	1648	1902	2.1	(1.50, 2.86)
Corail	Duraloc	21	896	2755	0.8	(0.47, 1.16)
Corail	Pinnacle	54	2670	4074	1.3	(1.00, 1.73)
Epoch	Trilogy	12	564	1351	0.9	(0.46, 1.55)
F2L Multineck	SPH-Blind	36	613	2751	1.3	(0.92, 1.81)
Mallory-Head	Mallory-Head	50	1881	7132	0.7	(0.52, 0.92)
Meridian	Vitalock	13	386	1774	0.7	(0.39, 1.25)
Natural Hip	Fitmore	15	762	3036	0.5	(0.28, 0.81)
Omnifit	Secur-Fit	33	502	2409	1.4	(0.94, 1.92)
Omnifit	Trident	30	966	4029	0.7	(0.50, 1.06)
S-Rom	Option	20	666	3045	0.7	(0.40, 1.01)
S-Rom	Pinnacle	32	1283	2656	1.2	(0.82, 1.70)
SL-Plus	EPF-Plus	29	1363	2411	1.2	(0.81, 1.73)
Secur-Fit	Trident	67	2980	9404	0.7	(0.55, 0.90)
Secur-Fit Plus	Trident	69	3434	13071	0.5	(0.41, 0.67)
Stability	Duraloc	11	401	1979	0.6	(0.28, 0.99)
Summit	ASR	13	848	1244	1.0	(0.56, 1.79)
Summit	Pinnacle	16	1434	3336	0.5	(0.27, 0.78)
Synergy	BHR	7	512	768	0.9	(0.37, 1.88)
Synergy	Reflection	140	6425	19582	0.7	(0.60, 0.84)
Taperloc	M2a	11	362	1065	1.0	(0.52, 1.85)
Taperloc	Mallory-Head	17	723	2442	0.7	(0.41, 1.11)
VerSys	Trilogy	94	3366	11384	0.8	(0.67, 1.01)
Other (618)	-	485	14665	41934	1.2	(1.06, 1.26)
Total		**1779**	**66736**	**195750**	**0.9**	**(0.87, 0.95)**

Note: Only prostheses with over 300 procedures have been listed.

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

Femoral Component	Acetabular Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
ABGII	ABGII	1.7 (1.2, 2.2)	2.4 (1.9, 3.1)	2.9 (2.3, 3.7)	4.3 (3.5, 5.2)	5.7 (4.4, 7.4)
ABGII	ABGII (shell & insert)	1.4 (0.7, 2.6)	1.5 (0.8, 2.8)	2.0 (1.1, 3.6)	2.3 (1.3, 3.9)	
ABGII	Trident	2.2 (1.5, 3.1)	3.4 (2.6, 4.6)	3.8 (2.9, 5.1)	4.9 (3.7, 6.6)	
Accolade	Trident	1.5 (1.2, 1.9)	2.3 (1.9, 2.9)	2.9 (2.3, 3.6)	3.8 (2.9, 5.1)	
Alloclassic	Allofit	1.5 (1.1, 2.0)	2.0 (1.5, 2.6)	2.4 (1.9, 3.1)	2.6 (2.1, 3.4)	
Alloclassic	Durom	1.5 (0.7, 3.4)	2.5 (1.3, 4.9)	6.5 (3.3, 12.8)		
Alloclassic	Fitmore	2.2 (1.5, 3.2)	3.1 (2.3, 4.3)	3.5 (2.6, 4.8)	4.2 (3.1, 5.7)	
Alloclassic	Morscher	1.0 (0.4, 2.6)	2.0 (1.0, 3.9)	2.3 (1.2, 4.3)	3.2 (1.8, 5.6)	
Anthology	Reflection	0.7 (0.2, 2.2)				
CLS	Allofit	1.6 (0.8, 3.1)	2.0 (1.1, 3.8)	2.3 (1.3, 4.2)	2.8 (1.6, 5.0)	
CLS	Fitmore	1.7 (0.9, 3.4)	2.7 (1.5, 4.7)	4.3 (2.7, 6.8)	4.6 (3.0, 7.2)	4.6 (3.0, 7.2)
Citation	Trident	2.0 (1.2, 3.2)	2.3 (1.5, 3.7)	2.8 (1.8, 4.3)	3.3 (2.0, 5.5)	
Citation	Vitalock	0.4 (0.1, 1.4)	0.9 (0.4, 2.2)	1.9 (1.0, 3.6)	2.2 (1.2, 3.9)	2.2 (1.2, 3.9)
Corail	ASR	2.1 (1.4, 3.1)	3.8 (2.6, 5.3)	4.5 (3.1, 6.6)		
Corail	Duraloc	1.5 (0.9, 2.6)	1.9 (1.2, 3.1)	2.1 (1.3, 3.4)	2.9 (1.8, 4.6)	
Corail	Pinnacle	2.0 (1.5, 2.6)	2.3 (1.8, 3.1)	2.3 (1.8, 3.1)		
Epoch	Trilogy	1.9 (1.0, 3.5)	2.1 (1.2, 3.8)	2.5 (1.4, 4.3)	2.5 (1.4, 4.3)	
F2L Multineck	SPH-Blind	3.1 (2.0, 4.8)	4.1 (2.8, 6.0)	4.8 (3.4, 6.8)	5.9 (4.2, 8.2)	
Mallory-Head	Mallory-Head	1.5 (1.1, 2.2)	1.9 (1.3, 2.6)	1.9 (1.4, 2.7)	3.0 (2.2, 4.1)	4.1 (2.9, 5.7)
Meridian	Vitalock	1.0 (0.4, 2.8)	1.8 (0.9, 3.8)	2.4 (1.3, 4.6)	3.7 (2.0, 6.5)	4.7 (2.5, 8.7)
Natural Hip	Fitmore	1.2 (0.6, 2.3)	1.3 (0.7, 2.5)	1.5 (0.8, 2.7)	2.1 (1.2, 3.6)	
Omnifit	Secur-Fit	3.2 (2.0, 5.2)	3.8 (2.5, 5.9)	4.9 (3.3, 7.2)	6.5 (4.5, 9.2)	7.3 (5.1, 10.3)
Omnifit	Trident	1.5 (0.9, 2.5)	1.8 (1.1, 2.9)	2.6 (1.7, 3.9)	3.9 (2.7, 5.6)	
S-Rom	Option	1.5 (0.8, 2.8)	2.0 (1.1, 3.4)	2.5 (1.5, 4.0)	3.2 (2.0, 5.0)	3.6 (2.3, 5.7)
S-Rom	Pinnacle	2.1 (1.4, 3.1)	2.4 (1.7, 3.5)	3.3 (2.3, 4.9)		
SL-Plus	EPF-Plus	1.6 (1.0, 2.4)	1.9 (1.3, 2.9)	3.1 (1.9, 4.8)		
Secur-Fit	Trident	1.3 (1.0, 1.8)	2.0 (1.6, 2.7)	2.2 (1.7, 2.9)	2.9 (2.2, 3.8)	3.4 (2.5, 4.5)
Secur-Fit Plus	Trident	1.2 (0.9, 1.6)	1.8 (1.4, 2.3)	2.0 (1.6, 2.5)	2.2 (1.7, 2.8)	2.2 (1.7, 2.8)
Stability	Duraloc	0.7 (0.2, 2.3)	1.8 (0.8, 3.6)	2.3 (1.2, 4.3)	2.6 (1.4, 4.7)	3.1 (1.7, 5.6)
Summit	ASR	1.0 (0.5, 2.1)	2.2 (1.2, 4.1)	2.9 (1.5, 5.6)		
Summit	Pinnacle	1.0 (0.6, 1.7)	1.2 (0.7, 2.0)	1.3 (0.8, 2.2)		
Synergy	BHR	1.2 (0.5, 2.7)	1.6 (0.7, 3.3)	1.6 (0.7, 3.3)		
Synergy	Reflection	1.4 (1.1, 1.7)	1.8 (1.5, 2.2)	2.3 (1.9, 2.7)	2.8 (2.4, 3.4)	4.3 (2.5, 7.4)
Taperloc	M2a	1.2 (0.4, 3.1)	2.5 (1.3, 5.0)	2.9 (1.5, 5.5)	4.5 (2.3, 8.7)	
Taperloc	Mallory-Head	1.7 (1.0, 3.0)	2.2 (1.3, 3.6)	2.4 (1.5, 3.9)	3.0 (1.7, 5.0)	
VerSys	Trilogy	2.1 (1.7, 2.6)	2.5 (2.0, 3.1)	2.7 (2.2, 3.3)	3.4 (2.7, 4.2)	3.4 (2.7, 4.2)
Other (618)	-	2.1 (1.8, 2.3)	2.9 (2.6, 3.2)	3.6 (3.3, 4.0)	4.7 (4.3, 5.2)	5.8 (5.1, 6.6)

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

Femoral Component	Acetabular Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
C-Stem	Duraloc	35	978	3465	1.0	(0.70, 1.40)
C-Stem	Pinnacle	10	432	695	1.4	(0.69, 2.65)
CPCS	Reflection	14	1407	3283	0.4	(0.23, 0.72)
CPT	Trabecular Metal Shell	5	307	361	1.4	(0.45, 3.23)
CPT	Trilogy	62	2600	8379	0.7	(0.57, 0.95)
Charnley	Vitalock	15	377	1907	0.8	(0.44, 1.30)
Definition	Vitalock	4	379	2092	0.2	(0.05, 0.49)
Elite Plus	Duraloc	47	1077	5133	0.9	(0.67, 1.22)
Elite Plus	Pinnacle	5	305	924	0.5	(0.18, 1.26)
Exeter	Mallory-Head	4	342	1681	0.2	(0.06, 0.61)
Exeter	Vitalock	38	1218	7466	0.5	(0.36, 0.70)
Exeter V40	ABGII	20	954	4244	0.5	(0.29, 0.73)
Exeter V40	Mallory-Head	10	684	2442	0.4	(0.20, 0.75)
Exeter V40	Trident	233	13668	31907	0.7	(0.64, 0.83)
Exeter V40	Trilogy	8	352	994	0.8	(0.35, 1.59)
Exeter V40	Vitalock	41	1959	7822	0.5	(0.38, 0.71)
Freeman	Mallory-Head	15	308	1562	1.0	(0.54, 1.58)
MS 30	Allofit	19	864	2701	0.7	(0.42, 1.10)
MS 30	Fitmore	4	354	1681	0.2	(0.06, 0.61)
Omnifit	Trident	42	1343	4934	0.9	(0.61, 1.15)
Spectron EF	Reflection	101	3730	12455	0.8	(0.66, 0.99)
VerSys	Trilogy	11	692	2427	0.5	(0.23, 0.81)
Other (331)	-	221	7609	25533	0.9	(0.76, 0.99)
Total		**964**	**41939**	**134088**	**0.7**	**(0.67, 0.77)**

Note: Some cementless components have been cemented.
Only prostheses with over 300 procedures have been listed.

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

Femoral Component	Acetabular Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
C-Stem	Duraloc	2.3 (1.5, 3.5)	3.2 (2.2, 4.6)	3.2 (2.2, 4.6)	4.5 (3.1, 6.4)	
C-Stem	Pinnacle	1.9 (0.9, 3.9)	3.0 (1.5, 6.0)	3.8 (1.9, 7.6)		
CPCS	Reflection	1.0 (0.6, 1.7)	1.0 (0.6, 1.7)	1.1 (0.7, 2.0)	1.1 (0.7, 2.0)	
CPT	Trabecular Metal Shell	1.6 (0.6, 4.2)	2.8 (1.0, 7.8)			
CPT	Trilogy	1.3 (1.0, 1.9)	2.0 (1.5, 2.7)	2.4 (1.8, 3.1)	3.1 (2.4, 4.1)	3.9 (2.6, 5.9)
Charnley	Vitalock	1.9 (0.9, 3.9)	2.7 (1.4, 4.9)	3.0 (1.6, 5.3)	3.9 (2.3, 6.5)	4.5 (2.7, 7.5)
Definition	Vitalock	0.3 (0.0, 1.9)	0.3 (0.0, 1.9)	0.5 (0.1, 2.2)	0.9 (0.3, 2.9)	1.3 (0.5, 3.5)
Elite Plus	Duraloc	1.9 (1.2, 2.9)	2.6 (1.8, 3.7)	3.4 (2.5, 4.7)	4.6 (3.4, 6.1)	5.6 (4.0, 7.7)
Elite Plus	Pinnacle	1.0 (0.3, 3.1)	1.7 (0.7, 4.0)	1.7 (0.7, 4.0)		
Exeter	Mallory-Head	0.6 (0.1, 2.3)	0.6 (0.1, 2.3)	0.9 (0.3, 2.8)	1.3 (0.5, 3.5)	1.3 (0.5, 3.5)
Exeter	Vitalock	1.6 (1.0, 2.5)	2.1 (1.4, 3.1)	2.3 (1.6, 3.4)	2.5 (1.8, 3.6)	3.2 (2.4, 4.5)
Exeter V40	ABGII	1.1 (0.6, 2.0)	1.2 (0.6, 2.1)	1.4 (0.8, 2.4)	2.2 (1.4, 3.6)	
Exeter V40	Mallory-Head	0.6 (0.2, 1.6)	1.0 (0.4, 2.1)	1.4 (0.7, 2.7)	1.4 (0.7, 2.7)	
Exeter V40	Trident	1.2 (1.0, 1.4)	1.6 (1.4, 1.9)	2.0 (1.8, 2.3)	2.8 (2.4, 3.3)	
Exeter V40	Trilogy	2.1 (1.0, 4.3)	2.1 (1.0, 4.3)	2.6 (1.3, 5.3)	2.6 (1.3, 5.3)	
Exeter V40	Vitalock	0.9 (0.6, 1.5)	1.4 (0.9, 2.0)	1.6 (1.1, 2.3)	2.2 (1.6, 3.1)	
Freeman	Mallory-Head	2.3 (1.1, 4.7)	3.6 (2.0, 6.4)	3.9 (2.2, 6.8)	4.8 (2.9, 8.0)	5.4 (3.3, 9.0)
MS 30	Allofit	1.3 (0.7, 2.4)	1.9 (1.2, 3.2)	2.3 (1.4, 3.7)	2.9 (1.8, 4.5)	
MS 30	Fitmore	0	0	0.3 (0.0, 2.3)	1.2 (0.4, 3.6)	2.7 (0.8, 8.7)
Omnifit	Trident	2.0 (1.4, 3.0)	2.7 (2.0, 3.8)	3.4 (2.5, 4.6)	3.5 (2.6, 4.7)	3.8 (2.7, 5.1)
Spectron EF	Reflection	1.3 (1.0, 1.7)	2.0 (1.5, 2.5)	2.4 (1.9, 3.0)	3.5 (2.8, 4.4)	5.2 (4.0, 6.8)
VerSys	Trilogy	1.2 (0.6, 2.4)	1.6 (0.8, 2.9)	1.6 (0.8, 2.9)	1.6 (0.8, 2.9)	
Other (331)	-	1.6 (1.4, 2.0)	2.2 (1.9, 2.6)	2.8 (2.4, 3.2)	3.8 (3.3, 4.4)	4.6 (4.0, 5.4)

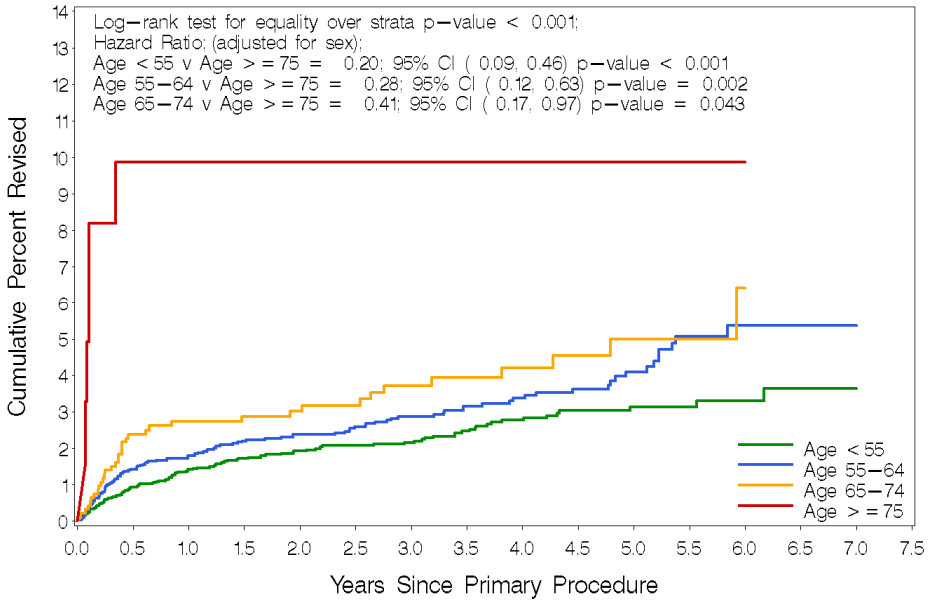
Note: Cumulative percent revision equal to zero indicates that the prosthesis combination has been followed up to this time with no revisions recorded.

Primary Total Resurfacing Hip Replacement

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

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	111	4928	15136	0.7	(0.60, 0.88)
55-64	119	4018	11984	1.0	(0.82, 1.19)
65-74	36	948	2936	1.2	(0.86, 1.70)
≥75	6	62	204	2.9	(1.08, 6.41)
Total	**272**	**9956**	**30260**	**0.9**	**(0.80, 1.01)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
< 55	4928	4102	3243	2421	1673	972	358	53
55-64	4018	3289	2623	1891	1258	727	260	27
65-74	948	799	636	469	324	188	57	3
≥ 75	62	47	42	38	27	14	4	0

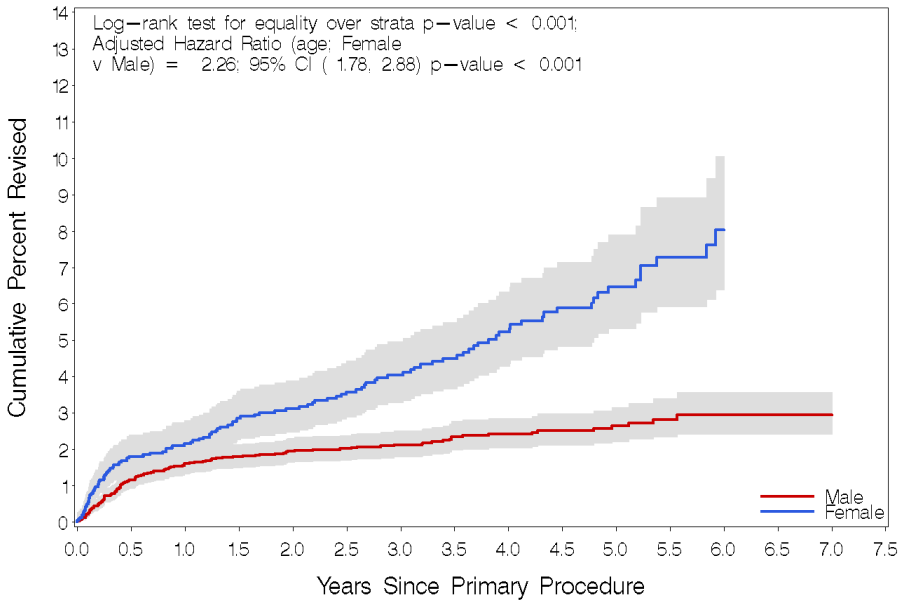
Table HT36: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	1.4 (1.1, 1.8)	1.9 (1.5, 2.4)	2.2 (1.8, 2.6)	3.1 (2.5, 3.8)	3.6 (2.8, 4.8)
55-64	1.8 (1.4, 2.3)	2.4 (1.9, 2.9)	2.9 (2.3, 3.5)	4.1 (3.3, 5.0)	5.4 (4.2, 6.8)
65-74	2.7 (1.9, 4.0)	3.0 (2.1, 4.4)	3.7 (2.6, 5.3)	5.0 (3.5, 7.2)	
≥75	9.9 (4.6, 20.7)	9.9 (4.6, 20.7)	9.9 (4.6, 20.7)	9.9 (4.6, 20.7)	

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

Gender	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	120	2613	8331	1.4	(1.19, 1.72)
Male	152	7343	21929	0.7	(0.59, 0.81)
Total	**272**	**9956**	**30260**	**0.9**	**(0.80, 1.01)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Female	2613	2202	1803	1344	945	561	214	26
Male	7343	6035	4741	3475	2337	1340	465	57

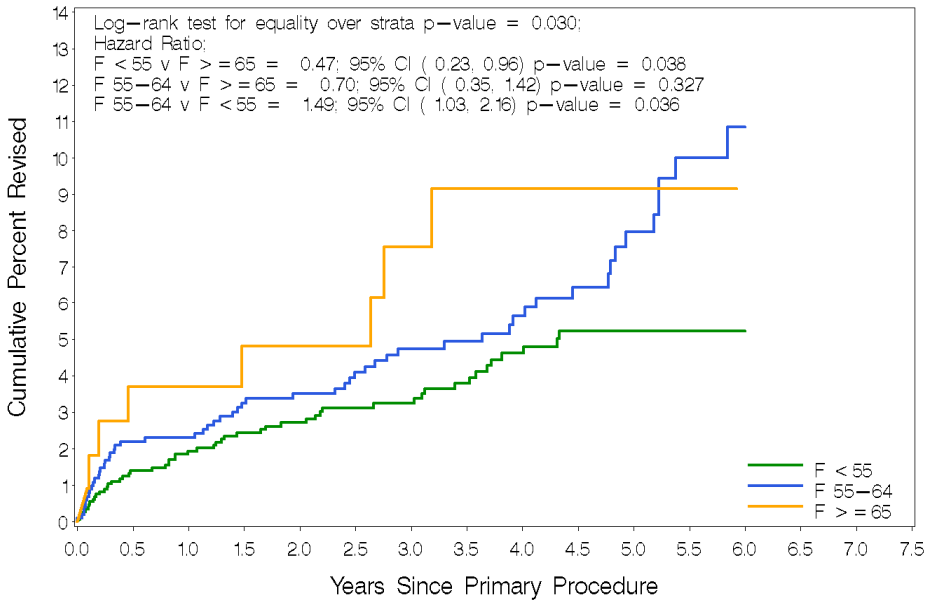
Table HT38: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	2.1 (1.6, 2.8)	3.1 (2.5, 3.9)	4.0 (3.3, 5.0)	6.5 (5.3, 7.9)	
Male	1.6 (1.3, 1.9)	1.9 (1.6, 2.3)	2.1 (1.8, 2.5)	2.6 (2.2, 3.1)	2.9 (2.4, 3.6)

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

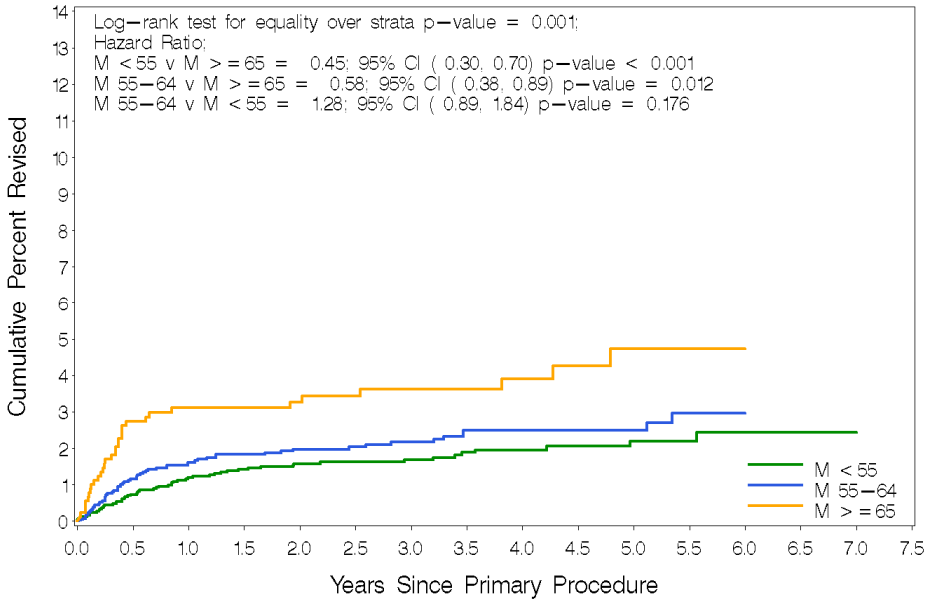
Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	<55	54	1476	4641	1.2	(0.87, 1.52)
Female	55-64	57	1025	3321	1.7	(1.30, 2.22)
Female	≥65	9	112	369	2.4	(1.11, 4.63)
Male	<55	57	3452	10495	0.5	(0.41, 0.70)
Male	55-64	62	2993	8662	0.7	(0.55, 0.92)
Male	≥65	33	898	2771	1.2	(0.82, 1.67)
Total		**272**	**9956**	**30260**	**0.9**	**(0.80, 1.01)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
F < 55	1476	1238	992	739	520	315	119	17
F 55-64	1025	867	731	545	380	217	87	9
F ≥ 65	112	97	80	60	45	29	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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
M < 55	3452	2864	2251	1682	1153	657	239	36
M 55-64	2993	2422	1892	1346	878	510	173	18
M ≥ 65	898	749	598	447	306	173	53	3

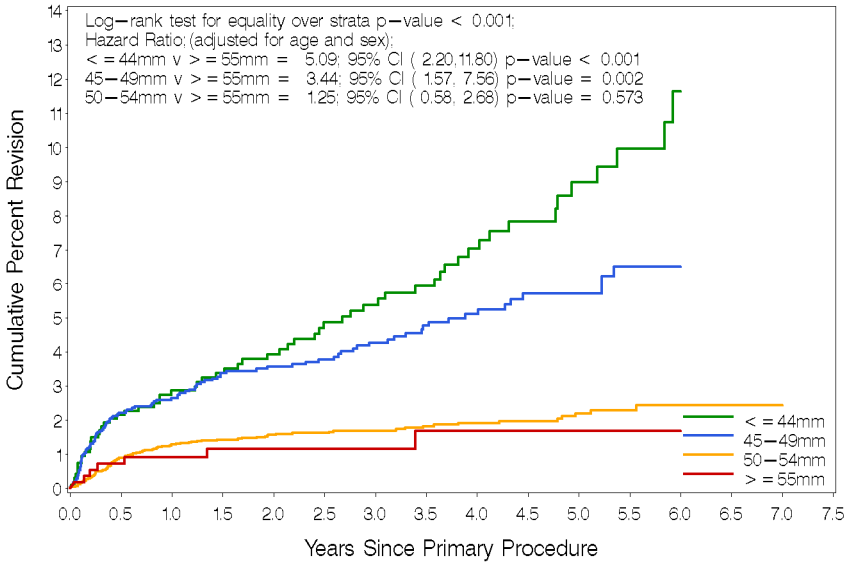
Table HT40: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Gender and Age (Primary Diagnosis OA excluding Infection)

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	<55	1.9 (1.3, 2.8)	2.7 (2.0, 3.7)	3.2 (2.4, 4.4)	5.2 (3.9, 6.9)	
	55-64	2.3 (1.5, 3.4)	3.5 (2.5, 4.9)	4.7 (3.5, 6.4)	8.0 (5.9, 10.7)	
	≥65	3.7 (1.4, 9.5)	4.8 (2.0, 11.2)	7.6 (3.6, 15.4)	9.2 (4.6, 17.8)	
Male	<55	1.2 (0.9, 1.6)	1.6 (1.2, 2.1)	1.7 (1.3, 2.2)	2.2 (1.6, 2.9)	2.4 (1.8, 3.4)
	55-64	1.6 (1.2, 2.2)	2.0 (1.5, 2.6)	2.2 (1.7, 2.8)	2.5 (1.9, 3.2)	
	≥65	3.1 (2.1, 4.5)	3.3 (2.3, 4.7)	3.6 (2.5, 5.1)	4.7 (3.2, 6.9)	

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

Femoral Component Size	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
≤44mm	61	959	3140	1.9	(1.49, 2.50)
45-49mm	103	2423	7016	1.5	(1.20, 1.78)
50-54mm	101	6001	18523	0.5	(0.44, 0.66)
≥55mm	7	573	1581	0.4	(0.18, 0.91)
Total	**272**	**9956**	**30260**	**0.9**	**(0.80, 1.01)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
≤44mm	959	789	664	522	387	221	93	13
45-49mm	2423	1957	1510	1090	716	423	173	14
50-54mm	6001	5040	4035	2982	2027	1152	380	50
≥55mm	573	451	335	225	152	105	33	6

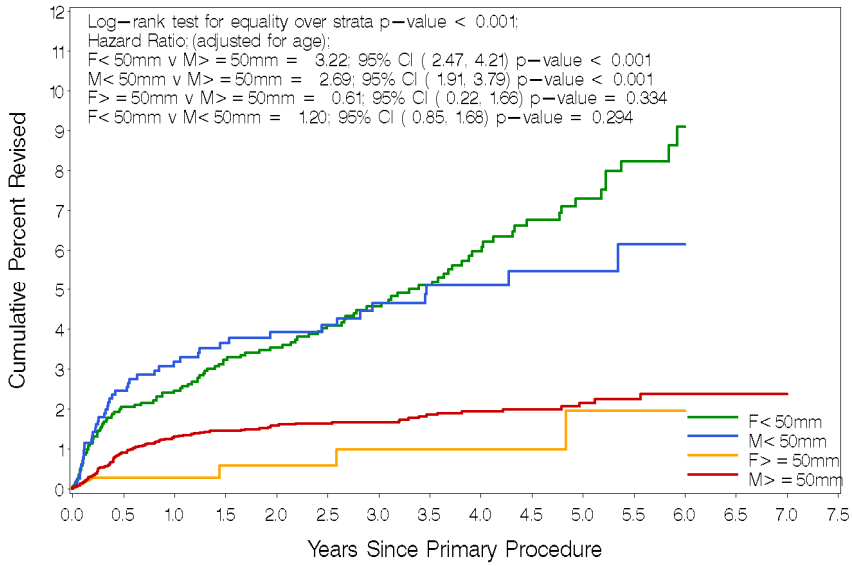
Table HT42: Yearly Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Femoral Component Head Size (Primary Diagnosis OA excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
≤44mm	2.9 (2.0, 4.2)	3.9 (2.8, 5.5)	5.4 (4.0, 7.2)	9.0 (6.8, 11.8)	
45-49mm	2.6 (2.1, 3.4)	3.6 (2.9, 4.4)	4.3 (3.4, 5.3)	5.7 (4.6, 7.1)	
50-54mm	1.3 (1.0, 1.6)	1.6 (1.3, 1.9)	1.7 (1.4, 2.1)	2.2 (1.8, 2.7)	2.4 (1.9, 3.1)
≥55mm	0.9 (0.4, 2.2)	1.2 (0.5, 2.6)	1.2 (0.5, 2.6)	1.7 (0.7, 3.8)	

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

Femoral Component Size		Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	<50mm	48	1143	3126	1.5	(1.13, 2.04)
Male	≥50mm	104	6200	18802	0.6	(0.45, 0.67)
Female	<50mm	116	2239	7030	1.7	(1.36, 1.98)
Female	≥50mm	4	374	1302	0.3	(0.08, 0.79)
Total		**272**	**9956**	**30260**	**0.9**	**(0.80, 1.01)**

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 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Male	<50mm	1143	876	662	487	312	176	82	3
Male	≥50mm	6200	5159	4079	2988	2025	1164	383	54
Female	<50mm	2239	1870	1512	1125	791	468	184	24
Female	≥50mm	374	332	291	219	154	93	30	2

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

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Male	<50mm	3.2 (2.3, 4.4)	3.9 (2.9, 5.3)	4.6 (3.4, 6.3)	5.5 (4.0, 7.4)	
Male	≥50mm	1.3 (1.0, 1.6)	1.6 (1.3, 2.0)	1.7 (1.4, 2.0)	2.1 (1.7, 2.7)	2.4 (1.9, 3.0)
Female	<50mm	2.5 (1.9, 3.2)	3.5 (2.8, 4.4)	4.6 (3.7, 5.6)	7.3 (6.0, 8.9)	
Female	≥50mm	0.3 (0.0, 1.9)	0.6 (0.1, 2.3)	1.0 (0.3, 3.1)	2.0 (0.6, 6.0)	

Table HT45: Primary Total Resurfacing Hip Replacement requiring Revision

Head Component	Acetabular Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
ASR	ASR	48	945	1871	2.6	(1.89, 3.40)
Adept	Adept	2	225	263	0.8	(0.09, 2.75)
Adept	Adept (cup)	0	5	5	0.0	(0.00, 77.70)
BHR	BHR	216	7682	26591	0.8	(0.71, 0.93)
Bionik	Bionik (shell)	1	72	87	1.1	(0.03, 6.38)
Conserve	Conserve Plus	0	9	16	0.0	(0.00, 23.66)
Conserve Plus	Conserve Plus	4	62	192	2.1	(0.57, 5.34)
Cormet	Cormet 2000	11	196	748	1.5	(0.73, 2.63)
Cormet 2000 HAP	Cormet 2000	9	95	374	2.4	(1.10, 4.57)
Cormet 2000 HAP Bi-Coated	Cormet 2000	3	192	294	1.0	(0.21, 2.98)
Durom	Durom	35	674	1532	2.3	(1.59, 3.18)
Icon	Icon	1	77	116	0.9	(0.02, 4.81)
Mitch TRH	Mitch TRH	4	296	217	1.8	(0.50, 4.71)
Recap	Recap	4	91	147	2.7	(0.74, 6.95)
Total		**338**	**10621**	**32452**	**1.0**	**(0.93, 1.16)**

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	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
ASR	ASR	3.8 (2.7, 5.3)	5.3 (3.9, 7.1)	6.0 (4.5, 8.1)		
Adept	Adept	0.5 (0.1, 3.2)	4.8 (0.8, 25.4)			
Adept	Adept (cup)	0	0			
BHR	BHR	1.5 (1.3, 1.8)	2.1 (1.8, 2.4)	2.5 (2.1, 2.9)	3.6 (3.1, 4.2)	4.6 (3.8, 5.4)
Bionik	Bionik (shell)	1.4 (0.2, 9.5)	1.4 (0.2, 9.5)			
Conserve	Conserve Plus	0	0	0		
Conserve Plus	Conserve Plus	3.2 (0.8, 12.3)	3.2 (0.8, 12.3)	6.0 (1.9, 18.2)	10.1 (3.6, 26.6)	
Cormet	Cormet 2000	2.1 (0.8, 5.4)	3.3 (1.5, 7.1)	4.5 (2.3, 8.8)	6.5 (3.4, 12.2)	
Cormet 2000 HAP	Cormet 2000	6.3 (2.9, 13.5)	7.4 (3.6, 14.8)	8.4 (4.3, 16.1)	10.3 (5.4, 19.1)	
Cormet 2000 HAP Bi-Coated	Cormet 2000	1.2 (0.3, 4.8)	1.2 (0.3, 4.8)	3.7 (0.9, 14.4)		
Durom	Durom	3.5 (2.3, 5.3)	4.7 (3.2, 6.7)	5.8 (4.0, 8.3)		
Icon	Icon	1.4 (0.2, 9.2)	1.4 (0.2, 9.2)	1.4 (0.2, 9.2)		
Mitch TRH	Mitch TRH	1.7 (0.6, 4.6)				
Recap	Recap	5.7 (2.1, 14.5)	5.7 (2.1, 14.5)	5.7 (2.1, 14.5)		

Note: Cumulative Percent Revision equal to zero indicates that the prosthesis combination has been followed up to this time with no revisions recorded.

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

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

Femoral/Acetabular Components	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and no longer used						
Elite Plus/Charnley LPW	89	436	2.29	3.331	0.0001	(1.79, 6.20)
Elite Plus/Apollo	52	277	2.53	3.808	0.0004	(1.81, 8.00)
H Moos/Mueller	19	85	8.21	11.856	<0.001	(5.65, 24.89)
* Margron	685	2448	2.29	2.999	<0.001	(2.30, 3.91)
**Artek	177	1019	3.34	5.162	<0.001	(3.68, 7.25)
**Inter-Op	33	190	3.16	4.934	<0.001	(2.22, 10.97)
**Revitan (non mod)	82	337	1.78	2.439	0.0286	(1.10, 5.42)
Re-identified and still used						
F2L Multineck/Delta	110	224	3.57	3.519	0.0004	(1.76, 7.04)
* Profemur Z	182	398	4.52	4.635	<0.001	(2.92, 7.36)
** MBA	120	435	2.76	3.651	<0.001	(2.07, 6.44)
** SPH-Blind	951	3949	1.57	2.182	<0.001	(1.70, 2.81)
Newly Identified						
Corail/ASR	1649	1904	2.10	1.591	0.0036	(1.16, 2.18)
* Adaptor (cemented)	100	94	5.33	3.601	0.0042	(1.50, 8.66)
*Anca_Fit	146	184	3.80	3.002	0.0037	(1.43, 6.30)
*Hayes Consensus	189	416	2.16	2.278	0.0135	(1.19, 4.38)
*Lyderic II (cemented)	74	197	2.54	2.969	0.0151	(1.23, 7.14)
**Bionik	294	305	2.95	2.063	0.0300	(1.07, 3.97)

Note: All components have been compared to all other Conventional Total Hip components.
* Femoral Components
** Acetabular Components

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and no longer used					
Elite Plus/Charnley LPW	1.2 (0.2, 8.2)	4.9 (1.9, 12.4)	6.1 (2.6, 14.1)	11.3 (6.0, 20.6)	13.2 (7.2, 23.3)
Elite Plus/Apollo	2.0 (0.3, 13.4)	4.0 (1.0, 15.1)	4.0 (1.0, 15.1)	12.5 (5.8, 25.9)	15.5 (7.6, 30.2)
H Moos/Mueller	5.6 (0.8, 33.4)	11.1 (2.9, 37.6)	33.3 (16.6, 59.6)	38.9 (20.8, 64.7)	38.9 (20.8, 64.7)
* Margron	5.8 (4.2, 7.8)	6.9 (5.2, 9.2)	7.5 (5.7, 9.9)	9.7 (7.3, 12.7)	
**Artek	2.9 (1.2, 6.7)	5.7 (3.1, 10.4)	8.1 (4.9, 13.2)	15.8 (11.1, 22.2)	20.1 (14.8, 27.0)
**Inter-Op	9.1 (3.0, 25.6)	9.1 (3.0, 25.6)	12.1 (4.7, 29.1)	18.4 (8.7, 36.5)	18.4 (8.7, 36.5)
**Revitan (non mod)	2.4 (0.6, 9.4)	6.1 (2.6, 14.0)	6.1 (2.6, 14.0)	9.1 (3.9, 20.7)	
Re-identified and still used					
F2L Multineck/Delta	5.6 (2.6, 12.0)	7.7 (3.9, 14.8)	7.7 (3.9, 14.8)		
* Profemur Z	6.2 (3.5, 10.9)	9.4 (5.9, 14.9)	12.2 (7.5, 19.7)		
** MBA	4.2 (1.8, 9.7)	7.0 (3.5, 13.4)	9.0 (4.9, 16.1)	12.6 (7.1, 21.9)	
** SPH-Blind	3.8 (2.8, 5.3)	4.7 (3.5, 6.3)	5.4 (4.1, 7.1)	6.8 (5.3, 8.8)	
Newly Identified					
Corail/ASR	2.1 (1.4, 3.1)	3.8 (2.6, 5.3)	4.5 (3.1, 6.6)		
*Adaptor (cemented)	7.1 (2.9, 16.7)	7.1 (2.9, 16.7)			
*Anca_Fit	4.6 (2.0, 10.1)	7.2 (3.0, 16.8)	7.2 (3.0, 16.8)		
*Hayes Consensus	3.2 (1.4, 7.0)	4.6 (2.3, 9.1)	4.6 (2.3, 9.1)		
* Lyderic II (cemented)	2.8 (0.7, 10.7)	6.4 (2.4, 16.3)	8.5 (3.6, 19.5)		
**Bionik	3.4 (1.7, 6.8)	4.2 (2.2, 8.3)			

Note: * Femoral Components
** Acetabular Components

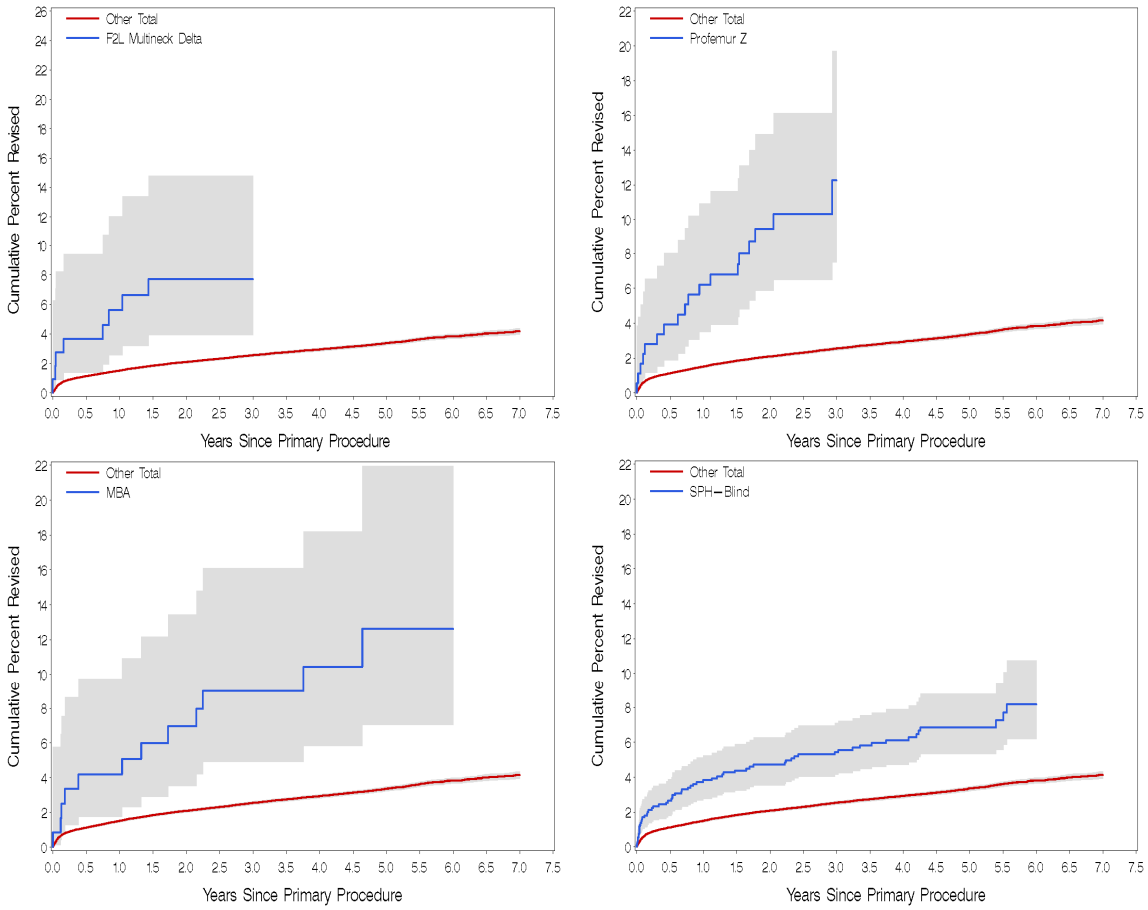
Table HT49: Yearly Usage of Individual Primary Conventional Total Hip Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and no longer used									
Elite Plus/Charnley LPW	3	19	23	29	15				
Elite Plus/Apollo	0	9	16	17	10				
H Moos/Mueller	0	5	9	5					
* Margron	0	28	56	130	123	140	96	83	29
**Artek	12	33	110	22					
**Inter-Op	0	9	24						
** Revitan (non mod)	0	0	0	6	53	23			
Re-identified and still used									
F2L Multineck/Delta	0	0	0	0	0	10	62	28	10
* Profemur Z	0	0	0	0	0	41	79	56	6
** MBA	0	0	8	40	29	19	11	8	5
** SPH-Blind	32	116	228	262	204	41	49	19	32
Newly Identified									
Corail/ASR	0	0	0	0	0	25	296	551	777
*Adaptor (cemented)	0	0	0	0	0	0	7	41	52
*Anca_Fit	0	0	0	0	0	9	21	50	66
*Hayes Consensus	0	0	0	1	15	38	70	29	36
* Lyderic II (cemented)	0	0	1	7	11	25	11	11	8
**Bionik	0	0	0	0	0	0	11	147	136

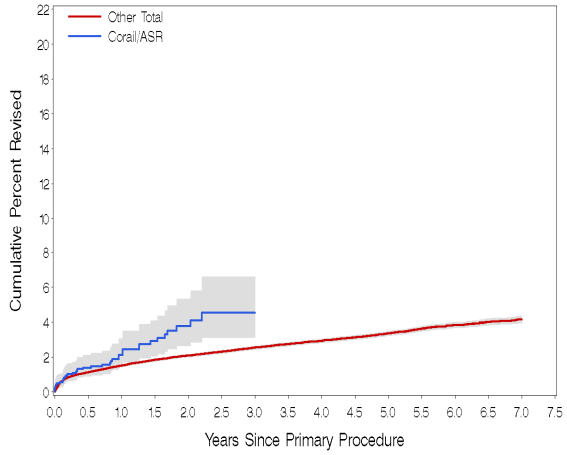
Note: * Femoral Components
** Acetabular Components

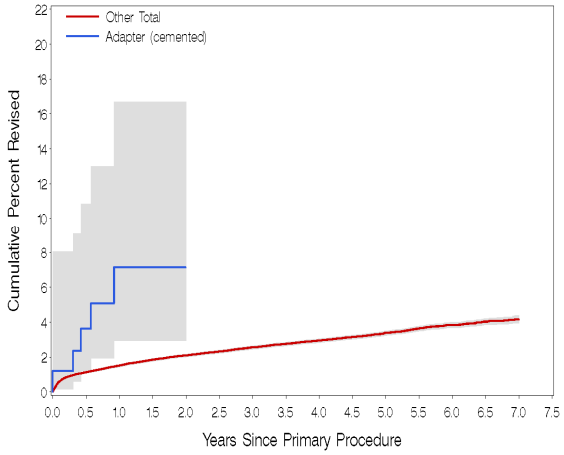
Figure HT34-43: Cumulative Percent Revision of Individual Primary Conventional Total Hip Prostheses identified as having a higher than anticipated Revision Rate

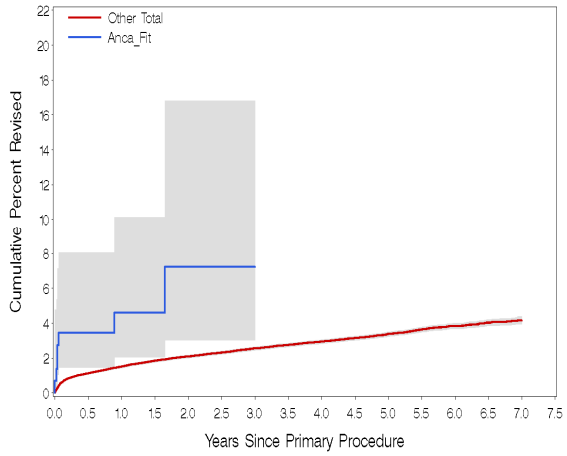
Re-identified and still used

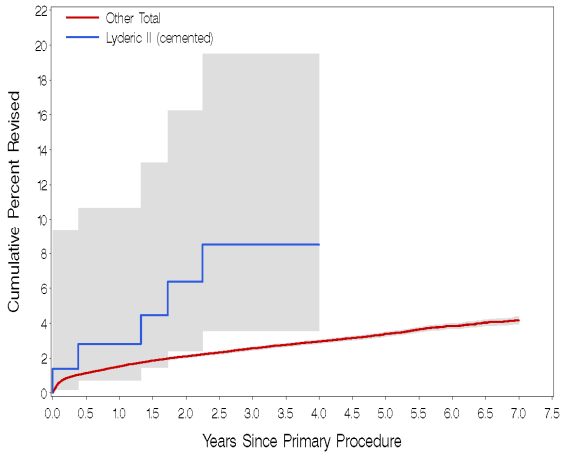


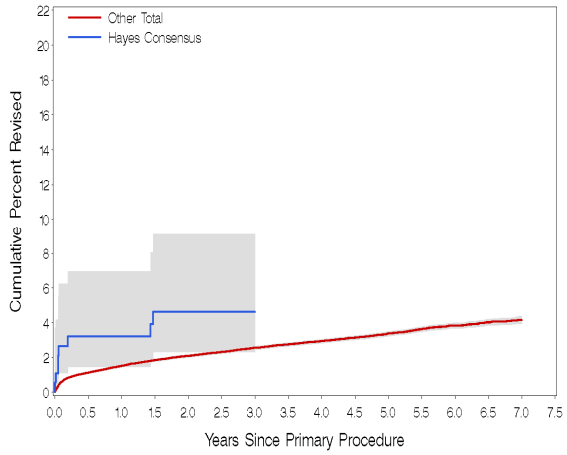
Newly Identified

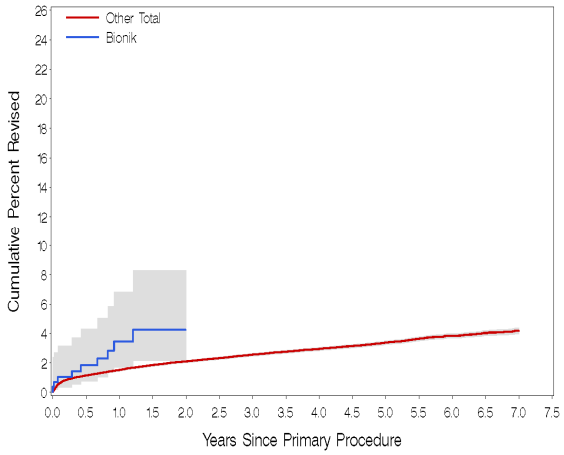












Primary Total Resurfacing Hip Replacement Prostheses with a higher than anticipated Revision Rate

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

Resurfacing Head/Cup Components	Total Number	Observed Component Years	Revisions per 100 Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and no longer used						
* Cormet 2000 HAP	95	374	2.41	2.786	0.0025	(1.44, 5.41)
Re-identified and still used						
ASR/ASR	945	1871	2.57	2.220	<0.0001	(1.63, 3.03)
Durom/Durom	674	1532	2.28	2.174	<0.0001	(1.53, 3.09)

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 Prostheses identified as having a higher than anticipated Revision Rate

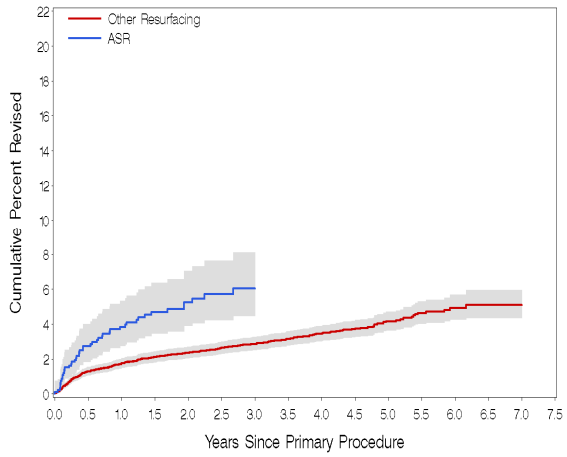
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and no longer used					
* Cormet 2000 HAP	6.3 (2.9, 13.5)	7.4 (3.6, 14.8)	8.4 (4.3, 16.1)	10.3 (5.4, 19.1)	
Re-identified and still used					
ASR/ASR	3.8 (2.7, 5.3)	5.3 (3.9, 7.1)	6.0 (4.5, 8.1)		
Durom/Durom	3.5 (2.3, 5.3)	4.7 (3.2, 6.7)	5.8 (4.0, 8.3)		

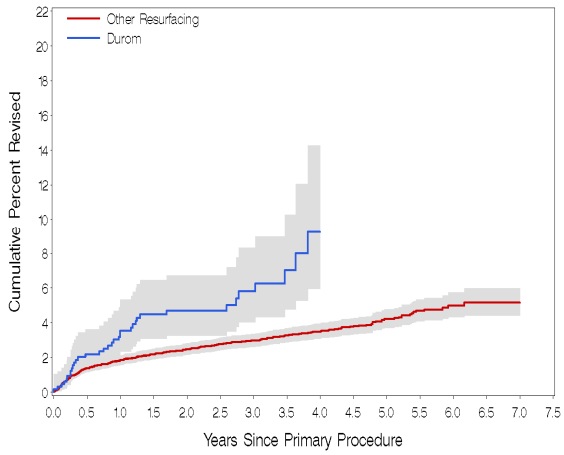
Table HT52: Yearly Usage of Individual Primary Total Resurfacing Hip Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and no longer used									
* Cormet 2000 HAP	0	0	1	17	38	39			
Re-identified and still used									
ASR/ASR	0	0	0	0	43	164	301	259	178
Durom/Durom	0	0	0	0	58	165	207	143	101

Figure HT 44-45: Cumulative Percent Revision of Individual Primary Total Resurfacing Hip Prostheses identified as having a higher than anticipated Revision Rate

Re-identified and still used





REVISION HIP REPLACEMENT

This report is based on the analysis of 23,782 revision hip procedures recorded by the Registry prior to the 31st December 2007. Included in this group of revisions is a subgroup containing 4,459 first revisions of primary hip procedures (both partial and total) that have been previously recorded by the Registry.

As previously mentioned the Registry categorises revisions into a number of different types. 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 os 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 femoral head exchange 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 it has 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 even 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 recorded by the Registry. Analysis of these data however is able to provide information on the types of revisions being undertaken, how that is changing and the reasons for those revisions.

There is an increasing proportion of revision procedures where the Registry does have a record of the original primary and hence a full chronological list of all procedures subsequent to that primary. The Registry refers to this subgroup of revisions as 'revisions of known primary procedures'. 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 primary partial, primary 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

Considering all hip revisions recorded by the Registry most revisions are categorised as major revisions (85% of all revisions). Of the major revisions 35.8% 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 (58.6%). When only one major component is revised it is most commonly the acetabular cup or shell (37.1% of all major revisions). Femoral stem only revisions account for 21.5% of all major revisions. There are a small number of major revisions where prostheses are removed and replaced by a cement spacer (2.9%), removed and not replaced (1.3%) or removed and reinserted (0.1%) (Table HR1).

Minor revisions account for 15% of all revision procedures. Most minor revisions involve exchange of both the head and insert (71.2% of all minor revisions) (Table HR2).

During the last five years there has not been any major change in the proportion of major partial, major total and minor revisions. There is however some state and territory variation in those proportions. This is most evident with minor revisions, which are undertaken at a higher although declining rate in both Western and South Australia (Figure HR1).

Age and Gender

Revision hip replacement is more common in females. The Registry has previously reported that the proportion of females undergoing revisions has increased in recent years. This trend has not continued in 2007. There has been a decline in the proportion of females having revision surgery from 55.6% in 2006 to 52.4% in 2007 (Table HR3). There has been little change in the age of patients undergoing revision surgery with the major age group in 2007 being between 75 and 84 years of age (32.6%) (Table HR4).

Diagnosis

The most common reason for revision in the 'all revision' group is loosening, which is reported in almost half of all revisions (45.7%). Dislocation is the next most common reason (14.8%). Lysis is reported in 10.1%, fracture in 9.2% and infection in 9.1% of all revisions. Prosthesis wear and breakage were reported in 6.4% of all revisions. The total number of diagnoses exceeds the total number of procedures because for some procedures there is more than one diagnosis provided. All diagnoses provided for each individual procedure have been included in this analysis (Table HR5).

Revision of Known Primary Hip Replacement

The Registry has analysed revisions for two different groups. The data just presented are for all revisions recorded by the Registry. The following data are from the analysis of that subgroup of revisions where the primary procedure is recorded by the Registry. The essential difference between the two groups is that revisions of known primary procedures are either early or mid term revisions. The Registry started collecting data in 1999 becoming fully national in 2002, therefore these revisions are revisions of primary procedures that have a maximum possible follow up of eight years and for the vast majority a considerably shorter follow up.

Type of Revision Hip Replacement

There are differences in the type of revision between the known primary procedures and the 'all revision' group. A smaller proportion of the revisions are major revisions (78% compared to 85%) (Tables HR1, HR2, HR6 and HR7).

There are less major total revisions in the known primary group (25.4%) compared to all revisions (35.8%). 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 36.3% compared to 21.5% and acetabular cup or shell 27.7% compared to 37.1%). (Tables HR1 and HR6)

There is a higher proportion of minor revisions in the revision of known primary group (22%) compared to all revisions (15%) (Tables HR6 and HR1). The most common minor revision involves the replacement of both the head and insert (62.2%) and head only revisions account for just over 20% of minor revisions (Table HR7).

Diagnosis

There are differences in the reason for revision of known primaries when compared to all revisions. Loosening is still the most common reason but the proportion is less (28.4% compared to 45.7%). Other diagnoses such as dislocation, fracture and infection are more common in the first revision of the known primary group (Table HR5). This reflects the fact that known revisions are early or mid term rather than long term.

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. We have excluded first revisions with infection as the reason for the initial revision. 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 does not have information on all of these factors and meaningful interpretation of any subsequent revision data related to infection is difficult.

When revisions for primary hip procedures other than conventional primary hips are excluded, the number of procedures available for analysis decreases from 4,459 to 3,145. This is further reduced to 2,616 procedures after excluding infection, of which 282 (10.8%) have subsequently been revised.

For the first revision of known conventional total hip replacement the rate of subsequent revision is dependent on the type of the first revision performed. A greater proportion of minor revisions undergo subsequent revision compared to major total and major partial revisions (5.5, 3.1 and 4.3 revisions per 100 observed component years respectively) (Table HR8). At three years the cumulative percent revision of a minor revision is 16.1%, a major partial is 12.1% and a major total revision is 8.2% (Table HR9 and Figure HR2).

Outcome of First Revision of Primary Total Resurfacing Hip Replacement

This year for the first time the Registry is presenting the results of the first revision of primary total resurfacing procedures. The re-revision rate of primary total resurfacing procedures is 2.8 per 100 observed component years. At 12 months they have a cumulative percent revision of 2.9%, 8.4% at three years and 11.1% at five years. These results are similar to the re-revision rate of major revisions of conventional total hip replacement (Tables HR10 and HR11 and Figure HR3).

REVISION HIP REPLACEMENT
1/9/1999 – 31/12/2007

Table HR1: Major Revisions of All Revision Hip Replacement by Fixation

Components Used	Cementless		Cemented		Hybrid		Removal		Total	
	N	%	N	%	N	%	N	%	N	%
Femoral Component Only	3044	15.0	1313	6.5	.	.	.	.	4357	21.5
Acetabular Component Only	5401	26.6	2127	10.5	.	.	.	.	7528	37.1
Femoral and Acetabular (THR)	3703	18.3	1385	6.8	2165	10.7	.	.	7253	35.8
Removal Prosthesis	.	.	.	.	.	.	260	1.3	260	1.3
Cement Spacer	.	.	.	.	.	.	578	2.9	578	2.9
Bipolar head and Femoral Component	115	0.6	2	0.0	157	0.8	.	.	274	1.4
Reinsertion of Components	8	0.0	16	0.1	.	.	.	.	24	0.1
Total	**12271**	**60.5**	**4843**	**23.9**	**2322**	**11.5**	**838**	**4.1**	**20274**	**100.0**

Table HR2: Minor Revisions of All Revision Hip Replacement

Components Used	N	%
Head/Insert	2499	71.2
Insert only	279	8.0
Head Only	449	12.8
Cable/Other Minor Components	281	8.0
Total	**3508**	**100.0**

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

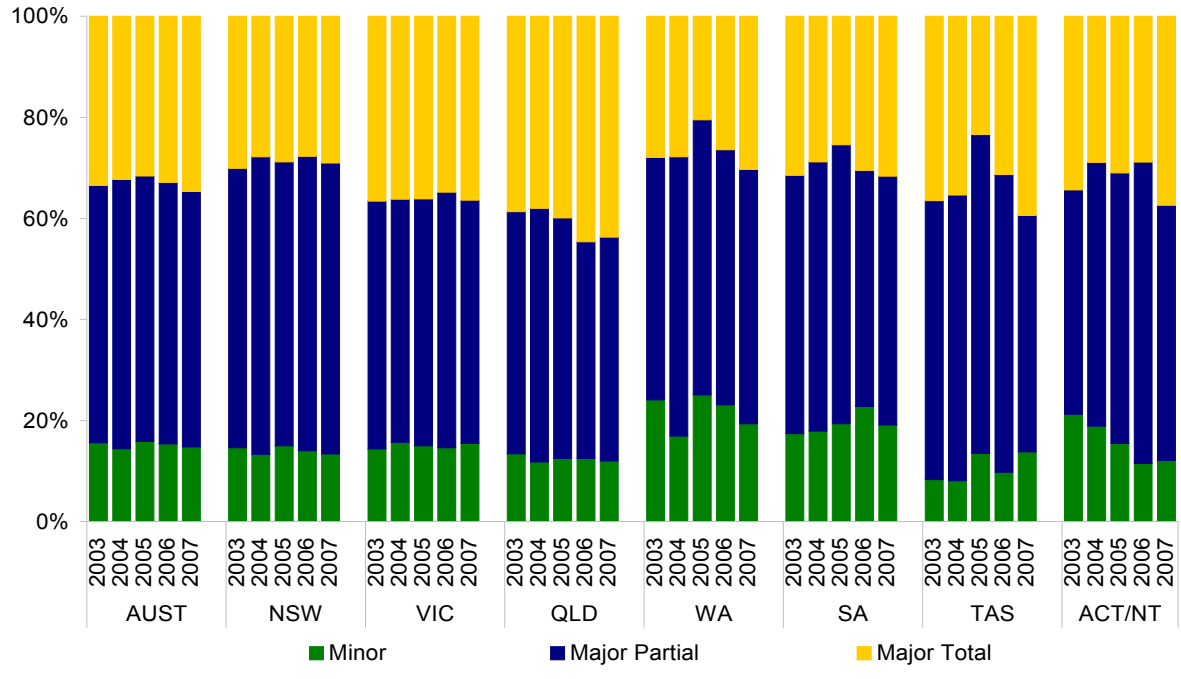


Table HR3: Revision Hip Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	1875	54.4	1569	45.6	3444	100.0
2004	1866	53.5	1623	46.5	3489	100.0
2005	1925	54.3	1619	45.7	3544	100.0
2006	1958	55.6	1566	44.4	3524	100.0
2007	1803	52.4	1640	47.6	3443	100.0

Table HR4: Revision Hip Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	334	9.7	585	17.0	1065	30.9	1141	33.1	319	9.3	3444	100.0
2004	353	10.1	570	16.3	1045	30.0	1191	34.1	330	9.5	3489	100.0
2005	332	9.4	575	16.2	1036	29.2	1229	34.7	372	10.5	3544	100.0
2006	363	10.3	613	17.4	1040	29.5	1162	33.0	346	9.8	3524	100.0
2007	330	9.6	578	16.8	1012	29.4	1124	32.6	399	11.6	3443	100.0

Table HR5: Revision Diagnosis of Revision Hip Replacement

Diagnosis	Revisions of Known Primary		All Revisions	
	N	%	N	%
Loosening	1367	28.4	12524	45.7
Dislocation of Prosthesis	1230	25.6	4046	14.8
Lysis	86	1.8	2764	10.1
Fracture	858	17.8	2515	9.2
Infection	653	13.6	2493	9.1
Wear Acetabulum	30	0.6	916	3.3
Pain	204	4.2	565	2.1
Implant Breakage Acetabular	47	1.0	545	2.0
Implant Breakage Stem	22	0.5	245	0.9
Implant Breakage Head	15	0.3	37	0.1
Other	297	6.2	740	2.7
Total	**4809**	**100.0**	**27390**	**100.0**

Note: Some patients have multiple diagnoses.

'Revision of Known Primary' Hip Replacement

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

Components Used	Cementless		Cemented		Hybrid		Removal		Total	
	N	%	N	%	N	%	N	%	N	%
Femoral Component Only	858	24.7	401	11.6	.	.	.	.	1259	36.3
Acetabular Component Only	776	22.4	186	5.4	.	.	.	.	962	27.7
Femoral and Acetabular (THR)	417	12.0	186	5.4	279	8.0	.	.	882	25.4
Removal Prosthesis	.	.	.	.	.	.	63	1.8	63	1.8
Cement Spacer	.	.	.	.	.	.	176	5.1	176	5.1
Bipolar Head and Femoral Component	59	1.7	.	.	56	1.6	.	.	115	3.3
Reinsertion of Components	6	0.2	4	0.1	.	.	.	.	10	0.3
Total	**2116**	**61.0**	**777**	**22.4**	**335**	**9.7**	**239**	**6.9**	**3467**	**100.0**

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

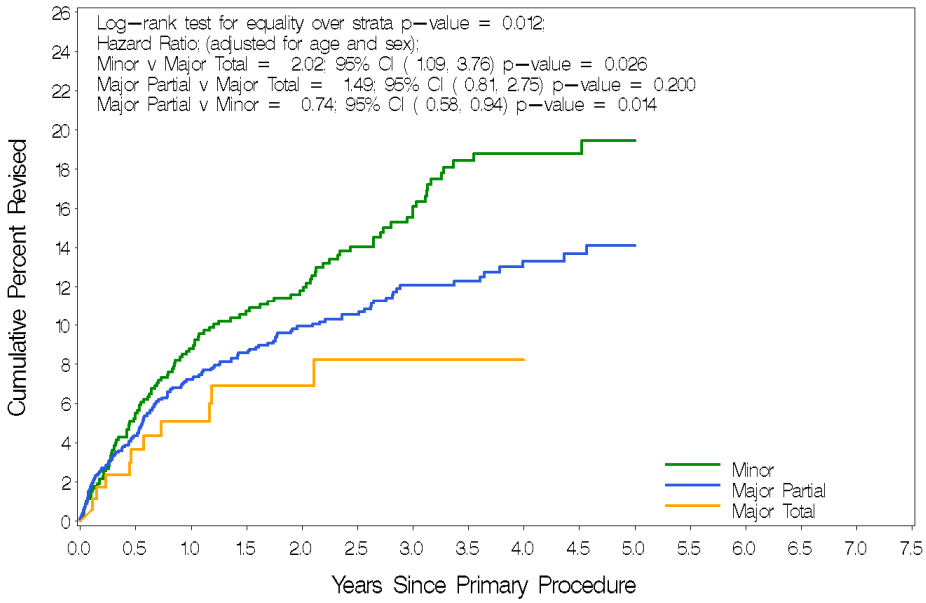
Components Used	N	%
Head/Insert	617	62.2
Insert Only	60	6.0
Head Only	211	21.3
Cable/Other Minor Components	104	10.5
Total	**992**	**100.0**

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

Primary Total Hip Revisions	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Minor	113	804	2039	5.5	(4.57, 6.66)
Major Partial	158	1628	3712	4.3	(3.62, 4.97)
Major Total	11	184	356	3.1	(1.54, 5.53)
Total	**282**	**2616**	**6107**	**4.6**	**(4.09, 5.19)**

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

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Minor	804	604	456	311	183	87	30	7
Major Partial	1628	1151	793	503	291	158	63	11
Major Total	184	116	72	45	25	12	5	2

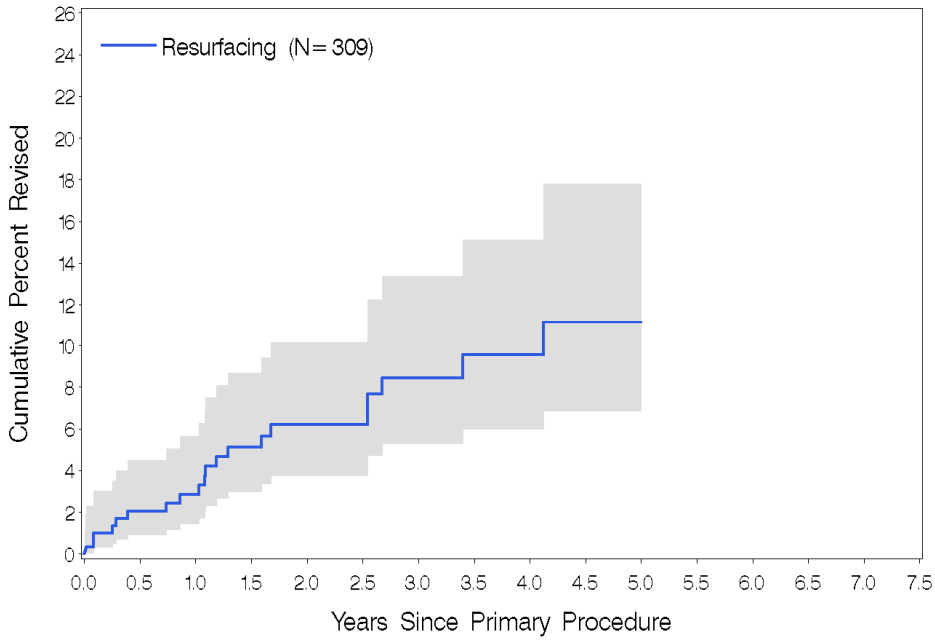
Table HR9: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Conventional Total Hip Replacement (excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Minor	8.8 (7.0, 11.1)	11.8 (9.6, 14.4)	16.1 (13.3, 19.3)	19.4 (16.1, 23.3)	
Major Partial	7.2 (6.0, 8.7)	9.9 (8.4, 11.7)	12.1 (10.3, 14.1)	14.1 (11.9, 16.7)	
Major Total	5.1 (2.6, 10.0)	6.9 (3.7, 12.5)	8.2 (4.5, 14.7)		

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

Primary Resurfacing Hip Revisions	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Resurfacing Revision	20	309	719	2.8	(1.70, 4.30)

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Resurfacing Revision	309	224	156	103	62	29	8	0

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Resurfacing Revision	2.9 (1.4, 5.6)	6.2 (3.7, 10.1)	8.4 (5.3, 13.4)	11.1(6.8, 17.8)	

KNEE REPLACEMENT

GENERAL INTRODUCTION

The analysis of knee replacements for this report is based on data received by the Registry with a procedure date prior to the end of 2007. There were 209,316 primary and revision knee procedures in this period. This is an additional 36,967 knee procedures compared to the 2007 Report.

Categories of Knee Replacement

There are a number of different ways knee replacement procedures can be categorised. 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 according to the class of prosthesis used. Prior to this year the Registry reported on three classes of partial knee replacement. They were unispacer (no longer used in Australia), patella/trochlear and unicompartmental knee prostheses. This year the Registry has included two further categories of partial knee replacement; partial resurfacing and bicompartmental knee replacement. Partial resurfacing replacements are prostheses that replace part of the articular surface on one side of the joint. The bicompartmental replacement is a knee replacement where a single femoral component replaces 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 component.

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 arthroplasty procedure. 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 available in a supplementary report on the Registry website www.aoa.org.au/jointregistry_pub.asp.

Gender

In general, knee replacement is more common in females (56.0%). There are however gender variations depending on the type of procedure. Primary patella/trochlear, bicompartmental and total knee replacements are more common in females (76.2%, 54.8% and 57.4% respectively). The percentage of males receiving unispacer is 51.3% and unicompartmental knee replacement is 51.1% Partial resurfacing procedures are performed equally in females and males (Table KG1).

Revision procedures are slightly more common in females (51.9%). During the last five years there has been almost no change in the proportion of males and females receiving primary unicompartmental and total knee replacements, which are by far the most common primary knee replacement (Figure KG1).

Age

The mean age for all knee replacement is 68.8 years (females 69.1 and males 68.4 years). Primary partial knee replacement is generally used in younger individuals compared to primary total knee replacement (partial resurfacing 48.3, unispacer 54.6, patella/trochlear 59.4, unicompartmental 65.6, bicompartmental 65.9 and total 69.3 years). The mean age for revision procedures is 69.5 years.

Although partial knee replacements are performed more commonly in younger individuals the percentage of individuals who are 65 years or older undergoing these procedures is not insignificant for partial resurfacing (11.1%), unispacer (10.3%) and patella/trochlear (33.4%) procedures. Over half of all unicompartmental (53.4%) and bicompartmental (52.4%) procedures are performed on individuals in this age group. The majority of primary total knee and revision procedures are undertaken on individuals that are 65 years and older (70.0% and 69.8% respectively).

For both primary unicompartmental and total knee replacement there has been almost no change in the proportion of primary knee replacements undertaken in individuals less than 65 years of age. Unicompartmental increased from 45.2% in 2003 to 48.5% in 2007 and total

knee increased from 29.4% in 2003 to 32.1% in 2007 (Figure KG2).

Diagnosis

The indication for almost all primary knee replacement procedures is osteoarthritis (partial resurfacing 90%, unispacer 100%, patella/trochlear 98.9%, uni-compartmental 98.8%, bicompartmental 100% and primary total 96.8%). The principal cause for revision knee replacement is loosening (36.5%).

Use of different Categories of Knee Replacement

The most common knee procedure is a primary total knee replacement (78.7% of all knee procedures recorded by the Registry). The proportion of other knee procedures is 12.2% for unicompartmental, 0.5% for patella/trochlear and 8.5% for revision procedures. There is a small number of procedures recorded for the other types of primary knee replacement, partial resurfacing (90), unispacer (39) and bicompartmental (42) (Table KG1).

The proportion of all knee replacements that are primary total knee replacements has increased each year from 77.2% in 2003 to 82.0% in 2007. The proportion of unicompartmental knees has decreased from a high of 14.6% in 2003 to 9.7% in 2007. The proportion of knee replacements that are revision procedures is the same in 2007 as it was in 2003 (8.2%) (Figure KG3).

State and Territory Variation in Use

There is some regional variation in the proportional use of the different knee procedures. All states however have shown a decrease in the use of unicompartmental knee procedures since 2003. Tasmania is the only state to show a small increase in the use of this type of prosthesis in 2007 compared to 2006 (Figure KG3).

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. Within five years 21.2% of patients have undergone bilateral knee replacement.

The Registry has recorded 32,695 individuals with bilateral knee procedures, 25.5% of these 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 77.8% of all same day bilateral procedures. Of the remaining same day bilateral procedures 18.5% are bilateral unicompartmental knee replacements (Table KG3).

General Comparison of Outcomes

The main outcome of 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 using the cumulative percent revision at specified time points (see Appendix 1 for the full definition).

Primary total knee replacement has the lowest rate of revisions per 100 observed component years when comparing all primary knee procedures (primary total 0.8, unicompartmental 1.9, patella/trochlear 3.1, and unispacer 36.0). The two new categories of primary knee replacement reported this year are partial resurfacing and bicompartmental primary knee replacement. Both have higher rates of revision per 100 observed component years compared to all other primary procedures other than the unispacer (partial resurfacing 7.5 and bicompartmental 21.7) (Table KG4).

Comparison of the cumulative percent revision further highlights the difference in the risk of revision for each of these procedures. At seven years the cumulative percent revision of primary total knee procedures is 4.3% and unicompartmental is 12.1%. The other procedures do not have seven year follow up, however the five year cumulative percent revision for patella/trochlear procedures is 13.8%, three year cumulative percent revision for unispacer procedures is 66.7% and for the two newly reported primary procedures, partial resurfacing is 16.5% at two years and bicompartmental is 10.2% at one year (Table KG5).

Outcome by Diagnosis

As with primary hip replacement, the Registry is presenting outcomes related to primary diagnosis for the first time. Only primary total knee replacement has been included in this analysis as primary partial knee replacement is almost entirely performed for osteoarthritis.

The outcomes of the four most common diagnoses for primary total knee replacement were compared using osteoarthritis as the comparator diagnosis. Rheumatoid arthritis had the lowest revision rate and the risk of revision is significantly less than for 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 KG4).

KNEE REPLACEMENT
1/9/1999 – 31/12/2007

Primary Partial Knee Replacement

Unispacer	▪ Medial or lateral compartment articular spacer
Partial Resurfacing	▪ Partial articular surface replacement
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	%
Unispacer	19	48.7	20	51.3	39	0.0
Partial Resurfacing	45	50.0	45	50.0	90	0.0
Patella/Trochlear	805	76.2	252	23.8	1057	0.5
Unicompartmental	12525	48.9	13082	51.1	25607	12.2
Bicompartmental	23	54.8	19	45.2	42	0.0
Total Knee	94557	57.4	70207	42.6	164764	78.7
Revision	9193	51.9	8524	48.1	17717	8.5
Total	**117167**	**56.0**	**92149**	**44.0**	**209316**	**100.0**

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

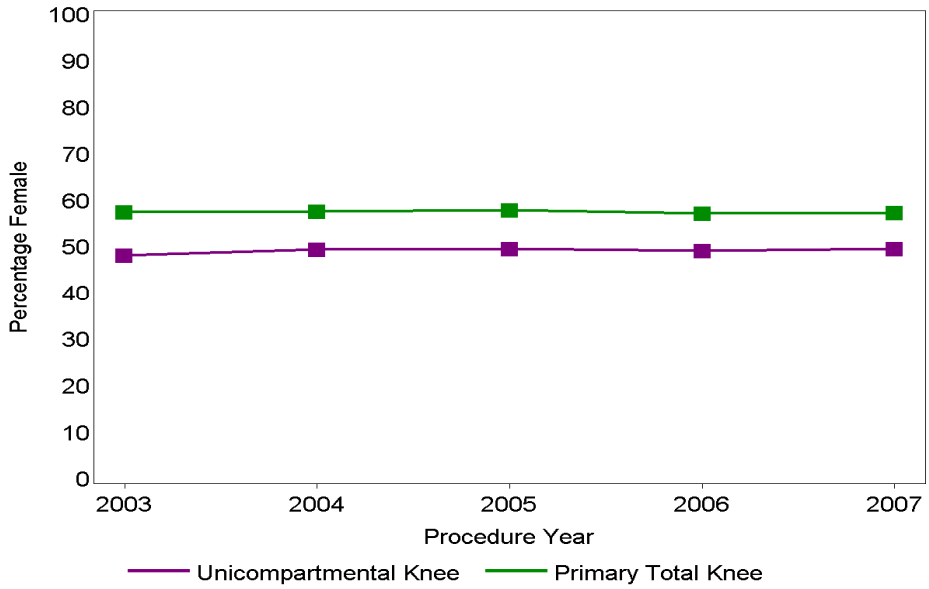


Table KG2: Number of Knee Replacements by Age

Type of Knee Replacement	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Unispacer	18	46.2	17	43.6	3	7.7	1	2.6	.	.	39	0.0
Partial Resurfacing	68	75.6	12	13.3	9	10.0	1	1.1	.	.	90	0.0
Patella/Trochlear	400	37.8	304	28.8	204	19.3	132	12.5	17	1.6	1057	0.5
Unicompartmental	3569	13.9	8367	32.7	8212	32.1	4976	19.4	483	1.9	25607	12.2
Bicompartmental	8	19.0	12	28.6	12	28.6	8	19.0	2	4.8	42	0.0
Total Knee	11072	6.7	38325	23.3	61967	37.6	48074	29.2	5326	3.2	164764	78.7
Revision	1554	8.8	3793	21.4	5868	33.1	5665	32.0	837	4.7	17717	8.5
Total	**16689**	**8.0**	**50830**	**24.3**	**76275**	**36.4**	**58857**	**28.1**	**6665**	**3.2**	**209316**	**100.0**

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

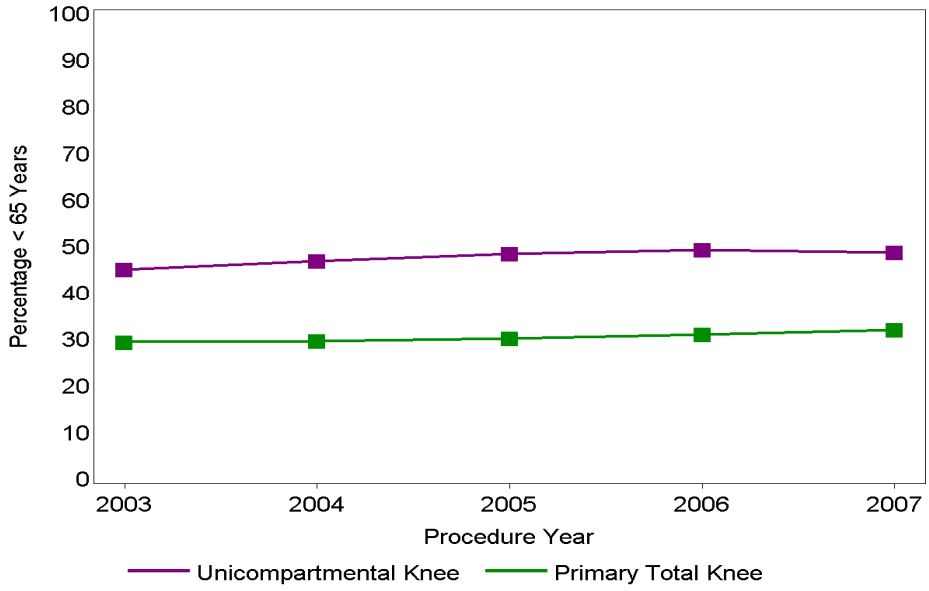


Figure KG3: Trends in Usage of Knee Replacement by State/Territory and Year

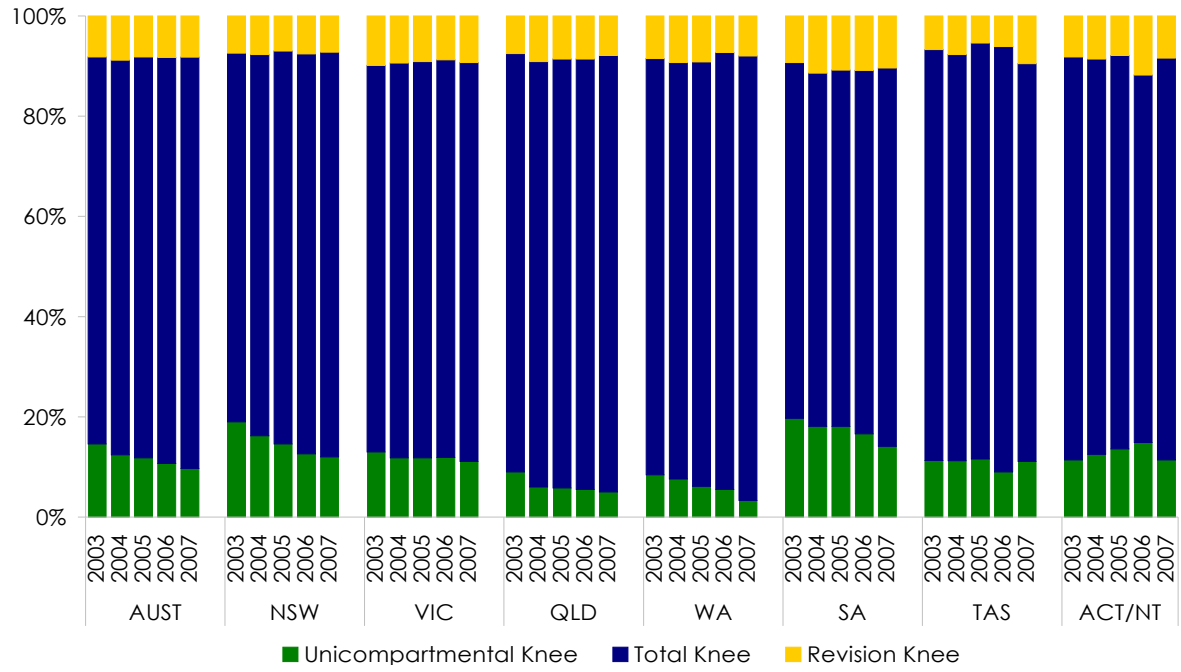


Table KG3: Time between Procedures for Bilateral Primary Knee Replacement

Bilateral Procedures	Same Day		1day-6months		≥6months		Total	
	N	%	N	%	N	%	N	%
Both Total	6482	19.8	4373	13.4	16389	50.1	27244	83.3
Both Unicompartmental	1540	4.7	563	1.7	1455	4.5	3558	10.9
Unicompartmental/Total	182	0.6	123	0.4	1331	4.1	1636	5.0
Both Other Partial	122	0.4	27	0.1	42	0.1	191	0.6
Total/Other Partial	5	0.0	4	0.0	41	0.1	50	0.2
Unicompartmental/Other Partial	0	0	1	0.0	15	0.0	16	0.0
Total	**8331**	**25.5**	**5091**	**15.6**	**19273**	**58.9**	**32695**	**100.0**

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

Table KG4: Primary Knee Replacement requiring Revision

Type of Knee Replacement	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Unispacer	26	39	72	36.0	(23.49, 52.69)
Partial Resurfacing	8	90	107	7.5	(3.23, 14.75)
Patella/Trochlear	93	1057	2955	3.1	(2.54, 3.86)
Unicompartmental	1613	25607	83298	1.9	(1.84, 2.03)
Bicompartmental	4	42	18	21.7	(5.90, 55.46)
Total Knee	4087	164764	495511	0.8	(0.80, 0.85)
Total	5831	191599	581961	1.0	(0.98, 1.03)

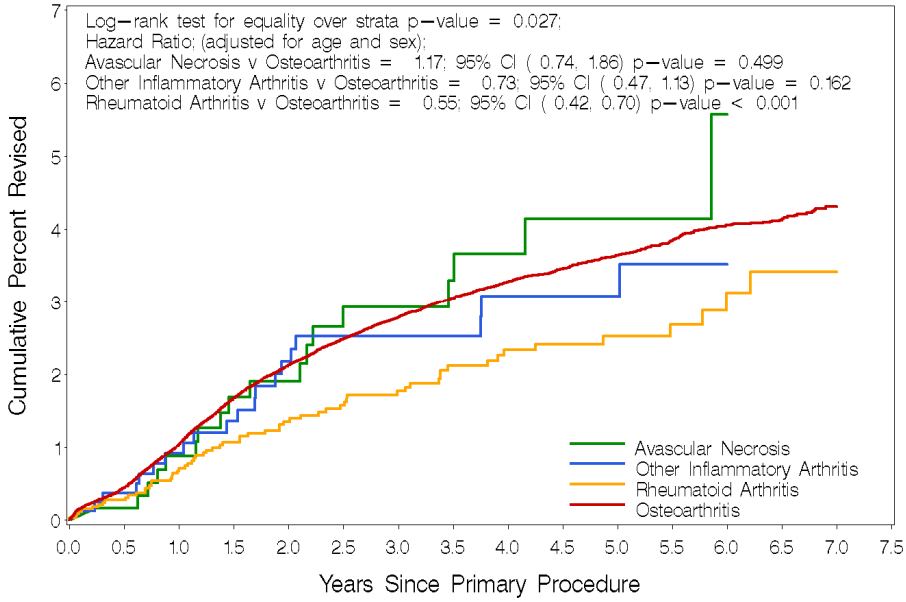
Table KG5: Yearly Cumulative Percent Revision of Primary Knee Replacement

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Unispacer	43.6 (29.8, 60.4)	64.1 (49.4, 78.6)	66.7 (52.0, 80.7)		
Partial Resurfacing	7.8 (3.3, 17.9)	16.5 (8.1, 31.7)			
Patella/Trochlear	2.9 (2.0, 4.2)	6.0 (4.6, 7.8)	9.5 (7.5, 11.9)	13.8 (11.2, 17.0)	
Unicompartmental	2.3 (2.1, 2.5)	4.5 (4.2, 4.8)	6.1 (5.8, 6.5)	8.8 (8.3, 9.2)	12.1 (11.1, 13.3)
Bicompartmental	10.2 (3.4, 28.7)				
Total Knee	1.0 (1.0, 1.1)	2.1 (2.0, 2.2)	2.8 (2.7, 2.9)	3.6 (3.5, 3.8)	4.3 (4.1, 4.5)

Table KG6: Primary Total Knee Replacement requiring Revision by Primary Diagnosis

Primary Diagnosis	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Avascular Necrosis	18	641	1963	0.9	(0.54, 1.45)
Osteoarthritis	3962	159529	478528	0.8	(0.80, 0.85)
Other Inflammatory Arthritis	20	852	2818	0.7	(0.43, 1.10)
Rheumatoid Arthritis	63	3385	11347	0.6	(0.43, 0.71)
Tumour	17	216	481	3.5	(2.06, 5.66)
Other (2)	7	141	373	1.9	(0.75, 3.87)
Total	**4087**	**164764**	**495511**	**0.8**	**(0.80, 0.85)**

Figure KG4: Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Avascular Necrosis	641	521	409	305	217	135	51	7
Other Inflammatory Arthritis	852	695	570	440	325	219	122	32
Rheumatoid Arthritis	3385	2857	2328	1821	1314	831	396	110
Osteoarthritis	159529	128472	99757	73451	50721	30799	13921	3560

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Avascular Necrosis	0.9 (0.4, 2.1)	1.9 (1.0, 3.5)	2.9 (1.7, 4.9)	4.1 (2.5, 6.8)	
Osteoarthritis	1.0 (1.0, 1.1)	2.1 (2.1, 2.2)	2.8 (2.7, 2.9)	3.6 (3.5, 3.8)	4.3 (4.1, 4.5)
Other Inflammatory Arthritis	0.9 (0.4, 1.9)	2.2 (1.3, 3.6)	2.5 (1.6, 4.0)	3.1 (1.9, 4.9)	
Rheumatoid Arthritis	0.7 (0.5, 1.1)	1.4 (1.0, 1.8)	1.8 (1.3, 2.3)	2.5 (1.9, 3.3)	3.4 (2.5, 4.7)
Tumour	3.5 (1.6, 7.7)	7.7 (4.3, 13.6)	9.8 (5.7, 16.7)	17.3 (10.2, 28.4)	
Other (2)	0.8 (0.1, 5.6)	6.3 (2.8, 13.6)	6.3 (2.8, 13.6)	6.3 (2.8, 13.6)	

PRIMARY PARTIAL KNEE REPLACEMENT

This section of the report details the outcomes of all primary partial knee replacement, including unispacer, partial resurfacing, patella/trochlear, unicompartmental and bicompartmental knee replacement. All of these procedures with the exception of the bicompartmental knee replacement involve surgery to a single compartment of the knee joint. The bicompartmental involves surgery to two compartments. The Registry distinguishes these partial procedures from total knee replacement which involves surgery to all three compartments of the knee.

A complete breakdown of age, gender, primary and revision diagnoses for each type of partial knee replacement is available in a supplementary report on the Registry website www.aoa.org.au/jointregistry_pub.asp.

Unispacer Knee Replacement

The Registry has information on 39 unispacer procedures and no new procedures have been reported to the Registry since April 2005. Only two types of unispacer have been used in Australia, the Zimmer UniSpacer (30) and the Advance Biosurfaces Inc. InterCushion (9) (Table KP1).

The Registry has reported the high early revision rate of this procedure for a number of years. There has been one further revision in the last 12 months. Of the nine InterCushion unispacer prostheses, all have been revised within two years. Just over half (56.7%) of the Zimmer UniSpacer prostheses have been revised within the first three years with 40% of these procedures being revised in the first 12 months (Table KP2 and Figure KP1). The major reasons for revision were pain (26.7%), synovitis (20.0%) and loosening (13.3%).

Partial Resurfacing Knee Replacement

As mentioned in the general chapter on knee replacement, partial resurfacing procedures are reported for the first time. The Registry regards a partial resurfacing procedure as a procedure that involves the partial replacement of the articular surface on one side of the joint in one or more compartments of the knee. Currently there is only a single prosthesis used for this procedure, the Hemicap. The Registry has not previously reported the outcome of partial resurfacing due to the small number of procedures undertaken. The Registry now has information on 90 of these knee procedures reported to the Registry over four years to 31st December 2007.

An equal number of males and females have undergone this procedure (Table KG1). The majority (75.6%) have been performed in patients under the age of 55 year and the remainder in patients between 55 and 82 years of age (Table KG2). The most common diagnosis for this procedure is osteoarthritis.

Partial resurfacing has a revision rate per 100 observed component years of 7.5 and a two year cumulative percent revision of 16.5% (Tables KP3 and KP4 and Figure KP2). The most common reasons for revision are progression of disease (50%) and pain (25%). Of the partial resurfacing procedures revised, 62.5% were revised to unicompartmental knee replacements and 37.5% to total knee replacements (data not shown).

Patella/Trochlear Knee Replacement

There have been 1,057 patellar/trochlear replacements reported to the Registry with a procedure date to the 31st December 2007, an additional 208 procedures compared to last year. Patella/trochlear replacements account for 0.5% of all knee procedures. They are undertaken more commonly in females (76.2%) and younger patients (66.7% of patients younger than 65 years) (Table KG1 and Table KG2).

Nine different trochlear prostheses have been used, one more than reported last year. These prostheses were combined with 16 different patellar prostheses some of which have been from different companies. On 15 occasions, six trochlear components have been used without a patellar prosthesis. The Registry is aware that some procedures where the patella was not used were undertaken post patellectomy (Table KP5). The Avon, LCS, Lubinus Patella Glide and RBK are the most common patella/trochlear replacement prostheses used accounting for 86% of all procedures (Table KP6).

Primary patella/trochlear replacements have a higher rate of revision compared to primary unicompartmental and total knee replacement (3.1 revisions per 100 observed component years and a five year cumulative percent revision of 13.8%) (Tables KG4 and KG5 and Figure KP3). The main reasons for revision of these procedures are progression of disease 24.2%, pain 22.2% and loosening 17.2%.

The outcome of patella/trochlear replacement varies depending on age with the five year cumulative percent revision declining with

increasing age. Those individuals aged less than 55 years at the time of surgery have a five year cumulative percent revision of 17.0%. The remaining three age groups, 55-64, 65-74 and 75 years and older have a five year cumulative percent revision of 13.0%, 12.3% and 7.0% respectively (Tables KP8 and KP9).

Males have over twice the risk of revision compared to females, revisions per 100 observed component years for males is 4.6 compared to 2.7 for females. The five year cumulative percent revision for males is 21.3% and for females is 11.7% (Tables KP10 and KP11).

There is considerable variation in outcome depending on the type of prosthesis used. The revisions per 100 observed component years for all nine trochlear prostheses are provided in Table KP6. Of the most commonly used prostheses the RBK and Avon have the lowest rate of revision (1.8 and 2.1 respectively) (Table KP6). The RBK however has fewer procedures and has not been followed up for as long as the Avon. The prosthesis with the lowest five year cumulative percent revision is the Avon (9.5%) (Table KP7).

Patella/Trochlear Knee Replacement with a higher than anticipated Revision Rate

The LCS has been identified by the Registry as having a higher than anticipated rate of revision compared to all other patella/trochlear procedures with 4.98 revisions per 100 observed component years (Hazard Ratio adjusted for age and sex (Adj HR)=2.05; 95% CI (1.26, 2.94) p=0.001) (Table KP24). The LCS patella/trochlear prosthesis has a five year cumulative percent revision of 23.0% (Table KP25 and Figure KP10).

Unicompartmental Knee Replacement

This year the Registry is reporting the analysis of 25,607 primary unicompartmental knee replacements to the 31st December 2007. Almost all unicompartmental procedures have been undertaken for osteoarthritis (98.8%).

Usage

Unicompartmental knee replacement continues to decrease as a proportion of all primary knee replacements. In 2007 unicompartmental procedures accounted for 9.7% of all knee procedures compared to 10.7% in 2006 and 14.6% in 2003 (Figure KG3). The total number of primary unicompartmental knee replacements performed in 2007 was 3,448, representing a continual decline from 4,102 procedures performed in 2003 (Table KP12).

Types of Prostheses Used

The Registry has recorded the use of 23 different types of unicompartmental knee replacement prostheses, 20 of which were used in 2007. This is an increase from 18 different prostheses used in 2006. The ten most commonly used prostheses accounted for 88.7% of all unicompartmental knee procedures in 2007. The Oxford 3 prosthesis continues to be the most frequently used, however as previously reported its use continues to decline reducing from 33.3% of all procedures in 2003 to 27.9% in 2007. The ZUK unicompartmental knee prosthesis was first used in 2005 and is now the second most used prosthesis (12.9% of all procedures in 2007). Apart from the Unix, which has increased slightly in numbers from 2006, most other unicompartmental prostheses have declined in use (Table KP12 and Figure KP4).

Changes in use with Gender and Age

The continued decline in use of this procedure is evident in both males and females and all age groups (Tables KP13 and KP14).

Unicompartmental knee replacement is most commonly undertaken in the 55-64 year age group (34.5% in 2007) followed by the 65-74 years (30.5% in 2007). Over 20% of individuals are 75 years and older and less than 15% are less than 55 years of age at the time of surgery (Table KP14).

Fixation

Most unicompartmental knee replacements recorded by the Registry have both cemented tibial and femoral components (89.7%). The proportion of uncemented unicompartmental knee replacements has slowly increased from 8.3% in 2003 to 13.4% in 2007. Hybrid fixation (either the tibial or femoral component cemented) has remained unchanged, accounting for 0.9% of all unicompartmental knee replacements (Table KP15 and Figure KP5).

Considerable state and territory variation continues with 40.3% cementless fixation in Victoria, an increase from 35.6% in 2006, and predominantly cement fixation in Western Australia (98.3%). South Australia continues to be the only state where hybrid fixation is used to any extent (5.2%) (Figure KP5).

Outcomes of Unicompartmental Knee Replacement

At one year, the cumulative percent revision for unicompartmental knee replacement is 2.3% and at seven years is 12.1%. This is almost three times the seven year cumulative percent revision of primary total knee replacement (4.3%) (Table KG5).

Effect of Age and Gender

The risk of revision following primary unicompartmental knee replacement differs significantly by age, however there is no significant difference with respect to gender.

The risk of revision significantly decreases with increasing age. The less than 55 year age group has the highest revision rate, 3.3 revisions per 100 component years, and a seven year cumulative percent revision of 20.0%. In the remaining age groups 55-64, 65-74 and 75 years and older there is a gradual decline in the rate of revision per 100 observed component years (2.2, 1.6 and 1.2 respectively) (Table KP16). The seven year cumulative percent revision also declines in a similar manner (14.5%, 9.5% and 6.1% respectively) (Table KP17 and Figure KP6).

Although not significant, females have a higher revision rate compared to males (2.1 and 1.8 revisions per 100 observed component years respectively), and a seven year cumulative percent revision of 12.9% and 11.0% respectively (Tables KP18 and KP19 and Figure KP7). The differences in risk of revision related to age previously mentioned are evident for both females and males (Tables KP20 and KP21 and Figures KP8 and KP9).

Prosthesis Specific Outcomes

The revision per 100 observed component years and the seven year cumulative percent revision where available is provided for all unicompartmental prostheses (Tables KP22 and KP23). There are 11 prostheses with over 1,000 observed component years recorded by the Registry and of these the least revised are the M/G, Repicci and Freedom PKR/Active with 1.4 revisions per 100 observed component years. The Freedom PKR/Active has a much shorter follow up period than the other two prostheses. The cumulative percent revision of these three prostheses is 8.1% at seven years for the M/G, 6.9% at five years for the Repicci and 3.0% at two years for the Freedom PKR/Active. The ZUK, a relatively recent prosthesis, is already the second most used prosthesis in 2007 and has 0.9 revisions per 100 observed component years and a two year cumulative percent revision of 1.4%.

Unicompartmental Knee Replacement with a higher than anticipated Revision Rate

This year the Registry is reporting on four unicompartmental prostheses that have been identified using the standard Registry algorithm to determine which prostheses have more than twice the rate of revision compared to all other prostheses in the same category. Three of these have been re-identified. They are the Advance (Adj HR=4.77; 95% CI (2.48, 9.18) p<0.0001), the AMC (Adj HR=1.88; 95% CI (1.37, 2.57) p<0.0001), and the Preservation Mobile (Adj HR=2.04; 95% CI (1.60, 2.61) p<0.0001). An additional unicompartmental prosthesis identified for the first time is the BalanSys (Adj HR=1.82; 95% CI (1.21, 2.76) p=0.0043) (Table KP27).

The three year cumulative percent revision for the Advance is 27.5%, AMC is 11.8% and BalanSys is 8.8% and the five year cumulative percent revision for Preservation Mobile is 19.5% (Table KP28 and Figures KP11 - KP14). All of these prostheses have been used during 2007, both the AMC and the BalanSys in considerable numbers (Table KP29).

Bicompartmental Knee Replacement

The Registry defines a bicompartmental knee replacement as a procedure that involves the use of single a 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 42 bicompartmental knee replacements reported to the Registry over two years to 31 December 2007. The prostheses have involved a single femoral prosthesis, the Journey Deuce, but two different tibial components, the Journey (8) and the Journey Deuce (34). The tibial components differ in that the Journey is a moulded medial tibial unicompartmental replacement and the Journey Deuce is a medial tibial tray with a separate insert. Just over 75 percent of these procedures have been undertaken in the 55-74 year age group, and approximately 55 percent are females (Tables KG1 and KG2).

The follow up for this small number of procedures is short with only 18 observed component years. However there have been four revisions all requiring the insertion of a patellar prosthesis. This small number of revisions equates to 21.7 revisions per 100 observed component years and a one year cumulative percent revision of 10.2% (Tables KG4 and KG5).

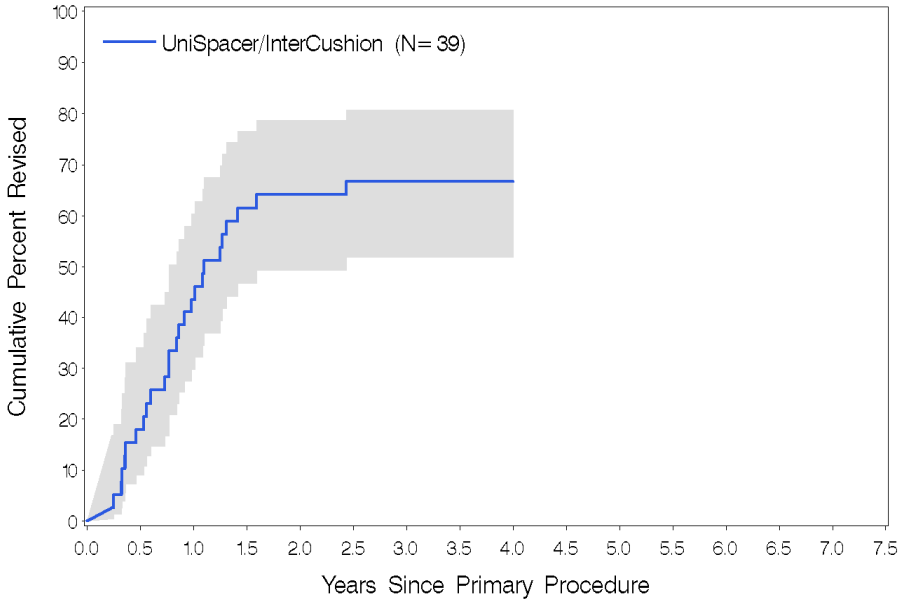
PRIMARY PARTIAL KNEE REPLACEMENT
1/9/1999 – 31/12/2007

Primary Unispacer Knee Replacement

Table KP1: Primary Unispacer Knee Replacement requiring Revision

Unispacer	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
InterCushion	9	9	8	110.8	(50.64, 210.3)
UniSpacer	17	30	64	26.5	(15.43, 42.41)
Total	**26**	**39**	**72**	**36.0**	**(23.49, 52.69)**

Figure KP1: Cumulative Percent Revision of Primary Unispacer Knee Replacement



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

Table KP2: Yearly Cumulative Percent Revision of Primary Unispacer Knee Replacement

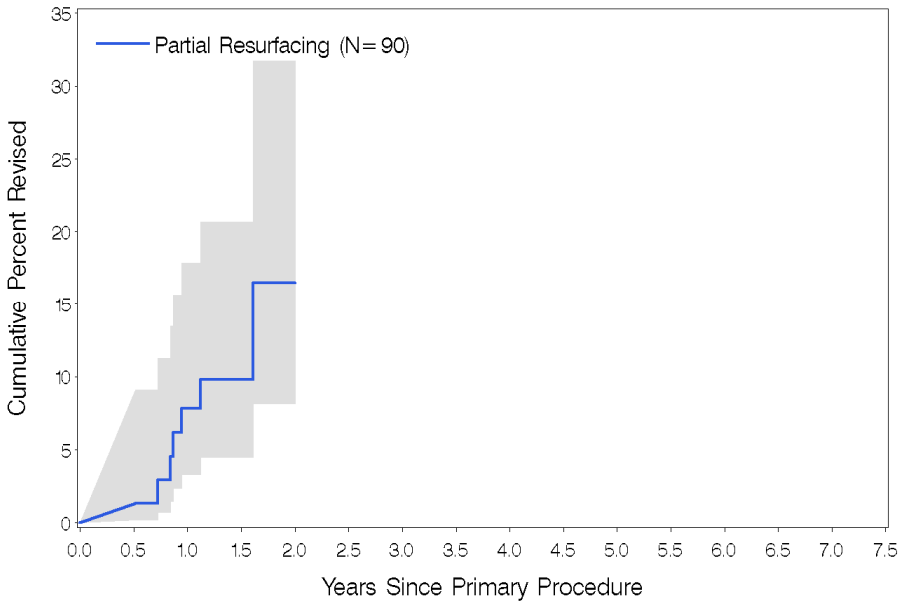
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
InterCushion	55.6 (28.1, 86.4)	100			
UniSpacer	40.0 (25.0, 59.5)	53.3 (37.0, 71.6)	56.7 (40.1, 74.4)		
Primary Unispacer	**43.6 (29.8, 60.4)**	**64.1 (49.4, 78.6)**	**66.7 (52.0, 80.7)**		

Primary Partial Resurfacing Knee Replacement

Table KP3: Primary Partial Resurfacing Knee Replacement requiring Revision

Partial Resurfacing	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Partial Resurfacing	8	90	107	7.5	(3.23, 14.75)
Total	**8**	**90**	**107**	**7.5**	**(3.23, 14.75)**

Figure KP2: Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Partial Resurfacing	90	53	13	1	0	0	0	0

Table KP4: Yearly Cumulative Percent Revision of Primary Partial Resurfacing Knee Replacement

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Partial Resurfacing	7.8 (3.3, 17.9)	16.5 (8.1, 31.7)			

Primary Patella/Trochlear Knee Replacement

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

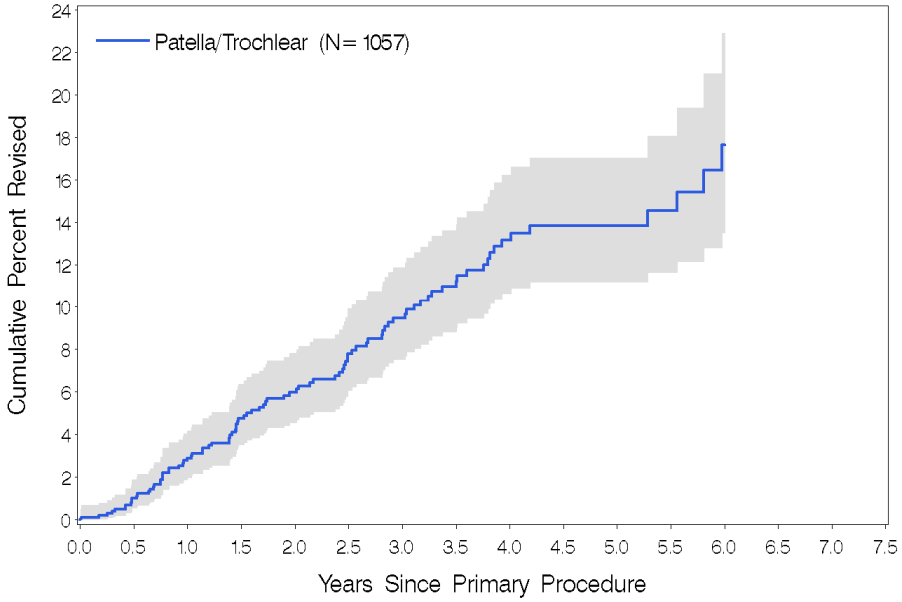
Resurfacing Trochlear	Patella	Number	Percent
Avon	Kinemax Plus	245	23.2
	Avon	101	9.6
	-	4	0.4
	Nexgen	2	0.2
	Duracon	1	0.1
LCS	LCS	312	29.5
	PFC Sigma	17	1.6
	-	6	0.6
	Nexgen	1	0.1
	Nexgen MBK	1	0.1
	Scorpio	1	0.1
Lubinus Patella Glide	Duracon	77	7.3
	Lubinus Patella Glide	37	3.5
	Genesis II	1	0.1
RBK	RBK	97	9.2
	Nexgen	4	0.4
	-	2	0.2
	Natural Knee II	1	0.1
MOD III	MOD III	64	6.1
	LCS	4	0.4
	-	1	0.1
	Genesis II	1	0.1
Themis	Themis	38	3.6
	-	1	0.1
	Nexgen	1	0.1
Competitor	Genesis II	32	3.0
Vanguard	Series A	3	0.3
	AGC	1	0.1
Global Custom Made	-	1	0.1
Total		**1057**	**100.0**

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

Table KP6: Primary Patella/Trochlear Knee Replacement requiring Revision

Resurfacing Trochlear	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Avon	23	353	1096	2.1	(1.33, 3.15)
Competitor	0	32	18	0.0	(0.00, 20.48)
Global Custom Made	0	1	5	0.0	(0.00, 73.27)
LCS	40	338	803	5.0	(3.56, 6.79)
Lubinus Patella Glide	14	115	416	3.4	(1.84, 5.64)
MOD III	10	70	323	3.1	(1.49, 5.70)
RBK	3	104	165	1.8	(0.38, 5.31)
Themis	3	40	128	2.3	(0.48, 6.83)
Vanguard	0	4	2	0.0	(0.00, 219.4)
Total	**93**	**1057**	**2955**	**3.1**	**(2.54, 3.86)**

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



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Patella/Trochlear	1057	841	639	455	281	150	68	22

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Avon	1.9 (0.9, 4.3)	3.9 (2.1, 6.9)	4.9 (2.9, 8.4)	9.5 (6.1, 14.6)	
LCS	3.3 (1.8, 6.1)	8.0 (5.2, 12.0)	14.7 (10.5, 20.5)	23.0 (16.8, 31.1)	
Lubinus Patella Glide	3.5 (1.3, 9.0)	7.9 (4.2, 14.7)	10.9 (6.3, 18.4)	12.1 (7.2, 20.0)	
RBK	2.4 (0.6, 9.4)	4.6 (1.4, 14.3)	4.6 (1.4, 14.3)		
Other (5)	4.0 (1.7, 9.4)	5.9 (2.9, 12.1)	10.1 (5.7, 17.6)	11.9 (6.8, 20.6)	16.8 (8.5, 31.9)

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

Table KP8: Primary Patella/Trochlear Knee Replacement requiring Revision by Age

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	43	400	1182	3.6	(2.63, 4.90)
55-64	27	304	834	3.2	(2.13, 4.71)
65-74	16	204	557	2.9	(1.64, 4.67)
≥75	7	149	382	1.8	(0.74, 3.78)
Total	**93**	**1057**	**2955**	**3.1**	**(2.54, 3.86)**

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	3.3 (1.9, 5.8)	6.3 (4.2, 9.6)	11.1 (7.9, 15.4)	17.0 (12.6, 22.7)	
55-64	2.7 (1.3, 5.5)	6.3 (3.8, 10.3)	9.4 (6.1, 14.3)	13.0 (8.7, 19.3)	
65-74	2.8 (1.2, 6.5)	5.4 (2.8, 10.1)	9.4 (5.4, 15.9)	12.3 (7.2, 20.5)	
≥75	2.3 (0.7, 6.9)	5.1 (2.3, 11.1)	5.1 (2.3, 11.1)	7.0 (3.2, 14.8)	

Table KP10: Primary Patella/Trochlear Knee Replacement requiring Revision by Gender

Gender	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	31	252	674	4.6	(3.13, 6.53)
Female	62	805	2281	2.7	(2.08, 3.48)
Total	**93**	**1057**	**2955**	**3.1**	**(2.54, 3.86)**

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Male	4.2 (2.2, 7.9)	9.3 (6.0, 14.5)	14.0 (9.5, 20.4)	21.3 (14.9, 30.0)	
Female	2.5 (1.6, 3.9)	5.0 (3.5, 6.9)	8.1 (6.1, 10.7)	11.7 (9.0, 15.1)	

Primary Unicompartmental Knee Replacement

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

Rank	2003	2004	2005	2006	2007
1	Oxford 3 (1366)	Oxford 3 (1149)	Oxford 3 (1112)	Oxford 3 (1064)	Oxford 3 (962)
2	Repicci (443)	Repicci (395)	Pres-Fixed (340)	Unix (350)	ZUK (445)
3	Pres-Fixed (373)	M/G (367)	Genesis (305)	Genesis (290)	Unix (360)
4	M/G (352)	Pres-Fixed (367)	M/G (301)	ZUK (287)	Freedom PKR/Active (259)
5	Allegretto Uni (337)	Genesis (300)	GRU (298)	Freedom PKR/Active (281)	Genesis (221)
6	GRU (318)	GRU (290)	Unix (270)	Pres-Fixed (256)	GRU (209)
7	Genesis (276)	Unix (238)	Repicci (259)	GRU (221)	Pres-Fixed (198)
8	Unix (260)	Allegretto Uni (191)	Freedom PKR/Active (223)	M/G (179)	Repicci (170)
9	Pres-Mobile (121)	Endo-Model Sled (178)	Endo-Model Sled (208)	Repicci (171)	Allegretto Uni (122)
10	Endo-Model Sled (101)	AMC (66)	Allegretto Uni (167)	Endo-Model Sled (144)	Endo-Model Sled (112)
Top 10 Usage	96.2%	95.1%	89.9%	89.5%	88.7%
Total Procedures	4102	3724	3875	3625	3448
Prosthesis Types	16	16	18	18	20

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

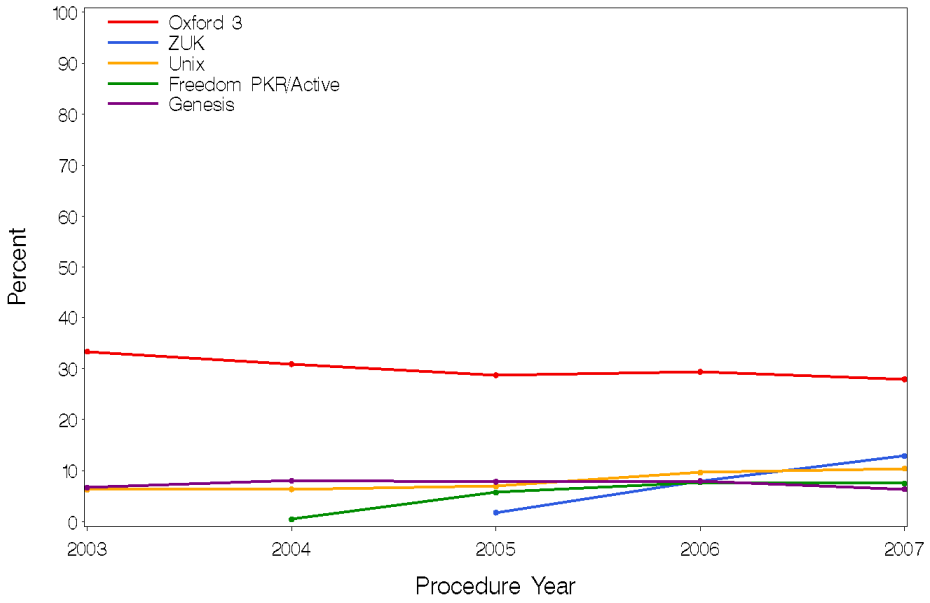


Table KP13: Primary Unicompartmental Knee Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	1984	48.4	2118	51.6	4102	100.0
2004	1848	49.6	1876	50.4	3724	100.0
2005	1927	49.7	1948	50.3	3875	100.0
2006	1786	49.3	1839	50.7	3625	100.0
2007	1716	49.8	1732	50.2	3448	100.0

Table KP14: Primary Unicompartmental Knee Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	524	12.8	1328	32.4	1359	33.1	815	19.9	76	1.9	4102	100.0
2004	513	13.8	1236	33.2	1137	30.5	768	20.6	70	1.9	3724	100.0
2005	555	14.3	1329	34.3	1196	30.9	720	18.6	75	1.9	3875	100.0
2006	549	15.1	1241	34.2	1133	31.3	622	17.2	80	2.2	3625	100.0
2007	495	14.4	1188	34.5	1051	30.5	639	18.5	75	2.2	3448	100.0

Table KP15: Prosthesis Fixation of Primary Unicompartmental Knee Replacement

Fixation	Number	Percent
Tibial and femoral cemented	22971	89.7
Tibial and femoral cementless	2440	9.5
Tibial only cemented	126	0.5
Femoral only cemented	70	0.3
Total	**25607**	**100.0**

Figure KP5: Trends in Prosthesis Fixation of Primary Unicompartmental Knee Replacement by State/Territory and Year

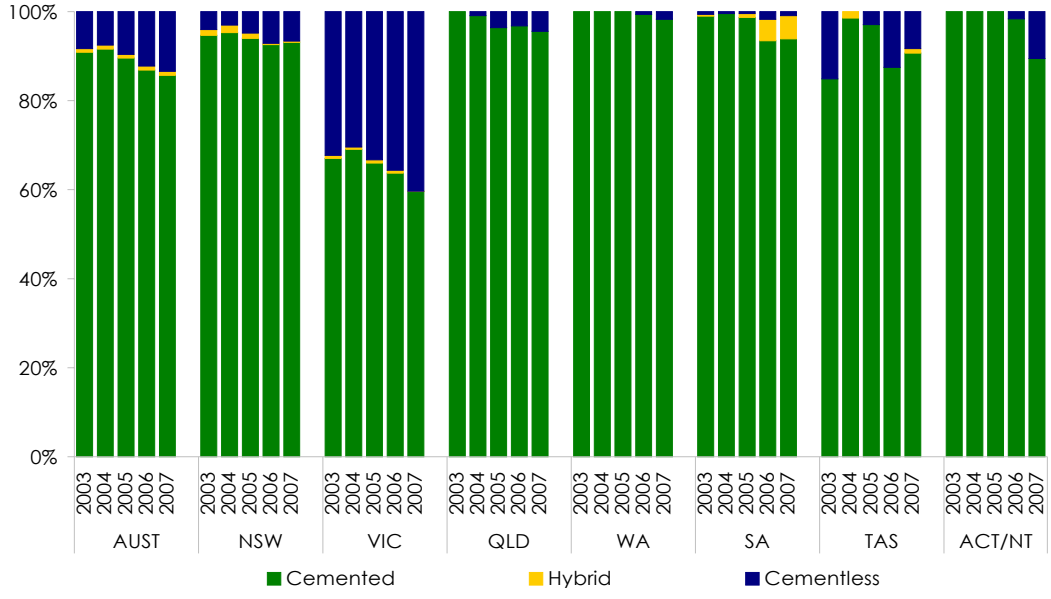
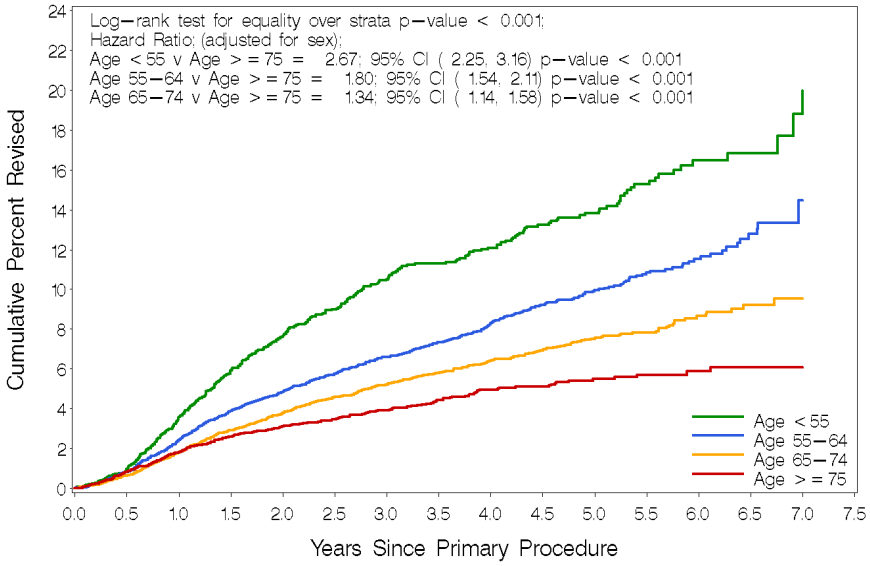


Table KP16: Primary Unicompartmental Knee Replacement requiring Revision by Age

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	360	3527	11027	3.3	(2.94, 3.62)
55-64	576	8296	26348	2.2	(2.01, 2.37)
65-74	441	8111	27309	1.6	(1.47, 1.77)
≥75	212	5372	17522	1.2	(1.05, 1.38)
Total	**1589**	**25306**	**82206**	**1.9**	**(1.84, 2.03)**

Figure KP6: Cumulative Percent Revision of Unicompartmental Knee Replacement by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
<55	3527	2922	2287	1723	1246	770	335	70
55-64	8296	6920	5563	4196	2989	1760	732	142
65-74	8111	6924	5654	4431	3289	2019	865	172
≥75	5372	4523	3721	2866	2006	1192	470	100

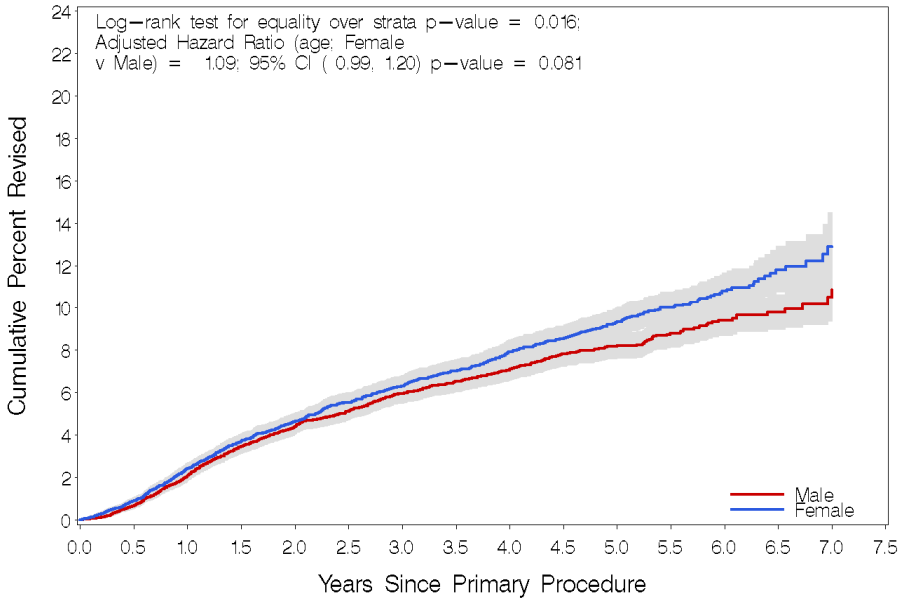
Table KP17: Yearly Cumulative Percent Revision of Unicompartmental Knee Replacement by Age

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	3.6 (3.0, 4.3)	7.6 (6.7, 8.6)	10.5 (9.4, 11.8)	13.8 (12.4, 15.4)	20.0 (16.3, 24.3)
55-64	2.4 (2.1, 2.8)	4.8 (4.4, 5.4)	6.6 (6.0, 7.2)	9.9 (9.1, 10.9)	14.5 (12.4, 16.9)
65-74	1.8 (1.5, 2.1)	3.8 (3.4, 4.3)	5.2 (4.7, 5.8)	7.6 (6.8, 8.3)	9.5 (8.4, 10.8)
≥75	1.8 (1.5, 2.2)	3.1 (2.6, 3.6)	3.9 (3.4, 4.5)	5.5 (4.8, 6.3)	6.1 (5.2, 7.2)

Table KP18: Primary Unicompartmental Knee Replacement requiring Revision by Gender

Gender	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	767	12964	42163	1.8	(1.69, 1.95)
Female	822	12342	40043	2.1	(1.91, 2.20)
Total	**1589**	**25306**	**82206**	**1.9**	**(1.84, 2.03)**

Figure KP7: Cumulative Percent Revision of Unicompartmental Knee Replacement by Gender



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Male	12964	10928	8816	6784	4919	2975	1243	250
Female	12342	10361	8409	6432	4611	2766	1159	234

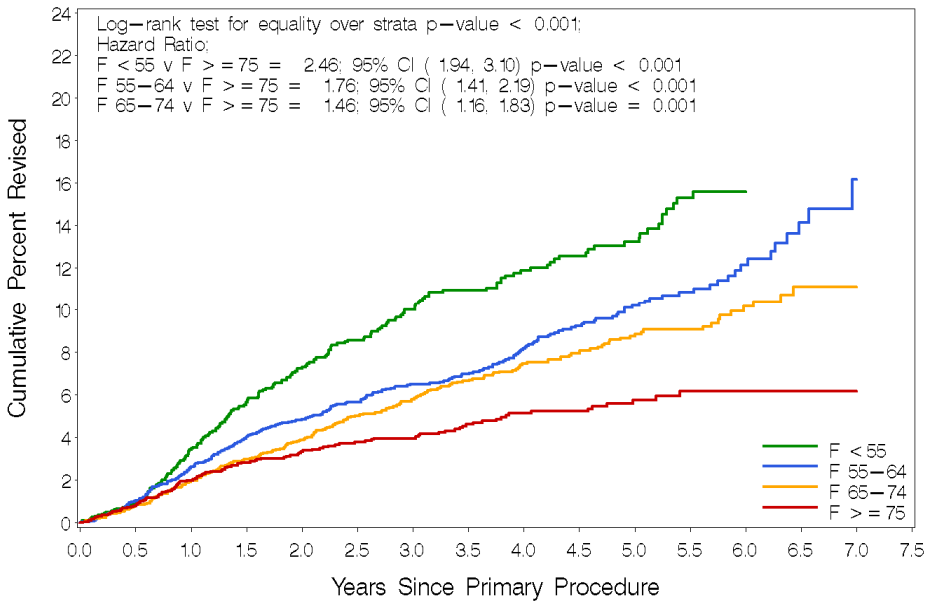
Table KP19: Yearly Cumulative Percent Revision of Unicompartmental Knee Replacement by Gender

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Male	2.1 (1.8, 2.4)	4.4 (4.0, 4.8)	5.9 (5.5, 6.4)	8.2 (7.6, 8.8)	10.9 (9.6, 12.3)
Female	2.4 (2.2, 2.7)	4.6 (4.2, 5.0)	6.3 (5.8, 6.8)	9.3 (8.7, 10.0)	12.9 (11.5, 14.5)

Table KP20: Primary Unicompartmental Knee Replacement requiring Revision by Gender and Age

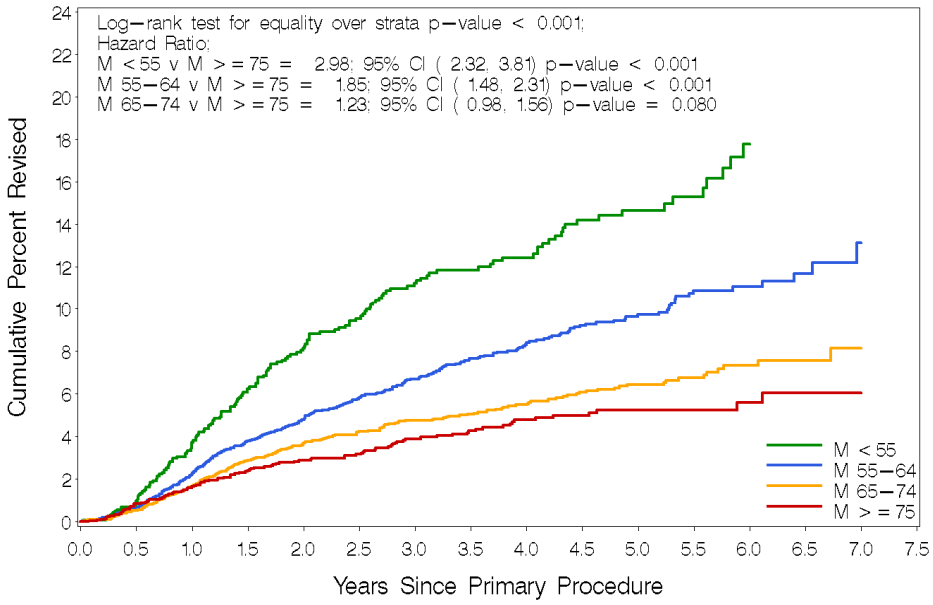
Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	<55	199	2023	6348	3.1	(2.71, 3.60)
	55-64	282	3998	12562	2.2	(1.99, 2.52)
	65-74	232	3718	12534	1.9	(1.62, 2.11)
	≥75	109	2603	8598	1.3	(1.04, 1.53)
Male	<55	161	1504	4678	3.4	(2.93, 4.02)
	55-64	294	4298	13786	2.1	(1.90, 2.39)
	65-74	209	4393	14775	1.4	(1.23, 1.62)
	≥75	103	2769	8924	1.2	(0.94, 1.40)
Total		**1589**	**25306**	**82206**	**1.9**	**(1.84, 2.03)**

Figure KP8: Cumulative Percent Revision of Unicompartmental Knee Replacement in Females by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
F < 55	2023	1671	1327	990	707	443	205	45
F 55-64	3998	3325	2672	1995	1397	804	315	54
F 65-74	3718	3170	2587	2024	1508	936	403	83
F ≥ 75	2603	2195	1823	1423	999	583	236	52

Figure KP9: Cumulative Percent Revision of Unicompartmental Knee Replacement in Males by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
M < 55	1504	1251	960	733	539	327	130	25
M 55-64	4298	3595	2891	2201	1592	956	417	88
M 65-74	4393	3754	3067	2407	1781	1083	462	89
M ≥ 75	2769	2328	1898	1443	1007	609	234	48

Table KP21: Yearly Cumulative Percent Revision of Unicompartmental Knee Replacement by Gender and Age

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	<55	3.4 (2.7, 4.4)	7.2 (6.1, 8.6)	10.0 (8.6, 11.6)	13.2 (11.5, 15.3)	
	55-64	2.6 (2.2, 3.2)	4.9 (4.2, 5.6)	6.5 (5.7, 7.4)	10.2 (9.0, 11.6)	16.2 (12.7, 20.4)
	65-74	2.0 (1.6, 2.5)	3.9 (3.3, 4.6)	5.8 (5.0, 6.7)	8.9 (7.7, 10.1)	11.1 (9.4, 13.1)
	≥75	2.0 (1.5, 2.6)	3.3 (2.7, 4.2)	4.0 (3.2, 4.9)	5.8 (4.7, 7.0)	6.2 (5.0, 7.6)
Male	<55	3.7 (2.8, 4.9)	8.1 (6.7, 9.8)	11.2 (9.5, 13.2)	14.7 (12.5, 17.1)	
	55-64	2.2 (1.8, 2.8)	4.8 (4.2, 5.6)	6.7 (5.9, 7.6)	9.7 (8.6, 11.0)	13.2 (10.7, 16.1)
	65-74	1.7 (1.3, 2.1)	3.7 (3.1, 4.4)	4.7 (4.1, 5.5)	6.4 (5.6, 7.4)	8.1 (6.6, 10.0)
	≥75	1.6 (1.2, 2.2)	2.9 (2.3, 3.6)	3.9 (3.2, 4.8)	5.2 (4.3, 6.4)	6.0 (4.7, 7.8)

Table KP22: Primary Unicompartmental Knee Replacement requiring Revision

Unicompartmental	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
AMC	40	458	990	4.0	(2.89, 5.50)
Advance	9	36	99	9.1	(4.14, 17.20)
Allegretto Uni	121	1677	6685	1.8	(1.50, 2.16)
BalanSys	23	343	590	3.9	(2.47, 5.85)
Eius	11	124	348	3.2	(1.58, 5.66)
Endo-Model Sled	36	780	1963	1.8	(1.28, 2.54)
Freedom PKR/Active	16	782	1118	1.4	(0.82, 2.32)
GCK	0	15	3	0.0	(0.00, 108.2)
GRU	62	1382	3688	1.7	(1.29, 2.16)
Genesis	119	1595	4490	2.7	(2.20, 3.17)
HLS Uni Evolution	2	82	100	2.0	(0.24, 7.22)
LCS	5	26	158	3.2	(1.03, 7.37)
M/G	100	1916	7214	1.4	(1.13, 1.69)
Natural Knee	18	143	658	2.7	(1.62, 4.33)
Optetrak	0	3	2	0.0	(0.00, 195.0)
Oxford 3	595	8644	30720	1.9	(1.78, 2.10)
PFC Sigma	15	137	841	1.8	(1.00, 2.94)
Preservation-Fixed	137	1907	5997	2.3	(1.92, 2.70)
Preservation-Mobile	68	401	1539	4.4	(3.43, 5.60)
Repicci	128	2369	9288	1.4	(1.15, 1.64)
UC-Plus	5	58	244	2.0	(0.67, 4.78)
Unix	96	1926	5772	1.7	(1.35, 2.03)
ZUK	7	803	791	0.9	(0.36, 1.82)
Total	**1613**	**25607**	**83298**	**1.9**	**(1.84, 2.03)**

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

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
AMC	4.7 (3.0, 7.3)	8.6 (6.1, 12.1)	11.8 (8.5, 16.2)		
Advance	11.8 (4.6, 28.4)	20.9 (10.5, 38.9)	27.5 (15.3, 46.3)		
Allegretto Uni	2.9 (2.2, 3.9)	4.8 (3.9, 6.0)	5.6 (4.5, 6.9)	8.3 (6.9, 10.0)	11.8 (9.0, 15.4)
BalanSys	5.4 (3.4, 8.7)	8.8 (5.8, 13.1)	8.8 (5.8, 13.1)		
Eius	4.2 (1.8, 9.7)	6.0 (2.9, 12.2)	8.5 (4.5, 15.9)	13.7 (7.1, 25.4)	
Endo-Model Sled	1.4 (0.8, 2.6)	3.3 (2.2, 5.0)	4.8 (3.3, 7.0)		
Freedom PKR/Active	1.3 (0.6, 2.6)	3.0 (1.7, 5.2)			
GRU	1.4 (0.9, 2.2)	3.6 (2.6, 4.8)	5.1 (3.9, 6.6)	7.5 (5.6, 10.1)	
Genesis	2.7 (2.0, 3.6)	5.6 (4.5, 7.0)	8.2 (6.8, 9.9)	11.0 (9.0, 13.3)	
HLS Uni Evolution	4.4 (1.0, 17.6)	4.4 (1.0, 17.6)	4.4 (1.0, 17.6)		
LCS	12.0 (4.0, 32.7)	12.0 (4.0, 32.7)	12.0 (4.0, 32.7)	16.0 (6.3, 37.2)	20.4 (9.0, 42.4)
M/G	1.5 (1.0, 2.2)	3.1 (2.4, 4.0)	4.2 (3.4, 5.3)	6.8 (5.5, 8.4)	8.1 (6.4, 10.3)
Natural Knee	5.6 (2.8, 10.9)	10.5 (6.5, 16.9)	12.0 (7.6, 18.5)	12.0 (7.6, 18.5)	14.0 (8.7, 22.0)
Oxford 3	2.3 (2.0, 2.7)	4.6 (4.2, 5.1)	6.3 (5.8, 6.9)	8.9 (8.2, 9.7)	11.5 (10.3, 12.9)
PFC Sigma	2.2 (0.7, 6.6)	5.8 (3.0, 11.3)	6.6 (3.5, 12.2)	8.1 (4.6, 14.1)	12.3 (7.0, 21.3)
Preservation-Fixed	2.6 (2.0, 3.5)	5.8 (4.7, 7.0)	7.3 (6.1, 8.7)	9.3 (7.8, 11.1)	
Preservation-Mobile	5.3 (3.5, 8.1)	9.8 (7.3, 13.3)	15.2 (11.9, 19.3)	19.4 (15.5, 24.1)	
Repicci	1.3 (0.9, 1.8)	2.5 (1.9, 3.3)	4.0 (3.2, 4.9)	6.9 (5.7, 8.2)	
UC-Plus	0	0	2.3 (0.3, 15.4)	7.2 (2.4, 20.8)	
Unix	1.9 (1.3, 2.6)	4.0 (3.1, 5.1)	5.5 (4.4, 6.8)	7.0 (5.6, 8.7)	
ZUK	1.4 (0.7, 3.0)	1.4 (0.7, 3.0)			

Note: Cumulative Percent Revision equal to zero indicates that the prosthesis has been followed up to this time with no revisions recorded.

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

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

Resurfacing Trochlear Component	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Newly Identified						
LCS	338	803	4.98	2.054	0.0008	(1.35, 3.13)

Note: LCS have been compared to all other Resurfacing Trochlear components.

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

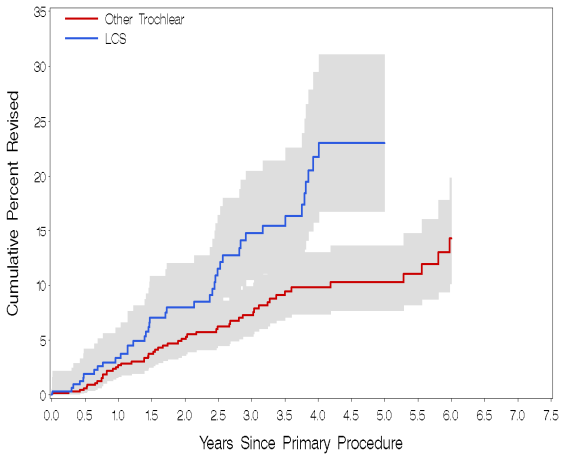
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Newly Identified					
LCS	3.3 (1.8, 6.1)	8.0 (5.2, 12.0)	14.7 (10.5, 20.5)	23.0 (16.8, 31.1)	

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
Newly Identified									
LCS	0	0	0	26	56	68	47	64	77

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

Newly Identified



Primary Unicompartmental Knee Replacement Prostheses with a higher than anticipated Revision Rate

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

Unicompartmental Component	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and still used						
Advance	36	99	9.06	4.769	<0.001	(2.48, 9.18)
AMC	458	990	4.04	1.877	<0.001	(1.37, 2.57)
Preservation-Mobile	400	1533	4.44	2.042	<0.001	(1.60, 2.61)
Newly Identified						
BalanSys	343	590	3.90	1.824	0.0043	(1.21, 2.76)

Note: All components have been compared to all other Unicompartmental components.

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

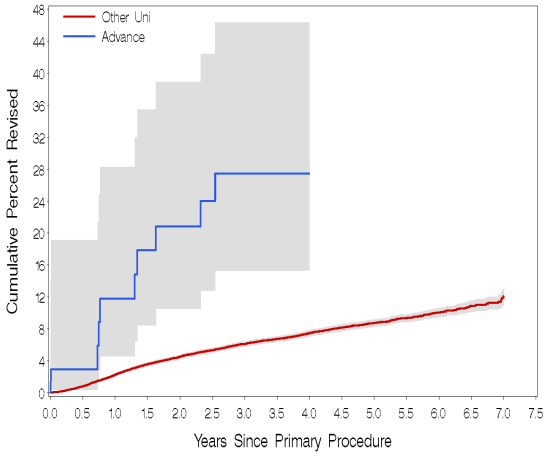
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and still used					
Advance	11.8 (4.6, 28.4)	20.9 (10.5, 38.9)	27.5 (15.3, 46.3)		
AMC	4.7 (3.0, 7.3)	8.6 (6.1, 12.1)	11.8 (8.5, 16.2)		
Preservation-Mobile	5.4 (3.5, 8.1)	9.9 (7.3, 13.3)	15.2 (12.0, 19.3)	19.5 (15.6, 24.2)	
Newly Identified					
BalanSys	5.4 (3.4, 8.7)	8.8 (5.8, 13.1)	8.8 (5.8, 13.1)		

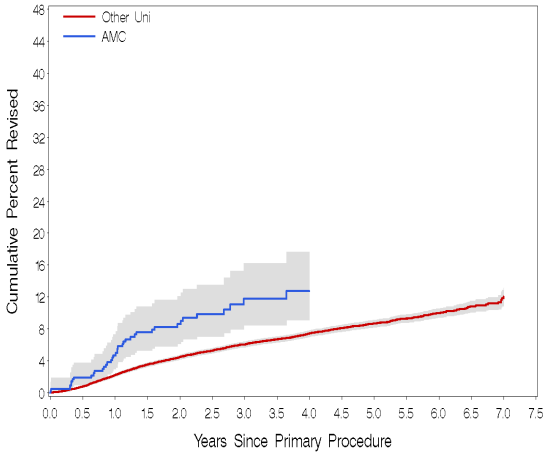
Table KP29: Yearly Usage of individual Primary Unicompartmental Knee Prostheses identified as having a higher than anticipated Revision Rate

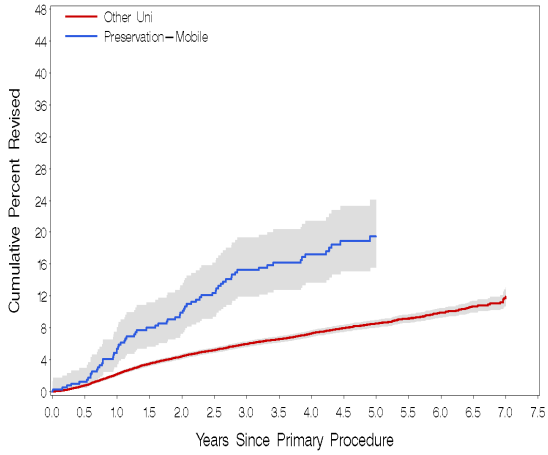
Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and still used									
Advance	0	0	0	0	13	11	7	2	3
AMC	0	0	0	0	80	66	123	84	105
Preservation-Mobile	0	0	15	149	121	59	26	17	13
Newly Identified									
BalanSys	0	0	0	0	0	51	106	102	84

Figure KP11-14: Cumulative Percent Revision of Individual Primary Unicompartmental Knee Prostheses identified as having a higher than anticipated Revision Rate

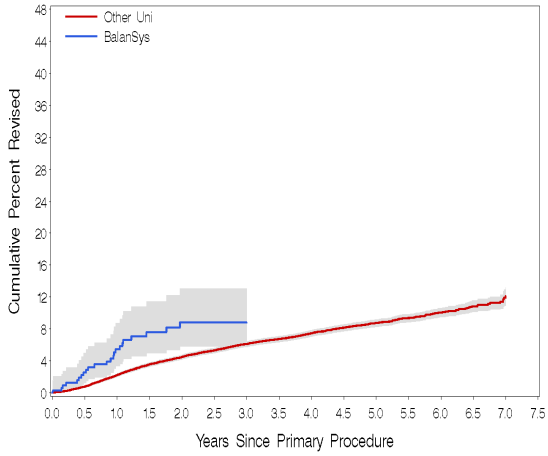
Re-identified and still used







Newly Identified



PRIMARY TOTAL KNEE REPLACEMENT

This report is based on the analysis of 164,764 primary total knee replacements recorded in the Registry up to and including 31st December 2007. This is an additional 29,965 primary total knee replacements compared to the 2007 Annual Report.

Analysis of Knee Replacement Systems versus Individual Prosthesis Design

As explained in last year's report the Registry is able to present data on the different types of knee prostheses. Different knee prostheses however are generally available as part of a knee system. The systems may contain many alternative prostheses which may vary in design depending on numerous features including the method of fixation, stability, mobility, flexion capacity and the materials used, amongst others.

Although possible, subdividing the prostheses based on each different design presents complexities and difficulties in providing a coherent presentation of the data. The Registry addresses this issue by providing information on all knee systems and then subdividing by fixation. Additionally, it provides analysis related to different design features which different individual knee systems have in common. Finally, analysis of the revision rates of individual prostheses looks at the catalogue ranges within a system in an attempt to highlight differences specific to a particular design within a system.

Usage

Primary total knee replacement is the most frequently used primary knee procedure. It has increased from 77.2% in 2003 to 82.0% of all knee procedures in 2007. There has been an increase in the proportion of total knee replacements in all states since 2003 except for Tasmania where there has been a decrease from 82.0% in 2003 to 79.4% in 2007 (Figure KG3).

This year there is a difference in the way prostheses have been categorised to determine the most frequently used prostheses. The major difference has been an increase in the division of systems into the different prosthesis types. The most apparent impact on this table relates to the reporting of the Genesis II. In previous years the Genesis II included both cobalt chrome and oxinium femoral components in the one group. As a consequence it was reported as the most frequently used prosthesis in last year's report. These two Genesis II prostheses are now considered separately which has resulted in an apparent difference in use compared to what was previously reported. This change has however been applied to the analysis of use across all years since the Registry commenced data collection and the use of both the cobalt chrome and oxinium femoral components can now be seen for each of the years reported.

In 2007 the Nexgen total knee was the most used prosthesis and accounts for 13.5% of all primary total knee procedures during that year. The LCS, previously the most used prosthesis since the Registry commenced data collection, is used in 12.8% of procedures. The top five prostheses account for 55.1% of all primary total knee procedures, and the top ten prostheses account for 82.7% of all procedures in 2007 (Table KT1 and Figure KT1).

There are 51 different knee systems recorded in the Registry for 2007, compared to 52 in 2006. Cemented systems have declined from 48 to 47 prostheses, hybrid systems have increased from 35 to 36 prostheses, and cementless systems have remained unaltered at 26 systems for 2007 (Tables KT1-KT4 and Figures KT1-KT4).

Changes in use with Gender and Age

Females continue to undergo primary total knee replacement more commonly (57.5% in 2007) than males. There has been little change in the proportion of males and females undergoing primary total knee replacement in the last five years (Table KT5).

Almost 90% of primary total knee replacements are performed on individuals aged between 55 and 84 years (Table KT6). There has been little change in the proportion of individuals in the different age groups during the last five years. In particular, there is no evidence to suggest that there has been increased use of primary total knee replacement in younger patients.

Fixation

Cementing of one or both the femoral and tibial components continues to be the most common method of fixation (76.3%). Hybrid fixation is almost always cement fixation of the tibial component (24.9%) and only occasionally the femoral component (1.2%) (Table KT7).

Nationally the use of cement fixation for both the tibial and femoral component has continued to increase. It now accounts for 54.2% of all primary total knee procedures. There has been no change in the use of cementless fixation during 2007 (23.3% of all primary total knee procedures). Hybrid fixation continues to

decrease in use and now accounts for 22.5% of all procedures.

There is some state and territory variation in the approach to fixation. Queensland has a higher rate of cement fixation compared to all other states (77.6%) while in Tasmania cementless fixation is the most common approach (82.4%) (Figure KT5).

Use of Patellar Resurfacing

Just over half of primary total knee procedures in 2007 did not have the patella resurfaced. There has however been a small increase in the use of patellar resurfacing over the last two years, increasing from 41.5% in 2005 to 45.4% in 2007.

There continues to be state and territory variation in the use of patellar resurfacing. In South Australia and Tasmania there was no patellar resurfacing in 83.3% of procedures. In NSW and Victoria patellar resurfacing is undertaken in the majority of procedures (53.5% and 53.0% respectively). When resurfacing the patella almost all patella prostheses are cemented (93.3%) (Table KT7 and Figure KT6).

Outcomes of Primary Total Knee Replacement

Effect of Age and Gender

The risk of revision in primary total knee replacement significantly decreases with increasing age. The Registry has compared four different age groups (<55, 55-64, 65-74 and ≥75). Revisions per 100 observed component years for these four age groups are 1.8, 1.1. 0.8 and 0.5 respectively. The cumulative percent revision at seven years is 9.2%, 6.3%, 4.0% and 2.3% for each of these age groups (Tables KT8 and KT9 and Figure KT7).

Men have a significantly higher revision rate compared to females (0.9 and 0.8 revisions per 100 observed component years respectively) with a seven year cumulative percent revision of 4.0% for females and 4.8% for males (hazard ratio (HR) (adjusted for age)=1.18; 95% CI (1.11,1.25) p<0.001) (Tables KT10 and KT11 and Figure KT8).

There is a significant age effect within males and females (Tables KT12 and KT13 and Figures KT9 and KT10). There is no significant difference in the risk of revision between males and females aged less than 55 years. In all other age groups, males have a significantly higher risk of revision compared to females; 55-64 (HR=1.18; 95% CI (1.06, 1.32) p=0.003), 65-74 (HR=1.20; 95% CI (1.08, 1.34) p = 0.001) and ≥75 (HR=1.16; 95% CI (1.01, 1.33) p=0.037) (data not shown).

Effect of Bearing Mobility

The Registry has recorded 117,540 fixed and 47,121 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. Revisions per 100 observed component years are higher for each of these groups with the exception of sliding (Table KT14). The number of sliding inserts is small compared to other mobile bearing inserts and so for subsequent analysis all mobile bearing inserts have been combined.

There is a significantly higher risk of revision in the mobile bearing insert group compared to fixed bearing inserts (Adj HR=1.27; 95% CI (1.19, 1.35) p<0.001). The cumulative percent revision at seven years for mobile bearing inserts is 5.1% and for fixed bearing inserts is 4.0% (Tables KT14 and KT15 and Figure KT11).

Effect of Stability

The Registry classifies stability for primary total knee replacements as minimally stabilised, posterior stabilised, fully stabilised (posterior and collateral stability) and hinged prostheses. The fully stabilised and hinged prostheses are used infrequently in the primary situation and usually for very complex primary procedures. Only the revision rates of these two types of procedures are presented, with the focus of this analysis being to compare the outcome of minimally and posterior stabilised primary total knee replacements.

The Registry has recorded 128,956 minimally stabilised, 34,666 posterior stabilised, 696 fully stabilised and 343 hinged primary procedures. The revision rate per 100 observed component years for minimally stabilised prostheses is 0.8, posterior stabilised is 1.0, fully stabilised is 1.3 and hinged is 2.4 (Table KT16).

The seven year cumulative percent revision for minimally stabilised is 4.1% and 5.2% for posterior stabilised. There is a significantly higher risk of revision for posterior stabilised compared to minimally stabilised prostheses (Adj HR=1.16; 95% CI (1.08, 1.25) p<0.001) (Table KT17 and Figure KT12).

Patellar Prosthesis v No Patellar Prosthesis

The Registry has recorded 93,796 primary total knee procedures where a patellar prosthesis was not used and 70,968 procedures where a patellar prosthesis was used. When a patellar prosthesis was not used, revisions per 100 observed component years are 0.9 compared to 0.7 when a patellar prosthesis was used (Table KT18). The seven year cumulative percent revision is 4.7%

and 3.8% respectively (Table KT19). When not using a patellar prosthesis the risk of revision is significantly higher than using a patellar prosthesis (Adj HR=1.32; 95% CI (1.24, 1.41) p<0.001) (Figure KT13).

Fixation

There is no significant difference in the revision rates at seven years of cemented, cementless, and hybrid fixation procedures (Tables KT20 and KT21 and Figure KT14). In determining these revision rates, as in previous years, the Registry has excluded the cementless oxinium prostheses from this analysis. These prostheses were withdrawn from the market some years ago because of their significantly higher early revision rate. Their inclusion falsely elevates the rate of revision of all other cementless procedures.

Prosthesis Types

The Registry has detailed the revision rates and cumulative percent revision for different prostheses in three different categories according to the method of fixation, cemented, cementless and hybrid in Tables KT22-KT27.

Only prostheses with more than 300 procedures recorded in the Registry have been individually listed. The remaining prostheses with less than 300 procedures are grouped together and reported as 'Other'. Prostheses in this 'Other' group are used infrequently or are new to the market and have insufficient numbers to be identified individually in the tables. As pointed out in previous reports, the combined revision rate of this group is generally higher than more frequently used prostheses. This is most evident with cementless and hybrid knee replacements.

The least revised prostheses in the cemented group are the Nexgen and Natural Knee both with 0.4 revisions per 100 component years. The cumulative percent revision of the Nexgen/Nexgen is slightly lower than the Natural Knee at five years, which is the maximum follow up for the Natural Knee. At seven years the cumulative revision for the cemented Nexgen is 2.1% (Tables KT22 and KT23).

As was the situation last year in the cementless group, the Advantim prosthesis has the lowest revision rate of 0.3 revisions per 100 observed component years and a cumulative percent revision of 1.6% at seven years (Tables KT24 and KT25). Only 583 Advantim prostheses have been reported to the Registry. The Nexgen cementless is the next least revised in this group with 0.5 revisions per 100 observed component years and a seven year cumulative percent revision of 2.5%. This prosthesis has been used more frequently with almost 6,000 procedures reported to the Registry (Tables KT24 and KT25).

In the hybrid group the AGC has a revision rate of 0.4 revisions per 100 observed component years and a cumulative percent revision of 2.4% at seven years. The next least revised prostheses are the Nexgen and the Natural Knee both with 0.5 revisions per 100 observed component years. The cumulative percent revision for Nexgen at seven years is 2.4% and both Nexgen and the Natural Knee have a cumulative percent revision of 2.3% at five years (Tables KT26 and KT27).

The 'Other' category in the cementless group has a cumulative percent revision of 13.3%. The seven year cumulative percent revision for the cemented 'Other' group is 7.0% and the hybrid 'Other' is 7.7% (Tables KT23, KT25 and KT27).

Comparison of Unicompartmental to Total Primary Knee Replacement

Primary unicompartmental knee replacement has twice the rate of revision when compared to primary total knee replacement (Adj HR= 2.02; 95% CI (1.90, 2.14) p<0.001) (Figure KT15). The rate of revision per 100 observed component years for primary unicompartmental knee procedures is 1.9 and for primary total knee procedures is 0.8 (Table KT28). At seven years the cumulative percent revision for unicompartmental knees is 11.9%, almost three times that for total knees 4.3% (Table KT29). The difference between primary unicompartmental and total knee replacement is evident for both genders in all age groups (Tables KT30 and KT31 and Figures KT16-23).

Prostheses with 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 those prostheses with sufficient numbers that have undergone further extensive analysis and subsequent review by a panel of orthopaedic surgeons to determine if the identified higher than anticipated rate of revision is likely to be due to factors specific to the prosthesis. In the 2007 Report, the Registry identified nine prostheses. This year a further eight primary total knee prostheses have been identified. They have been divided into three groups. The first group include prostheses that the Registry does not have any record of use in 2007. The second group includes prostheses with reported use in 2007 and have been identified in previous reports

as having a higher than anticipated rate of revision. The third group is those prostheses that are being identified for the first time.

The first group includes seven prostheses with virtually no use since 2003. They are the four different cementless macrotextured oxinium knee systems (Genesis and Profix femoral components with either fixed insert Genesis or Profix tibial components or Smith and Nephew MBK tibial component), Gemini MK II, Interax and Trac knee prostheses (Tables KT32-34).

The second group includes two prostheses that were identified last year and were still used in 2007, the Optetrak-PS/Optetrak and the Profix/MBK knee. The revisions per 100 observed component years for these two prostheses are 1.79 and 2.13 respectively. The cumulative percent revision at five years for the Optetrak-PS/Optetrak is 6.7% and for the Profix/MBK is 9.4% (Tables KT32-KT34 and Figures KT24 and KT25).

There are eight prostheses in the third group. Within this group the AMK and the IBII have not been used for a number of years. The AMK has 1.38 revisions per 100 observed component years and a seven year cumulative percent revision of 8.9% (Adj HR=2.17; 95% CI (1.36, 3.45) p=0.0011). The IBII has 1.76 revisions per 100 observed component years and a seven year cumulative percent revision of 11.6% (Adj HR=2.85; 95% CI (1.85, 4.38) p<0.0001).

The remaining six prostheses that are being identified for the first time are currently in use. Details of these are shown in Tables KT32-KT34 and Figures KT26-KT33.

The cemented Genesis II Oxinium (PS) femoral component combined with the Genesis II tibial component is identified as having a higher than anticipated rate of revision for the first time. The Registry has recorded 3,323 procedures using this combination of prostheses. There have been 1.63 revisions per 100 observed component years and a cumulative percent revision of 4.5% at three years (Adj HR=1.40; 95% CI (1.14, 1.73) p=0.002).

The Rotaglide Plus Knee replacement has been used in 616 procedures, 33 of which have been revised. There have been 1.45 revisions per 100 observed component years and a cumulative percent revision of 6.3% at five years (Adj HR=1.75; 95% CI (1.24, 2.46) p=0.0014). It is those procedures that have been used with hybrid fixation that are largely contributing to the higher revision rate (16 revisions in 172 procedures), 2.7 revisions per 100 observed component years, five year cumulative percent revision of 11.3%. (data not shown).

The Registry has recorded a relatively small number of TC-Plus primary total knee replacements (67) with only 12 of these being implanted in the last two years. There have been five revisions of this prosthesis (2.94 revisions per 100 observed component years) and a cumulative percent revision of 10.2% at three years (Adj HR=3.34; 95% CI (1.39, 8.03) p=0.0069).

This year one further Optetrak knee combination has been identified as having a higher than anticipated rate of revision, Optetrak-PS/Optetrak-RBK. In last year's report the Registry detailed the various possible combinations of femoral and tibial components. There have been nine different Optetrak femoral components reported to the Registry. They are the Optetrak-CR Exactech (Cemented and Cementless) and Asymmetric (Cemented and Cementless) and the Optetrak-PS Exactech (Cemented and Cementless) and Asymmetric (Cemented) and the Hi-Flex (Cemented and Cementless). There have been five cemented tibial components reported, the Optetrak-RBK, Exactech, All poly, Trapezoidal and Offset Revision.

The Optetrak-RBK tibial component has been combined with two femoral components, Optetrak-PS Hi-Flex (cemented and cementless). Both have a higher than anticipated rate of revision but the Registry is reporting them as a single combination (Optetrak PS/Optetrak-RBK). There have been 256 procedures reported using this combination, 174 in 2007 and consequently follow up is short. There have been 3.48 revisions per 100 observed component years and a cumulative percent revision of 3.6% at one year (Adj HR=3.33; 95% CI (1.59, 6.98) p=0.0015).

The Optetrak-CR/Optetrak was also identified by the algorithm as having a higher than anticipated rate of revision when compared to all other cemented total knees (six revisions in 85 procedures). The Exactech tibial component was used in all procedures and the femoral component consisted of Optetrak-CR Exactech and Asymmetric cemented (38) but also 47 cementless femoral components that were used with cement. When considering these different combinations individually five of the revisions were in the group where the cementless femoral components were cemented. Although identified by the algorithm it is being mentioned rather than identified as the Registry is uncertain as to why a high number of cementless prostheses were cemented.

PRIMARY TOTAL KNEE REPLACEMENT
1/9/1999 to 31/12/2007

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

Rank	2003	2004	2005	2006	2007
1	LCS (3184)	LCS (3557)	LCS (3704)	LCS (3607)	Nexgen (3921)
2	Duracon (2847)	Duracon (2665)	Nexgen (3082)	PFC Sigma (3412)	LCS (3731)
3	Nexgen (2159)	Nexgen (2520)	PFC Sigma (2939)	Nexgen (3116)	PFC Sigma (3558)
4	Scorpio (2115)	PFC Sigma (2514)	Duracon (2674)	Scorpio (2568)	Scorpio (2491)
5	PFC Sigma (1944)	Scorpio (2146)	Scorpio (2478)	Genesis II (2448)	Triathlon (2316)
6	Genesis II (1521)	Genesis II (2017)	Genesis II (2341)	Duracon (2313)	Genesis II (2260)
7	Profix (1033)	Nexgen LPS Flex (1274)	Nexgen LPS Flex (1697)	Nexgen LPS Flex (1760)	Duracon (1968)
8	Natural Knee (1002)	Profix (1198)	Genesis II Oxinium (1311)	Genesis II Oxinium (1557)	Genesis II Oxinium (1775)
9	Nexgen LPS (903)	Genesis II (1003)	Profix (1252)	Triathlon (1009)	Nexgen LPS Flex (1250)
10	Genesis II (725)	Active Knee (837)	Active Knee (768)	Profix (873)	Vanguard (754)
Top 10 Usage	80.2%	83.7%	84.6%	82.9%	82.7%
Total Procedures	21733	23585	26287	27326	29051
Prosthesis Types	48	51	50	52	51

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

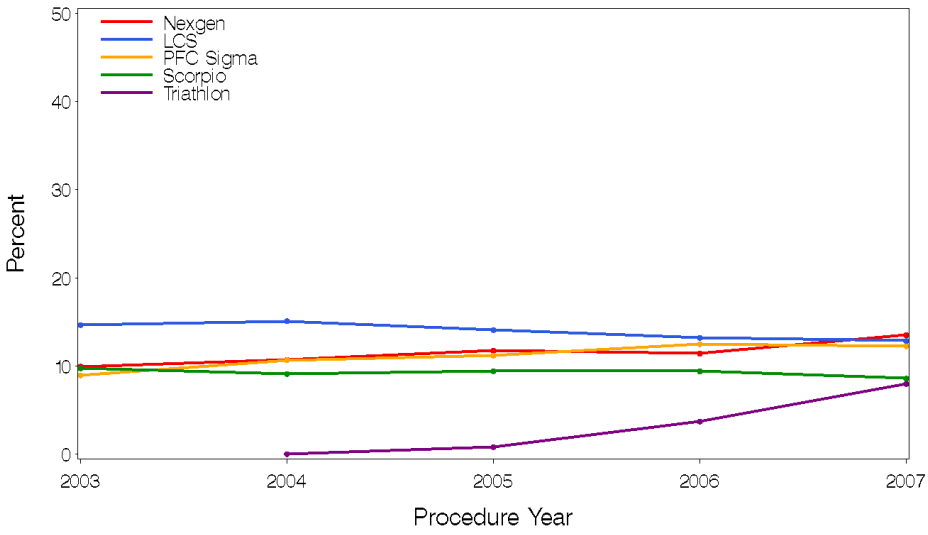


Table KT2: 10 Most Common Femoral Components used in Primary Total Knee Replacement with Cement Fixation

Rank	2003	2004	2005	2006	2007
1	Duracon (1246)	Genesis II (1434)	Genesis II (1739)	PFC Sigma (2055)	PFC Sigma (2108)
2	Genesis II (1089)	PFC Sigma (1427)	Nexgen LPS Flex (1668)	Genesis II (1807)	Nexgen (1998)
3	LCS (985)	Nexgen LPS Flex (1266)	PFC Sigma (1590)	Nexgen LPS Flex (1677)	Genesis II Oxinium (1763)
4	PFC Sigma (843)	Duracon (1217)	Genesis II Oxinium (1290)	Genesis II Oxinium (1539)	Genesis II (1751)
5	Nexgen LPS (830)	LCS (1021)	Duracon (1197)	Duracon (1177)	Triathlon (1337)
6	Nexgen (802)	Genesis II Oxinium (992)	Nexgen (960)	Nexgen (1086)	Nexgen LPS Flex (1182)
7	Scorpio (713)	Nexgen (947)	LCS (937)	Scorpio (853)	Duracon (1085)
8	Nexgen LPS Flex (690)	Scorpio (713)	Scorpio (795)	LCS (802)	Scorpio (994)
9	Profix (636)	Profix (707)	Profix (764)	Triathlon (715)	LCS (795)
10	Genesis II (548)	Nexgen LPS (670)	Nexgen LPS (429)	Profix (562)	Profix (397)
Top 10 Usage	83.7%	88.8%	86.8%	85.7%	85.2%
Total Procedures	10015	11709	13095	14326	15736
Prosthesis Types	42	42	45	48	47

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

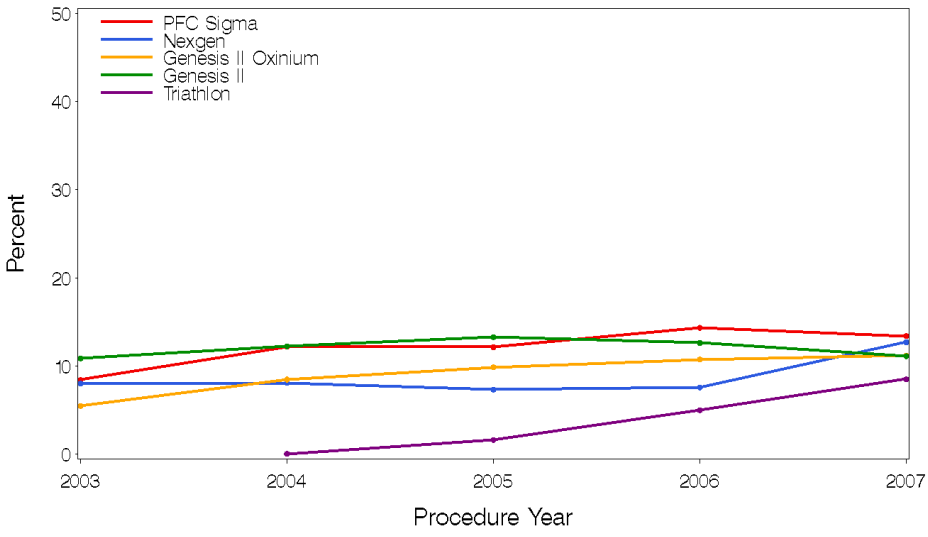


Table KT3: 10 Most Common Femoral Components used in Primary Total Knee Replacement with Cementless Fixation

Rank	2003	2004	2005	2006	2007
1	LCS (1470)	LCS (1762)	LCS (1951)	LCS (2080)	LCS (2232)
2	Nexgen (784)	Nexgen (798)	Nexgen (1116)	Nexgen (954)	Nexgen (938)
3	Scorpio (500)	Active Knee (696)	Scorpio (604)	Scorpio (602)	Triathlon (566)
4	Natural Knee (492)	Scorpio (547)	Active Knee (477)	PFC Sigma (446)	Scorpio (522)
5	Active Knee (481)	Duracon (376)	Duracon (443)	Duracon (414)	PFC Sigma (440)
6	Duracon (477)	Natural Knee (374)	PFC Sigma (392)	RBK (365)	RBK (376)
7	PFC Sigma (313)	PFC Sigma (323)	RBK (385)	Active Knee (266)	Active Knee (371)
8	RBK (301)	RBK (280)	Natural Knee (255)	Natural Knee II (225)	Duracon (357)
9	Profix (187)	Profix (202)	Profix (215)	Triathlon (186)	Natural Knee II (212)
10	Maxim (139)	Maxim (87)	Advantim (79)	Profix (162)	Profix (168)
Top 10 Usage	90.5%	95.7%	94.6%	90.3%	91.3%
Total Procedures	5686	5692	6255	6310	6770
Prosthesis Types	23	20	26	26	26

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

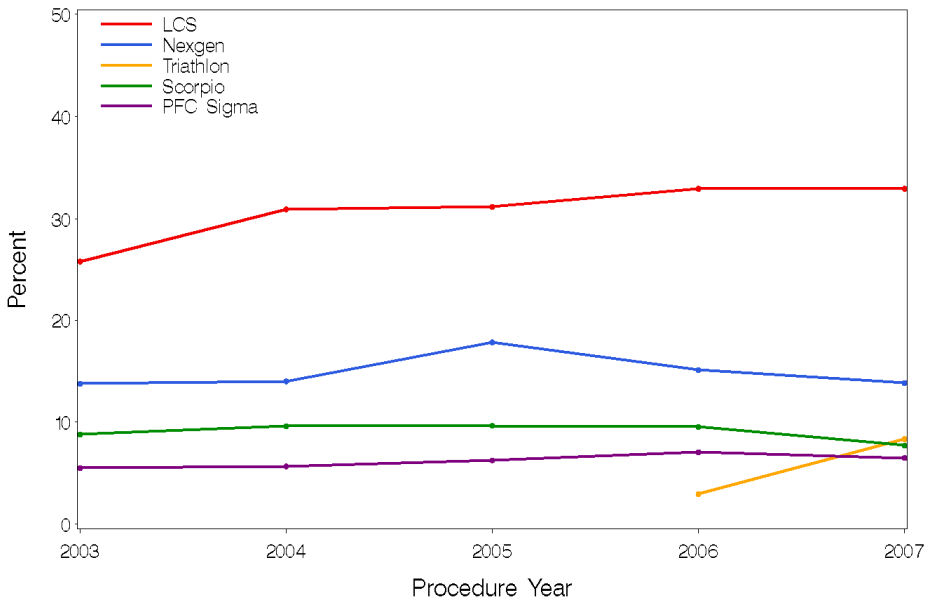


Table KT4: 10 Most Common Femoral Components used in Primary Total Knee Replacement with Hybrid Fixation

Rank	2003	2004	2005	2006	2007
1	Duracon (1124)	Duracon (1072)	Scorpio (1079)	Scorpio (1113)	PFC Sigma (1010)
2	Scorpio (902)	Scorpio (886)	Duracon (1034)	Nexgen (1076)	Nexgen (985)
3	PFC Sigma (788)	Nexgen (775)	Nexgen (1006)	PFC Sigma (911)	Scorpio (975)
4	LCS (729)	LCS (774)	PFC Sigma (957)	LCS (725)	LCS (704)
5	Nexgen (573)	PFC Sigma (764)	LCS (816)	Duracon (722)	Duracon (526)
6	Genesis II (377)	Genesis II (501)	Genesis II (547)	Genesis II (574)	Genesis II (464)
7	Maxim (251)	Profix (289)	Profix (273)	Active Knee (202)	Triathlon (413)
8	Natural Knee (237)	Maxim (285)	Maxim (216)	Maxim (182)	Vanguard (335)
9	Profix (210)	Natural Knee (208)	Active Knee (210)	Profix (149)	Maxim (203)
10	AGC (190)	AGC (138)	Natural Knee (179)	Nexgen LPS (133)	Active Knee (142)
Top 10 Usage	89.2%	92.0%	91.1%	86.5%	88.0%
Total Procedures	6032	6184	6937	6690	6545
Prosthesis Types	36	39	35	35	36

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

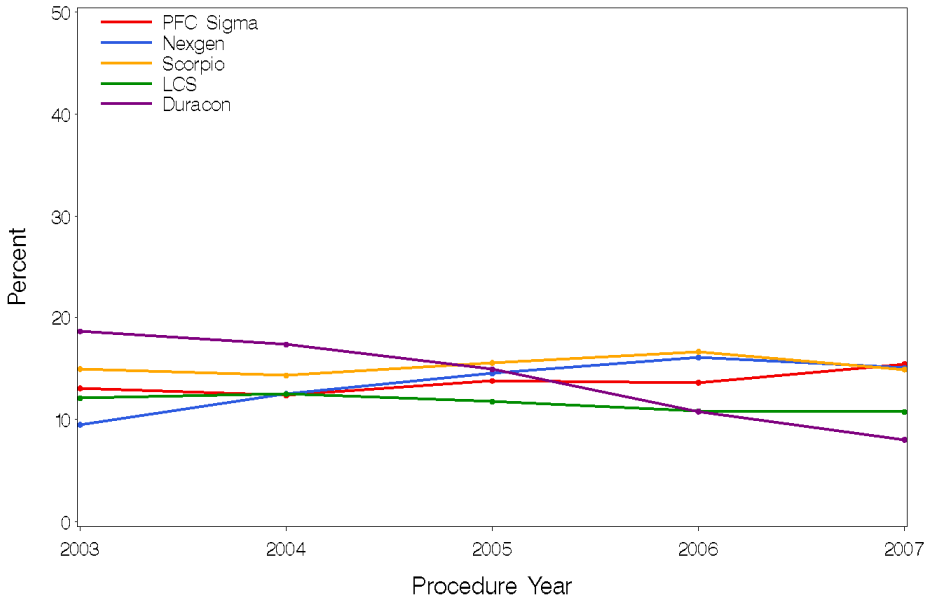


Table KT5: Primary Total Knee Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	12516	57.6	9217	42.4	21733	100.0
2004	13637	57.8	9948	42.2	23585	100.0
2005	15255	58.0	11032	42.0	26287	100.0
2006	15674	57.4	11652	42.6	27326	100.0
2007	16695	57.5	12356	42.5	29051	100.0

Table KT6: Primary Total Knee Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	1532	7.0	4868	22.4	8244	37.9	6414	29.5	675	3.1	21733	100.0
2004	1597	6.8	5410	22.9	8927	37.9	6939	29.4	712	3.0	23585	100.0
2005	1731	6.6	6203	23.6	9673	36.8	7842	29.8	838	3.2	26287	100.0
2006	1787	6.5	6710	24.6	10135	37.1	7761	28.4	933	3.4	27326	100.0
2007	2002	6.9	7330	25.2	10724	36.9	8004	27.6	991	3.4	29051	100.0

Table KT7: Prosthesis Fixation of Primary Total Knee Replacement

Fixation	Total		Patella Used			
			Patella Cementless		Patella Cemented	
	Number	%	Number	%	Number	%
Tibial and femoral cemented	82856	50.3	89	0.1	41964	50.6
Tibial and femoral cementless	38901	23.6	4062	10.4	8416	21.6
Tibial only cemented	40997	24.9	506	1.2	14753	36.0
Femoral only cemented	2010	1.2	83	4.1	1095	54.5
Total	**164764**	**100.0**	**4740**	**2.9**	**66228**	**40.2**

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

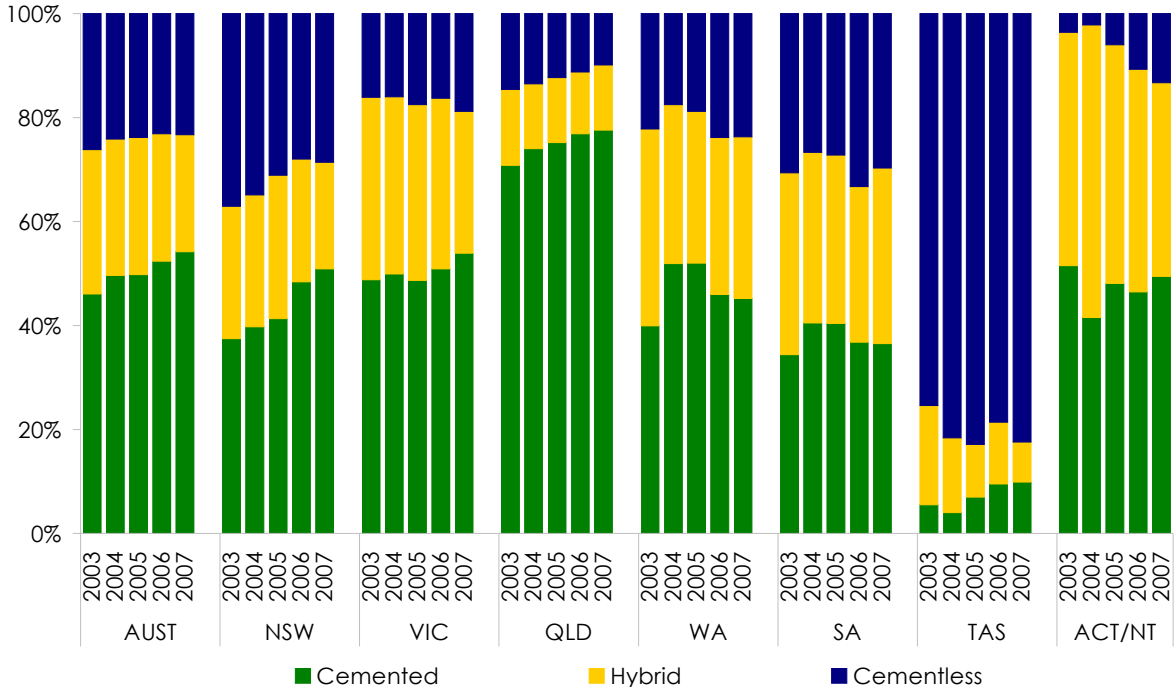


Figure KT6: Trends in Patella Usage and Fixation of Primary Total Knee Replacement by State/Territory and Year

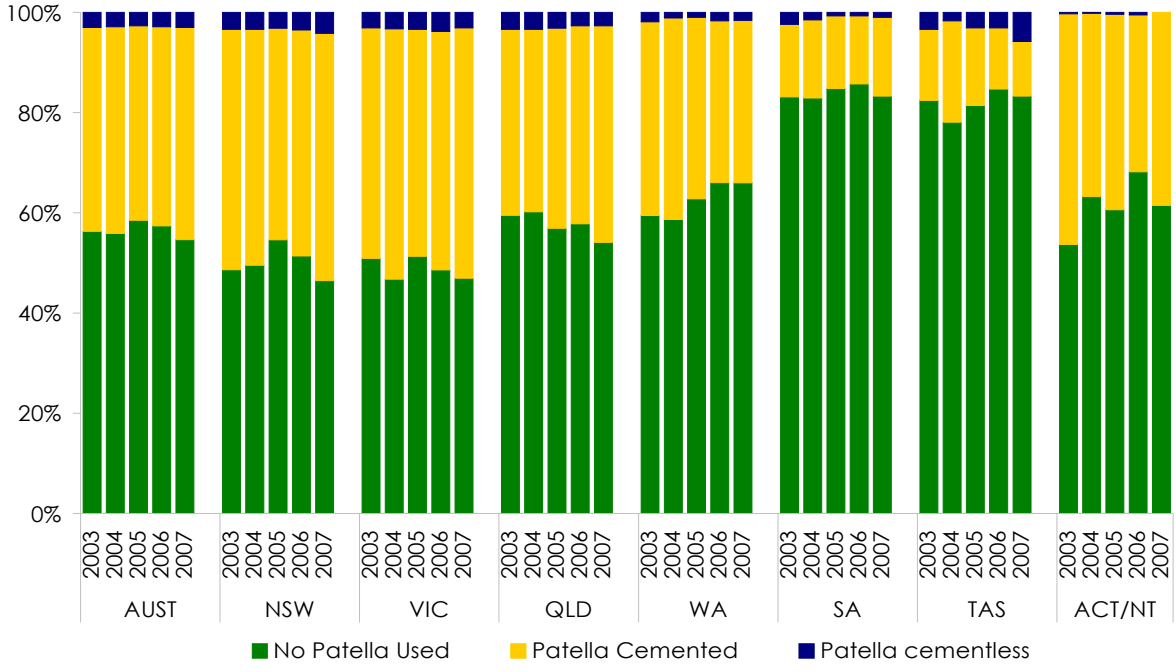
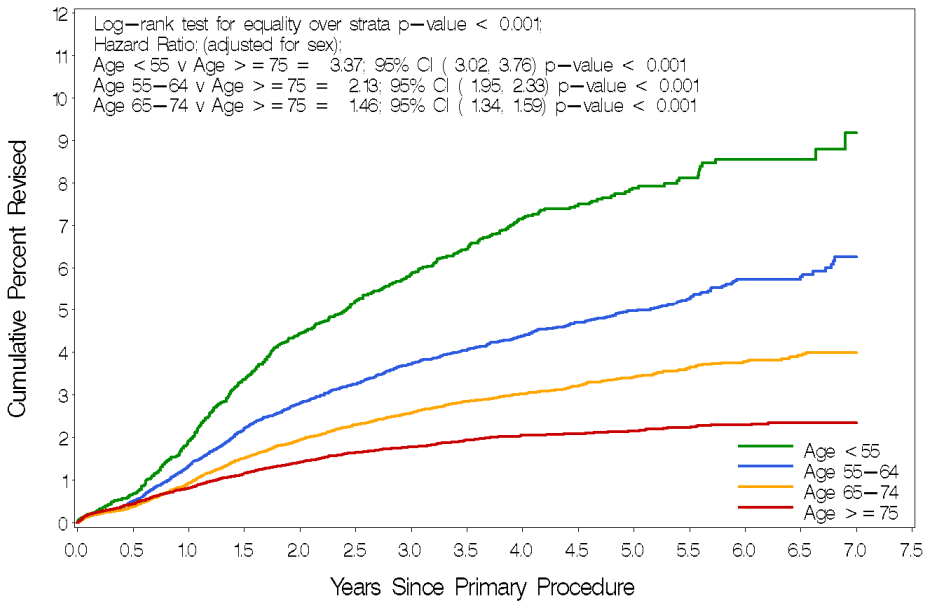


Table KT8: Primary Total Knee Replacement requiring Revision by Age (Primary Diagnosis OA)

Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
<55	529	10078	29944	1.8	(1.62, 1.92)
55-64	1214	37018	108130	1.1	(1.06, 1.19)
65-74	1409	60342	185308	0.8	(0.72, 0.80)
≥75	810	52091	155147	0.5	(0.49, 0.56)
Total	**3962**	**159529**	**478528**	**0.8**	**(0.80, 0.85)**

Figure KT7: Cumulative Percent Revision of Primary Total Knee Replacement by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
<55	10078	8056	6239	4624	3210	1928	864	217
55-64	37018	29373	22478	16433	11300	6869	3024	769
65-74	60342	49018	38387	28703	20032	12374	5740	1521
≥75	52091	42025	32653	23691	16179	9628	4293	1053

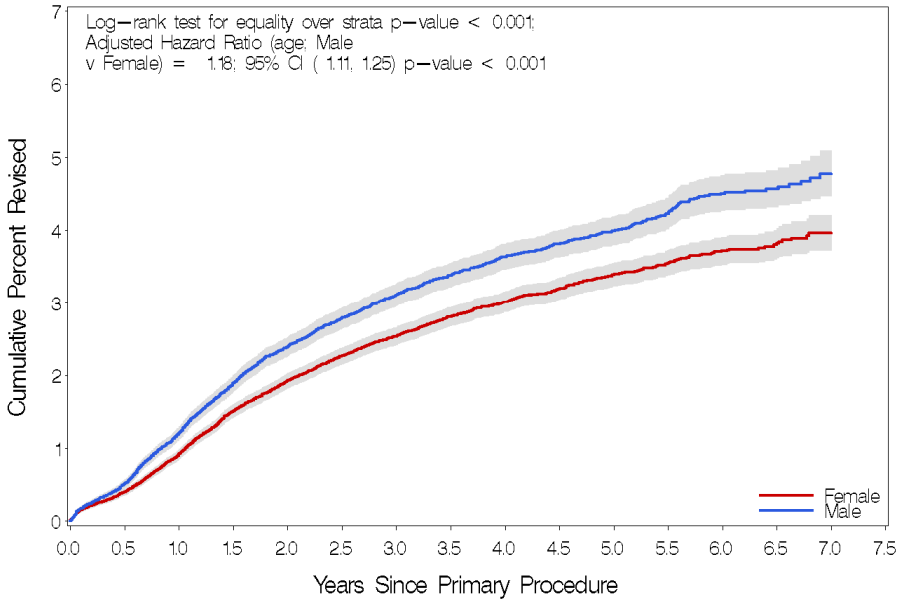
Table KT9: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Age

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
<55	1.9 (1.6, 2.2)	4.4 (4.0, 4.9)	5.8 (5.3, 6.4)	7.9 (7.2, 8.6)	9.2 (8.1, 10.5)
55-64	1.3 (1.2, 1.5)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	5.0 (4.7, 5.3)	6.3 (5.7, 6.8)
65-74	0.9 (0.8, 1.0)	1.9 (1.8, 2.1)	2.6 (2.4, 2.7)	3.4 (3.2, 3.6)	4.0 (3.7, 4.3)
≥75	0.8 (0.7, 0.9)	1.4 (1.3, 1.5)	1.8 (1.6, 1.9)	2.2 (2.0, 2.3)	2.3 (2.2, 2.5)

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

Gender	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Male	1890	68658	204531	0.9	(0.88, 0.97)
Female	2072	90871	273998	0.8	(0.72, 0.79)
Total	**3962**	**159529**	**478528**	**0.8**	**(0.80, 0.85)**

Figure KT8: Cumulative Percent Revision of Primary Total Knee Replacement by Gender



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Male	68658	55066	42566	31304	21624	13199	5970	1545
Female	90871	73406	57191	42147	29097	17600	7951	2015

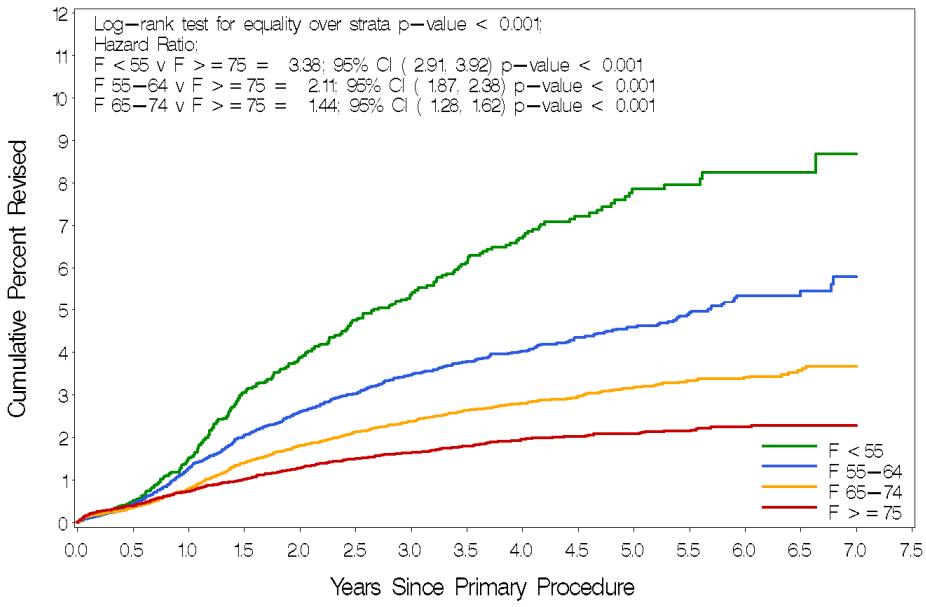
Table KT11: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Gender

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Male	1.2 (1.1, 1.3)	2.4 (2.3, 2.5)	3.1 (3.0, 3.3)	4.0 (3.8, 4.2)	4.8 (4.5, 5.1)
Female	0.9 (0.9, 1.0)	1.9 (1.8, 2.0)	2.5 (2.4, 2.7)	3.4 (3.2, 3.6)	4.0 (3.7, 4.2)

Table KT12: Primary Total Knee Replacement requiring Revision by Gender and Age

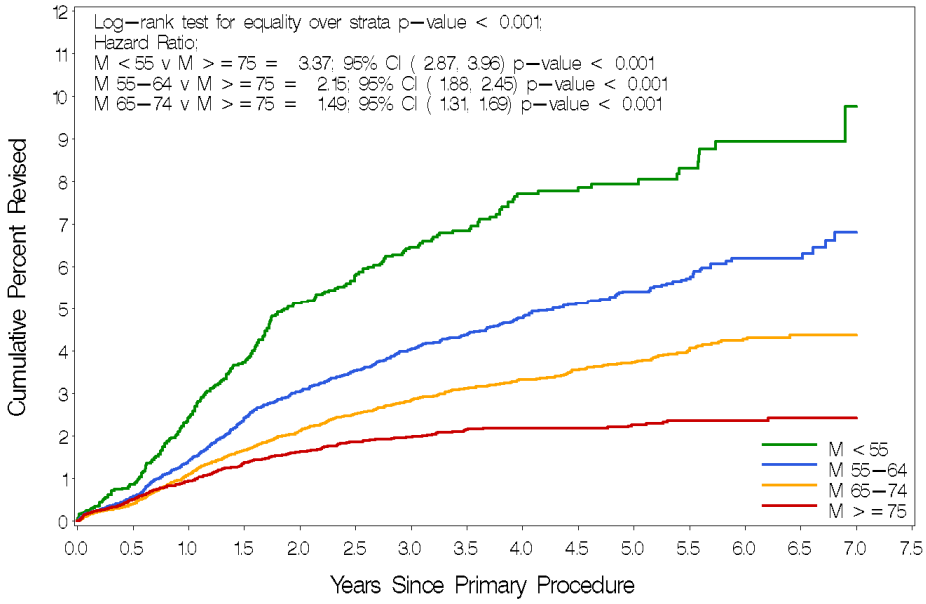
Gender	Age	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	<55	273	5613	16509	1.7	(1.46, 1.86)
	55-64	608	20065	58616	1.0	(0.96, 1.12)
	65-74	729	33850	104454	0.7	(0.65, 0.75)
	≥75	462	31343	94418	0.5	(0.45, 0.54)
Male	<55	256	4465	13434	1.9	(1.68, 2.15)
	55-64	606	16953	49514	1.2	(1.13, 1.33)
	65-74	680	26492	80854	0.8	(0.78, 0.91)
	≥75	348	20748	60728	0.6	(0.51, 0.64)
Total		**3962**	**159529**	**478528**	**0.8**	**(0.80, 0.85)**

Figure KT9: Primary Total Knee Replacement requiring Revision for Females by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
F < 55	5613	4476	3447	2554	1740	1050	453	115
F 55-64	20065	15969	12246	8925	6118	3631	1584	392
F 65-74	33850	27553	21653	16152	11293	6980	3274	872
F ≥ 75	31343	25408	19845	14516	9946	5939	2640	636

Figure KT10: Primary Total Knee Replacement requiring Revision for Males by Age



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
M < 55	4465	3580	2792	2070	1470	878	411	102
M 55-64	16953	13404	10232	7508	5182	3238	1440	377
M 65-74	26492	21465	16734	12551	8739	5394	2466	649
M ≥ 75	20748	16617	12808	9175	6233	3689	1653	417

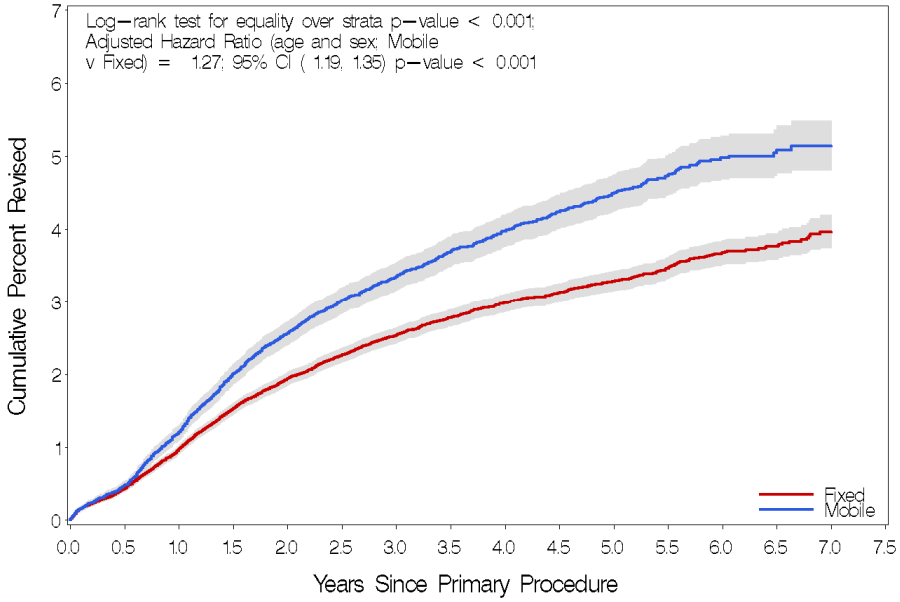
Table KT13: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Gender and Age

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	<55	1.5 (1.2, 1.9)	3.9 (3.3, 4.5)	5.4 (4.7, 6.1)	7.9 (6.9, 8.9)	8.7 (7.4, 10.2)
	55-64	1.3 (1.1, 1.4)	2.6 (2.4, 2.9)	3.5 (3.2, 3.8)	4.6 (4.2, 5.0)	5.8 (5.1, 6.6)
	65-74	0.8 (0.7, 0.9)	1.8 (1.7, 2.0)	2.4 (2.2, 2.6)	3.2 (2.9, 3.4)	3.7 (3.3, 4.0)
	≥75	0.7 (0.6, 0.8)	1.3 (1.2, 1.4)	1.6 (1.5, 1.8)	2.1 (1.9, 2.3)	2.3 (2.1, 2.5)
Male	<55	2.4 (2.0, 2.9)	5.1 (4.5, 5.9)	6.5 (5.7, 7.4)	7.9 (7.0, 9.0)	9.8 (7.9, 12.0)
	55-64	1.4 (1.2, 1.6)	3.0 (2.8, 3.3)	4.0 (3.7, 4.4)	5.4 (5.0, 5.9)	6.8 (6.0, 7.7)
	65-74	1.1 (1.0, 1.2)	2.1 (1.9, 2.3)	2.8 (2.6, 3.1)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)
	≥75	0.9 (0.8, 1.1)	1.6 (1.4, 1.8)	2.0 (1.8, 2.2)	2.3 (2.0, 2.5)	2.4 (2.1, 2.8)

Table KT14: Primary Total Knee Replacement requiring Revision by Bearing Mobility

Bearing Mobility	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Fixed	2657	117540	352899	0.8	(0.72, 0.78)
Rotating	1227	41461	120553	1.0	(0.96, 1.08)
Sliding	42	956	5355	0.8	(0.57, 1.06)
Rotating - Sliding	157	4704	16388	1.0	(0.81, 1.12)
Unknown	4	103	316	1.3	(0.34, 3.24)
Total	**4087**	**164764**	**495511**	**0.8**	**(0.80, 0.85)**

Figure KT11: Cumulative Percent Revision of Fixed Bearing and Mobile Bearing Primary Total Knee Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Fixed	117540	94821	73507	53939	37442	22800	10343	2672
Mobile	47121	37896	29657	22150	15180	9216	4155	1039

Note: Mobile is the combination of the Rotating, Rotating-Sliding and Sliding groups.

Table KT15: Yearly Cumulative Percent Revision of Fixed Bearing and Mobile Bearing Primary Total Knee Replacement

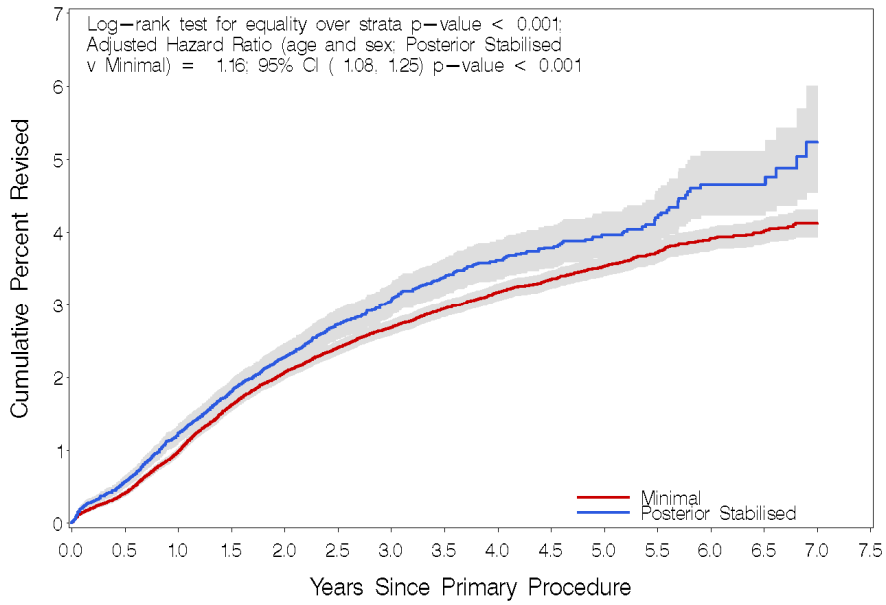
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Fixed	1.0 (0.9, 1.0)	1.9 (1.9, 2.0)	2.5 (2.4, 2.6)	3.3 (3.2, 3.4)	4.0 (3.8, 4.2)
Mobile	1.2 (1.1, 1.3)	2.6 (2.4, 2.7)	3.4 (3.2, 3.5)	4.5 (4.2, 4.7)	5.1 (4.8, 5.5)

.

Table KT16: Primary Total Knee Replacement requiring Revision by Stability

Stability	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Minimal	3198	128956	405516	0.8	(0.76, 0.82)
Posterior Stabilised	845	34666	87333	1.0	(0.90, 1.04)
Fully Stabilised	21	696	1561	1.3	(0.83, 2.06)
Hinged	19	343	786	2.4	(1.46, 3.78)
Unknown	4	103	316	1.3	(0.34, 3.24)
Total	**4087**	**164764**	**495511**	**0.8**	**(0.80, 0.85)**

Figure KT12: Cumulative Percent Revision of Primary Total Knee Replacement by Stability



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Minimal	128956	106041	84249	63357	44841	27733	12777	3284
Posterior Stabilised	34666	26028	18443	12396	7550	4152	1675	416

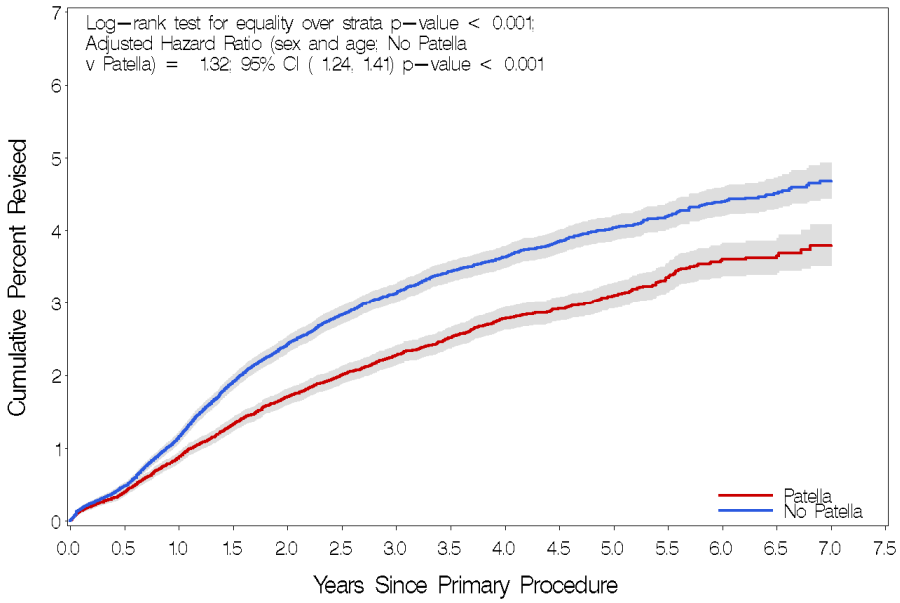
Table KT17: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Stability

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Minimal	1.0 (0.9, 1.0)	2.1 (2.0, 2.2)	2.7 (2.6, 2.8)	3.5 (3.4, 3.7)	4.1 (3.9, 4.3)
Posterior Stabilised	1.2 (1.1, 1.4)	2.3 (2.1, 2.5)	3.1 (2.8, 3.3)	4.0 (3.7, 4.3)	5.2 (4.6, 6.0)

Table KT18: Primary Total Knee Replacement requiring Revision by Patella Usage

Patella Usage	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
No Patella used	2618	93796	284438	0.9	(0.89, 0.96)
Patella used	1469	70968	211074	0.7	(0.66, 0.73)
Total	**4087**	**164764**	**495511**	**0.8**	**(0.80, 0.85)**

Figure KT13: Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
No Patella used	93796	76130	59102	43301	30151	18590	8754	2514
Patella used	70968	56668	44132	32836	22502	13448	5756	1199

Table KT19: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Patella Usage

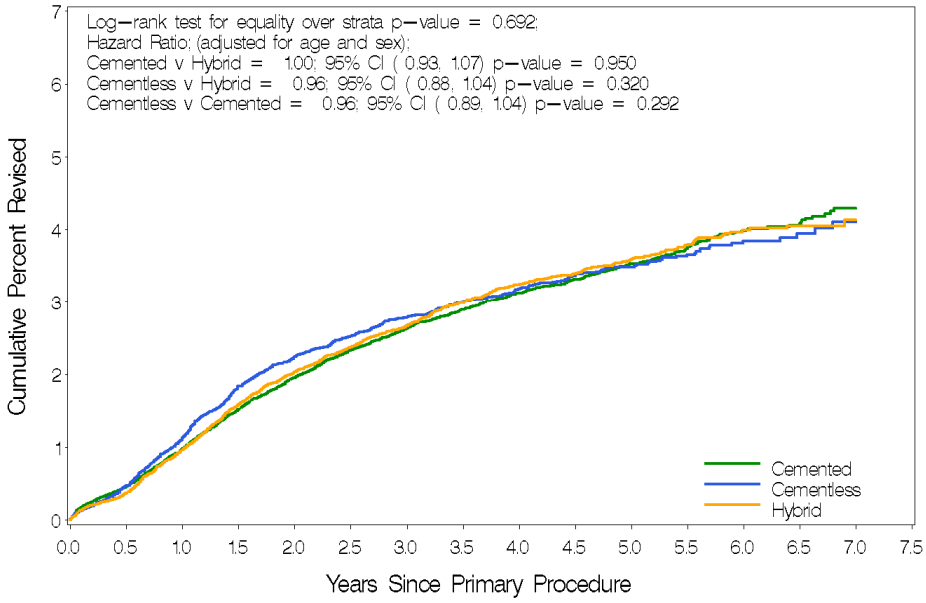
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
No Patella used	1.2 (1.1, 1.2)	2.4 (2.3, 2.5)	3.1 (3.0, 3.3)	4.0 (3.9, 4.2)	4.7 (4.4, 4.9)
Patella used	0.9 (0.8, 1.0)	1.7 (1.6, 1.8)	2.3 (2.2, 2.4)	3.1 (2.9, 3.3)	3.8 (3.5, 4.1)

Table KT20: Primary Total Knee Replacement requiring Revision by Fixation (excluding cementless Genesis Oxinium and Profix Oxinium)

Form Cement	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Cemented	1926	82856	242857	0.8	(0.76, 0.83)
Cementless	952	38633	115961	0.8	(0.77, 0.87)
Hybrid	1079	43007	135852	0.8	(0.75, 0.84)
Total	**3957**	**164496**	**494671**	**0.8**	**(0.78, 0.83)**

Note: Cementless Genesis Oxinium and Profix Oxinium have higher than anticipated revision rates that increase the cementless revision rates overall.

Figure KT14: Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (excluding cementless Genesis Oxinium and Profix Oxinium)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Cemented	82856	65641	50267	36738	25147	15555	7366	1858
Cementless	38633	31211	24435	18067	12416	7196	3012	793
Hybrid	43007	35719	28372	21196	14957	9243	4125	1062

Table KT21: Yearly Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (excluding cementless Genesis Oxinium and Profix Oxinium)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Cemented	1.0 (0.9, 1.1)	2.0 (1.9, 2.1)	2.6 (2.5, 2.8)	3.5 (3.4, 3.7)	4.3 (4.0, 4.6)
Cementless	1.1 (1.0, 1.2)	2.2 (2.1, 2.4)	2.8 (2.6, 3.0)	3.5 (3.3, 3.7)	4.1 (3.7, 4.5)
Hybrid	1.0 (0.9, 1.1)	2.0 (1.9, 2.2)	2.7 (2.5, 2.8)	3.6 (3.4, 3.8)	4.1 (3.8, 4.5)

Table KT22: Primary Total Knee Replacement with Cement Fixation requiring Revision

Femoral Component	Tibial Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
AGC	AGC	62	2679	9792	0.6	(0.49, 0.81)
Advance	Advance	31	531	2113	1.5	(1.00, 2.08)
Duracon	Duracon	193	8183	27208	0.7	(0.61, 0.82)
Genesis II	Genesis II	233	9827	28962	0.8	(0.70, 0.91)
Genesis II Oxinium	Genesis II	144	6280	13514	1.1	(0.90, 1.25)
Journey	Journey	2	460	314	0.6	(0.08, 2.30)
Kinemax Plus	Kinemax Plus	44	1681	7337	0.6	(0.44, 0.81)
LCS	LCS	187	4110	19430	1.0	(0.83, 1.11)
LCS	MBT	40	2777	6621	0.6	(0.43, 0.82)
LCS	PFC Sigma	5	395	861	0.6	(0.19, 1.36)
Maxim	Maxim	19	551	1980	1.0	(0.58, 1.50)
Natural Knee	Natural Knee	17	1167	3947	0.4	(0.25, 0.69)
Nexgen	Nexgen	74	7152	19317	0.4	(0.30, 0.48)
Nexgen LPS	Nexgen	96	3808	15409	0.6	(0.50, 0.76)
Nexgen LPS Flex	Nexgen	124	6608	14952	0.8	(0.69, 0.99)
Optetrak-PS	Optetrak	44	996	2363	1.9	(1.35, 2.50)
PFC Sigma	MBT	10	466	859	1.2	(0.56, 2.14)
PFC Sigma	PFC Sigma	148	8984	23310	0.6	(0.54, 0.75)
Profix	Mobile Bearing Knee	34	334	1284	2.6	(1.83, 3.70)
Profix	Profix	105	3512	10832	1.0	(0.79, 1.17)
RBK	RBK	11	621	1389	0.8	(0.40, 1.42)
Scorpio	Scorpio/Series 7000	128	5146	15031	0.9	(0.71, 1.01)
Triathlon	Triathlon	13	2269	2151	0.6	(0.32, 1.03)
Vanguard	Maxim	2	342	399	0.5	(0.06, 1.81)
Other (106)	-	160	3977	13484	1.2	(1.01, 1.39)
Total		**1926**	**82856**	**242857**	**0.8**	**(0.76, 0.83)**

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	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
AGC	AGC	0.6 (0.4, 1.1)	1.6 (1.1, 2.2)	2.2 (1.7, 2.9)	3.0 (2.3, 3.9)	3.4 (2.6, 4.4)
Advance	Advance	2.2 (1.2, 4.0)	5.6 (3.9, 8.2)	5.9 (4.1, 8.4)	6.5 (4.5, 9.2)	
Duracon	Duracon	1.0 (0.8, 1.2)	1.8 (1.5, 2.1)	2.4 (2.1, 2.8)	3.2 (2.8, 3.7)	3.7 (3.0, 4.5)
Genesis II	Genesis II	1.0 (0.9, 1.3)	2.0 (1.7, 2.4)	2.7 (2.4, 3.2)	3.5 (3.0, 4.0)	4.0 (3.5, 4.7)
Genesis II Oxinium	Genesis II	1.3 (1.1, 1.7)	2.2 (1.8, 2.6)	3.0 (2.5, 3.6)	5.1 (4.0, 6.4)	
Journey	Journey	0.8 (0.2, 3.3)				
Kinemax Plus	Kinemax Plus	0.9 (0.6, 1.5)	1.9 (1.3, 2.7)	2.3 (1.7, 3.2)	2.9 (2.1, 3.9)	4.0 (2.7, 6.0)
LCS	LCS	1.0 (0.7, 1.3)	2.7 (2.2, 3.2)	3.7 (3.1, 4.3)	4.9 (4.2, 5.6)	5.5 (4.8, 6.4)
LCS	MBT	0.9 (0.6, 1.4)	1.6 (1.2, 2.3)	1.9 (1.4, 2.7)	2.5 (1.7, 3.9)	
LCS	PFC Sigma	0.6 (0.1, 2.2)	1.3 (0.5, 3.6)	1.3 (0.5, 3.6)	2.7 (0.9, 8.1)	
Maxim	Maxim	1.1 (0.5, 2.5)	2.6 (1.5, 4.4)	2.8 (1.7, 4.8)	4.5 (2.8, 7.1)	
Natural Knee	Natural Knee	0.4 (0.2, 1.1)	1.1 (0.6, 2.0)	1.5 (0.9, 2.5)	1.9 (1.1, 3.0)	
Nexgen	Nexgen	0.5 (0.3, 0.7)	0.9 (0.7, 1.2)	1.3 (1.0, 1.7)	1.7 (1.3, 2.2)	2.1 (1.5, 2.9)
Nexgen LPS	Nexgen	0.9 (0.6, 1.2)	1.6 (1.3, 2.1)	2.1 (1.7, 2.7)	2.8 (2.3, 3.5)	3.3 (2.7, 4.2)
Nexgen LPS Flex	Nexgen	0.9 (0.7, 1.2)	1.9 (1.6, 2.3)	2.6 (2.2, 3.2)	3.3 (2.6, 4.2)	
Optetrak-PS	Optetrak	1.8 (1.1, 2.9)	4.0 (2.8, 5.6)	5.7 (4.2, 7.9)	6.9 (4.9, 9.5)	
PFC Sigma	MBT	2.0 (1.0, 4.1)	2.8 (1.5, 5.2)	2.8 (1.5, 5.2)		
PFC Sigma	PFC Sigma	0.9 (0.7, 1.1)	1.5 (1.3, 1.8)	2.0 (1.6, 2.3)	2.8 (2.3, 3.4)	2.8 (2.3, 3.4)
Profix	Mobile Bearing Knee	2.1 (1.0, 4.4)	5.3 (3.3, 8.3)	8.2 (5.7, 11.8)	12.0 (8.3, 17.2)	
Profix	Profix	1.3 (0.9, 1.7)	2.5 (2.0, 3.1)	3.4 (2.7, 4.1)	4.0 (3.3, 4.8)	4.2 (3.4, 5.2)
RBK	RBK	0.8 (0.3, 2.0)	2.1 (1.1, 4.0)	3.0 (1.6, 5.6)	3.0 (1.6, 5.6)	
Scorpio	Scorpio/Series 7000	1.0 (0.7, 1.3)	2.0 (1.6, 2.5)	2.8 (2.3, 3.4)	3.7 (3.0, 4.4)	5.1 (3.7, 6.9)
Triathlon	Triathlon	0.6 (0.3, 1.2)	1.2 (0.6, 2.3)			
Vanguard	Maxim	0.6 (0.1, 2.3)	0.6 (0.1, 2.3)			
Other (106)	-	1.5 (1.1, 2.0)	2.9 (2.3, 3.5)	3.8 (3.2, 4.6)	5.6 (4.7, 6.6)	7.0 (5.9, 8.3)

Table KT24: Primary Total Knee Replacement with Cementless Fixation requiring Revision

Femoral Component	Tibial Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Active Knee	Active Knee	73	2477	7149	1.0	(0.80, 1.28)
Advantim	Advantim	7	583	2173	0.3	(0.13, 0.66)
Duracon	Duracon	76	2948	10080	0.8	(0.59, 0.94)
Genesis II	Mobile Bearing Knee	15	474	2200	0.7	(0.38, 1.12)
LCS	LCS	93	2309	11836	0.8	(0.63, 0.96)
LCS	MBT	207	9706	23629	0.9	(0.76, 1.00)
Maxim	Maxim	19	576	2619	0.7	(0.44, 1.13)
Natural Knee	Natural Knee	53	1685	7173	0.7	(0.55, 0.97)
Natural Knee II	Natural Knee II	3	399	407	0.7	(0.15, 2.15)
Nexgen	Nexgen	93	5874	17926	0.5	(0.42, 0.64)
PFC Sigma	Coordinate	20	1036	2879	0.7	(0.42, 1.07)
PFC Sigma	MBT	37	1139	2774	1.3	(0.94, 1.84)
Profix	Profix	24	921	2882	0.8	(0.53, 1.24)
RBK	RBK	42	1971	5263	0.8	(0.58, 1.08)
Rotaglide Plus	Rotaglide Plus	13	347	1324	1.0	(0.52, 1.68)
Scorpio	Scorpio/Series 7000	94	3351	9804	1.0	(0.77, 1.17)
Triathlon	Triathlon	3	752	472	0.6	(0.13, 1.86)
Other (44)	-	210	2353	6212	3.4	(2.94, 3.87)
Total		**1082**	**38901**	**116802**	**0.9**	**(0.87, 0.98)**

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	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
Active Knee	Active Knee	1.1 (0.7, 1.6)	2.7 (2.1, 3.5)	3.2 (2.5, 4.1)	4.1 (3.2, 5.3)	
Advantim	Advantim	0.4 (0.1, 1.5)	1.0 (0.4, 2.5)	1.6 (0.7, 3.3)	1.6 (0.7, 3.3)	1.6 (0.7, 3.3)
Duracon	Duracon	1.0 (0.7, 1.4)	2.0 (1.5, 2.6)	2.7 (2.1, 3.4)	3.4 (2.7, 4.4)	3.9 (3.0, 5.1)
Genesis II	Mobile Bearing Knee	1.5 (0.7, 3.1)	1.5 (0.7, 3.1)	2.0 (1.0, 3.8)	3.3 (1.9, 5.6)	4.2 (2.5, 7.0)
LCS	LCS	1.4 (1.0, 1.9)	2.6 (2.0, 3.3)	3.3 (2.6, 4.1)	4.1 (3.3, 5.0)	4.5 (3.6, 5.6)
LCS	MBT	1.1 (0.9, 1.3)	2.2 (1.9, 2.6)	2.7 (2.3, 3.1)	3.4 (2.9, 4.0)	
Maxim	Maxim	1.7 (0.9, 3.2)	2.6 (1.6, 4.3)	3.2 (2.0, 5.0)	3.4 (2.2, 5.3)	3.4 (2.2, 5.3)
Natural Knee	Natural Knee	1.1 (0.7, 1.8)	2.0 (1.4, 2.8)	2.3 (1.7, 3.2)	3.4 (2.6, 4.6)	5.9 (3.3, 10.6)
Natural Knee II	Natural Knee II	0.3 (0.0, 1.8)	1.7 (0.5, 5.5)			
Nexgen	Nexgen	0.7 (0.5, 0.9)	1.5 (1.2, 1.8)	2.0 (1.6, 2.4)	2.1 (1.7, 2.6)	2.5 (1.9, 3.4)
PFC Sigma	Coordinate	0.7 (0.3, 1.5)	1.4 (0.7, 2.4)	2.1 (1.3, 3.6)	3.5 (2.2, 5.7)	
PFC Sigma	MBT	2.3 (1.6, 3.5)	3.7 (2.7, 5.2)	4.1 (3.0, 5.7)	4.4 (3.1, 6.1)	
Profix	Profix	1.3 (0.7, 2.3)	2.9 (1.9, 4.4)	2.9 (1.9, 4.4)	3.6 (2.3, 5.5)	
RBK	RBK	1.1 (0.7, 1.7)	2.0 (1.4, 2.8)	2.6 (1.9, 3.6)	3.0 (2.1, 4.1)	
Rotaglide Plus	Rotaglide Plus	0.6 (0.2, 2.5)	2.0 (0.9, 4.3)	3.2 (1.7, 6.0)	4.1 (2.3, 7.3)	
Scorpio	Scorpio/Series 7000	1.4 (1.1, 1.9)	2.6 (2.1, 3.3)	3.1 (2.5, 3.9)	4.1 (3.3, 5.2)	4.3 (3.4, 5.4)
Triathlon	Triathlon	0.7 (0.2, 2.9)				
Other (44)	-	3.8 (3.0, 4.7)	9.1 (7.8, 10.5)	11.8 (10.3, 13.6)	13.3 (11.6, 15.2)	

Table KT26: Primary Total Knee Replacement with Hybrid Fixation requiring Revision

Femoral Component	Tibial Component	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
AGC	AGC	19	1118	4542	0.4	(0.25, 0.65)
Active Knee	Active Knee	16	805	1899	0.8	(0.48, 1.37)
Duracon	Duracon	189	6901	25880	0.7	(0.63, 0.84)
Genesis II	Genesis II	82	3096	9370	0.9	(0.70, 1.09)
LCS	LCS	76	2165	9829	0.8	(0.61, 0.97)
LCS	MBT	39	2380	5498	0.7	(0.50, 0.97)
LCS	PFC Sigma	5	441	810	0.6	(0.20, 1.44)
Maxim	Maxim	28	1272	3715	0.8	(0.50, 1.09)
Natural Knee	Natural Knee	23	1097	4657	0.5	(0.31, 0.74)
Nexgen	Nexgen	73	5410	15175	0.5	(0.38, 0.60)
Nexgen LPS	Nexgen	11	623	1676	0.7	(0.33, 1.17)
PFC Sigma	MBT	10	805	1333	0.8	(0.36, 1.38)
PFC Sigma	PFC Sigma	129	4840	15463	0.8	(0.70, 0.99)
Profix	Mobile Bearing Knee	33	620	2099	1.6	(1.08, 2.21)
Profix	Profix	23	693	2372	1.0	(0.61, 1.45)
Scorpio	Scorpio/Series 7000	154	6470	20231	0.8	(0.65, 0.89)
Triathlon	Triathlon	0	522	338	0.0	(0.00, 1.09)
Other (82)	-	169	3749	10967	1.5	(1.32, 1.79)
Total		**1079**	**43007**	**135852**	**0.8**	**(0.75, 0.84)**

Note: Some cementless components have been cemented.
Only prostheses with over 300 procedures have been listed.

Table KT27: Yearly Cumulative Percent Revision of Primary Total Knee Replacement with Hybrid Fixation

Femoral Component	Tibial Component	CPR 1 Yr	CPR 2 Yrs	CPR 3 Yrs	CPR 5 Yrs	CPR 7 Yrs
AGC	AGC	0.7 (0.4, 1.5)	1.2 (0.7, 2.0)	1.4 (0.8, 2.4)	2.2 (1.3, 3.5)	2.4 (1.5, 3.9)
Active Knee	Active Knee	0.4 (0.1, 1.2)	2.0 (1.1, 3.5)	2.9 (1.7, 5.0)	2.9 (1.7, 5.0)	
Duracon	Duracon	1.2 (0.9, 1.5)	2.1 (1.8, 2.5)	2.6 (2.2, 3.0)	3.3 (2.9, 3.9)	3.7 (3.2, 4.3)
Genesis II	Genesis II	1.1 (0.8, 1.6)	2.5 (2.0, 3.2)	3.1 (2.5, 3.9)	3.6 (2.9, 4.5)	4.3 (3.2, 5.7)
LCS	LCS	1.0 (0.6, 1.5)	1.8 (1.3, 2.5)	2.5 (1.9, 3.2)	3.7 (3.0, 4.7)	4.5 (3.5, 5.7)
LCS	MBT	0.7 (0.4, 1.1)	1.7 (1.2, 2.5)	2.3 (1.6, 3.2)	3.2 (2.1, 4.8)	
LCS	PFC Sigma	1.1 (0.4, 2.9)	1.1 (0.4, 2.9)	1.7 (0.7, 4.2)		
Maxim	Maxim	0.7 (0.3, 1.3)	2.0 (1.3, 3.0)	2.4 (1.6, 3.6)	3.2 (2.2, 4.7)	
Natural Knee	Natural Knee	0.6 (0.3, 1.4)	1.6 (1.0, 2.5)	1.8 (1.2, 2.8)	2.3 (1.5, 3.6)	
Nexgen	Nexgen	0.5 (0.3, 0.7)	1.2 (0.9, 1.6)	1.6 (1.3, 2.1)	2.3 (1.7, 2.9)	2.4 (1.8, 3.1)
Nexgen LPS	Nexgen	0.2 (0.0, 1.4)	0.7 (0.2, 2.2)	1.4 (0.6, 3.3)	4.8 (2.5, 9.0)	
PFC Sigma	MBT	1.5 (0.8, 2.8)	1.8 (0.9, 3.4)	1.8 (0.9, 3.4)		
PFC Sigma	PFC Sigma	1.2 (0.9, 1.6)	2.4 (2.0, 3.0)	2.7 (2.3, 3.3)	3.7 (3.1, 4.4)	3.7 (3.1, 4.4)
Profix	Mobile Bearing Knee	1.3 (0.7, 2.6)	3.7 (2.4, 5.6)	5.2 (3.6, 7.5)	7.1 (5.0, 10.1)	
Profix	Profix	1.4 (0.7, 2.6)	2.0 (1.2, 3.4)	3.1 (2.0, 4.9)	4.0 (2.6, 6.1)	
Scorpio	Scorpio/Series 7000	0.8 (0.6, 1.0)	1.6 (1.3, 2.0)	2.4 (2.0, 2.9)	3.6 (3.0, 4.3)	4.7 (3.6, 6.3)
Triathlon	Triathlon	0				
Other (82)	-	1.7 (1.3, 2.2)	3.9 (3.3, 4.7)	5.6 (4.8, 6.6)	6.8 (5.9, 8.0)	7.7 (6.6, 9.1)

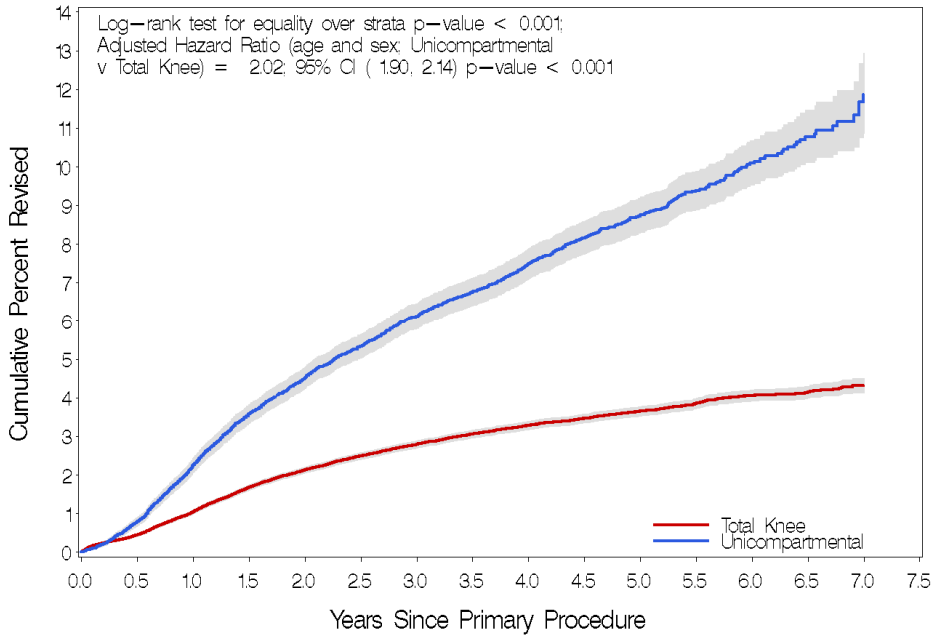
Note: Cumulative percent revision equal to zero indicates that the prosthesis has been followed up to this time with no revision recorded.

Outcomes of Primary Unicompartmental and Total Knee Replacement

Table KT28: Primary Unicompartmental and Total Knee Replacement requiring Revision

Type of Knee Replacement	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Total Knee	3962	159529	478528	0.8	(0.80, 0.85)
Unicompartmental	1589	25306	82206	1.9	(1.84, 2.03)
Total	**5551**	**184835**	**560735**	**1.0**	**(0.96, 1.02)**

Figure KT15: Cumulative Percent Revision of Primary Unicompartmental and Total Knee Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Total Knee	159529	128472	99757	73451	50721	30799	13921	3560
Unicompartmental	25306	21289	17225	13216	9530	5741	2402	484

Table KT29: Yearly Cumulative Percent Revision of Primary Unicompartmental and Total Knee Replacement

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Total Knee	1.0 (1.0, 1.1)	2.1 (2.1, 2.2)	2.8 (2.7, 2.9)	3.6 (3.5, 3.8)	4.3 (4.1, 4.5)
Unicompartmental	2.3 (2.1, 2.5)	4.5 (4.2, 4.8)	6.1 (5.8, 6.5)	8.8 (8.3, 9.2)	11.9 (10.9, 12.9)

Table KT30: Primary Unicompartmental and Total Knee Replacement requiring Revision by Age and Gender

Knee Replacement by Age and Gender		Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Female	TKR <55	273	5613	16509	1.7	(1.46, 1.86)
	UKR <55	199	2023	6348	3.1	(2.71, 3.60)
	TKR 55-64	608	20065	58616	1.0	(0.96, 1.12)
	UKR 55-64	282	3998	12562	2.2	(1.99, 2.52)
	TKR 65-74	729	33848	104442	0.7	(0.65, 0.75)
	UKR 65-74	232	3718	12534	1.9	(1.62, 2.11)
	TKR ≥75	462	31345	94430	0.5	(0.45, 0.54)
	UKR ≥75	109	2603	8598	1.3	(1.04, 1.53)
Total		**2894**	**103213**	**314041**	**0.9**	**(0.89, 0.96)**
Male	TKR <55	256	4465	13434	1.9	(1.68, 2.15)
	UKR <55	161	1504	4678	3.4	(2.93, 4.02)
	TKR 55-64	606	16953	49514	1.2	(1.13, 1.33)
	UKR 55-64	294	4298	13786	2.1	(1.90, 2.39)
	TKR 65-74	680	26491	80849	0.8	(0.78, 0.91)
	UKR 65-74	209	4393	14775	1.4	(1.23, 1.62)
	TKR ≥75	348	20749	60734	0.6	(0.51, 0.64)
	UKR ≥75	103	2769	8924	1.2	(0.94, 1.40)
Total		**2657**	**81622**	**246694**	**1.1**	**(1.04, 1.12)**

Figures KT16-KT23: Cumulative Percent Revision of Primary Unicompartmental and Total Knee Replacement by Gender and Age

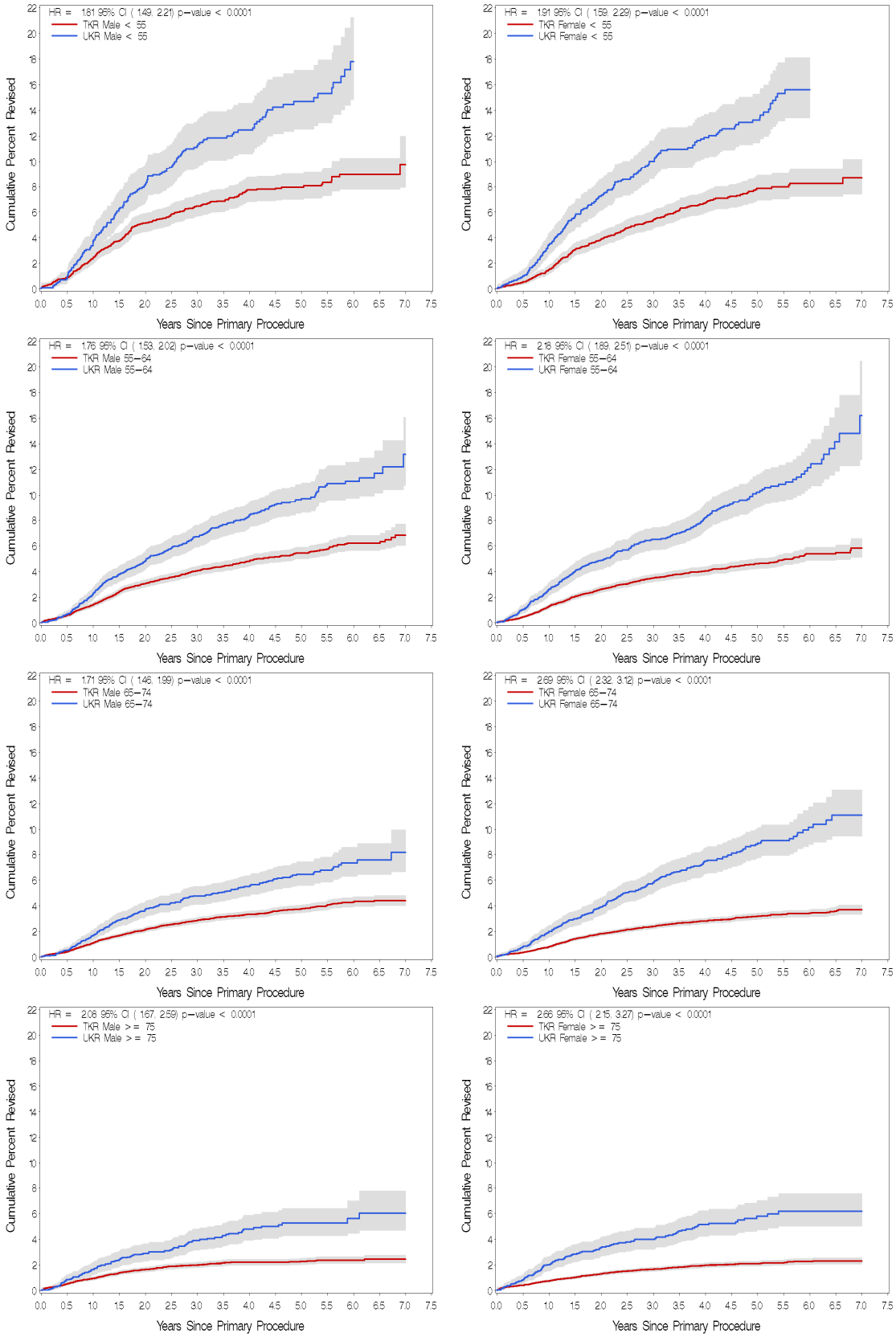


Table KT31: Yearly Cumulative Percent Revision of Primary Unicompartmental and Total Knee Replacement by Age and Gender

CPR		1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Female	TKR <55	1.5 (1.2, 1.9)	3.9 (3.3, 4.5)	5.4 (4.7, 6.1)	7.9 (6.9, 8.9)	8.7 (7.4, 10.2)
	UKR <55	3.4 (2.7, 4.4)	7.2 (6.1, 8.6)	10.0 (8.6, 11.6)	13.2 (11.5, 15.3)	
	TKR 55-64	1.3 (1.1, 1.4)	2.6 (2.4, 2.9)	3.5 (3.2, 3.8)	4.6 (4.2, 5.0)	5.8 (5.1, 6.6)
	UKR 55-64	2.6 (2.2, 3.2)	4.9 (4.2, 5.6)	6.5 (5.7, 7.4)	10.2 (9.0, 11.6)	16.2 (12.7, 20.4)
	TKR 65-74	0.8 (0.7, 0.9)	1.8 (1.7, 2.0)	2.4 (2.2, 2.6)	3.2 (2.9, 3.4)	3.7 (3.3, 4.0)
	UKR 65-74	2.0 (1.6, 2.5)	3.9 (3.3, 4.6)	5.8 (5.0, 6.7)	8.9 (7.7, 10.1)	11.1 (9.4, 13.1)
	TKR ≥75	0.7 (0.6, 0.8)	1.3 (1.2, 1.4)	1.6 (1.5, 1.8)	2.1 (1.9, 2.3)	2.3 (2.1, 2.5)
	UKR ≥75	2.0 (1.5, 2.6)	3.3 (2.7, 4.2)	4.0 (3.2, 4.9)	5.8 (4.7, 7.0)	6.2 (5.0, 7.6)
Male	TKR <55	2.4 (2.0, 2.9)	5.1 (4.5, 5.9)	6.5 (5.7, 7.4)	7.9 (7.0, 9.0)	9.8 (7.9, 12.0)
	UKR <55	3.7 (2.8, 4.9)	8.1 (6.7, 9.8)	11.2 (9.5, 13.2)	14.7 (12.5, 17.1)	
	TKR 55-64	1.4 (1.2, 1.6)	3.0 (2.8, 3.3)	4.0 (3.7, 4.4)	5.4 (5.0, 5.9)	6.8 (6.0, 7.7)
	UKR 55-64	2.2 (1.8, 2.8)	4.8 (4.2, 5.6)	6.7 (5.9, 7.6)	9.7 (8.6, 11.0)	13.2 (10.7, 16.1)
	TKR 65-74	1.1 (1.0, 1.2)	2.1 (1.9, 2.3)	2.8 (2.6, 3.1)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)
	UKR 65-74	1.7 (1.3, 2.1)	3.7 (3.1, 4.4)	4.7 (4.1, 5.5)	6.4 (5.6, 7.4)	8.1 (6.6, 10.0)
	TKR ≥75	0.9 (0.8, 1.1)	1.6 (1.4, 1.8)	2.0 (1.8, 2.2)	2.3 (2.0, 2.5)	2.4 (2.1, 2.8)
	UKR ≥75	1.6 (1.2, 2.2)	2.9 (2.3, 3.6)	3.9 (3.2, 4.8)	5.2 (4.3, 6.4)	6.0 (4.7, 7.8)

Primary Total Knee Replacement Prostheses with a higher than anticipated Revision Rate

Table KT32: Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

Femoral/Tibial Components	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Hazard Ratio	P Value	HR 95% CI
Re-identified and no longer used						
Gemini MK II/ Gemini MK II	21	94	5.31	6.482	<0.001	(2.70, 15.55)
Genesis II Oxinium Cless/Genesis II	117	415	9.89	10.689	<0.001	(7.86, 14.54)
Genesis II Oxinium Cless/MBK	88	248	19.79	20.095	<0.001	(15.15, 26.65)
Interax/Interax	58	356	2.25	3.693	0.0002	(1.85, 7.39)
Profix Oxinium Cless/MBK	158	540	11.84	13.408	<0.001	(10.47, 17.17)
Profix Oxinium Cless/Profix	71	246	10.58	11.241	<0.001	(7.65, 16.52)
Trac/Trac	138	787	1.65	2.278	0.0031	(1.32, 3.93)
Re-identified and still used						
Optetrak-PS/Optetrak	1132	2800	1.79	2.025	<0.001	(1.53, 2.68)
Profix/Mobile Bearing Knee	1205	4131	2.13	2.424	<0.001	(1.96, 2.99)
Newly Identified						
AMK/AMK	202	1301	1.38	2.165	0.0011	(1.36, 3.45)
Genesis II Oxinium PS Cted/Genesis II	3323	5521	1.63	1.403	0.0016	(1.14, 1.73)
IB II/IB II	199	1191	1.76	2.849	<0.001	(1.85, 4.38)
Optetrak-PS/Optetrak-RBK	256	201	3.48	3.327	0.0015	(1.59, 6.98)
Rotaglide Plus/ Rotaglide Plus	616	2281	1.45	1.745	0.0014	(1.24, 2.46)
TC-Plus/TC-Plus	67	170	2.94	3.344	0.0069	(1.39, 8.03)

Note: All components have been compared to all other Total Knee components.

Table KT33: Yearly Cumulative Percent revision of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Re-identified and no longer used					
Gemini MK II/ Gemini MK II	9.5 (2.5, 33.0)	14.3 (4.8, 38.0)	14.3 (4.8, 38.0)	23.8 (10.7, 48.1)	
Genesis II Oxinium Cless/Genesis II	10.3 (6.0, 17.5)	27.0 (19.9, 36.2)	35.1 (27.1, 44.6)	36.0 (27.9, 45.5)	
Genesis II Oxinium Cless /MBK	22.8 (15.4, 33.1)	48.2 (38.3, 59.1)	51.6 (41.6, 62.4)	56.2 (46.2, 66.8)	
Interax/Interax	0	0	5.4 (1.8, 15.7)	11.1 (5.1, 23.0)	15.5 (8.0, 28.8)
Profix Oxinium Cless /MBK	8.3 (4.9, 13.9)	27.0 (20.7, 34.7)	40.2 (32.9, 48.3)	41.5 (34.2, 49.7)	
Profix Oxinium Cless /Profix	14.1 (7.8, 24.6)	33.8 (24.1, 46.1)	35.2 (25.4, 47.5)	36.7 (26.7, 49.0)	
Trac/Trac	2.2 (0.7, 6.6)	4.3 (2.0, 9.4)	5.9 (3.0, 11.4)	9.0 (5.2, 15.3)	9.0 (5.2, 15.3)
Re-identified and still used					
Optetrak-PS/Optetrak	1.8 (1.1, 2.8)	4.0 (2.8, 5.5)	5.8 (4.3, 7.8)	6.7 (5.0, 9.0)	
Profix/Mobile Bearing Knee	2.2 (1.5, 3.2)	4.9 (3.8, 6.4)	6.8 (5.4, 8.5)	9.4 (7.5, 11.9)	
Newly Identified					
AMK/AMK	1.0 (0.3, 3.9)	3.0 (1.4, 6.6)	5.1 (2.8, 9.2)	6.6 (3.9, 11.1)	8.9 (5.6, 14.0)
Genesis II Oxinium PS Cted/Genesis II	2.1 (1.6, 2.7)	3.4 (2.7, 4.2)	4.5 (3.5, 5.6)		
IB II/IB II	0	1.0 (0.3, 4.0)	3.0 (1.4, 6.7)	6.8 (4.0, 11.4)	11.6 (7.6, 17.6)
Optetrak-PS/Optetrak-RBK	3.6 (1.5, 8.5)				
Rotaglide Plus/ Rotaglide Plus	0.7 (0.3, 1.8)	3.0 (1.9, 4.9)	4.1 (2.7, 6.2)	6.3 (4.4, 9.0)	
TC-Plus/TC-Plus	1.6 (0.2, 10.7)	3.3 (0.8, 12.5)	10.2 (4.3, 23.3)		

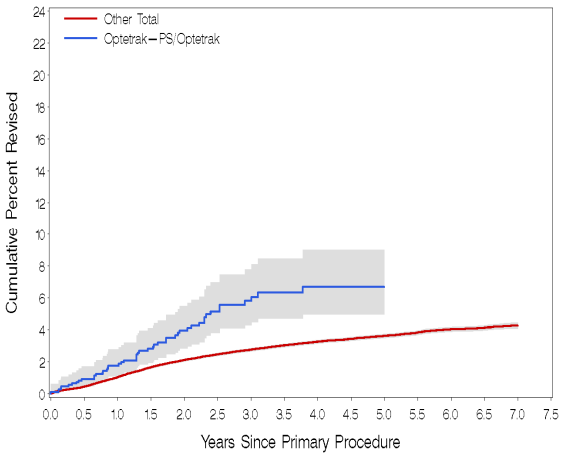
Note: Cumulative Percent Revision equal to zero indicates that the prosthesis combination has been followed up to this time with no revisions recorded.

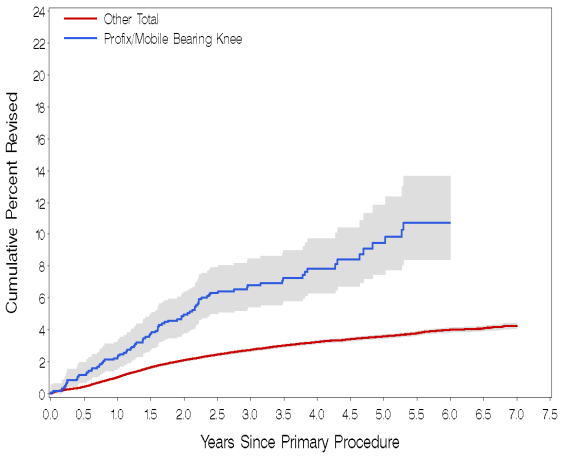
Table KT34: Yearly Usage of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

Year of Implant	1999	2000	2001	2002	2003	2004	2005	2006	2007
Re-identified and no longer used									
Gemini MK II/ Gemini MK II	0	0	4	10	7				
Genesis II Oxinium Cless/Genesis II	0	0	7	8	102				
Genesis II Oxinium Cless /MBK	0	0	0	22	66				
Interax/Interax	10	30	18						
Profix Oxinium Cless /MBK	0	0	0	63	95				
Profix Oxinium Cless /Profix	0	0	0	10	61				
Trac/Trac	7	36	52	33	9	1			
Re-identified and still used									
Optetrak-PS/Optetrak	0	14	22	90	130	155	252	253	216
Profix/Mobile Bearing Knee	0	0	55	214	204	349	269	54	60
Newly Identified									
AMK/AMK	34	92	70	3	2	1			
Genesis II Oxinium PS Cted/Genesis II	0	0	0	14	74	454	701	948	1132
IB II/IB II	0	64	90	33	12				
Optetrak-PS/Optetrak-RBK	0	0	0	0	0	0	1	81	174
Rotaglide Plus/ Rotaglide Plus	0	0	56	125	151	110	101	43	30
TC-Plus/TC-Plus	0	0	0	0	1	27	27	6	6

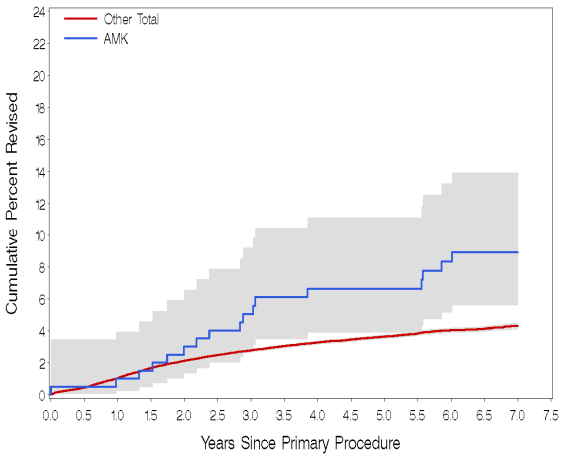
Figure KT24-KT33: Cumulative Percent Revision of Individual Primary Total Knee Prostheses identified as having a higher than anticipated Revision Rate

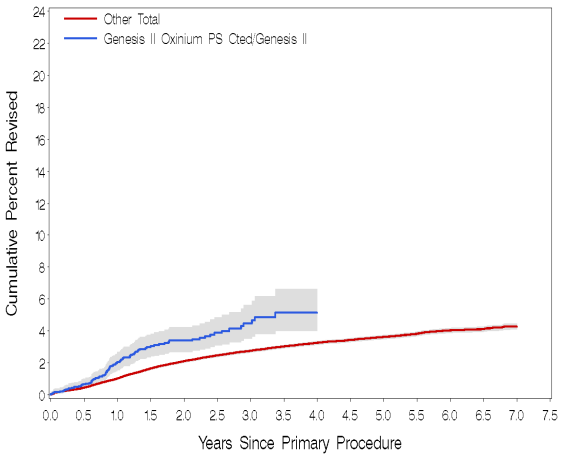
Re-identified and still used

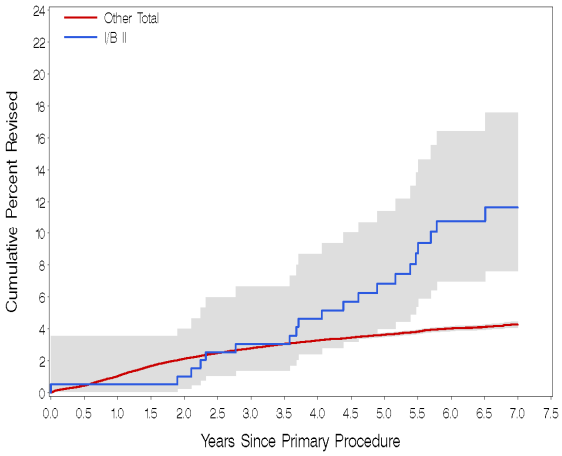


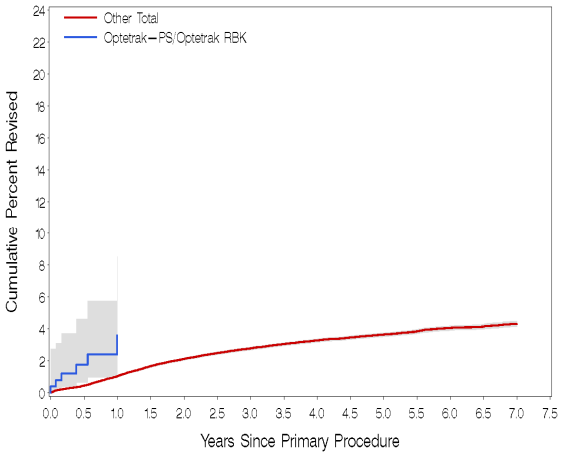


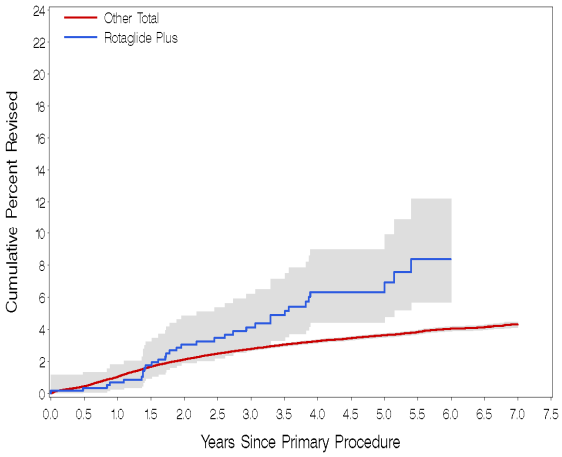
Newly Identified

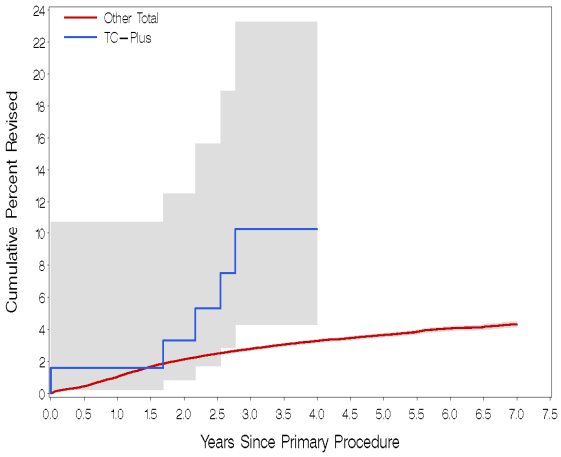












REVISION KNEE REPLACEMENT

This report is based on the analysis of 17,717 revision knee procedures recorded by the Registry. Included in this group of revisions is a subgroup containing 5,835 first revisions of a primary knee replacements that the Registry has recorded. The remaining 11,882 procedures are revisions of primary procedures performed before the implementation of the Registry. All have a procedure date up to and including the 31st December 2007.

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 only one of the femoral or tibial 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 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 it has 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 even 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 the Registry does have a record of the original primary and hence a full chronological list of all procedures subsequent to that primary. The Registry refers to this subgroup of revisions as 'revisions of known primary procedures'. These are revisions of any type of primary knee replacement recorded by the Registry. The outcome analysis reported in this section is based on determining the rate of subsequent revision of the first revision of known primary knees 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 (67.5%). The most common major revision is a major total revision involving both femoral and tibial components (70.5%). When a major partial revision is undertaken it usually involves revision of the tibial component (13.7% of all major revisions) (Table KR1).

Primary partial knee replacements may be revised by using partial or total knee prostheses. The small number of partial knee components used in revision procedures indicates that most primary partial knee replacements are revised to a total knee replacement (Table KR1). The other type of major revision that has a large number of procedures is when both components are removed and replaced with a cement spacer (5.2%) (Table KR1).

There are 5,761 minor revisions (32.5% of all revisions). Insert only exchanges comprise 40.1% of this group, 30.1% are patellar resurfacing procedures and 23.8% 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 reported to the Registry apart from a small decrease in the proportion of major partial revisions. Similarly there is little variation in the proportions of the different types of revision procedures within each state and territory apart from a slight reduction of minor revision in Western Australia and Queensland (Figure KR1).

Age and Gender

There has been a slight increase in the proportion of females undergoing knee revision in recent years. In 2007 the percentage of females being revised was 52.6% (Table KR3).

There has been little change in the age of patients undergoing revision knee surgery with the major age group in 2007 continuing to be between 65 and 74 years (32.0%) (Table KR4).

Diagnosis

The most common reason for revision is loosening (36.5%). Other major reasons for revision include infection (14.9%), tibial wear

(7.5%), pain (7.2%), lysis (6.9%) and patello-femoral pain (5.6%) (Table KR5).

Analysis of First Revision of Known Primary Knee Replacement

The essential difference between the known primary procedures subgroup of revisions compared to all revision procedures is that because the primary has been recorded by the Registry and the revision must have occurred subsequent to this, these revisions are either early or mid term revisions.

Type of Revision Knee Replacement

There are differences in the type of 'revision in the known primary' group when compared to the 'all revision' group.

The 'revision of known primary' group has a lower proportion of major revisions (63.1%) compared to the 'all revision' group (67.5%). There is also a reduction in the proportion of major revisions that are major total revisions (62.5% compared to 70.3%). Other differences include a higher proportion of femoral only major revisions (11.4% compared to 6.6%) and greater use of unicompartmental knee components (5.4% compared to 2.4%) (Table KR6). There is also a higher proportion of minor revisions (37.0% compared to 32.5%). The most common minor revisions are insert only (43.1%) and patellar resurfacing only (40.9%) (Table KR7).

Diagnosis

Diagnoses are similar between the 'revision of known primary' and 'all revision' groups with the exception of those diagnoses associated with wear. Diagnoses associated with wear occur more frequently in the 'all revision' group, with the exception of loosening which occurs in a similar proportion between the two groups. Pain and patello-femoral pain occur more frequently in the 'revision of known primary' group compared to the 'all revision' group (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. Primary unispacer, partial resurfacing, patella/trochlear and bicompart-mental procedures have been excluded from this analysis due to small numbers. First revisions revised for infection have been excluded for the same reasons as previously detailed in the outcomes of the first revision of 'known primary' hip replacements.

The outcomes of the first revision of known primary unicompartmental knee replacement (1,532 procedures) and known primary total knee replacement (3,122 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 first 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 (Table KR8).

Unicompartmental to unicompartmental revisions when combined into one group have a revision rate of 9.3 revisions per 100 observed compartment years compared to 3.0 for unicompartmental to total knee. The rate of revision of a unicompartmental to unicompartmental revision is almost three times greater than a unicompartmental to total knee (hazard ratio (adjusted for age and sex) (Adj HR)=2.97; 95% CI (2.14, 4.14) p<0.001) (Table KR10 and Figure KR3). The cumulative percent revision at five years is 29.5% for unicompartmental to unicompartmental and 12.9% for unicompartmental to total knee revision (Table KR11).

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 almost three and a half times greater than a primary total knee (Adj HR=3.41; 95% CI (2.75, 4.23)

p<0.001) (Table KR12 and Figure KR4). The cumulative percent revision of a primary total knee replacement at five years is 2.9% and a conversion of a unicompartmental knee to a total knee is 12.9% (Table KR13).

Outcome of First Revision of Known Primary Total Knee Replacement

Unlike unicompartmental knee replacement (and total hip 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 a trend of fewer re-revisions if a major revision is undertaken initially. There is no significant difference in the re-revision rate between minor, major partial and major total revisions (5.3, 5.1 and 4.2 revisions per 100 observed component years respectively) (Table KR14 and Figure KR5). At three years the cumulative percent revision of a minor revision is 15.8%, a major partial revision is 14.8% and a major total revision is 12.5% (Table KR15). The five year cumulative percent re-revision for minor revision is 19.8% and major partial revision is 18.7%.

The Registry has also directly compared the outcome of total knee revisions of both primary unicompartmental and primary total knee replacement. The subsequent risk of re-revision following the first revision of a primary total knee replacement is significantly higher than the risk of re-revision following the first revision of a primary unicompartmental knee replacement. In other words a total knee revision of a primary unicompartmental knee replacement is revised less frequently in the first four years than a total knee revision of a primary total knee replacement (Tables KR16 and KR17 and Figure KR6).

REVISION KNEE REPLACEMENT
1/9/1999 to 31/12/2007

Table KR1: Major Revisions of All Revision Knee Replacement

Components Used	Cemented		Cementless		Hybrid (Tibial Cted)		Hybrid (Tibial Cless)		N/A		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Tibial and Femoral (TKR)	6803	56.9	613	5.1	750	6.3	264	2.2	.	.	8430	70.5
Tibial Only	1550	13.0	87	0.7	.	.	.	.	.	.	1637	13.7
Femoral Only	724	6.1	69	0.6	.	.	.	.	.	.	793	6.6
Uni Tibial and Femoral (UKR)	67	0.6	6	0.1	2	0.0	4	0.0	.	.	79	0.7
Uni Tibial Only	126	1.1	13	0.1	.	.	.	.	.	.	139	1.2
Uni Femoral Only	61	0.5	2	0.0	.	.	.	.	.	.	63	0.5
Cement spacer	.	.	.	.	.	.	.	.	626	5.2	626	5.2
Removal of Prostheses	.	.	.	.	.	.	.	.	119	1.0	119	1.0
Fusion Nail	.	.	.	.	.	.	.	.	39	0.3	39	0.3
Reinsertion of Components	4	0.0	1	0.0	1	0.0	2	0.0	.	.	8	0.1
Patella/Trochlear	23	0.2	.	.	.	.	.	.	.	.	23	0.2
Total	**9358**	**78.3**	**791**	**6.6**	**753**	**6.3**	**270**	**2.3**	**784**	**6.6**	**11956**	**100.0**

Table KR2: Minor Revisions of All Revision Knee Replacement

Components Used	N	%
Insert and Patella	1370	23.8
Patella Only	1733	30.1
Insert Only	2309	40.1
Uni Insert Only	188	3.3
Cable/ Other minor components	149	2.6
Removal of patella	8	0.1
Unispacer	4	0.1
Total	**5761**	**100.0**

Figure KR1: Trends in Usage for Revision Knee Replacement by State/Territory and Year

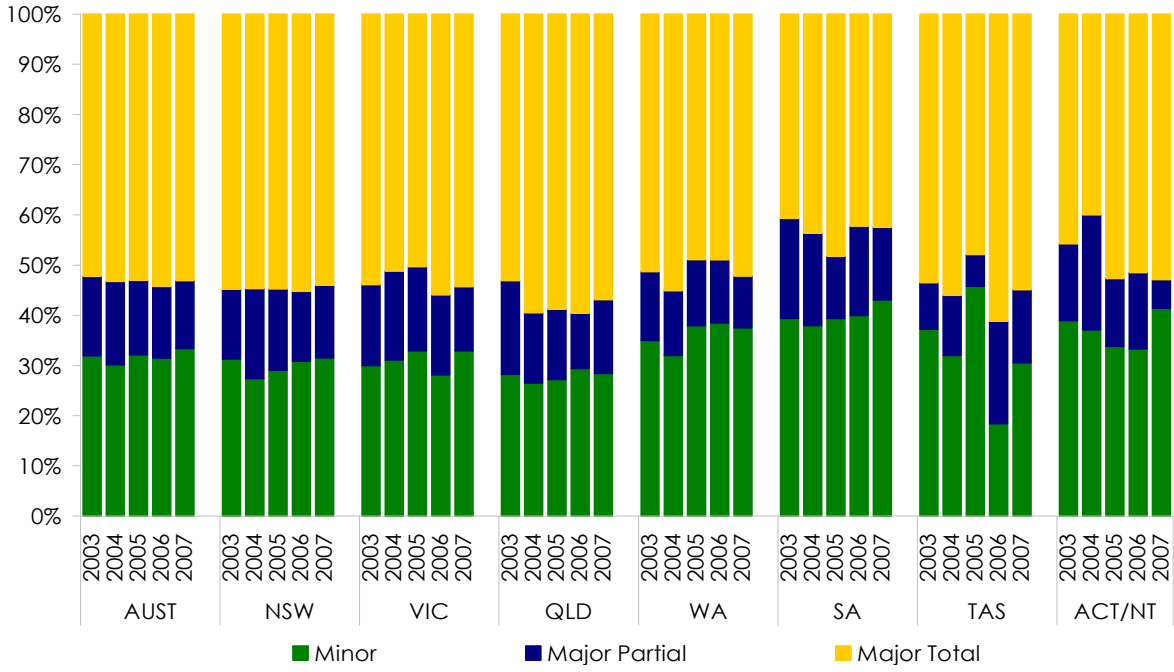


Table KR3: Revision Knee Replacement by Gender and Year

Year	Female		Male		Total	
	N	%	N	%	N	%
2003	1193	51.6	1120	48.4	2313	100.0
2004	1375	51.9	1275	48.1	2650	100.0
2005	1363	50.3	1349	49.7	2712	100.0
2006	1441	51.1	1378	48.9	2819	100.0
2007	1531	52.6	1380	47.4	2911	100.0

Table KR4: Revision Knee Replacement by Age and Year

Year	<55		55-64		65-74		75-84		≥85		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2003	215	9.3	450	19.5	753	32.6	791	34.2	104	4.5	2313	100.0
2004	274	10.3	590	22.3	885	33.4	794	30.0	107	4.0	2650	100.0
2005	230	8.5	574	21.2	923	34.0	868	32.0	117	4.3	2712	100.0
2006	246	8.7	664	23.6	925	32.8	851	30.2	133	4.7	2819	100.0
2007	261	9.0	695	23.9	932	32.0	862	29.6	161	5.5	2911	100.0

Table KR5: Revision Diagnosis of Revision Knee Replacement

Diagnosis	Revisions of Known Primary		All Revisions	
	N	%	N	%
Loosening	2198	35.1	7382	36.5
Infection	1009	16.1	3017	14.9
Wear Tibial	93	1.5	1524	7.5
Pain	727	11.6	1451	7.2
Lysis	118	1.9	1384	6.9
Patello Femoral Pain	571	9.1	1128	5.6
Implant Breakage Tibial	57	0.9	665	3.3
Progression of Disease	310	5.0	623	3.1
Instability	238	3.8	585	2.9
Fracture	158	2.5	418	2.1
Arthrofibrosis	193	3.1	337	1.7
Other	93	1.5	311	1.5
Implant Breakage Patella	31	0.5	254	1.3
Malalignment	112	1.8	201	1.0
Wear Patella	14	0.2	196	1.0
Synovitis	42	0.7	129	0.6
Implant Breakage Femoral	22	0.4	123	0.6
Bearing/Dislocation	64	1.0	113	0.6
Incorrect Sizing	73	1.2	110	0.5
Dislocation	57	0.9	103	0.5
Patella Maltracking	32	0.5	86	0.4
Avascular Necrosis	25	0.4	33	0.2
Patella Erosion	17	0.3	18	0.1
Heterotopic Bone	2	0.0	11	0.1
Total	**6255**	**100.0**	**20201**	**100.0**

Note: Some patients have multiple diagnoses.

'Revision of Known Primary' Knee Replacement

Table KR6: Major 'Revision of Known Primary' Revision Knee Replacement

Components Used	Cemented		Cementless		Hybrid (Tibial Cted)		Hybrid (Tibial Cless)		N/A		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Tibial and Femoral	1649	44.9	257	7.0	322	8.8	69	1.9	.	.	2297	62.5
Tibial Only	471	12.8	27	0.7	.	.	.	.	.	.	498	13.5
Femoral Only	393	10.7	25	0.7	.	.	.	.	.	.	418	11.4
Uni Tibial and Femoral	41	1.1	4	0.1	2	0.1	3	0.1	.	.	50	1.4
Uni Tibial Only	95	2.6	10	0.3	.	.	.	.	.	.	105	2.9
Uni Femoral Only	41	1.1	1	0.0	.	.	.	.	.	.	42	1.1
Cement spacer	.	.	.	.	.	.	.	.	199	5.4	199	5.4
Removal of Prostheses	.	.	.	.	.	.	.	.	48	1.3	48	1.3
Fusion Nail	.	.	.	.	.	.	.	.	4	0.1	4	0.1
Reinsertion of Components	3	0.1	1	0.0	1	0.0	1	0.0	.	.	6	0.2
Patella/Trochlear	9	0.2	.	.	.	.	.	.	.	.	9	0.2
Total	**2702**	**73.5**	**325**	**8.8**	**325**	**8.8**	**73**	**2.0**	**251**	**6.8**	**3676**	**100.0**

Table KR7: Minor 'Revision of Known Primary' Revision Knee Replacement

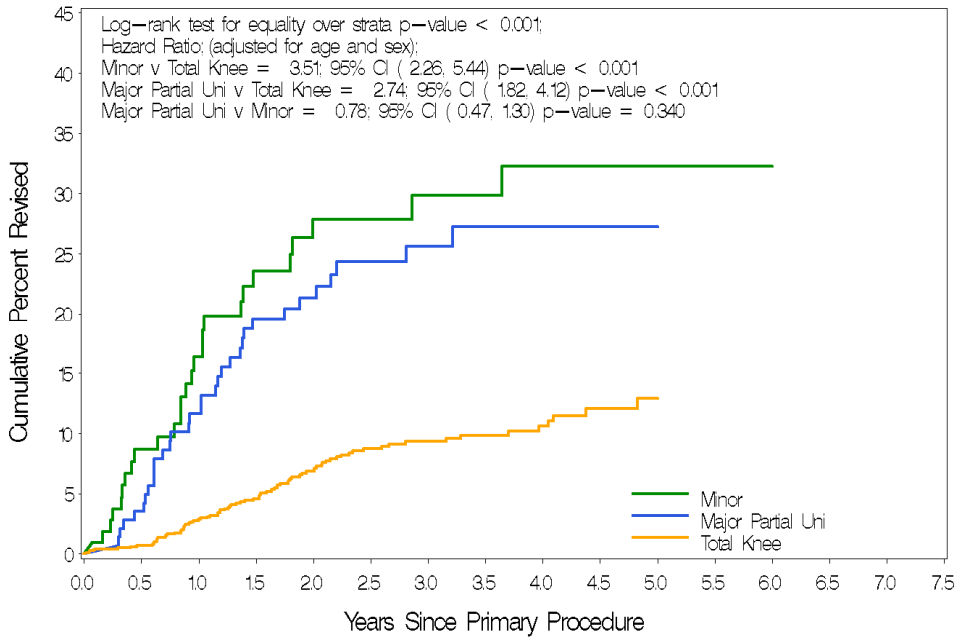
Components Used	N	%
Insert and Patella	299	13.8
Patella Only	882	40.9
Insert Only	930	43.1
Cable/ Other minor components	44	2.0
Unispacer	4	0.2
Total	**2159**	**100.0**

Table KR8: Outcome of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

Primary UKR Revision	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Minor	27	111	255	10.6	(6.98, 15.42
Major Partial Uni	33	146	377	8.8	(6.02, 12.29)
Major Total Uni	4	24	57	7.0	(1.92, 18.04)
Revision to TKR	86	1251	2856	3.0	(2.41, 3.72)
Total	**150**	**1532**	**3545**	**4.2**	**(3.58, 4.97)**

Note: Excluding revisions where no minor or major tibial or femoral components have been inserted.
Excluding 3 Patella/Trochlear Resurfacing Revisions.

Figure KR2: Cumulative Percent Revision of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Minor	111	74	47	34	24	15	5	1
Major Partial Uni	146	116	82	54	33	18	6	0
Revision to TKR	1251	927	633	400	211	88	17	1

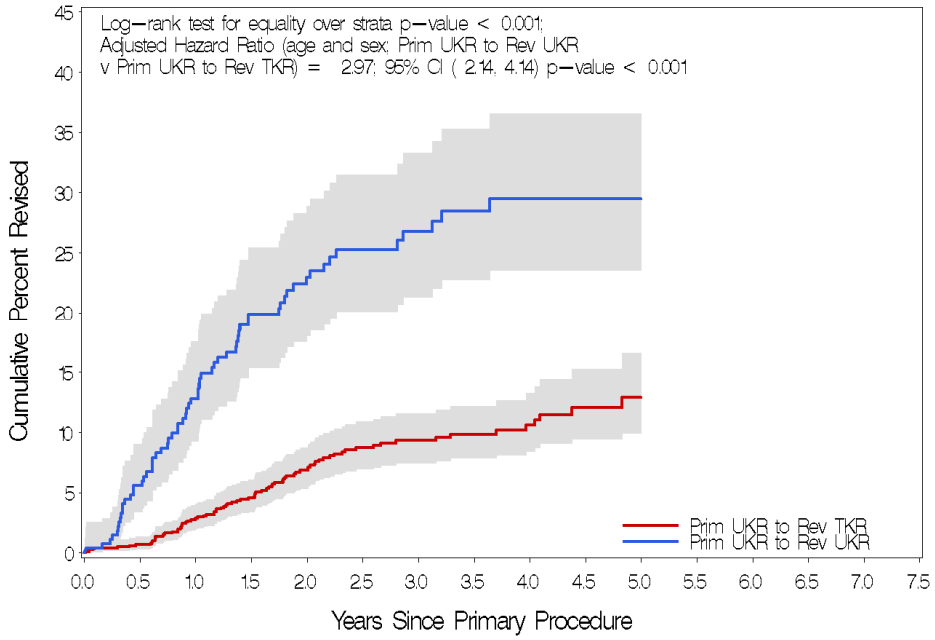
Table KR9: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Minor	16.3 (10.3, 25.4)	27.9 (19.6, 38.7)	29.9 (21.1, 41.2)	32.3 (22.9, 44.3)	
Major Partial Uni	11.6 (7.3, 18.3)	21.3 (15.2, 29.4)	25.6 (18.7, 34.5)	27.2 (19.9, 36.6)	
Revision to TKR	2.8 (2.0, 4.1)	6.8 (5.3, 8.7)	9.3 (7.5, 11.6)	12.9 (10.0, 16.6)	

Table KR10: Outcome of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

Procedure	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Prim UKR to Rev TKR	86	1251	2856	3.0	(2.41, 3.72)
Prim UKR to Rev UKR	64	281	689	9.3	(7.16, 11.87)
Total	**150**	**1532**	**3545**	**4.2**	**(3.58, 4.97)**

Figure KR3: Cumulative Percent Revision of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Prim UKR to Rev TKR	1251	927	633	400	211	88	17	1
Prim UKR to Rev UKR	281	207	140	93	61	36	13	3

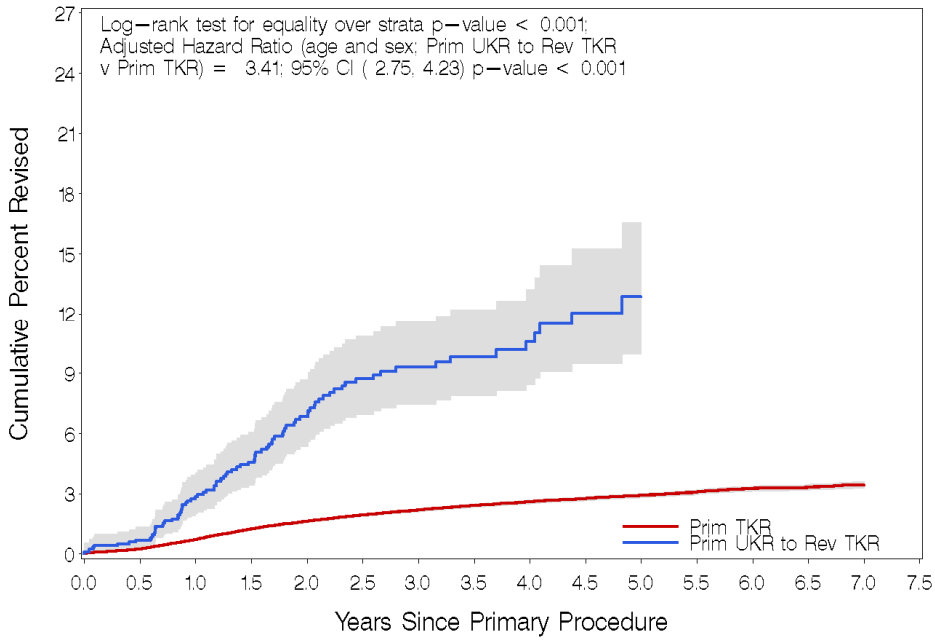
Table KR11: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Prim UKR to Rev TKR	2.8 (2.0, 4.1)	6.8 (5.3, 8.7)	9.3 (7.5, 11.6)	12.9 (10.0, 16.6)	
Prim UKR to Rev UKR	12.8 (9.3, 17.6)	22.9 (18.0, 28.9)	26.8 (21.3, 33.3)	29.5 (23.6, 36.5)	

Table KR12: Outcome of Primary Total Knee Replacement and Total Knee 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

Procedure	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Prim UKR to Rev TKR	86	1251	2856	3.0	(2.41, 3.72)
Prim TKR	3160	163837	494340	0.6	(0.62, 0.66)
Total	**3245**	**165088**	**497199**	**0.7**	**(0.63, 0.68)**

Figure KR4: Cumulative Percent Revision of Primary Total Knee Replacement and Total Knee 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Prim UKR to Rev TKR	1251	927	633	400	211	88	17	1
Prim TKR	163837	132386	103033	76032	52607	32013	14504	3713

Table KR13: Yearly Cumulative Percent Revision of Primary Total Knee Replacement and Total Knee 'Revision of Known Primary' Unicompartmental Knee Replacement (excluding Infection)

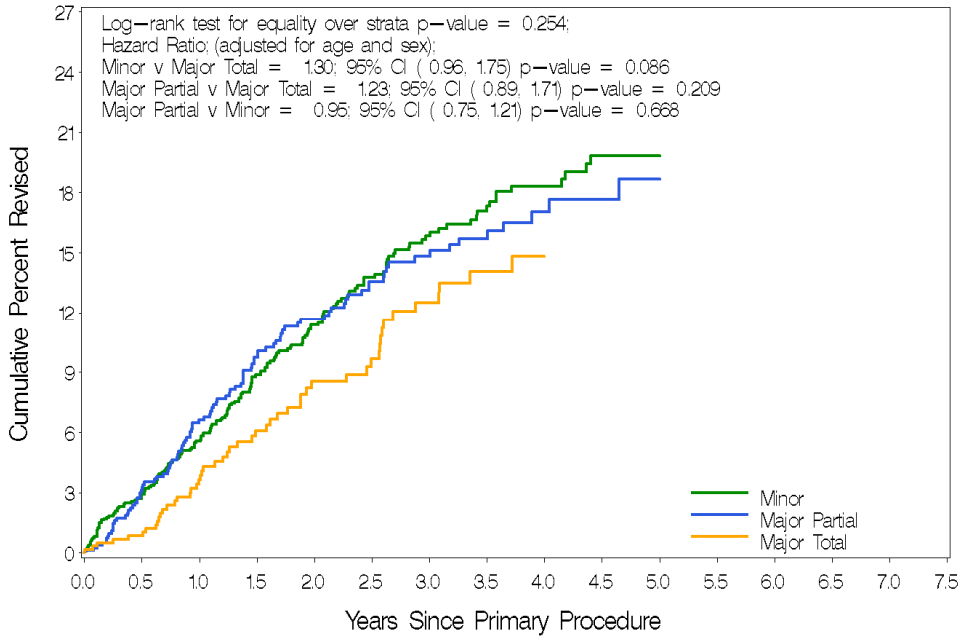
CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Prim UKR to Rev TKR	2.8 (2.0, 4.1)	6.8 (5.3, 8.7)	9.3 (7.5, 11.6)	12.9 (10.0, 16.6)	
Prim TKR	0.7 (0.7, 0.7)	1.6 (1.6, 1.7)	2.2 (2.1, 2.3)	2.9 (2.8, 3.0)	3.4 (3.3, 3.6)

Table KR14: Outcome of 'Revision of Known Primary' Total Knee Replacement (excluding Infection)

Primary Total Knee Revision	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Minor	190	1623	3562	5.3	(4.60, 6.15)
Major Partial	103	861	2026	5.1	(4.15, 6.17)
Major Total	56	638	1343	4.2	(3.15, 5.41)
Total	**349**	**3122**	**6931**	**5.0**	**(4.52, 5.59)**

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

Figure KR5: Cumulative Percent Revision of 'Revision of Known Primary' Total Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Minor	1623	1151	779	460	251	121	33	7
Major Partial	861	643	459	301	140	60	15	1
Major Total	638	438	278	189	97	39	7	1

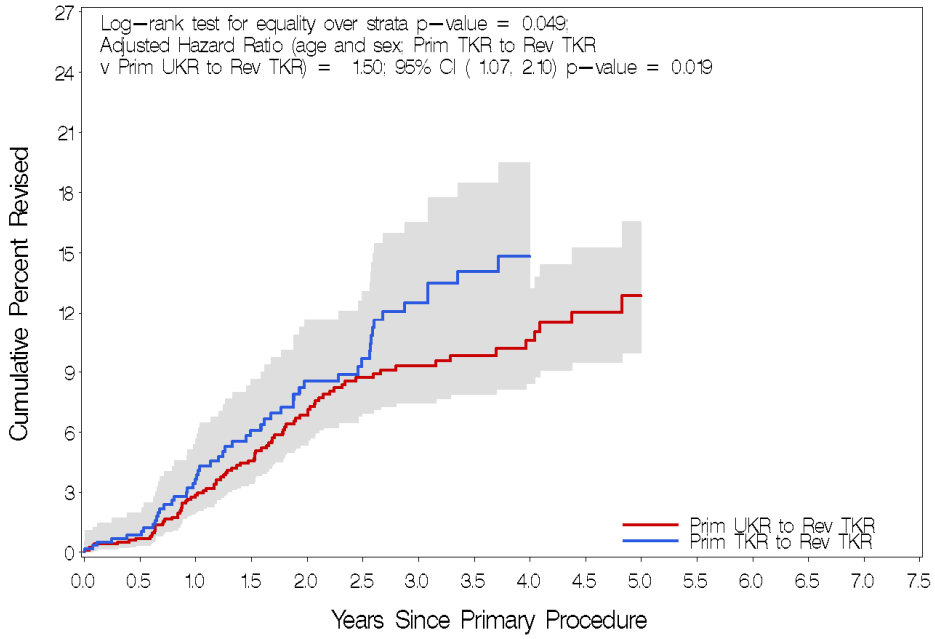
Table KR15: Yearly Cumulative Percent Revision of 'Revision of Known Primary' Total Knee Replacement (excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Minor	5.6 (4.5, 6.9)	11.4 (9.7, 13.3)	15.8 (13.7, 18.3)	19.8 (17.0, 23.0)	
Major Partial	6.6 (5.1, 8.7)	11.7 (9.5, 14.3)	14.8 (12.2, 17.9)	18.7 (15.0, 23.1)	
Major Total	3.6 (2.3, 5.7)	8.5 (6.2, 11.7)	12.5 (9.4, 16.5)		

Table KR16: Outcome of Total Knee 'Revision of Known Primary' Total and Unicompartmental Knee Replacement (excluding Infection)

Type of Revision Knee	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Prim TKR to Rev TKR	56	638	1343	4.2	(3.15, 5.41)
Prim UKR to Rev TKR	86	1251	2856	3.0	(2.41, 3.72)
Total	**142**	**1889**	**4200**	**3.4**	**(2.85, 3.99)**

Figure KR6: Cumulative Percent Revision of Total Knee 'Revision of Known Primary' Total and Unicompartmental Knee Replacement (excluding Infection)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Prim TKR to Rev TKR	638	438	278	189	97	39	7	1
Prim UKR to Rev TKR	1251	927	633	400	211	88	17	1

Table KR17: Yearly Cumulative Percent Revision of Total Knee 'Revision of Known Primary' Total and Unicompartmental Knee Replacement (excluding Infection)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Prim TKR to Rev TKR	3.6 (2.3, 5.7)	8.5 (6.2, 11.7)	12.5 (9.4, 16.5)		
Prim UKR to Rev TKR	2.8 (2.0, 4.1)	6.8 (5.3, 8.7)	9.3 (7.5, 11.6)	12.9 (10.0, 16.6)	

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 2007.

Usage

Antibiotic cement is used more commonly in cemented primary hip and knee replacement compared to plain cement. A procedure is identified as having antibiotic cement if at least one of the components uses antibiotic cement.

In 2003 antibiotic cement was used in 63.2% of primary conventional total hip replacement and 62.9% of primary total knee replacement when cement was used. This has progressively increased and in 2007, when cement was used, antibiotic cement was used in 84.6% of primary conventional total hip replacement and 82.9% of primary total knee replacement (Figures C1 and C2). This trend is evident in all states and territories for both primary conventional total hip and total knee replacements with the exception of Western Australia where there has been a decline in the use of antibiotic cement from 85.4% in 2006 to 76.0% in 2007 in conventional total hip replacement (Figures C1 and C2).

Primary Hip Replacement

In recent years the number of different types of cement used in primary hip replacement has increased. This increase continued in 2007 with the number of different types of cement used with femoral stem fixation increasing from 48 in 2006 to 52 in 2007. The number of different types of cement used for acetabular fixation also increased from 37 in 2006 to 40 in 2007 (Table C1).

The most common cement used for both femoral stem and acetabular cup fixation is Simplex Tobra. The ten most frequently used cements accounted for 91.8% of all cemented procedures for the femoral component and 95.6% for the acetabular component (Table C1).

Primary Knee Replacement

In 2007 there was also an increase in the number of different types of cement used in primary knee replacement. The number of cement types used for femoral component fixation increased from 47 in 2006 to 50 in 2007, tibial component fixation increased from 46 to 50 and for patellar fixation increased from 45 to 48 (Table C2).

CMW 1 G is the most frequently used cement for fixation of the femoral and tibial components, and Simplex Tobra for the patellar component. The ten most frequently used cements accounted for 92.3% of all cemented procedures for the femoral component, 92.4% for the tibial component and 91.5% for the patellar component (Table C2).

Revision Hip Replacement

The types of cement used in revision procedures are listed separately for femoral stem and acetabular components cemented as part of the revision procedure (Table C3). There is a smaller number of cement types used in revision hip replacement compared to primary procedures (39 for femoral stems and 34 for acetabular components). The top ten cement types account for 92.8% of all procedures where the femoral stem is cemented and 95.6% when the acetabular component is cemented.

When considering the ten most frequently used cements, the main difference in the cement type used is that plain cement is used less often in revision than primary procedures. Of the 10 most frequently used cements in the femoral stem for primary and revision hips only two are plain cement, Simplex P and CMW 1 Plain. These two cements are used in 28.0% of cemented primary femoral stems and 13.5% of cemented revision femoral stems.

Of the 10 most frequently used cements in the acetabulum for primary and revision hips only three are plain cement, CMW 1 Plain, Simplex P and CMW 2 Plain. These three cements account for 32.0% of primary procedures and 12.9% of revision procedures when the acetabular component is cemented.

Simplex Tobra is the most commonly used cement (33.3%) in cemented femoral revisions, and CMW1 G the most common (23.6%) in cemented acetabular revisions (Table C3).

Revision Knee Replacement

The types of cement used in revision knee procedures are also listed separately for femoral, tibial and patellar components cemented as part of a revision procedure (Table C4). Similar to revision hips there is a smaller number of cement types used compared to primary procedures (39 for femoral and patellar components and 41 for tibial components). The ten most common cements are used in 92.6% of all cemented femoral revisions, 92.5% of cemented tibial

revisions and 92.4% of cemented patellar revisions (Table C4).

When considering the ten most frequently used cements, the main difference in the cement types used when femoral and tibial components are cemented is that plain cement is used less often in revision than primary procedures. This difference is not evident when comparing cemented patellar primary and revision procedures.

There are three types of plain cement used in the 10 most frequently used cements for both primary and revision knee procedures (Simplex P, CMW 1 Plain and CMW 2 Plain.). These are used in 23.1% of cemented primary and 11.2% of cemented revision femoral components. In cemented tibial procedures these three plain cements are used in 26.8% of cemented primary and 12.5% of the cemented revision procedures. When the patellar component is cemented these three plain cements are used in 25.2% of primary and 22.7% of revisions procedures (Table C4).

CMW 1 G is the most frequently used cement in cemented revision procedures for all three components (20.0%, 20.5% and 15.6% respectively) (Table C4).

Outcomes of Primary Hip and Knee Replacement

The Registry has compared the outcomes of the use of cement with and without antibiotics in primary conventional total hip and total knee replacements.

Primary Conventional Total Hip Replacement

When cement is used in primary conventional total hip replacement, it may be used for either or both the femoral stem or acetabular cup. The Registry records whether antibiotic or plain cement is used for both the femoral and acetabular component or if a combination of antibiotic or plain cement is used for one or other of the two components (Table C5).

There is no significant difference in the risk of revision between antibiotic and plain cement (Tables C6 and C7 and Figure C3). There are however some differences in the reasons for revision. The number of revisions for infection is lower if antibiotic cement is used (0.4%) than if plain cement is used (0.6%), as is the number of revisions for loosening and lysis (0.7% for antibiotic cement and 1.3% for plain). Conversely, there are more revisions for dislocation when antibiotic cement is used (0.8%) than when plain cement is used (0.6%) (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

When using cement in primary total knee replacement, plain cement has a significantly higher risk of revision compared to when antibiotic cement is used (hazard ratio (adjusted for age and sex)=1.15; 95% CI (1.04, 1.27) p=0.005) (Tables C9, C10 and C11 and Figure C4). When examining the reasons for revision there is a higher number of revisions for infection when plain cement is used (0.9%) compared to when antibiotic cement is used (0.6%). There is also more revisions for loosening and lysis when using plain cement (1.1%) compared to antibiotic cement (0.6%).

CEMENT IN HIP AND KNEE REPLACEMENT
1/9/1999 – 31/12/2007

Figure C1: Trends in Usage of Antibiotic Cement in Primary Conventional Total Hip Replacement by State/Territory and Year

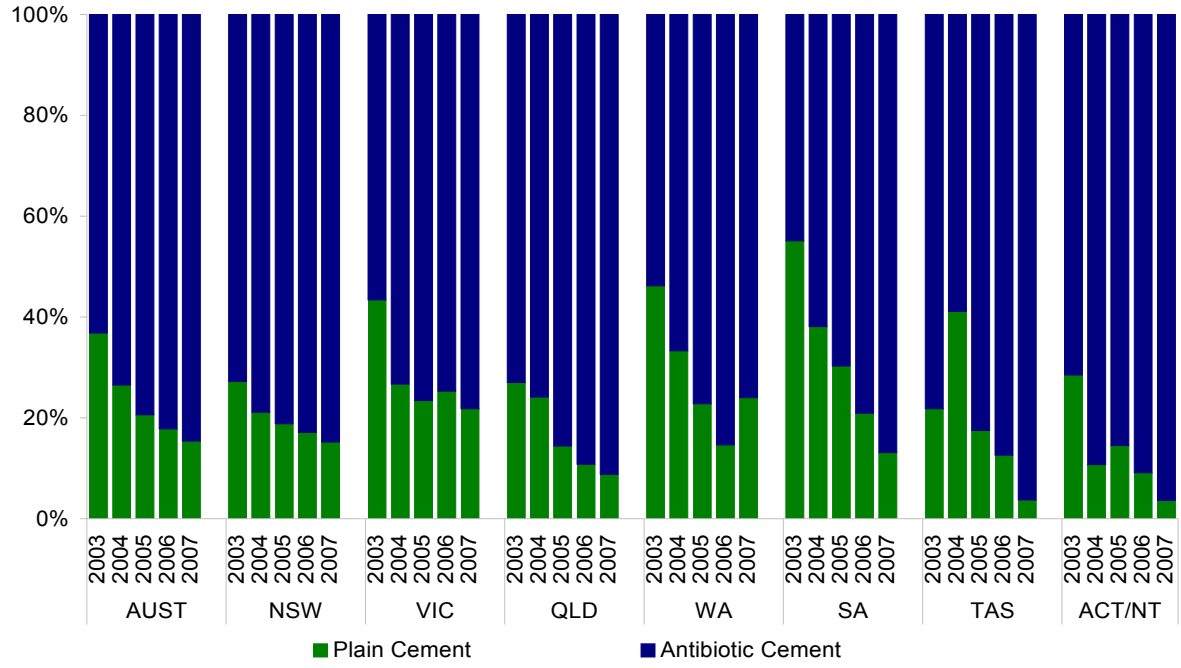


Figure C2: Trends in Usage of Antibiotic Cement in Primary Total Knee Replacement by State/Territory and Year

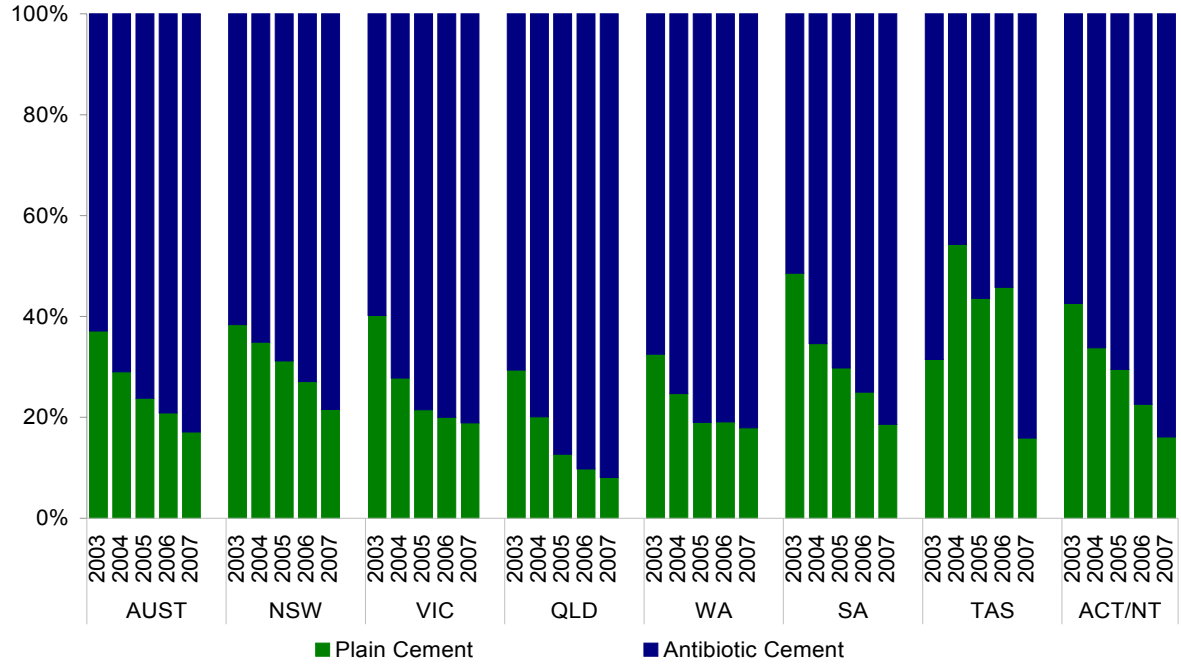


Table C1: Top 10 Cements used in Primary Hip Replacement by location

Femur	N	%	Acetabulum	N	%
Simplex Tobra*	21049	28.0	Simplex Tobra*	3435	21.0
Simplex P	17483	23.3	CMW 1 Plain	2420	14.8
Antibiotic Simplex*	13712	18.2	Simplex P	2195	13.4
CMW 1 G*	4763	6.3	CMW 1 G*	2005	12.2
CMW 1 Plain	3551	4.7	Palacos R*	1564	9.5
Palacos R*	2912	3.9	Antibiotic Simplex*	1520	9.3
Palamed G*	1844	2.5	CMW 2 G*	1068	6.5
CMW 3 G*	1711	2.3	Palamed G*	648	4.0
Palacos E*	1133	1.5	CMW 2 Plain	629	3.8
Palacos R+G*	851	1.1	Palacos R+G*	185	1.1
Other (42)	6126	8.2	Other (30)	717	4.4
Total	**75135**	**100.0**	**Total**	**16386**	**100.0**

Note: More than one type of cement was used in some procedures.
Primary hip replacement does not include partial, total resurfacing or thrust plates.

Table C2: Top 10 Cements used in Primary Knee Replacement by location

Femur	N	%	Tibia	N	%	Patella	N	%
CMW 1 G*	17152	15.7	CMW 1 G*	22339	15.2	Simplex Tobra*	8745	13.0
Simplex Tobra*	13233	12.1	Simplex Tobra*	18193	12.4	CMW 1 G*	8546	12.7
Antibiotic Simplex*	10836	9.9	Simplex P	16097	10.9	Antibiotic Simplex*	7813	11.6
Simplex P	10725	9.8	Antibiotic Simplex*	14224	9.7	Simplex P	6374	9.5
Palamed G*	10366	9.5	CMW 1 Plain	12581	8.6	Palamed G*	5769	8.6
Palacos R*	9214	8.4	Palamed G*	12023	8.2	CMW 2 Plain	5679	8.4
CMW 1 Plain	8749	8.0	CMW 2 G*	11494	7.8	Palacos R*	5037	7.5
CMW 2 G*	8460	7.8	Palacos R*	11009	7.5	CMW 2 G*	5017	7.5
Palacos R+G*	6294	5.8	CMW 2 Plain	10794	7.3	CMW 1 Plain	4876	7.3
CMW 2 Plain	5673	5.2	Palacos R+G*	7138	4.9	Palacos R+G*	3631	5.4
Other (40)	8358	7.7	Other (40)	11207	7.6	Other (38)	5742	8.5
Total	**109060**	**100.0**	**Total**	**147099**	**100.0**	**Total**	**67229**	**100.0**

Note: More than one type of cement was used in some procedures.
Primary Knee Replacement does not include partial resurfacing.

Table C3: Top 10 Cements used in Revision Hip Replacement by location

Femur	N	%	Acetabulum	N	%
Simplex Tobra*	1652	33.3	CMW 1 G*	1190	23.6
Antibiotic Simplex*	1033	20.8	Simplex Tobra*	977	19.4
Simplex P	523	10.5	Palacos R*	647	12.8
CMW 1 G*	428	8.6	Antibiotic Simplex*	577	11.4
Palacos R*	323	6.5	CMW 2 G*	340	6.7
Palamed G*	199	4.0	CMW 1 Plain	304	6.0
CMW 1 Plain	147	3.0	Palamed G*	297	5.9
Palacos R+G*	121	2.4	Simplex P	233	4.6
CMW 3 G*	103	2.1	Palacos R+G*	145	2.9
CMW 2 G*	77	1.6	CMW 2 Plain	115	2.3
Other (29)	356	7.2	Other (24)	222	4.4
Total	**4962**	**100.0**	**Total**	**5047**	**100.0**

Note: More than one type of cement was used in some procedures.

Table C4: Top 10 Cements used in Revision Knee Replacement by location

Femur	N	%	Tibia	N	%	Patella	N	%
CMW 1 G*	1766	20.0	CMW 1 G*	2094	20.5	CMW 1 G*	1148	15.6
Simplex Tobra*	1257	14.2	Simplex Tobra*	1399	13.7	CMW 2 G*	993	13.5
Palacos R*	1006	11.4	Palacos R*	1108	10.8	CMW 2 Plain	871	11.9
Antibiotic Simplex*	995	11.3	Antibiotic Simplex*	1093	10.7	Simplex Tobra*	826	11.3
Palamed G*	886	10.0	Palamed G*	976	9.6	Antibiotic Simplex*	659	9.0
CMW 2 G*	783	8.9	CMW 2 G*	942	9.2	Palacos R*	659	9.0
Palacos R+G*	498	5.6	Palacos R+G*	557	5.5	Palamed G*	519	7.1
Simplex P	385	4.4	Simplex P	438	4.3	Simplex P	470	6.4
CMW 1 Plain	311	3.5	CMW 2 Plain	436	4.3	CMW 1 Plain	323	4.4
CMW 2 Plain	289	3.3	CMW 1 Plain	401	3.9	Palacos R+G*	317	4.3
Other (29)	655	7.4	Other (31)	770	7.5	Other (29)	555	7.6
Total	**8831**	**100.0**	**Total**	**10214**	**100.0**	**Total**	**7340**	**100.0**

Note: More than one type of cement was used in some procedures.

Cement in Primary Conventional Total Hip Replacement

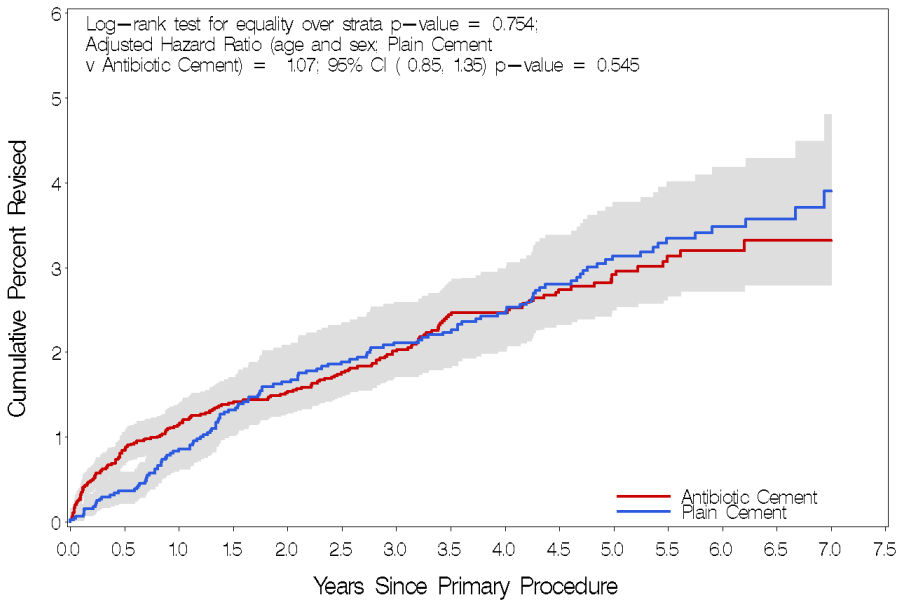
Table C5: Cemented Primary Conventional Total Hip Replacement requiring Revision by Cement Type

Antibiotic Status Femoral - Acetabular	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Antibiotic - Antibiotic	164	7856	26113	0.6	(0.54, 0.73)
Antibiotic - Plain	8	229	836	1.0	(0.41, 1.89)
Plain - Antibiotic	16	665	2387	0.7	(0.38, 1.09)
Plain - Plain	124	4482	20373	0.6	(0.51, 0.73)
Total	**312**	**13232**	**49709**	**0.6**	**(0.56, 0.70)**

Table C6: Cemented Primary Conventional Total Hip Replacement requiring Revision by Cement Type

Antibiotic Status	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Plain Cement	124	4482	20373	0.6	(0.51, 0.73)
Antibiotic Cement	188	8750	29336	0.6	(0.55, 0.74)
Total	**312**	**13232**	**49709**	**0.6**	**(0.56, 0.70)**

Figure C3: Cumulative Percent Revision of Cemented Primary Conventional Total Hip Replacement by Cement Type



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Plain Cement	4482	4166	3789	3373	2866	2165	1298	446
Antibiotic Cement	8750	7476	6122	4761	3370	2126	1005	234

Table C7: Yearly Cumulative Percent Revision of Cemented Primary Conventional Total Hip Replacement by Cement Type (Primary Diagnosis OA)

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Plain Cement	0.9 (0.6, 1.2)	1.6 (1.3, 2.1)	2.1 (1.7, 2.6)	3.1 (2.6, 3.8)	3.9 (3.2, 4.8)
Antibiotic Cement	1.1 (0.9, 1.4)	1.5 (1.3, 1.8)	2.0 (1.7, 2.4)	2.9 (2.5, 3.4)	3.3 (2.8, 3.9)

Table C8: Revision Diagnosis for Primary Conventional Total Hip Replacement by Cement Type

Diagnosis	Antibiotic		Plain	
	N	%	N	%
Dislocation of Prosthesis	72	0.8	27	0.6
Fracture	18	0.2	13	0.3
Infection	37	0.4	28	0.6
Loosening/Lysis	63	0.7	59	1.3
Other	8	0.1	5	0.1
Total	**198**	**2.3**	**132**	**2.9**

Cement in Primary Total Knee Replacement

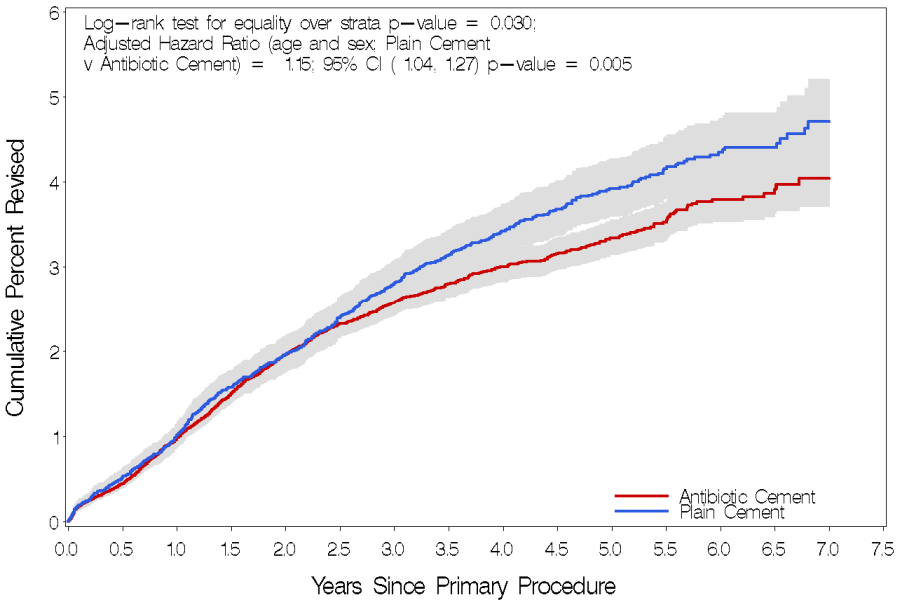
Table C9: Cemented Primary Total Knee Replacement requiring Revision by Cement Type

Antibiotic Status Femoral - Tibia	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Antibiotic - Antibiotic	1273	60602	161047	0.8	(0.75, 0.84)
Antibiotic - Plain	7	435	1595	0.4	(0.18, 0.90)
Plain - Antibiotic	10	238	787	1.3	(0.61, 2.34)
Plain - Plain	561	18325	69184	0.8	(0.75, 0.88)
Total	**1851**	**79600**	**232613**	**0.8**	**(0.76, 0.83)**

Table C10: Cemented Primary Total Knee Replacement requiring Revision by Cement Type

Antibiotic Status	Number Revised	Total Number	Observed Component Years	Revisions per 100 Observed Component Years	Exact 95% CI
Plain Cement	561	18325	69184	0.8	(0.75, 0.88)
Antibiotic Cement	1290	61275	163429	0.8	(0.75, 0.83)
Total	**1851**	**79600**	**232613**	**0.8**	**(0.76, 0.83)**

Table C4: Cumulative Percent Revision of Cemented Primary Total Knee Replacement requiring Revision by Cement Type



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Plain Cement	18325	16072	13606	11239	8884	6012	3284	931
Antibiotic Cement	61275	46939	34577	23904	15125	8802	3723	831

Table C11: Yearly Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type

CPR	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Plain Cement	1.0 (0.9, 1.2)	2.0 (1.8, 2.2)	2.8 (2.6, 3.1)	3.9 (3.6, 4.3)	4.7 (4.3, 5.2)
Antibiotic Cement	1.0 (0.9, 1.1)	2.0 (1.8, 2.1)	2.6 (2.4, 2.7)	3.3 (3.1, 3.6)	4.0 (3.7, 4.4)

Table C12: Revision Diagnosis for Primary Total Knee Replacement by Cement Type

Diagnosis	Antibiotic		Plain	
	N	%	N	%
Fracture	27	0.0	15	0.1
Infection	386	0.6	156	0.9
Loosening/Lysis	376	0.6	193	1.1
Pain	136	0.2	41	0.2
Other	444	0.7	199	1.1
Total	**1369**	**2.2**	**604**	**3.3**

Mortality following Primary Hip and Knee Replacement

Mortality information has been obtained by matching all Registry data up to and including 31st December 2007 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 sex 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 sex differences within groups, the adjusted measure may be used to compare the mortality of different procedures and will become useful in 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 (31st December 2007). This provides a true rate. Exact confidence intervals based on the Poisson distribution of the number of observed deaths are also given.

Mortality Associated with Primary Hip Replacement

The mortality associated with hip replacement varies depending on the category and there has been little change in mortality trends over the last year. As would be anticipated, crude cumulative mortality of primary partial hip replacement is high (45.4%) compared to primary total hip (6.6%). This is also reflected in the mortality rate per 100 person years, 21.2 for partial and 2.0 for primary total hip replacement. After standardising mortality for age and sex these differences are still apparent, 23.3% for partial and 2.4% for primary hip replacement (Table M1).

The risk of death for partial hip replacement is over five times greater than primary total hip replacement (hazard ratio (adjusted for age and sex) (Adj HR)=5.22; 95% CI (5.05, 5.40) p<0.001) (Figure M1). At seven years 68.3% of patients with primary partial hip replacement have died, compared 14.1% of patients with total hip replacement (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 seven years, the mortality following bipolar and unipolar modular hip replacement is over 55% compared to 79% mortality following unipolar monoblock hip replacement (Tables M3 and M4 and Figure M2). As previously reported for unipolar monoblock hip replacement, there is a significant difference in the risk of mortality between Austin Moore type and Thompson type prostheses. The mortality at seven years for Austin Moore type prostheses is 77.6% and for Thompson type prostheses is 75.4%. (Tables M5 and M6 and Figure M3).

With regard to primary total hip replacement, both total resurfacing and thrust plate procedures have a cumulative mortality of 0.9% and 1.4% respectively, compared to 7.1% for conventional total hip replacement. After standardising for age and sex, the mortality rate for total resurfacing is 0.6, thrust plate is 0.5 and conventional total hip replacement is 2.6 (Table M3). This difference is almost certainly related to the younger age of individuals receiving total resurfacing and thrust plate procedures.

Mortality Associated with Primary Knee Replacement

Trends previously reported for mortality following knee replacement remain unchanged. The cumulative mortality varies according to the extent of the procedure. There were no deaths recorded for unispacer, partial resurfacing and bicompartmental replacement. The cumulative mortality for patella/trochlear replacement is 2.3%, unicompartmental is 3.5% and primary total is 5.4% (Table M7). After adjusting for age and sex, primary total knee replacement has a higher mortality than unicompartmental knee replacement (Adj HR=1.37; 95% CI (1.27, 1.48) p<0.001) (Figure M4).

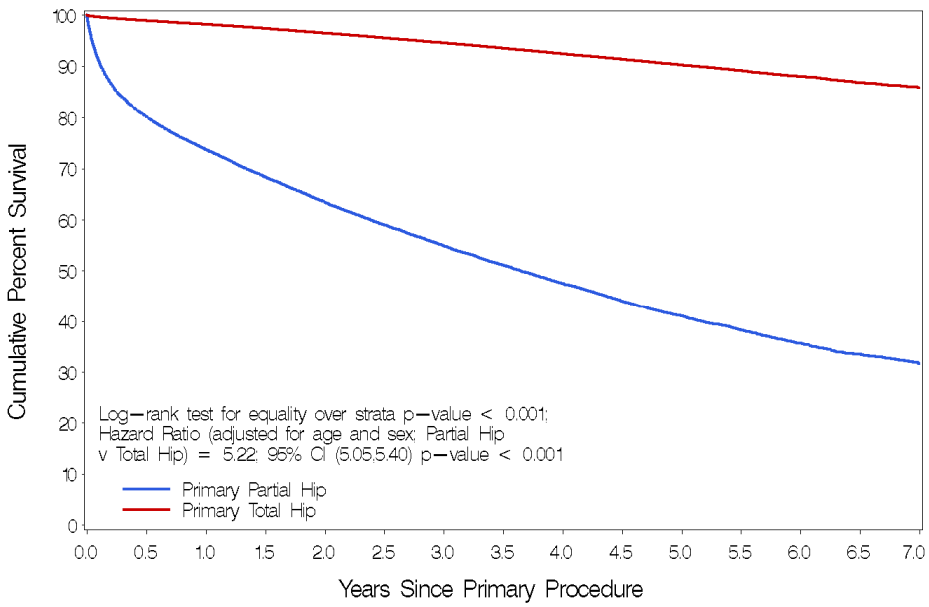
MORTALITY FOLLOWING PRIMARY HIP AND KNEE REPLACEMENT
1/9/1999 – 31/12/2007

Primary Hip Replacement

Table M1: Mortality following Primary Hip Replacement

Type of Hip Replacement	Number Deaths	Number Patients	Cumulative Mortality (% deaths)	Standardised Mortality	Person Years	Rate per 100 Person Years	Exact 95% CI
Primary Partial Hip	13850	30491	45.4	23.3	65402	21.2	(20.83, 21.53)
Primary Total Hip	7665	115823	6.6	2.4	379067	2.0	(1.98, 2.07)
Total	**21515**	**146314**	**14.7**	**3.8**	**444469**	**4.8**	**(4.78, 4.91)**

Figure M1: Cumulative Percent Survival of Primary Hip Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Partial Hip	30491	19120	13518	9163	5743	3212	1361	358
Total Hip	115823	96616	78087	60310	43372	27685	13240	3405

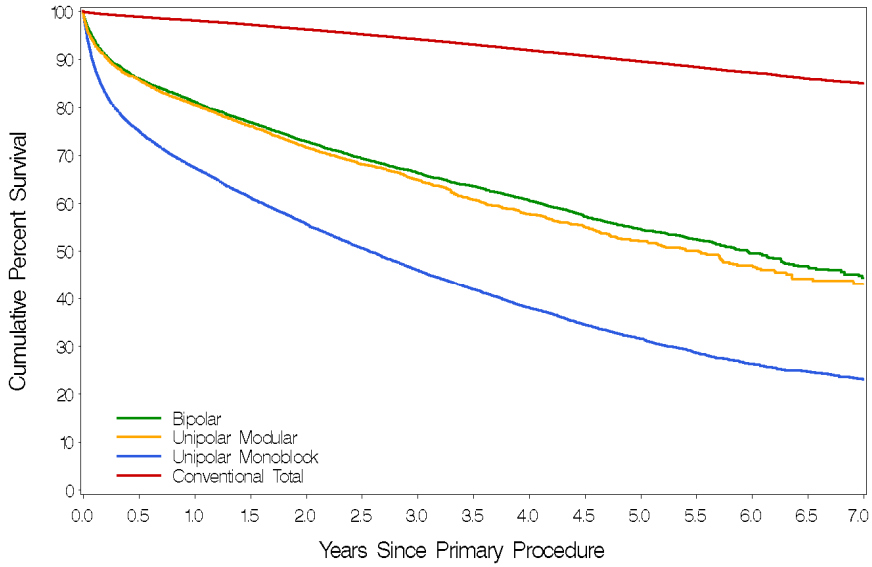
Table M2: Yearly Cumulative Percent Survival of Primary Hip Replacement

CPS	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Partial Hip	73.7 (73.2, 74.2)	63.4 (62.9, 64.0)	54.9 (54.3, 55.6)	41.0 (40.3, 41.8)	31.7 (30.6, 32.8)
Total Hip	98.2 (98.1, 98.3)	96.5 (96.3, 96.6)	94.5 (94.4, 94.7)	90.2 (90.0, 90.5)	85.9 (85.4, 86.3)

Table M3: Mortality following Primary Hip Replacement by Type

Type of Hip Replacement	Number Deaths	Number Patients	Cumulative Mortality (% deaths)	Standardised Mortality	Person Years	Rate per 100 Person Years	Exact 95% CI
Bipolar	2789	7749	36.0	26.2	20176	13.8	(13.32, 14.35)
Unipolar Monoblock	9048	15810	57.2	14.5	32973	27.4	(26.88, 28.01)
Unipolar Modular	2013	6924	29.1	18.8	12242	16.4	(15.73, 17.18)
Partial Resurfacing	0	8	0.0	0.0	12	0.0	(0.00, 30.76)
Total Resurfacing	83	9143	0.9	0.6	29291	0.3	(0.23, 0.35)
Thrust Plate	2	140	1.4	0.5	581	0.3	(0.04, 1.24)
Conventional Total	7580	106540	7.1	2.6	349195	2.2	(2.12, 2.22)
Total	**21515**	**146314**	**14.7**	**3.8**	**444469**	**4.8**	**(4.78, 4.91)**

Figure M2: Cumulative Percent Survival of Primary Hip Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Bipolar	7749	5614	4287	3100	2037	1133	435	118
Unipolar Monoblock	15810	9517	6844	4627	2880	1656	727	184
Unipolar Modular	6924	3985	2384	1435	826	423	199	56
Conventional Total	106540	88692	71684	55454	39985	25655	12500	3303

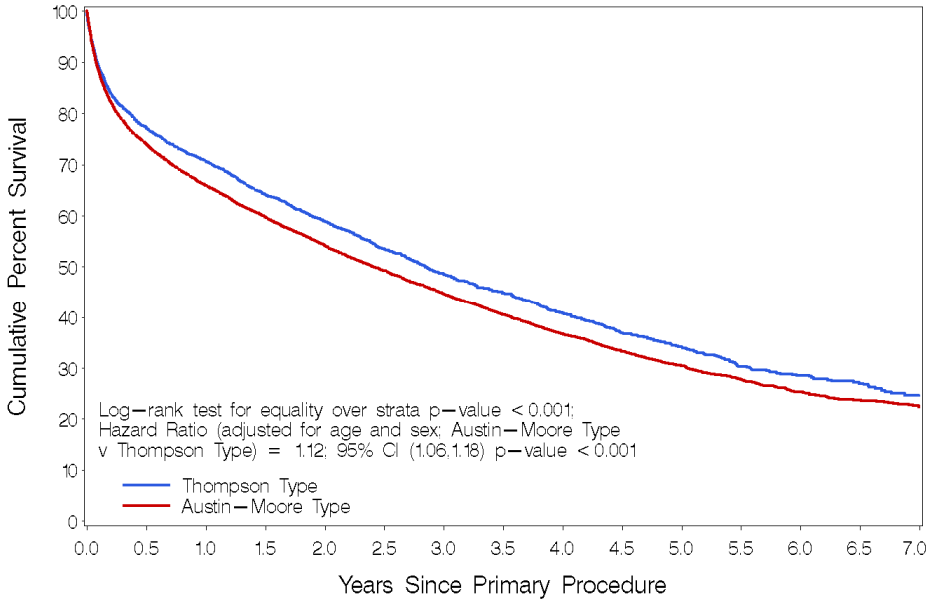
Table M4: Yearly Cumulative Percent Survival of Primary Hip Replacement

CPS	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Bipolar	81.1 (80.2, 82.0)	72.9 (71.8, 73.9)	66.3 (65.1, 67.4)	54.6 (53.1, 56.0)	44.4 (41.8, 46.9)
Unipolar Monoblock	67.4 (66.6, 68.1)	55.7 (54.9, 56.5)	46.0 (45.2, 46.9)	31.5 (30.6, 32.5)	23.1 (21.8, 24.3)
Unipolar Modular	80.4 (79.4, 81.4)	71.6 (70.4, 72.8)	64.8 (63.3, 66.3)	52.0 (49.9, 54.1)	43.0 (39.7, 46.3)
Conventional Total	98.1 (98.0, 98.1)	96.2 (96.1, 96.3)	94.1 (94.0, 94.3)	89.5 (89.3, 89.8)	85.0 (84.6, 85.5)

Table M5: Mortality following Primary Unipolar Monoblock Hip Replacement

Unipolar Monoblock Hip Replacement	Number Deaths	Number Patients	Cumulative Mortality (% deaths)	Standardised Mortality	Person Years	Rate per 100 Person Years	Exact 95% CI
Austin-Moore Type	6931	11538	60.1	15.5	24511	28.3	(27.62, 28.95)
ETS	130	549	23.7	7.5	607	21.4	(17.88, 25.41)
Thompson Type	1987	3723	53.4	13.5	7854	25.3	(24.20, 26.44)
Total	**9048**	**15810**	**57.2**	**14.5**	**32973**	**27.4**	**(26.88, 28.01)**

Figure M3: Cumulative Percent Survival of Primary Austin-Moore and Thompson Type Unipolar Monoblock Hip Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Austin-Moore Type	11538	6926	5096	3535	2228	1276	543	131
Thompson Type	3723	2338	1639	1066	652	380	184	53

Table M6: Yearly Cumulative Percent Survival of Primary Unipolar Monoblock Hip Replacement

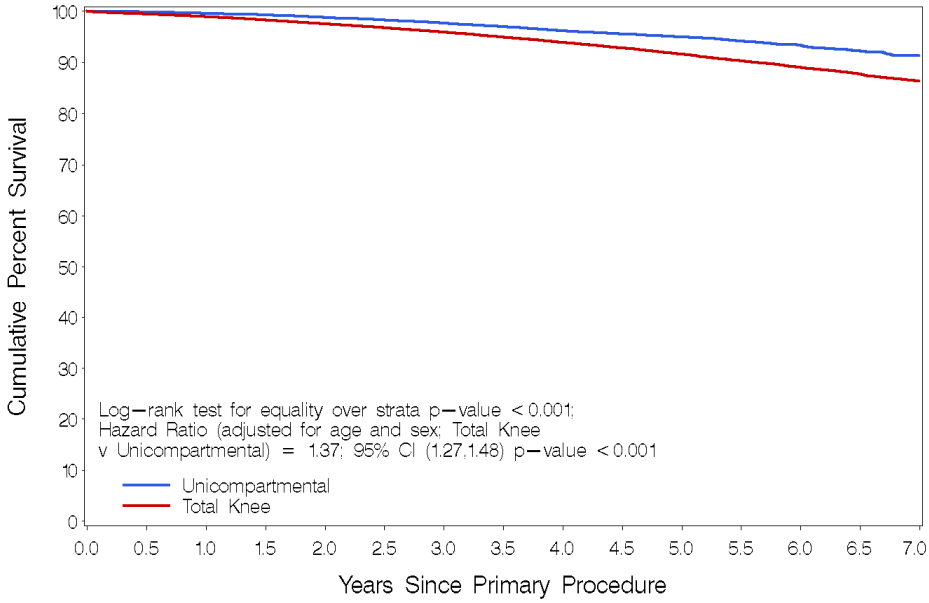
CPS	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
ETS	78.1 (74.0, 81.6)	69.8 (64.6, 74.4)	65.1 (58.6, 70.9)		
Austin-Moore Type	65.9 (65.0, 66.8)	54.2 (53.3, 55.1)	44.7 (43.7, 45.7)	30.4 (29.4, 31.4)	22.4 (21.0, 23.8)
Thompson Type	70.6 (69.1, 72.1)	58.9 (57.2, 60.5)	48.7 (46.9, 50.4)	34.1 (32.1, 36.2)	24.6 (22.0, 27.3)

Knee Replacement

Table M7: Mortality following Knee Replacement by Type

Type of Knee Replacement	Number Deaths	Number Patients	Cumulative Mortality (% deaths)	Standardised Mortality	Person Years	Rate per 100 Person Years	Exact 95% CI
Partial Resurfacing	0	81	0.0	0.0	104	0.0	(0.00, 3.54)
Unispacer	0	37	0.0	0.0	142	0.0	(0.00, 2.59)
Patella/Trochlear	19	832	2.3	0.9	2553	0.7	(0.45, 1.16)
Unicompartmental	734	21086	3.5	1.1	73866	1.0	(0.92, 1.07)
Bicompartmental	0	30	0.0	0.0	11	0.0	(0.00, 33.54)
Primary Total	7017	130536	5.4	8.3	417812	1.7	(1.64, 1.72)
Total	**7770**	**152602**	**5.1**	**7.8**	**494489**	**1.6**	**(1.54, 1.61)**

Figure M4: Cumulative Percent Survival of Primary Unicompartmental and Total Knee Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Unicompartmental	21086	18329	15363	12180	9044	5672	2486	537
Primary Total	130536	107981	86379	65667	46838	29448	13777	3593

Table M8: Yearly Cumulative Percent Survival of Primary Knee Replacement

CPS	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs
Patella/Trochlear	99.9 (99.0, 100.0)	99.3 (98.3, 99.8)	98.6 (97.1, 99.3)	95.7 (92.8, 97.5)	90.8 (81.4, 95.5)
Unicompartmental	99.6 (99.5, 99.6)	98.8 (98.6, 98.9)	97.7 (97.4, 97.9)	95.0 (94.6, 95.4)	91.3 (90.3, 92.2)
Total Knee	98.9 (98.8, 99.0)	97.5 (97.4, 97.6)	95.9 (95.7, 96.0)	91.6 (91.3, 91.8)	86.3 (85.8, 86.7)

Appendices

APPENDIX 1

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 before 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 (χ^2) Test: Any test whose statistic has a chi-square distribution under the null hypothesis is called a chi-square test. A common example is a test for association between two categorical variables whose data are arrayed in a cross-classification table of counts (Pearson's chi-square test). This can be generalised to many situations where the distribution of observed data is being compared to an expected, theoretical distribution.

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.

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 Rate: A measure of the instantaneous risk of occurrence of an event, for example death, at a point in time, t. It 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 sex as appropriate; Hazard Ratio (adjusted for age and sex) = Adj HR.

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, for example, 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 (31/12/2007) whichever happens first. This is then divided by 365.25 to get 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 1/1/2007 was revised on 1/7/2007. 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 1/1/2007 died without being revised on 1/4/2007. This individual has 0.25 component years.

3. A primary procedure on 1/1/2007 and has not been revised. This individual has 1 component year (as observation time is censored at 31/12/2007).

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 course.

APPENDIX 2

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 for 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 the 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. Further to this the Registry is a Federal Quality Assurance Activity *(see below)* and all information is protected.

Data Management & Confidentiality

The Data Management & Analysis Centre, University of Adelaide undertakes data entry, validation and analysis and provides secure data storage.

The DMAC was established in 1993. Professor Philip Ryan, Professor in Public Health, heads DMAC. The centre staff includes 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 assistants and data manager, 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 the DMAC. After a period of time the forms are scanned and electronically stored. As with all data these will be securely stored. All data will be 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 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.

The intention is to provide surgeons with access to their own information through secure internet access. As yet the software has not been developed that would allow this to occur. 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 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 3

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. Approximately 65,000 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 send reports to the Registry on a regular basis to validate the information collected.

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 computer.

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 Ms Ann Tomkins, 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 Ms Ann Tomkins.

APPENDIX 4

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 and a date by which the majority of hospitals for that state were participating. The first full year of complete national data was 2003.

State/Territory	Commencement Date	Majority Hospitals Participating	
Australia	September 1999	September 2002	99.0% complete National data
New South Wales	June 2001	May 2002	96.8% hospitals
Victoria	July 2000	May 2001	90.6% hospitals
Queensland	April 2000	November 2001	98.1% hospitals
Western Australia	April 2000	May 2000	80.9% hospitals
South Australia	September 1999	December 1999	94.5% hospitals
Tasmania	September 2000	November 2000	90% hospitals
Australian Capital Territory	May 2001	July 2001	100% hospitals
Northern Territory	October 2000	October 2000	100% hospitals

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APPENDIX 5

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 6

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