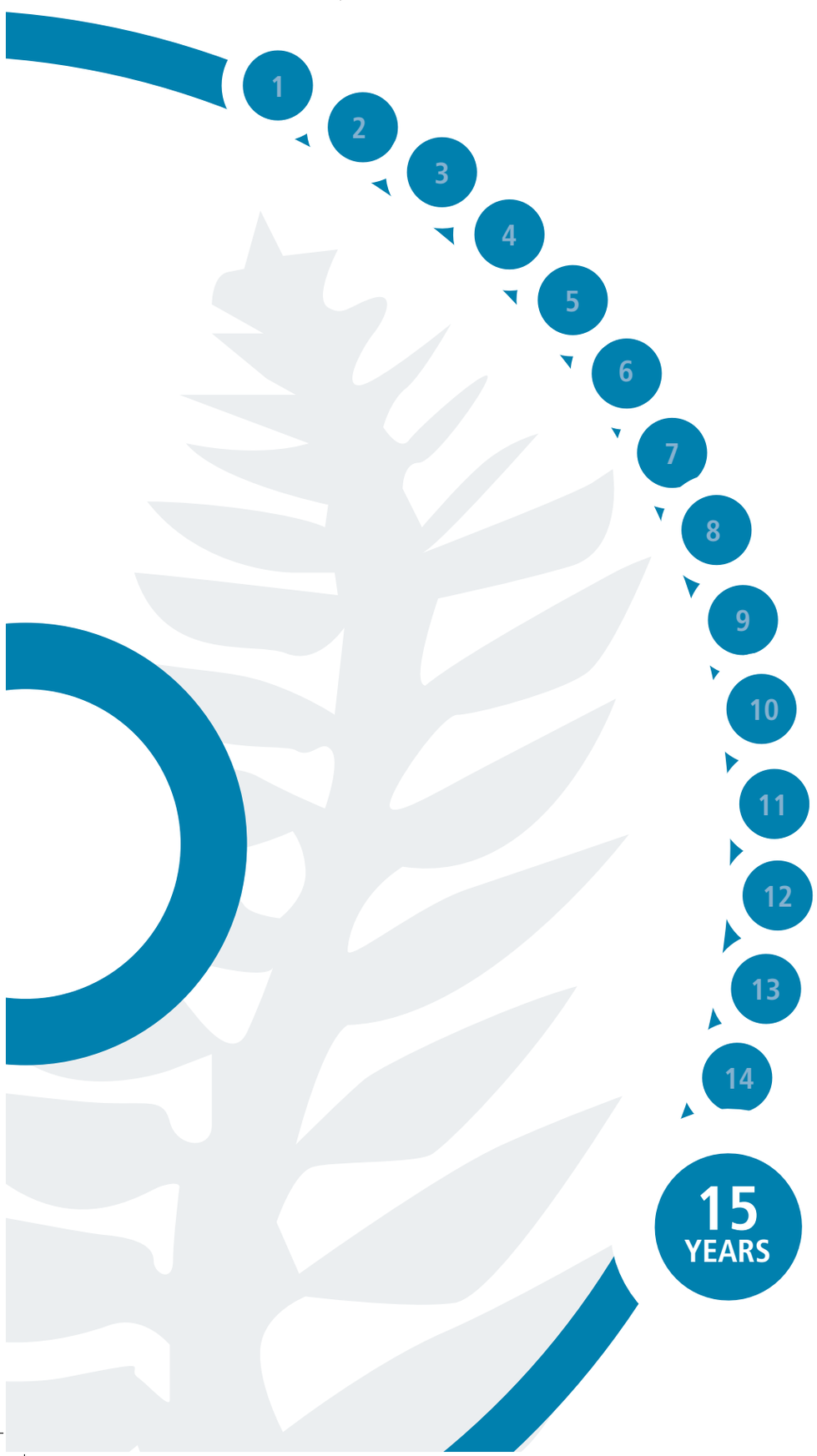
THE NEW ZEALAND JOINT REGISTRY

FIFTEEN YEAR REPORT
JANUARY 1999 TO DECEMBER 2013



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Orthopaedic Association

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Email: toni.hobbs@cdhb.health.nz
Website: www.nzoa.org.nz/nz-joint-registry

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EDITORIAL COMMENT

It is our great pleasure to present the fifteen year report of the New Zealand Orthopaedic Association's New Zealand Joint Registry.

This milestone report is not only for celebrating 15 years but also for passing 200,000 arthroplasty registrations and racking up more than one million observed component years. It contains a considerable amount of new data, largely focusing on changes over the 15 years in the form of stacked graphs; for example, bearing surfaces and head sizes for hips, mobile vs fixed bearing knees, and usage of the different shoulder prostheses.

The total number of registered joint arthroplasties at 31st of December 2013 was 200,816, which had been performed on 142,228 individual patients, of which 22,813 (16%) have died during the 15 year period.

The number of observed component years (ocys) contained within the Registry is now in excess of one million. The increase of 18,046 registered joints for 2013 compared with the 17,127 in 2012 represents an overall annual gain of 5.3%, which is twice the percentage gain in 2012. There were increased registrations for hip (3.0%), knee (5.3%), unicompartmental knee (0.7%), shoulder (6.7%) and an 8% fall for elbow primary arthroplasty categories when compared with 2012 registrations. As for previous years, analyses of revision data has been confined to primary registered arthroplasties.

It is of interest that the proportion of knees to hips has increased from 37% in 1999 to 46% in 2013 and that the mean BMIs are 31.2 (knees) and 28.12 (hips). There are significant numbers of morbidly obese (BMI>40) people receiving arthroplasties.

In this year's report the format of previous years has been followed such that each arthroplasty section is self- contained. This does, however, result in a certain amount of intersection repetition.

Hip Arthroplasty

There are 93,487 primary hip arthroplasties (including 1429 resurfacing arthroplasties) in the Registry with an overall revision rate of 0.72 per 100 ocys (95% confidence interval; 0.70 -0.75) with a 14 year prosthesis survival of 88.00 %. (cemented & hybrid 89%; uncemented 87.6%).The proportion of uncemented arthroplasties has slightly risen slightly from 44.8% in 2012 to 45.7% in 2013, despite KM survival curves continuing to demonstrate better medium term survival for cemented and hybrid hip arthroplasty.

As in previous years, the three types of hip fixation have been analysed against the four age bands: less than 55 years; 55-64 years; 65-74 years, and greater than 75 years. The data shows that overall the hybrid hip has the lowest revision rate across the four age bands. When the bearing surface revision rates are compared, the ceramic on ceramic are overall performing the best and the metal on metal the worst. It is noteworthy that no metal on metal hip arthroplasties were registered in 2013 and that the use of head sizes >/= to 36mm continues to fall and in 2013 constituted just 22% of the total.

Survival curves for the various types of uncemented hip arthroplasties illustrate the poorer survival for metal on metal hip arthroplasty.

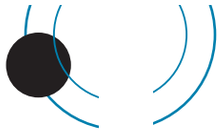
There are 976 (951 in 2012) hip prosthesis combinations in the Registry but 597(61%) have fewer than 10 registrations. The Corail/Pinnacle combination remains currently the most popular but the ExeterV40/ Trident combination has accumulated the most component years at 28,274 from 5,914 primary arthroplasties and has the very low revision rate of 0.47/100 ocys.

Revision rates for individual hip component combinations (minimum of 50 primary procedures) assembled in order of numbers of arthroplasties as well as revision rates have been calculated. In addition, tables listing combinations by fixation method have been added to make it easier for readers to determine the combination options used within the three types of prosthesis fixation. Seven combinations which are still currently being used have revision rates significantly higher ($p<0.05$) than the overall rate of 0.72/100 ocys and one - the Exeter V40/Continuum combination - was in the top ten with 300 implanted in 2013. Although revision rates for the individual femoral and acetabular components are no longer included it is once again noted that 8 of the 9 combinations with the popular Continuum cup continue to have high revision rates although not all are statistically significant. However, the revision rate for the cup is falling from a high of 2.0 in 2011 to 1.35 per 100 ocys in 2013. It is also worth noting that the revision rate for monoblock stems which have been implanted for an average of 9.5 years have the very low revision rate of 0.41/100 ocys.

This year revision rates for X linked and standard polyethylene have been compared for both metal and ceramic heads. It was found that ceramic/plastic with standard polyethylene has a significantly higher revision rate compared with the cross linked variety whereas there was no difference for the two metal/plastic combinations.

KM survival curves for some of the hip combinations with a minimum of 1,500 arthroplasties and 10 years of analysable data have once again been included as well as eight year survival curves for those combinations with a minimum of 2,000 procedures. It is noted that the Exeter combinations, except for Exeter/Contemporary, are among the better and the Spectron combinations among the poorer survival curves.

The revision rates for the various bearing surfaces used in primary hip arthroplasty i.e. metal on plastic, metal on metal,



> "This milestone report is not only for celebrating 15 years but also for passing 200,000 arthroplasty registrations and racking up more than one million observed component years."

ceramic on plastic, ceramic on metal, ceramic on ceramic have once again been analysed with respect to head size. Head sizes >36mm (64% are metal on metal articulation) had a significantly higher revision rate at 2.9 compared to 0.8 for sizes 36mm, 0.62 for 32mm and 0.69/100 ocys for =<28mm. These findings are similar to those from other Registries.

Another addition for this year is comparing the survival of minor (defined as replacement of liners, bearings, heads, patellae) versus major(defined as replacement of acetabulae, femoral, or tibial components +/- minor components) revisions for both hips and knees. Somewhat surprisingly the revision rate after a major revision is significantly better than for a minor revision for both hips and knees suggesting that some minor revisions should have been full revisions.

There has been a further increase in the number of primary hip revisions with ALVAL (aseptic lymphocytic vascular-associated lesions), or similar, listed as the reason for revision. In 2011 the number increased from15 to 72, in 2012 to102 and in 2013 to146 and is indicative of the continuing failure rate of metal on metal hip prosthesis combinations which have >36mm heads. This is reflected in the ASA analyses which show for the first time that there is a higher revision rate for ASA 1 compared to ASA 2. It is worth noting in this context that 42% of the conventional ASR prostheses have been revised.

Other new analyses included this year are yearly stacked graphs to demonstrate changes over the last 15 years of head size, bearing surfaces, polyethylene and reasons for revision. Survival curves for the 5 main reasons for revision are also included as well as for cemented/uncemented stems and cups.

Resurfacing hip arthroplasty registrations continue to track downwards and in 2013 were 90 compared with the high of 203 in 2009. The revision rate has climbed to 1.77/100 ocys, 2.5 times that for conventional hip arthroplasty.

Overall the total hip revision rate noted above and the fourteen year prosthesis survival of 88.00% are among the best for similar national joint registries.

Knee Arthroplasty

71,211 primary knee arthroplasties have been registered totalling 394,014 ocys with the overall revision rate 0.50/100 ocys, (95% confidence interval; 0.47-0.52) and the excellent fourteen year survival of 94.40%.

As was done for recent annual reports several variants of basically the same knee prosthesis type eg Nexgen LCS, which are registered separately, have been merged into the one group to enable comparable statistical analyses with other prostheses which may have also had variants but are registered as one or 2 prostheses.

There are 50 different types of knee prostheses in the Registry with 23 (48%) having less than 10 registrations.

The Triathlon remains as the current most popular followed by Nexgen. Calculation of revision rates for individual prostheses with a minimum of 50 arthroplasties shows that among the bigger usage numbers the Duracon has the lowest revision rate of 0.30/100ocys. The Nexgen has the biggest number of registrations at 15,827 and 84,325 ocys.

For fully cemented knees, the Insall/Burstein, Scorpio Optetrak, and Oxford Tricompartmental Femoral prostheses have significantly higher revision rates than the overall rate of 0.50/100 ocys @ the 95% confidence (but only the latter two were implanted in 2013). For fully uncemented knees the LCS has a significantly higher revision rate.

KM survival curves for six of the cemented knee prostheses with a minimum of 10 years of analysable data have again been included. The Duracon has the highest and the LCS and Nexgen the lowest (but still very good) survival.

Although uncemented knee arthroplasty represents just 4% of all primary knee arthroplasties it has a significantly higher revision rate ($p<0.05$) than either fully cemented or hybrid in which the tibial component is cemented and the femoral component uncemented. The KM curves for the three types of fixation show that the uncemented curve continues to steeply diverge from the other two.

Image guidance (IG), first recorded by the Registry in 2005, remains quite popular for primary knee arthroplasty and during 2013 was used in 17% of procedures, the highest annual usage yet. Comparison of revision rates for IG with non IG procedures demonstrates a rate of 0.53 versus 0.49/100 ocys. There is no statistical difference between the two at this early stage.

The analyses comparing revision rates and 10 year survival of fixed versus mobile bearing knees show for the first time there is no longer a significantly higher revision rate for mobile bearing knees when compared with fixed bearing knees and this is further confirmed in the survival curves beyond 10 years.

Again this year we have performed separate analyses for cruciate retaining versus posterior stabilised knee prostheses and have demonstrated that overall there are significantly higher revision rates for posterior stabilised prostheses which are also graphically illustrated with the KM survival graphs.

There are 292 patello-femoral prostheses registered, with 49 added in 2013, a 5% increase, which reverses the 29% decrease on 2012. Twenty (6.8%) have been revised and the revision rate at 1.77/100 ocys is 3.5 times that for total knee arthroplasty. All except four were revised to a total knee arthroplasty.

Other new analyses included this year are yearly stacked graphs to demonstrate changes over the last 15 years comparing the use of mobile versus fixed bearing knees and posterior stabilized versus cruciate retaining knees. Survival curves for the five main reasons for revision are also included.

Unicompartmental Knee Arthroplasty

There are 8,113 registered primary unicompartmental prostheses with a total of 46,383 ocys, a mean revision rate of 1.27/100 ocys and an 8 year survival of 85.9%

Once again the Oxford uncemented prosthesis was very dominant, accounting for more than the total of all the others in 2013. It also continues to have the lowest revision rate at 0.72/100 ocys.

The minimally invasive approach for the uni-compartmental knee arthroplasty remains popular and in 2013 was used in 31% of procedures.

Ankle Arthroplasty

There are 1,058 primary registered ankle prostheses with a total of 4,858 ocys, a mean revision rate of 1.42/100ocys and an eight year survival of 89%.

There were 113 primary ankle arthroplasties registered in 2013 which was five more than the previous year. The Salto prosthesis totally overshadowed all others, accounting for 90% of the 2013 registrations. It also has by far the lowest revision rate with a mean implantation time of three years.

Shoulder Arthroplasty

There are 5,528 registered primary shoulder prostheses with a total of 24,335 ocys, a mean revision rate of 1.04/100 ocys and a 10 year survival of 91.6%.

This year a further prosthesis category, humeral sphere, was added to the others in the shoulder arthroplasty section, making six in total for analyses with respect to revision rates and Oxford scores. A new stacked graph demonstrates the evolution over time of the six categories.

With regard to revision rates, there is a significantly higher revision rate for partial resurfacing compared both with the overall mean and conventional total arthroplasty. Revision rates also vary greatly among the large number of registered prostheses within the different categories but it is noteworthy that the SMR which is currently the most popular of the prosthesis options has seven times the revision rate of the long established Global and 10 times that of the Global AP and the Bigliani/Flatow conventional total prostheses. The SMR conventional total prosthesis analyses do, however, include SMR L2 glenoid data which, because of its high failure rate, was withdrawn in 2011.

Conventional total and resurfacing head categories have significantly better six month and five year Oxford scores.

Elbow Arthroplasty

There are 409 registered primary elbow prostheses with a total of 2,240 ocys, a mean revision rate of 1.07/100 ocys and a four year survival of 94%. Numbers registered per year continue to decline with just 22 in 2013 from the high of 40 in 2008.

The Coonrad Morrey prosthesis continues to be the most popular with 17 of the 22 implanted.

Deep Infection

Once again we have compared the deep infection revision rates within six months of the arthroplasty for primary hip and knee arthroplasty against the theatre environment. Six months has been chosen, as infection within this time period is highly likely to have been introduced at the time of surgery. This year's analyses again demonstrate that for primary hip and knee arthroplasty there was an increased risk for revision for deep infection when the primary procedure was carried out in a laminar flow theatre with a space suit compared with a conventional theatre without a space suit (2.4 & 2.8 times respectively for hip and knee). The use of space suits also significantly increases the risk of revision for deep infection in both conventional and laminar flow theatres. There has been no change in the percentage of arthroplasties performed in laminar flow theatres nor in the use of space suits in 2013 compared with 2012.

Oxford 12 Questionnaire

More 10 year Oxford scores have been analysed for primary hip and knee arthroplasty. When the various score categories are compared to the six month and five year outcomes the only significant difference is an increase in the pain category for hips but not for knees. These 10 year scores affirm that the six-month score is indicative of the longer term outcome.

As noted in previous years, the statistically significant relationship between the six month and five year scores and revision within two years of the score date for primary hips, knees (including unicompartmental) and shoulders has again been demonstrated. This year revision within two years of 10 year Oxford scores demonstrates a similar significant relationship for hip and knee arthroplasty. Once again analyses of hip and knee six month post first revision arthroplasty questionnaire data has been undertaken and it demonstrates a similar relationship between the Oxford score at six months and the second revision within two years.

In terms of using the Oxford scores as a screening tool for arthroplasty follow-up it is worth noting that, using six month data, 70% of hip and unicompartmental and 71% of knee revisions within two years would have been captured by monitoring the lowest 30% of the Oxford scores. From the five year data, 73% of hip and 62% of knee revisions would have been captured by again monitoring the lowest 30% of the Oxford scores.

Deceased Person's Data

A deceased person's data is valid in perpetuity for all analyses involving the time interval prior to the person's death e.g. if a person dies eight years post primary hip replacement their data is always valid for all analyses for that eight year period. Hence the rider "deceased patients censored at time of death."

Publications and Presentations

Since last year's report further peer reviewed papers based on registry data have been published in, accepted by or submitted to international journals as well multiple podium presentations (see Appendix 2).

Alastair Rothwell	*Supervisor*
Toni Hobbs	*Coordinator*
Chris Frampton	*Statistician*

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For audit compliance information

Mike Wall, Alumni Software:

For continued monitoring and upgrading of database software

European Arthroplasty Registry:

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- NEW ZEALAND ORTHOPAEDIC ASSOCIATION
- ORTHOPAEDIC SURGEONS
- SOUTHERN CROSS HOSPITALS
- WISHBONE TRUST

PARTICIPATING HOSPITALS

We wish to gratefully acknowledge the support of all participating hospitals and especially the coordinators who have taken responsibility for the data forms.

HOSPITALS AND CONTACTS

Public Hospitals

Auckland Hospital
Auckland 1142
Contact: Shelley Thomas

Burwood Hospital
Christchurch 8083
Contact: Diane Darley

Christchurch Hospital
Christchurch 8140
Contact: Kirsty Harrison

Dunedin Hospital
Dunedin 9016
Contact: Jennifer Larsen

Elective Surgery Centre
Takapuna 0740
Contact: Alannah Domigan

Gisborne Hospital
Gisborne 4010
Contact: Candice Dowell

Grey Base Hospital
Greymouth 7840
Contact: Arianne Go

Hawkes Bay Hospital
Hastings 4120
Contact: Jacqueline Cornish

Hutt Hospital
Lower Hutt 5040
Contact: Michelle Krause/Margot Clapham

Kenepuru Hospital
Porirua 5240
Contact: Tracey Doyle

Manukau Surgery Centre
Auckland 2104
Contact: Amanda Ellis

Masterton Hospital
Masterton 5840
Contact: Lisa Manihera

Middlemore Hospital
Auckland 1640
Contact: Lalesh Deo

Nelson Hospital
Nelson 7040
Contact: Claudia Teunissen/Anne Fryer

North Shore Hospital,
Takapuna 0740
Contact: Chris Cavalier

Palmerston North Hospital
Palmerston North 4442
Contact: Maria Shaw/Angela Callum

Rotorua Hospital
Rotorua 3046
Contact: Janice Reynolds/Jackie Dearman

Southland Hospital
Invercargill 9812
Contact: Helen Powley

Taranaki Base Hospital
New Plymouth 4342
Contact: Allison Tijsen

Tauranga Hospital
Tauranga 3143
Contact: David Nyhoff

Timaru Hospital
Timaru 7940
Contact: Destiny Templeton-Wolfe

Waikato Hospital
Hamilton 3204
Contact: Lorraine Granger

Wairau Hospital
Blenheim 7240
Contact: Monette Johnston

Wellington Hospital
Newtown 6242
Contact: Zoe Perkins/Scott Morgan

Whakatane Hospital
Whakatane 3158
Contact: Karen Burke

Whanganui Hospital
Whanganui
Contact: Susan Slight

Whangarei Area Hospital
Whangarei 0140
Contact: Helen Harris

Private Hospitals

Ascot Integrated Hospital
Remuera 1050
Contact: Margie Robertson

Belverdale Hospital
Wanganui 4500
Contact: Jane Young

Bidwill Trust Hospital
Timaru 7910
Contact: Kay Taylor

Boulcott Hospital
Lower Hutt 5040
Contact: Karen Hall

Bowen Hospital
Wellington 6035
Contact: Pam Kohnke

Braemar Private Hospital
Hamilton 3204
Contact: Suzi Dasseville/Phyllis Lee

Chelsea Hospital
Gisborne 4010
Contact: Debbie Gooden

Crest Hospital
Palmerston North 4440
Contact: Susan Wright

Grace Hospital
Tauranga 3112
Contact: Anne Heke

Kensington Hospital
Whangarei 0112
Contact: Sandy Brace

Manuka Street Hospital
Nelson 7010
Contact: Sabine Mueller

Mercy Hospital
Dunedin 9054
Contact: Liz Cadman

Mercy Integrated Hospital
Auckland 1023
Contact: Marie Buitenhek/Janine Wells

Ormiston Hospital
Auckland 2016
Contact: Julie Hodgson

Royston Hospital
Hastings 4122
Contact: Suzette Du Plessis

Southern Cross Hospital, Brightside
Epsom 1023
Contact: Theresa Lambert

Southern Cross Hospital
Christchurch Central 8013
Contact: Diane Kennedy

Southern Cross Hospital
Hamilton East 3216
Contact: Christine Gregor

Southern Cross Hospital
Invercargill Central 9810
Contact: Maree Henderson

Southern Cross Hospital
New Plymouth 4310
Contact: Sheralee Faull

Southern Cross North Harbour
Glenfield 0627
Contact: Rita Redman

Southern Cross Hospital
Rotorua 3015
Contact: Chris Mott

Southern Cross Hospital
Newtown, Wellington 6021
Contact: Marian Lee

St Georges Hospital
Christchurch 8014
Contact: Stephanie May

Wakefield Hospital
Newtown, Wellington 6021
Contact: Jan Kereopa

PROFILE OF THE AVERAGE NEW ZEALAND ORTHOPAEDIC SURGEON*

From our analyses, the average orthopaedic surgeon performed 2013

37 Total hip arthroplasties

with 45% using uncemented,13% fully cemented and 42% hybrid prostheses: has a 88% survival at 14 years and a revision rate of 0.71 per 100 component years; 0.49% have been revised for deep infection; 84% at six months, 89% at five years and 87% at 10 years had an excellent or good Oxford score.

36 Total knee arthroplasties

with almost all cemented but only 12 with patellae resurfaced; has a 94.40% survival at 14 years and a revision rate of 0.50 per 100 component years; 0.69% have been revised for deep infection; 73% at six months, 83% at five years and 81% at 10 years had an excellent or good Oxford score.

9 Unicompartmental knee arthroplasties

with most cemented; has an 85.9% survival at 12 years and a revision rate of 1.27 per 100 component years; 0.29% have been revised for deep infection; 82% at six months, 88% at 5 years and 83% at ten years had an excellent or good Oxford score.

9 Shoulder arthroplasties

with a 70:30 split between total arthroplasty varieties and hemiarthroplasty; has a 91.6% survival at 10 years and a revision rate of 10.9 per 100 component years; 0.36% have been revised for deep infection; 68% at six months, 77% at five years and 71% at 10 years had excellent or good Oxford scores.

6 Total ankle arthroplasties

mostly uncemented; 89.2% survival at eight years and a revision rate of 1.42 per 100 component years; 0.47% revised for deep infection; 57% at six months and 68% at five years had excellent or good Oxford derived scores.

<2 Total elbow arthroplasties

most likely a cemented Coonrad-Morrey prosthesis; 94% survival at four years and a revision rate of 1.07 per 100 component years; 1.4% have been revised for deep infection; 71% at six months and 90% at five years had excellent or good Oxford derived scores.

** Averages derived from the number of surgeons recorded performing the above procedures during 2013 and not from the **total pool** of orthopaedic surgeons.*

DEVELOPMENT AND IMPLEMENTATION OF THE NEW ZEALAND JOINT REGISTRY

The year 1997 marked 30 years since the first total hip replacement had been performed in New Zealand and as a way of recognising this milestone it was unanimously agreed by the membership of the New Zealand Orthopaedic Association (NZOA) to adopt a proposal by the then President, Alastair Rothwell, to set up a National Joint Registry.

New Zealand surgeons had always been heavily dependent upon northern hemisphere teaching, training and outcome studies for developing their joint arthroplasty practice and it was felt that it was more than timely to determine the characteristics of joint arthroplasty practice in New Zealand and compare the outcomes with northern hemisphere counterparts. It was further considered that New Zealand would be ideally suited for a National Registry with its strong and co-operative NZOA membership, close relationship with the implant supply industry and its relatively small population. Advantages of a Registry were seen to be: survivorship of different types of implants and techniques; revision rates and reasons for these; infection and dislocation rates; patient satisfaction outcomes; audit for individual surgeons, hospitals, and regions; opportunities for in-depth studies of certain cohorts and as a database for fundraising for research.

Administrative Network

It was decided that the Registry should be based in the Department of Orthopaedic Surgery, Christchurch Hospital and initially run by three part-time staff: a Registry Supervisor (Alastair Rothwell), the Registry Coordinator (Toni Hobbs) and the Registry Secretary (Pat Manning). As all three already worked in the Orthopaedic Department, it was a cost-effective and efficient arrangement to get the Registry underway.

New Zealand was divided into 19 geographic regions and an orthopaedic surgeon in each region was designated as the Regional Coordinator whose task was to set up and maintain the data collection network within the hospitals for that region.

This network included a Theatre Nurse Coordinator in every hospital in New Zealand who voluntarily took responsibility for supervising the completion, collection and dispatch of the data forms to the Registry.

Data Collection Forms

The clear message from the NZOA membership was to keep the forms for data collection simple and user friendly. The Norwegian Joint Register's form was used as a starting point but a number of changes were made following early trials. The forms are largely if not completely filled out by the operating theatre circulating nurse ready to be checked and signed by the surgeon at the end of the operation.

Data Base

The Microsoft Access 97 database programme was chosen because it is easy to use, has powerful query functions, can cope with one patient having several procedures on one or more joints over a lifetime and has "add on" provisions. The database is expected to meet the projected requirements of the Registry for at least 20 years. It can accommodate software upgrades as required.

Patient Generated Outcomes

The New Zealand Registry was one of the first to collect data from patient generated outcomes. The validated Oxford Hip and Knee outcomes questionnaires were chosen and questions were added to these, relating to dislocation, infection and any other complication that did not require further joint surgery. It was agreed that these questionnaires should be sent to all registered patients six months following surgery and then at five yearly intervals. The initial response rate was between 70 & 75% and this has remained steady over the five year period.

However, because of the large number of registered primary hip and knee arthroplasties and, on the advice of our statistician, questionnaires have been sent out on a random selection basis since July 2002 to achieve an annual response of 20% for each group. All patients in the other arthroplasty groups, including revision arthroplasty, are sent the questionnaires.

Funding

Several sources of funding were investigated including contributions from the Ministry of Health, various funding agencies, medical insurance societies and an implant levy payable by surgeons and public hospitals to supplement a grant from the NZOA. In the early years the Registry had a "hand to mouth" existence relying on grants from the NZOA and Wishbone Trust until it received significant annual grants from the Accident Compensation Corporation. From 2002, funding became more reliable with the surgeons paying a $10 levy, increased to $15 in 2008, for each joint registered from a private hospital, and the Ministry of Health agreeing to pay $72,000 a year as part of the Government Joint Initiative. Since 2005 the Southern Cross Hospitals have contributed $10,000 annually.

Ethical Approval

Application was made to the Canterbury Ethical Committee early in 1998; first for approval for hospital data collection without the need for patient consent and second for the patient generated outcomes using the Oxford 12 questionnaire plus the additional questions. The first part of the application was initially readily approved but the second part required several amendments to patient information and consent forms before approval was obtained.

A reapplication had to be made when the Ethics Committee of a private hospital chain refused to allow their nurses

to participate in the project unless there was prior written patient consent. This view was supported by the Privacy Commissioner on the grounds that the Registry data includes patient identification details. The approval process was eventually successful but did delay the New Zealand-wide launch.

Surgeon and Hospital Reports

It was agreed that, every six months, reports were to be generated from the Registry database for primary and revision hip and knee replacements and to consist of: the number of procedures performed by the individual surgeon or at the hospital; the total number of procedures performed in the region in which the surgeon works; and the national total and cumulative totals for each of these categories. Six month and, more recently, five year Oxford 12 scores are also included. Since 2008 each surgeon also receives their individual revision rate for their registered primary arthroplasties, and the reports have become annual rather than six monthly.

Introduction of the Registry

The National Joint Registry was introduced as a planned staged procedure.

Stage I: November 1997 to March 1998

The base administrative structure was established. The data forms and the database were developed and a trial was performed at Burwood Hospital.

Stage II: April 1998 to June 1998

Further trialling was performed throughout the Christchurch Hospitals and the data forms and information packages were further refined.

Stage III: July 1998 to March 1999

The data collection was expanded into five selected New Zealand regions for trial and assessment.

Also during this time communication networks and the distribution of information packages into the remaining regions of New Zealand were carried out.

Stage IV: April 1st 1999

The National Joint Registry became fully operational throughout New Zealand.

DEVELOPMENT SINCE THE INTRODUCTION OF THE REGISTRY

INCLUSION OF OTHER JOINT REPLACEMENT ARTHROPLASTIES

At the request of the NZOA membership, the database for the Registry was expanded to include total hip replacements for fractured neck of femur, unicompartmental replacements for knees, and total joint replacements for ankles, elbows and shoulders (including hemiarthroplasty for the latter). Commencement of this data collection was in January 2000 and this information is included in the annual surgeon and hospital reports.

The validated Oxford questionnaire was available for the shoulder and was modified, but not validated as a questionnaire for the elbow and ankle joints. All those receiving total arthroplasty of the above joints, as well as unicompartmental knee arthroplasty, are sent questionnaires with a reply rate of between 70 and 75%. As for hips and knees, the questionnaires are sent out six months post-surgery and then at five yearly intervals.

Monitoring of Data Collection

The aim of the Registry is to achieve a minimum of 90% compliance for all hospitals undertaking joint replacement surgery in New Zealand.

It is quite easy to check the compliance for public hospitals as they are required to make regular returns with details of all joint replacement surgery to the NZ Health Information Service. For a small fee, the registered joints from the Registry can be compared against the hospital returns for the same period and the compliance calculated. Any obvious discrepancies are checked out with the hospitals concerned and the situation remedied. It is more difficult with private hospital surgery as they are not required to file electronic returns. However, by enlisting the aid of prosthesis supply companies, it is possible to check the use of prostheses region by region and any significant discrepancy is further investigated.

Another method is to check data entry for each hospital against the previous corresponding months and if there is an obvious trend change then again this is investigated.

The most recent compliance audit in March 2014 again demonstrated a New Zealand-wide public hospital compliance of > 95% when compared to NZHIS data.

Registered patient deaths are also obtained from the NZHIS.

Data Entry by Scanning

Barcoding of the labels containing all the prosthesis identification data has now become widespread throughout the implant industry and currently staff are able to scan in 84% of hip and 90% of knee prosthesis data directly into the Registry.

All manually entered data is at least double checked for accuracy.

Staffing

The staff has expanded to three part-time data entry personnel. They maintain a lag time between receipt and entry of data forms of no more than six weeks. It has been necessary to employ temporary staff during busy periods eg posting out the patient questionnaires.

The 2013 Registry staff are: Alastair Rothwell, Supervisor; Toni Hobbs, Coordinator; Lynley Diggs and Anne McHugh Data Processors.

Use of Registry Data

There have been increasing numbers of requests for information from the Registry from a wide variety of sources. Great care is taken to protect patient confidentiality at all times and patient details are only released to appropriately accredited personnel. It is also emphasised that Ethics Committee approval is required for any research projects involving patient contact.

Registry Board

This Registry Board membership consists of: five Orthopaedic Surgeons; Registry Coordinator; Orthopaedic Implant Industry Representative; Arthritis New Zealand Representative; Chief Executive and Secretary NZOA. The main tasks of the Board are to monitor the organisational structure and functions of the Registry, rule on difficult requests for information from the Registry, advise appropriate authorities regarding data from the Registry that could affect the health status of implant patients, encourage and support research and collaborate with the International Society of Arthroplasty Registries.

NUMBER OF JOINTS ANALYSED
1ST JANUARY 1999- 31ST DECEMBER 2013

Numbers of procedures registered

	15 years	14 years	13 years	12 years	11 years	10 years	9 years	1-8 years
Hips, primary	93,487	85,778	78,287	71,057	63,681	56,383	49,374	42,421
Hips, revision	13,954	12,731	11,593	10,463	9,445	8,405	7,360	6,383
Knees, primary	71,503	64,810	58,454	52,214	46,093	40,068	34,458	28,705
Knees, revision	5,580	5,092	4,608	4,159	3,727	3,293	2,883	2,499
Knees unicompartmental	8,311	7,388	6,668	6,035	5,452	4,826	4,284	3,709
Shoulders, primary	5,528	4,783	4,085	3,505	3,013	2,498	2,044	1,641
Shoulders, revision	436	360	306	255	213	180	139	105
Elbows, primary	409	387	363	331	301	267	227	191
Elbows, revision	70	67	64	56	49	41	36	31
Ankles, primary	1,058	945	837	728	603	484	377	298
Ankles, revision	101	83	66	50	38	29	26	19
Lumbar Disc, primary	149	142	140	129	111	94	75	59
Lumbar Disc, revision	3	3	3	3	3			
Cervical Disc, primary	226	200	168	122	95	57		
Cervical Disc, revision	1	1	1	1	1			
TOTAL	**200,816**	**182,770**	**165,643**	**149,108**	**132,825**	**116,625**	**101,314**	**86,061**

Bilateral joint replacements carried out under the same anaesthetic

Bilateral hips

1,845 patients (3,690 hips) 4% of primary hips

Bilateral knees

2,988 patients (5,976 knees) 8% of primary knees

Bilateral Unicompartmental knees

662 patients (1,324 knees) 16% of unicompartmental knees

Bilateral ankles

2 patients (4 ankles)

Bilateral shoulders

4 patients (8 shoulders)

During the 15 year period 142,228 individual patients were registered, of which 22,813 (16%) have died.

Trainee Surgeons: In the following analyses consultants took responsibility for their registrar surgeon procedures

HIP ARTHROPLASTY

PRIMARY HIP ARTHROPLASTY

The fifteen-year report analyses data for the period January 1999 – December 2013. There were 93,487 primary hip procedures registered including 1,429 resurfacing arthroplasties. This is an additional 7,710 compared to last year's report.

1999	4,114
2000	4,715
2001	4,932
2002	4,830
2003	5,058
2004	6,029
2005	6,320
2006	6,430
2007	6,962
2008	7,004
2009	7,306
2010	7,367
2011	7,220
2012	7,490
2013	7,710

There was a 3% increase in hip registrations for 2013 which is slightly less than 2012's increase over the previous year.

Data Analysis

Age and sex distribution

The average age for all patients with primary hip arthroplasty was 66.87 years, with a range of 13.43 – 100.95 years.

All hip arthroplasty

	Female	Male
Number	49,224	44,263
Percentage	52.65	47.35
Mean age	68.35	65.23
Maximum age	100.95	97.48
Minimum age	13.43	15.86
Standard dev.	11.62	11.50

Conventional hip arthroplasty

	Female	Male
Number	48,967	43,091
Percentage	53.19	46.81
Mean age	68.44	65.60
Maximum age	100.95	97.48
Minimum age	13.43	15.86
Standard dev.	11.56	11.36

Resurfacing hip arthroplasty

	Female	Male
Number	257	1,172
Percentage	17.98	82.02
Mean age	50.08	51.89
Maximum age	65.88	75.69
Minimum age	25.72	17.74
Standard dev.	7.17	8.52

2004	21
2005	138
2006	169
2007	188
2008	191
2009	203
2010	185
2011	142
2012	102
2013	90

A further 90 resurfacing hips were registered during 2013. This is 12 fewer than for 2012 and continues the yearly downward trend from the high of 203 in 2009.

Body Mass Index

For the four year period 2010 - 2013, there were 16,115 BMI registrations for primary hip replacements. The average was 28.72 with a range of 14 – 62 and a standard deviation of 5.51.

Previous operation

None	89,453
Internal fixation	1,864
Osteotomy	521
Arthrodesis	76

Diagnosis

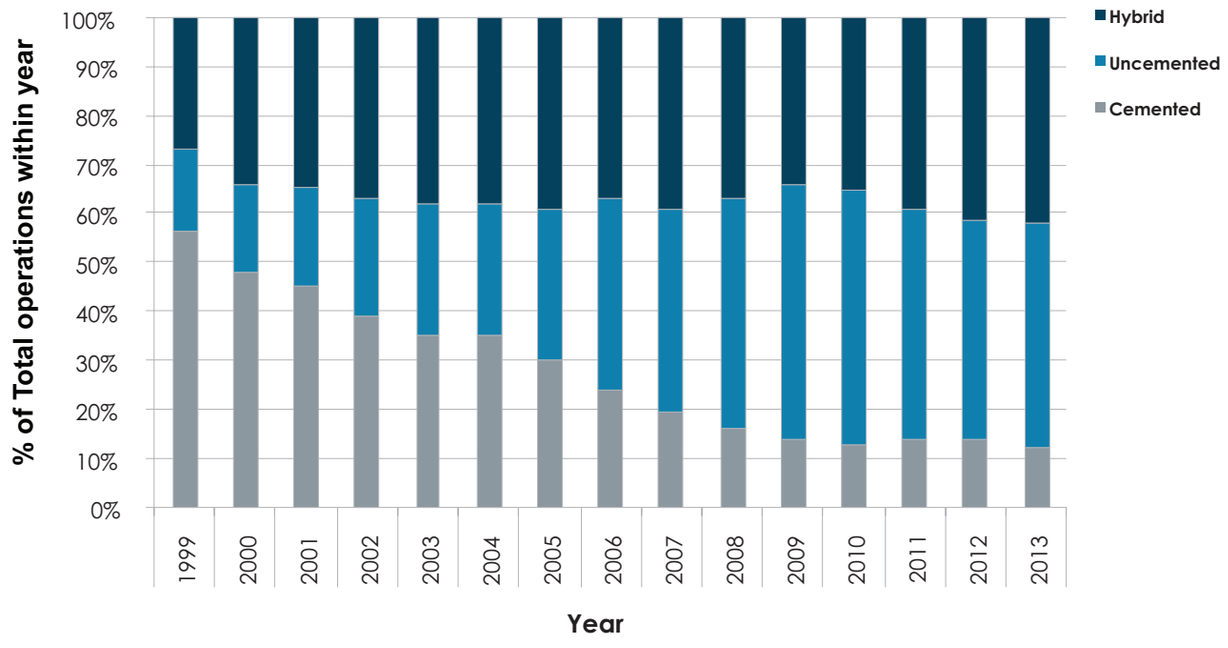
Osteoarthritis	81,220
Acute fracture NOF	3,376
Avascular necrosis	2,912
Developmental dysplasia	2,334
Rheumatoid arthritis	1,320
Old fracture NOF	1,179
Other inflammatory	757
Tumour	440
Post-acute dislocation	286

Approach

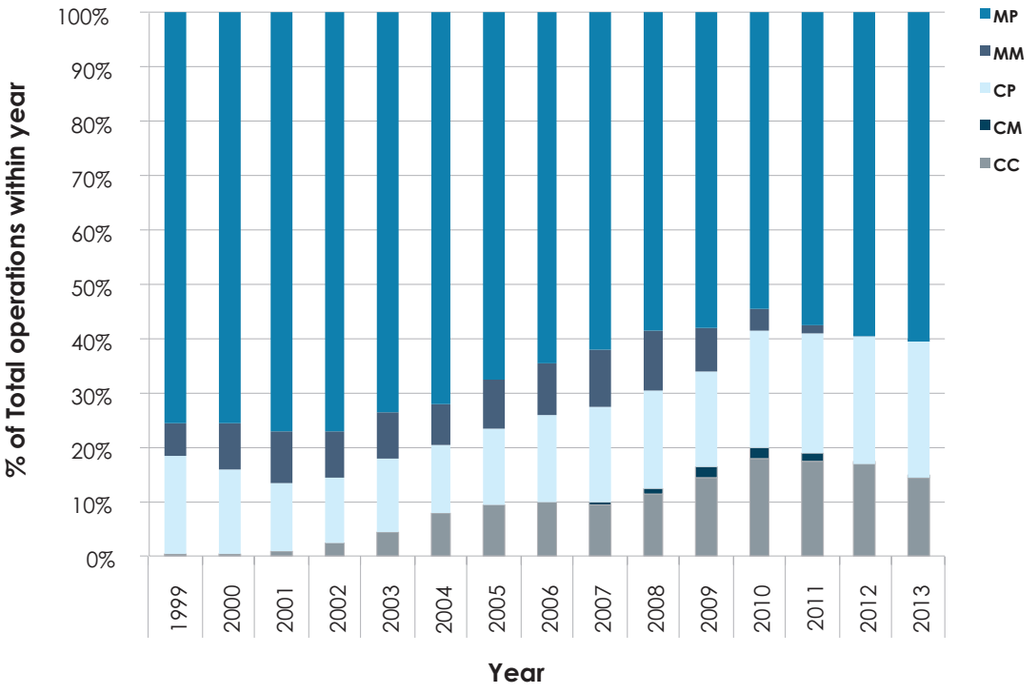
Posterior	59,563
Lateral	25,219
Anterior	3,636
Minimally invasive	1,532
Trochanteric osteotomy	180
Image guided surgery	343

Image guided surgery was added to the updated forms at the beginning of 2005, but there continues to be little interest in the technique. The minimally invasive approach has also waned after a surge in 2008.

Comparison of proportions of cemented vs uncemented vs hybrid by year

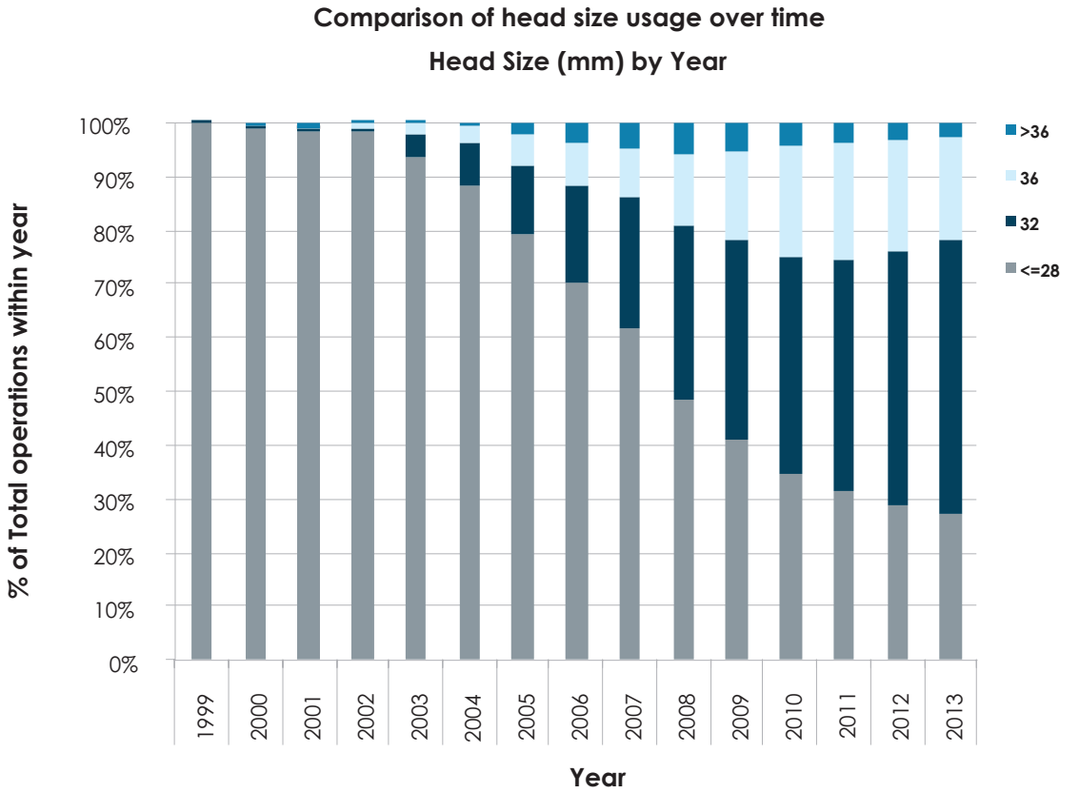


Comparison of different bearing surface usage over time

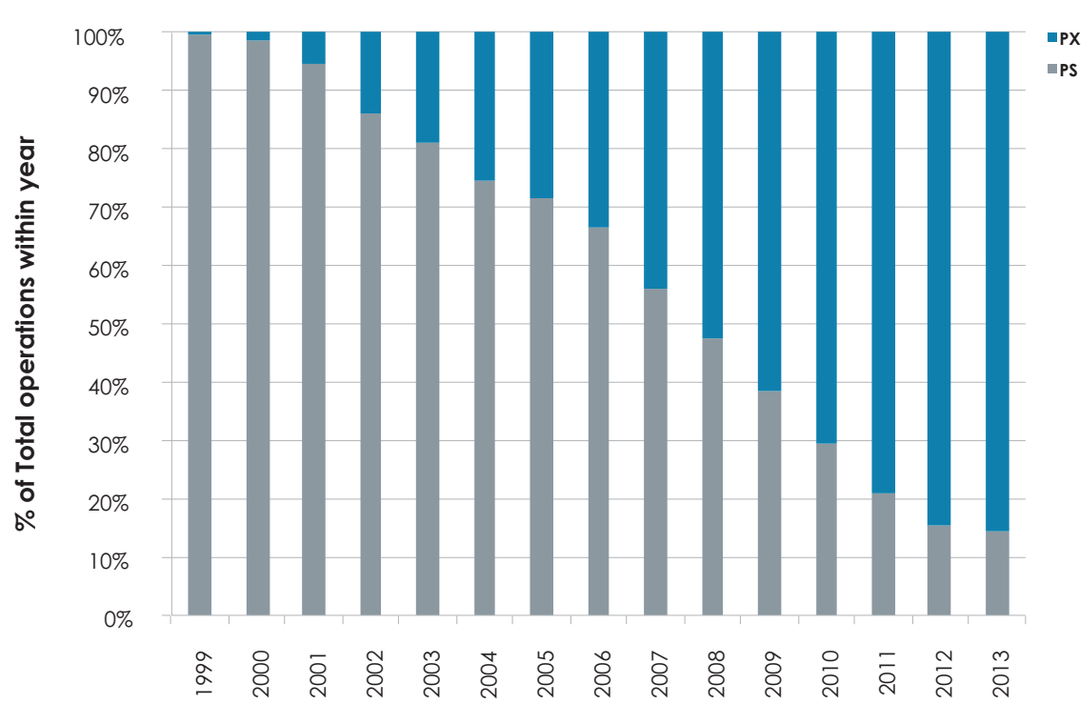


CC = ceramic/ceramic; CP = ceramic/polyethylene; CM = ceramic/metal; MM = metal/metal & MP = metal/polyethylene

Comparison of head size usage over time



Comparison usage of standard vs cross linked polyethylene over time



PS = standard & PX = cross linked polyethylene

Bone graft

Femoral autograft	218
Femoral allograft	40
Femoral synthetic	5
Acetabular autograft	757
Acetabular allograft	105
Acetabular synthetic	4

Cement

Femur cemented	58310 (62%)
Antibiotic in cement	36953 (63%)
Acetabulum cemented	23933 (26%)
Antibiotic in cement	14515 (61%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic: 89,418 (96%)

A cephalosporin was used in 87% of patients.

Operating theatre

Conventional	56,773
Laminar flow	35,198
Space suits	26,972

In 2013, 43% of arthroplasties were performed in laminar flow theatres, the same as for 2012, and 34% with space suits, which is 4% lower than for 2012.

ASA Class

This was introduced with the updated forms at the beginning of 2005.

Definitions

ASA class 1: A healthy patient

ASA class 2: A patient with mild systemic disease

ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating

ASA class 4: A patient with an incapacitating systemic disease that is a constant threat to life

ASA	Number	Percentage
1	10,489	18
2	35,425	59
3	13,565	22
4	501	1

For the nine-year period 2005 – 2013, there were 59,980 (94%) primary hip procedures with the ASA class recorded.

Operative time (skin to skin in minutes)

Mean 79 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the nine-year period 2005 – 2013.

Consultant	55,034
Advanced trainee supervised	5,315
Advanced trainee unsupervised	1,821
Basic trainee	1,461

Prosthesis usage

Conventional primary hips

Top 10 femoral components used in 2013

Exeter V40	2,847
Corail	960
Twinsys uncemented	501
CLS	295
Stemsys	291
Synergy porous	285
Twinsys cemented	273
MS 30	263
Polarstem uncemented	248
CPT	241

The Polarstem uncemented has replaced the C-Stem AMT from the 2012 list.

Top 10 acetabular components used in 2013

Pinnacle	1,312
RM Pressfit cup	975
Continuum TM	910
Trident	817
R3 porous	604
Tritanium	469
Fitmore	416
Trilogy	302
Contemporary	294
Reflection porous	252

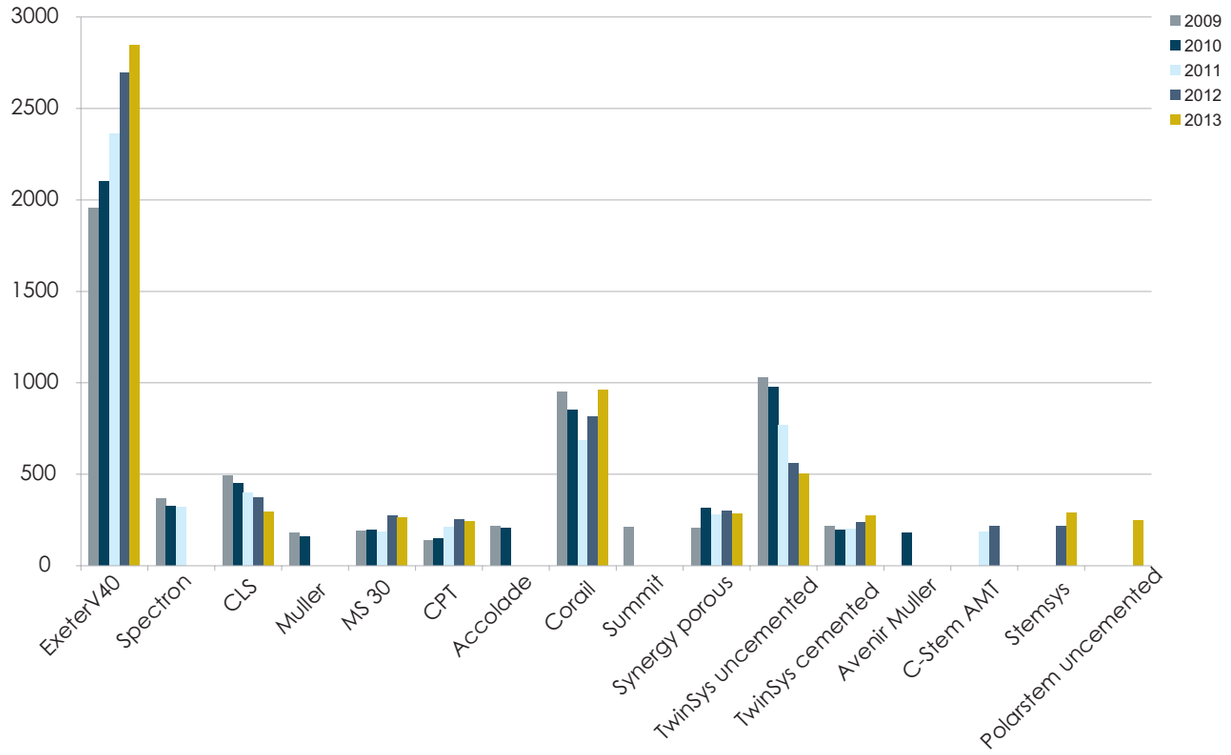
No order change from 2012.

Top Ten Combinations used in 2013

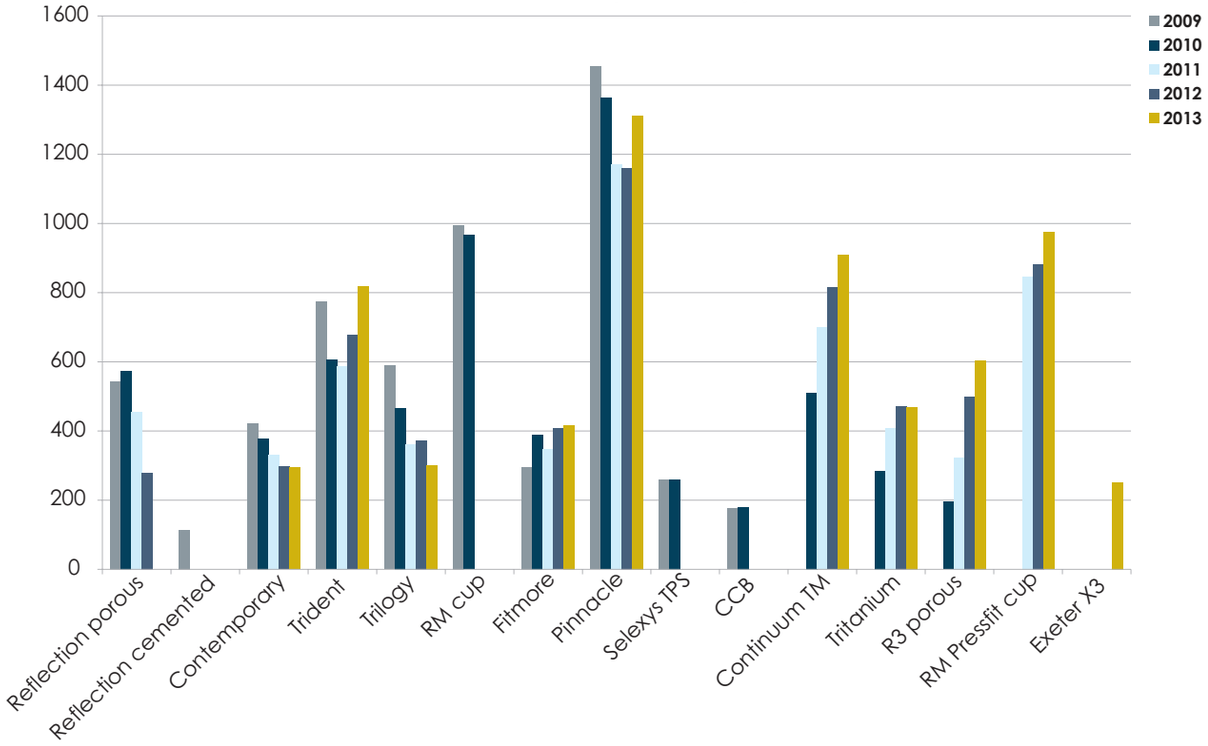
Femur	Acetabulum	All Years	2013
Corail	Pinnacle	4,596	757
Exeter V40	Trident	5,914	685
TwinSys uncemented	RM Pressfit cup	3,338	388
Exeter V40	Tritanium	1,031	329
Exeter V40	Continuum TM	980	297
Exeter V40	Contemporary	5,362	292
Exeter V40	Exeter X3	682	251
Synergy Porous	R3 porous	802	238
Exeter V40	RM Pressfit cup	1,056	199
TwinSys cemented	RM Pressfit cup	908	190

The Exeter V 40/RM Pressfit cup has replaced the Exeter V40/Trilogy from the 2012 list.

Most Used Femoral Components 5 years 2009 - 2013

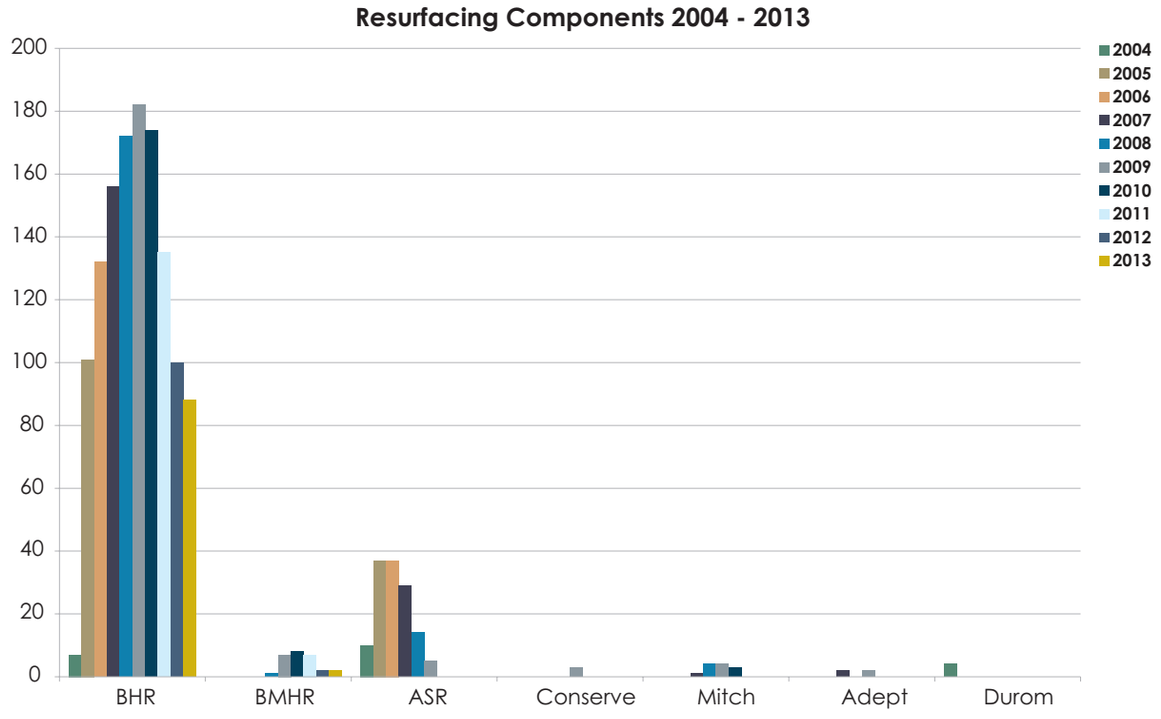


Most Used Femoral Components 5 years 2009- 2013



Resurfacing hips components used in 2013

BHR	88
BMHR	2



Surgeon and Hospital Workload

Surgeons

In 2013, 211 surgeons performed 7,710 total hip replacements, an average of 37 procedures per surgeon.

34 surgeons performed less than 10 procedures (7 less than in 2012) and 51 performed more than 50 (4 more than in 2012).

Hospitals

In 2013, primary hip replacement was performed in 53 hospitals, 28 public and 25 private.

The average number of total hip replacements per hospital was 145.

REVISION HIP ARTHROPLASTY

Revision is defined by the Registry as a new operation in a previously replaced hip joint during which one of the components is exchanged, removed, manipulated or added. It includes excision arthroplasty and amputation, but not soft tissue procedures. A two-stage procedure is registered as one revision.

Data Analysis

For the fifteen-year period January 1999 – December 2013, there were 13,954 revision hip procedures registered. This is an additional 1,223 compared to last year's report.

The average age for a revision hip replacement was 69.92 years, with a range of 17.52–97.72 years.

Revision hips

	Female	Male
Number	6,741	7,213
Percentage	48.31	51.69
Mean age	70.10	69.76
Maximum age	97.72	97.17
Minimum age	17.52	25.68
Standard dev.	12.16	10.80

The percentage of revision hips to primary hips is 13%, i.e. for every 100 hip arthroplasties, 87 will be primary replacements and 13 will be revisions. This percentage has not changed during the 15 years.

Body Mass Index

For the four year period 2010 - 2013, there were 1,243 BMI registrations for revision hip replacements. The average BMI was 28.96 with a range of 15- 55 with a standard deviation of 5.64.

Revision of Registered Primary Hip Arthroplasties

This section analyses data for revisions of **registered primary hip arthroplasties** for the fifteen year period.

There were 3,914 revisions of the 92,058 primary conventional hip replacements (4.3%) and 88 revisions of the 1,429 resurfacing hip replacements (6%), a total of 4,002 revisions.

Conventional hip arthroplasty analyses

Time to revision for conventional hips

Mean	1,633 days
Maximum	5,364 days
Minimum	0 days
Standard deviation	1,410 days

Reason for revision

Dislocation	991
Loosening acetabular component	902
Loosening femoral component	674
Pain	555
Deep infection	452
Fracture femur	369
ALVAL*	146
High blood level of metal ions	12

There was often more than one reason listed on the data form and all were entered.

** ALVAL(aseptic lymphocytic vascular-associated lesions) also includes listed revision reasons of metallosis, pseudotumour, hypersensitivity and synovitis. They all relate to metal on metal bearing revisions.*

Analysis by time of the 6 main reasons for revision

Years	Dislocation		Loosening Acetab		Loosening Fem		Deep infection		Pain		Fracture Femur	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	370	37.30	76	8.40	44	6.50	114	25.20	25	4.50	123	33.30
1	79	8.00	37	4.10	27	4.00	45	10.00	30	5.40	31	8.40
2	129	13.00	61	6.80	57	8.50	79	17.50	73	13.20	23	6.20
3	88	8.90	61	6.80	56	8.30	55	12.20	65	11.70	27	7.30
4	71	7.20	71	7.90	55	8.20	33	7.30	54	9.70	20	5.40
5	42	4.20	61	6.80	54	8.00	25	5.50	44	7.90	32	8.70
6	52	5.20	63	7.00	58	8.60	18	4.00	46	8.30	22	6.00
7	45	4.50	77	8.50	64	9.50	19	4.20	44	7.90	13	3.50
8	31	3.10	63	7.00	61	9.10	13	2.90	26	4.70	14	3.80
9	32	3.20	71	7.90	42	6.20	17	3.80	31	5.60	12	3.30
10	10	1.00	81	9.00	46	6.80	12	2.70	33	5.90	18	4.90
11	18	1.80	56	6.20	47	7.00	10	2.20	27	4.90	14	3.80
12	10	1.00	51	5.70	33	4.90	5	1.10	35	6.30	8	2.20
13	12	1.20	41	4.50	20	3.00	4	0.90	14	2.50	8	2.20
14	2	0.20	32	3.50	10	1.50	3	0.70	8	1.40	4	1.10
Total	**991**	**100.00**	**902**	**100.00**	**674**	**100.00**	**452**	**100.00**	**555**	**100.00**	**369**	**100.00**

Analyses of percentages of the 6 main reasons for revision by year

	Dislocation	Loosening Acetab	Loosening Fem	Deep infection	Pain	Fracture Femur
	%	%	%	%	%	%
1999	54.50	3.00	6.10	9.10	6.10	3.00
2000	61.80	7.30	10.90	16.40	5.50	3.60
2001	56.00	9.50	2.40	19.00	10.70	4.80
2002	44.90	20.20	7.90	14.60	16.90	3.40
2003	42.30	25.40	10.00	17.70	8.50	8.50
2004	33.80	20.90	20.30	17.60	9.50	9.50
2005	34.10	19.20	16.20	15.60	9.00	7.20
2006	32.70	22.00	21.50	9.80	7.90	8.90
2007	29.50	24.30	18.30	14.90	7.50	9.30
2008	24.90	26.70	19.50	11.20	10.00	12.20
2009	22.30	29.40	20.60	10.20	10.20	11.80
2010	21.60	25.60	19.60	12.20	16.60	10.70
2011	20.70	22.70	17.00	8.80	20.70	9.80
2012	17.30	23.70	16.70	8.70	18.40	9.70
2013	15.90	22.00	16.90	10.30	18.60	9.10

NB each year column does not add up to 100% as often more than one cause for revision is listed and there are other reasons for revision other than the 6 above listed in the registry.

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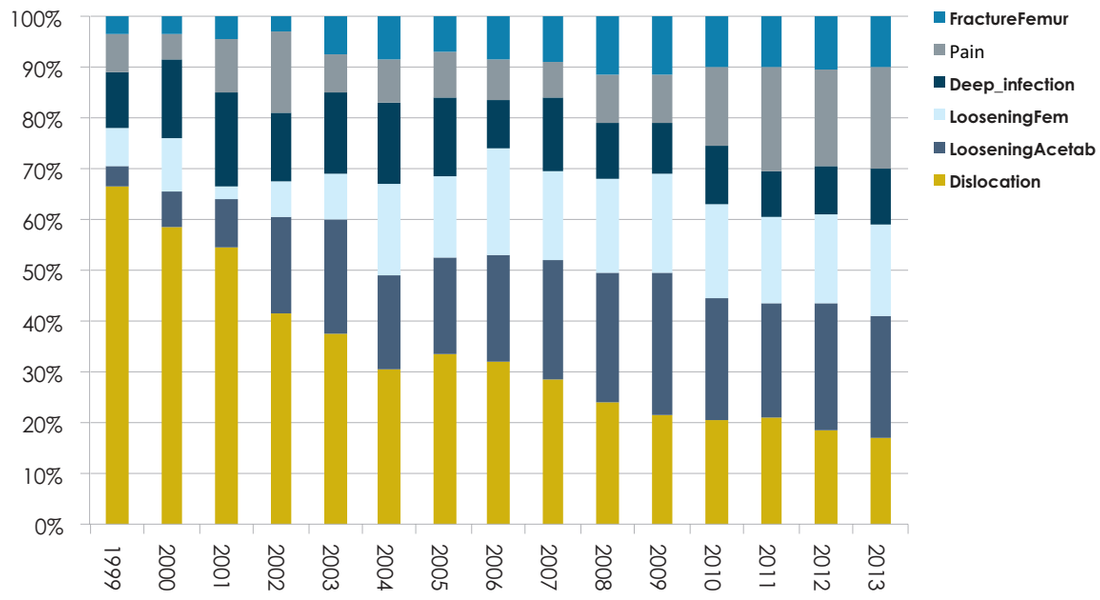


Resurfaced Hip Analyses

There were 1,429 resurfacing hips registered and 88 have been revised.

Time to revision for resurfaced hips

Mean	1,418 days
Maximum	3,165 days
Minimum	10 days
Standard deviation	845 days

Reason for revision

Pain	25
Loosening acetabulum	11
Deep infection	11
Loosening femoral component	11
Fracture femur	10
Dislocation	1

Statistical note

In the tables below there are two statistical terms readers may not be familiar with:

i) Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in place.

ii) Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percentage and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow up in calculating the revision rate. These rates are usually very low, hence it is expressed per 100 component years rather than per component year. Statisticians consider that this is a more accurate way of deriving a revision rate for comparison when analysing data with widely varying follow up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical Significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CI's) but sometimes significance can apply in the presence of CI overlap.

Conventional Primary Hip Arthroplasties

All Primary Total Hip Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
92058	540616	3914	0.72	0.70	0.75

There are 976 (951 in 2012) hip prosthesis combinations in the Registry; 597 (61%) have fewer than 10 registered procedures and 319 (33%) one only.

The tables below contain the analyses of the 193 that have a minimum of 50 primary registered procedures. As stated above it is important to note the confidence intervals and observed component years in conjunction with the revision rates.

Revisions versus Hip Prostheses Combinations Sorted on Number of Implantations

Minimum of 50 primary registered arthroplasties

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	5914	28724.2	136	0.47	0.40	0.56
Exeter V40	Contemporary	5362	30130.6	128	0.42	0.35	0.51
Corail	Pinnacle	4596	15237.4	112	0.74	0.61	0.88
TwinSys uncemented	RM Pressfit cup	3338	11990.6	69	0.58	0.45	0.73
Spectron	Reflection cemented	2940	24361.7	222	0.91	0.80	1.04
Spectron	Reflection porous	2755	18512.2	134	0.72	0.61	0.86
CLS	Fitmore	2027	13977.7	74	0.53	0.42	0.66
Exeter V40	Trilogy	2002	9885.8	49	0.50	0.37	0.66
Accolade	Trident	1867	12596.3	74	0.59	0.46	0.74
Muller	Muller PE cup	1687	13816.8	55	0.40	0.30	0.52
CLS	Morscher	1682	15866.8	78	0.49	0.39	0.61
Exeter V40	Exeter	1617	10867.6	53	0.49	0.37	0.64
Exeter	Contemporary	1551	15684.2	144	0.92	0.77	1.08
MS 30	Fitmore	1344	6778.5	20	0.30	0.18	0.46
Exeter	Exeter	1326	12864.6	89	0.69	0.56	0.85
Summit	Pinnacle	1296	5299.6	54	1.02	0.77	1.33
CLS	CLS Expansion	1263	11126.7	88	0.79	0.63	0.97
TwinSys uncemented	Selexys TPS	1227	5035.7	65	1.29	1.00	1.65
Exeter V40	Pinnacle	1204	3873.2	20	0.52	0.32	0.80
Synergy Porous	Reflection porous	1154	6534.8	30	0.46	0.31	0.66
Spectron	Duraloc	1153	10979.3	125	1.14	0.95	1.36
Exeter V40	RM Pressfit cup	1056	3604.0	10	0.28	0.13	0.51
Exeter V40	Tritanium	1031	1749.6	17	0.97	0.57	1.56
Exeter V40	Duraloc	987	7470.6	59	0.79	0.60	1.02
Exeter V40	Continuum TM	980	1695.0	21	1.24	0.77	1.89
Muller	RM cup	916	7631.3	57	0.75	0.57	0.97
TwinSys cemented	RM Pressfit cup	908	2721.6	17	0.62	0.36	1.00

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter	Osteolock	836	8958.7	51	0.57	0.42	0.75
Synergy Porous	R3 porous	802	1549.9	18	1.16	0.69	1.84
MS 30	Morscher	787	7282.5	48	0.66	0.49	0.87
CCA	CCB	703	4215.7	16	0.38	0.22	0.62
CLS	Duraloc	699	6745.0	57	0.85	0.64	1.09
CPT	Trilogy	691	3667.6	35	0.57	0.66	1.33
C-stem AMT	Pinnacle	686	1598.8	8	0.50	0.22	0.99
Exeter V40	Exeter X3	682	932.2	6	0.64	0.24	1.40
Exeter V40	Reflection cemented	651	2582.2	9	0.35	0.16	0.66
Exeter V40	Morscher	630	4901.4	25	0.51	0.33	0.75
Elite plus	Duraloc	608	5275.0	77	1.46	1.15	1.82
Exeter	Duraloc	553	6290.8	59	0.94	0.71	1.21
Exeter	Morscher	551	6419.7	28	0.44	0.29	0.63
CPT	ZCA	526	4299.3	23	0.53	0.34	0.80
Corail	Duraloc	464	3434.7	28	0.82	0.54	1.18
MS 30	Muller PE cup	462	3702.0	15	0.41	0.23	0.67
Charnley	Charnley	456	4263.4	17	0.40	0.23	0.64
CLS	Trilogy	446	1898.0	12	0.63	0.33	1.10
Exeter V40	Fitmore	433	1487.5	4	0.27	0.07	0.69
Exeter V40	Reflection porous	430	2086.7	7	0.34	0.13	0.69
CPT	Continuum TM	420	604.2	7	1.16	0.47	2.39
CLS	RM Pressfit cup	403	1641.5	13	0.79	0.42	1.35
Versys cemented	ZCA	391	3231.1	20	0.62	0.38	0.96
TwinSys uncemented	Delta-PF Cup	370	1212.5	1	0.08	0.00	0.46
Spectron	R3 porous	347	660.3	4	0.61	0.17	1.55
ABGII	Trident	342	2612.9	20	0.77	0.47	1.18
Exeter V40	CCB	339	1175.5	3	0.26	0.05	0.75
Muller	Weber	337	2498.9	7	0.28	0.11	0.58
Polarstem uncemented	Reflection porous	324	581.4	12	2.06	1.07	3.61
CLS	Reflection porous	313	1573.2	12	0.76	0.39	1.33
S-Rom	Pinnacle	313	2114.3	23	1.09	0.69	1.63
TwinSys cemented	CCB	309	1037.5	2	0.19	0.02	0.70
Femoral Stem Press Fit	Continuum TM	307	621.6	9	1.45	0.66	2.75
Charnley	Charnley Cup Ogee	303	3050.3	16	0.52	0.30	0.85
Elite plus	Charnley	298	3068.4	19	0.62	0.37	0.97
Elite plus	Elite Plus LPW	282	2454.9	11	0.45	0.22	0.80
CBC Stem	RM Pressfit cup	281	1068.8	12	1.12	0.58	1.96
CLS	Continuum TM	275	511.7	3	0.59	0.12	1.71
Polarstem uncemented	R3 porous	273	310.4	2	0.64	0.08	2.33
Versys	Trilogy	272	2867.4	13	0.45	0.24	0.78

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Osteolock	270	2392.8	10	0.42	0.20	0.77
H-Max S	Delta-TT Cup	265	395.3	6	1.52	0.56	3.30
Stemsys	Fixa Ti Por	263	302.7	4	1.32	0.36	3.38
Muller	RM Pressfit cup	248	1167.8	3	0.26	0.05	0.75
Stemsys	DeltaMotion Cup	243	685.0	3	0.44	0.09	1.28
C-stem AMT	Marathon cemented	242	657.0	5	0.76	0.25	1.78
Versys cemented	Trilogy	237	2026.7	7	0.35	0.14	0.71
Exeter V40	R3 porous	217	295.4	2	0.68	0.08	2.45
Exeter	Trilogy	213	2308.0	12	0.52	0.27	0.91
CPT	Duraloc	212	1954.5	12	0.61	0.32	1.07
Trabecular Metal Stem	Continuum TM	212	414.3	10	2.41	1.16	4.44
Spectron	Morscher	210	2178.3	19	0.87	0.53	1.36
TwinSys uncemented	Trilogy	209	890.1	8	0.90	0.39	1.77
CLS	Durom	198	1241.1	30	2.42	1.63	3.45
MS 30	Trilogy	194	844.8	3	0.36	0.07	1.04
CLS	Allofit	192	1152.4	13	1.13	0.60	1.93
Lateral straight stem	Muller PE cup	188	1565.6	9	0.57	0.26	1.09
CBC Stem	Expansys shell	183	1153.4	14	1.21	0.66	2.04
Accolade	Pinnacle	180	801.8	2	0.25	0.03	0.90
Avenir Muller uncemented	Continuum TM	160	331.4	8	2.41	1.04	4.76
CLS	Trident	159	1244.1	11	0.88	0.44	1.58
Friendly	Delta-PF Cup	159	922.5	3	0.33	0.07	0.95
Corail	ASR	156	834.7	69	8.27	6.43	10.46
Accolade	Tritanium	152	351.5	2	0.57	0.07	2.06
Spectron	Mallory-Head	152	1260.5	6	0.48	0.17	1.04
Omnifit	Trident	149	1226.2	12	0.98	0.51	1.71
TwinSys cemented	RM cup	148	881.9	4	0.45	0.12	1.16
CPT	Trident	145	1020.8	11	1.08	0.54	1.93
MS 30	Continuum TM	145	268.3	2	0.75	0.09	2.69
Corail	Reflection porous	140	762.7	1	0.13	0.00	0.73
ABGII	Duraloc	139	1450.7	22	1.52	0.95	2.30
Femoral Stem Press Fit	Trilogy	138	598.9	4	0.67	0.18	1.71
Corail	Ultima	135	947.8	3	0.32	0.07	0.93
Muller	ZCA	135	548.0	2	0.36	0.04	1.32
Exeter V40	Trabecular Metal Shell	134	427.1	8	1.87	0.81	3.69
Summit	Trilogy	132	635.6	4	0.63	0.17	1.61
CCA	RM Pressfit cup	131	842.6	3	0.36	0.07	1.04
S-Rom	ASR	130	618.3	82	13.26	10.55	16.46
Exeter	CLS Expansion	129	1346.4	8	0.59	0.26	1.17

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Contemporary	128	955.1	7	0.73	0.29	1.51
Exeter V40	Monoblock Acetabular Cup	123	1108.1	5	0.45	0.15	1.05
TwinSys uncemented	RM cup	122	494.3	3	0.61	0.13	1.77
CPT	Fitmore	119	430.7	7	1.63	0.65	3.35
Exeter	Muller PE cup	119	1231.6	5	0.41	0.13	0.95
ABG	Duraloc	116	1502.2	19	1.26	0.76	1.98
Accolade	Muller PE cup	114	872.2	1	0.11	0.00	0.64
Corail	Trilogy	114	246.2	2	0.81	0.10	2.93
Synergy Porous	BHR Acetabular Cup	114	623.9	9	1.44	0.66	2.74
CLS	RM cup	113	768.2	13	1.69	0.90	2.89
Exeter	Bio-clad poly	113	1101.2	6	0.54	0.20	1.19
Prodigy	Duraloc	113	1201.6	15	1.25	0.70	2.06
Stemsys	RM Pressfit cup	113	146.9	1	0.68	0.02	3.79
Corail	Tritanium	111	167.7	2	1.19	0.14	4.31
Muller	Trilogy	111	516.6	10	1.94	0.93	3.56
Elite plus	Elite Plus Ogee	110	928.1	5	0.54	0.17	1.26
Exeter V40	Bio-clad poly	110	547.2	2	0.37	0.04	1.32
Accolade II	Trident	109	57.3	1	1.74	0.04	9.72
Muller	Continuum TM	108	183.3	2	1.09	0.13	3.94
ABGII	Delta-PF Cup	107	838.6	8	0.95	0.41	1.88
Muller	ZCA all-poly cup	107	189.9	0	0.00	0.00	1.94
CLS	Weill ring	106	1176.9	6	0.51	0.19	1.11
TwinSys uncemented	Continuum TM	106	233.4	3	1.29	0.27	3.76
Avenir Muller uncemented	RM cup	105	357.9	1	0.28	0.01	1.56
Basis	Reflection porous	105	412.8	1	0.24	0.01	1.35
Mallory-Head	M2A	105	820.6	10	1.22	0.58	2.24
Stemsys	Agilis Ti-por	104	89.6	0	0.00	0.00	4.12
Corail	Continuum TM	101	130.3	2	1.53	0.19	5.54
Summit	Duraloc	101	795.5	5	0.63	0.20	1.47
Avenir Muller uncemented	Pinnacle	99	341.2	3	0.88	0.18	2.57
Accolade II	Tritanium	96	58.3	0	0.00	0.00	6.33
Corail	Monoblock Acetabular Cup	95	524.7	4	0.76	0.21	1.95
Exeter V40	Muller PE cup	94	661.6	3	0.45	0.09	1.33
Anthology Porous	BHR Acetabular Cup	93	414.6	6	1.45	0.53	3.15
Standard straight stem	RM cup	92	788.0	6	0.76	0.28	1.66
Avenir Muller uncemented	Tritanium	91	235.2	0	0.00	0.00	1.57
Exeter V40	CLS Expansion	88	755.1	1	0.13	0.00	0.74
Summit	ASR	88	480.9	23	4.78	3.03	7.18

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Synergy Porous	Delta-PF Cup	87	354.5	0	0.00	0.00	1.04
H-Max M	Delta-TT Cup	86	269.5	2	0.74	0.09	2.68
CPT	Monoblock Acetabular Cup	84	622.5	7	1.12	0.45	2.32
Exeter	Trident	84	922.4	0	0.00	0.00	0.40
MS 30	RM Pressfit cup	83	468.1	1	0.21	0.01	1.19
CLS	Monoblock Acetabular Cup	80	513.5	3	0.58	0.12	1.71
CPT	Tritanium	80	219.7	3	1.37	0.28	3.99
MS 30	ZCA all-poly cup	79	98.9	0	0.00	0.00	3.73
Muller	Duraloc	79	822.3	8	0.97	0.42	1.92
Corail	Delta-PF Cup	78	534.5	1	0.19	0.00	1.04
S-Rom	Ultima	78	919.0	7	0.76	0.31	1.57
Spectron	Fitmore	78	778.8	4	0.51	0.14	1.32
Spectron	Trident	78	636.2	3	0.47	0.10	1.38
Muller	Trident	75	522.1	6	1.15	0.42	2.50
AML MMA	Duraloc	74	771.9	9	1.17	0.53	2.21
CCA	Contemporary	74	705.2	10	1.42	0.68	2.61
Corail	DeltaMotion Cup	74	137.0	0	0.00	0.00	2.69
Trabecular Metal Stem	Monoblock Acetabular Cup	74	474.0	3	0.63	0.13	1.85
ABG	ABGII	72	896.3	12	1.34	0.69	2.34
Contemporary	Contemporary	71	764.6	10	1.31	0.63	2.41
H-Max M	Delta-PF Cup	71	239.6	4	1.67	0.45	4.28
Spectron	Biomex acet shell porous	68	769.3	1	0.13	0.00	0.72
ABGII	Pinnacle	67	348.3	3	0.86	0.18	2.52
Exeter V40	Delta-TT Cup	67	93.5	0	0.00	0.00	3.95
Spectron	Muller PE cup	66	571.1	6	1.05	0.39	2.29
Anthology Porous	R3 porous	65	285.9	4	1.40	0.38	3.58
CLS	Pinnacle	65	276.7	0	0.00	0.00	1.33
TwinSys cemented	Selexys TPS	65	191.5	4	2.09	0.57	5.35
Furlong	Furlong	64	509.5	5	0.98	0.32	2.29
Standard straight stem	Muller PE cup	63	467.3	0	0.00	0.00	0.79
CPT	Pinnacle	61	282.7	2	0.71	0.09	2.56
CPT	ZCA all-poly cup	61	117.8	1	0.85	0.02	4.73
Wagner cone stem	Fitmore	61	503.2	3	0.60	0.12	1.74
CBC Stem	Fitmore	59	327.9	5	1.53	0.50	3.56
CLS	Artek	59	572.6	22	3.84	2.41	5.82
Lateral straight stem	Weber	57	522.6	3	0.57	0.12	1.68
Muller	Morscher	56	589.8	3	0.51	0.10	1.49
C-Stem	Elite Plus Ogee	55	439.3	2	0.46	0.06	1.64

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Duraloc	55	628.1	5	0.80	0.26	1.86
Muller	Fitmore	55	259.6	1	0.39	0.01	2.15
AML	Duraloc	53	597.9	2	0.33	0.04	1.21
C-Stem	Duraloc	53	492.1	5	1.02	0.33	2.37
Corail	Trident	53	140.6	2	1.42	0.17	5.14
Exeter V40	Weber	53	417.2	0	0.00	0.00	0.88
Exeter V40	ZCA	53	344.0	1	0.29	0.01	1.62
Exeter V40	ZCA all-poly cup	53	60.5	0	0.00	0.00	6.10
Tri-Lock BPS	Pinnacle	53	139.8	3	2.14	0.44	6.27
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	52	40.5	1	2.46	0.06	13.73
Muller	CLS Expansion	52	301.2	4	1.33	0.36	3.40
Friendly	Delta-TT Cup	50	136.6	2	1.46	0.18	5.29

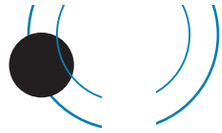
Revisions versus Hip Prostheses Combinations Sorted on Revision Rate

Minimum of 50 primary registered arthroplasties

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*S-Rom	ASR	130	618.3	82	13.26	10.55	16.46
*Corail	ASR	156	834.7	69	8.27	6.43	10.46
*Summit	ASR	88	480.9	23	4.78	3.03	7.18
*CLS	Artek	59	572.6	22	3.84	2.41	5.82
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	52	40.6	1	2.46	0.06	13.73
*CLS	Durom	198	1241.1	30	2.42	1.63	3.45
*#Avenir Muller uncemented	Continuum TM	160	331.4	8	2.41	1.04	4.76
*#Trabecular Metal Stem	Continuum TM	212	414.3	10	2.41	1.16	4.44
Tri-Lock BPS	Pinnacle	53	139.9	3	2.14	0.44	6.27
TwinSys cemented	Selexys TPS	65	191.5	4	2.09	0.57	5.35
*#Polarstem uncemented	Reflection porous	324	581.4	12	2.06	1.07	3.61
*Muller	Trilogy	111	516.6	10	1.94	0.93	3.56
*Exeter V40	Trabecular Metal Shell	134	427.1	8	1.87	0.81	3.69
Accolade II	Trident	109	57.3	1	1.74	0.04	9.72
*CLS	RM cup	113	768.2	13	1.69	0.90	2.89
H-Max M	Delta-PF Cup	71	239.6	4	1.67	0.45	4.28
CPT	Fitmore	119	430.7	7	1.63	0.65	3.35
Corail	Continuum TM	101	130.3	2	1.53	0.19	5.54

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CBC Stem	Fitmore	59	327.9	5	1.53	0.50	3.56
H-Max S	Delta-TT Cup	265	395.3	6	1.52	0.56	3.30
*ABGII	Duraloc	139	1450.7	22	1.52	0.95	2.30
Friendly	Delta-TT Cup	50	136.6	2	1.46	0.18	5.29
Elite plus	Duraloc	608	5275.0	77	1.46	1.15	1.82
Femoral Stem Press Fit	Continuum TM	307	621.6	9	1.45	0.66	2.75
Anthology Porous	BHR Acetabular Cup	93	414.6	6	1.45	0.53	3.15
Synergy Porous	BHR Acetabular Cup	114	623.9	9	1.44	0.66	2.74
Corail	Trident	53	140.7	2	1.42	0.17	5.14
CCA	Contemporary	74	705.2	10	1.42	0.68	2.61
Anthology Porous	R3 porous	65	285.9	4	1.40	0.38	3.58
CPT	Tritanium	80	219.7	3	1.37	0.28	3.99
ABG	ABGII	72	896.3	12	1.34	0.69	2.34
Muller	CLS Expansion	52	301.2	4	1.33	0.36	3.40
Stemsys	Fixa Ti Por	263	302.7	4	1.32	0.36	3.38
Contemporary	Contemporary	71	764.6	10	1.31	0.63	2.41
*#TwinSys uncemented	Selexys TPS	1227	5035.7	65	1.29	1.00	1.65
TwinSys uncemented	Continuum TM	106	233.4	3	1.29	0.27	3.76
*ABG	Duraloc	116	1502.2	19	1.26	0.76	1.98
Prodigy	Duraloc	113	1201.6	15	1.25	0.70	2.06
*#Exeter V40	Continuum TM	980	1695.0	21	1.24	0.77	1.89
Mallory-Head	M2A	105	820.6	10	1.22	0.58	2.24
CBC Stem	Expansys shell	183	1153.4	14	1.21	0.66	2.04
Corail	Tritanium	111	167.7	2	1.19	0.14	4.31
AML MMA	Duraloc	74	771.9	9	1.17	0.53	2.21
Synergy Porous	R3 porous	802	1549.9	18	1.16	0.69	1.84
CPT	Continuum TM	420	604.2	7	1.16	0.47	2.39
Muller	Trident	75	522.1	6	1.15	0.42	2.50
*Spectron	Duraloc	1153	10979.3	125	1.14	0.95	1.36
CLS	Allofit	192	1152.4	13	1.13	0.60	1.93
CPT	Monoblock Acetabular Cup	84	622.5	7	1.12	0.45	2.32
CBC Stem	RM Pressfit cup	281	1068.8	12	1.12	0.58	1.96
Muller	Continuum TM	108	183.3	2	1.09	0.13	3.94
S-Rom	Pinnacle	313	2114.3	23	1.09	0.69	1.63
CPT	Trident	145	1020.8	11	1.08	0.54	1.93
Spectron	Muller PE cup	66	571.1	6	1.05	0.39	2.29
*#Summit	Pinnacle	1296	5299.6	54	1.02	0.77	1.33
C-Stem	Duraloc	53	492.1	5	1.02	0.33	2.37
Furlong	Furlong	64	509.5	5	0.98	0.32	2.29

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Omnifit	Trident	149	1226.2	12	0.98	0.51	1.71
Muller	Duraloc	79	822.3	8	0.97	0.42	1.92
Exeter V40	Tritanium	1031	1749.6	17	0.97	0.57	1.56
CPT	Trilogy	691	3667.6	35	0.95	0.66	1.33
ABGII	Delta-PF Cup	107	838.6	8	0.95	0.41	1.88
Exeter	Duraloc	553	6290.8	59	0.94	0.71	1.21
*Exeter	Contemporary	1551	15684.2	144	0.92	0.77	1.08
*#Spectron	Reflection cemented	2940	24361.7	222	0.91	0.80	1.04
TwinSys uncemented	Trilogy	209	890.1	8	0.90	0.39	1.77
CLS	Trident	159	1244.1	11	0.88	0.44	1.58
Avenir Muller uncemented	Pinnacle	99	341.2	3	0.88	0.18	2.57
Spectron	Morscher	210	2178.3	19	0.87	0.53	1.36
ABGII	Pinnacle	67	348.3	3	0.86	0.18	2.52
CPT	ZCA all-poly cup	61	117.8	1	0.85	0.02	4.73
CLS	Duraloc	699	6745.0	57	0.85	0.64	1.09
Corail	Duraloc	464	3434.7	28	0.82	0.54	1.18
Corail	Trilogy	114	246.2	2	0.81	0.10	2.93
MS 30	Duraloc	55	628.1	5	0.80	0.26	1.86
CLS	RM Pressfit cup	403	1641.5	13	0.79	0.42	1.35
CLS	CLS Expansion	1263	11126.7	88	0.79	0.63	0.97
Exeter V40	Duraloc	987	7470.6	59	0.79	0.60	1.02
ABGII	Trident	342	2612.9	20	0.77	0.47	1.18
CLS	Reflection porous	313	1573.2	12	0.76	0.39	1.33
Corail	Monoblock Acetabular Cup	95	524.7	4	0.76	0.21	1.95
S-Rom	Ultima	78	919.0	7	0.76	0.31	1.57
Standard straight stem	RM cup	92	788.0	6	0.76	0.28	1.66
C-stem AMT	Marathon cemented	242	657.0	5	0.76	0.25	1.78
Muller	RM cup	916	7631.3	57	0.75	0.57	0.97
MS 30	Continuum TM	145	268.3	2	0.75	0.09	2.69
H-Max M	Delta-TT Cup	86	269.5	2	0.74	0.09	2.68
Corail	Pinnacle	4596	15237.4	112	0.74	0.61	0.88
MS 30	Contemporary	128	955.1	7	0.73	0.29	1.51
Spectron	Reflection porous	2755	18512.2	134	0.72	0.61	0.86
CPT	Pinnacle	61	282.7	2	0.71	0.09	2.56
Exeter	Exeter	1326	12864.6	89	0.69	0.56	0.85
Stemsys	RM Pressfit cup	113	146.9	1	0.68	0.02	3.79
Exeter V40	R3 porous	217	295.4	2	0.68	0.08	2.45



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Femoral Stem Press Fit	Trilogy	138	598.9	4	0.67	0.18	1.71
MS 30	Morscher	787	7282.5	48	0.66	0.49	0.87
Polarstem uncemented	R3 porous	273	310.4	2	0.64	0.08	2.33
Exeter V40	Exeter X3	682	932.2	6	0.64	0.24	1.40
Trabecular Metal Stem	Monoblock Acetabular Cup	74	474.0	3	0.63	0.13	1.85
CLS	Trilogy	446	1898.0	12	0.63	0.33	1.10
Summit	Trilogy	132	635.6	4	0.63	0.17	1.61
Summit	Duraloc	101	795.5	5	0.63	0.20	1.47
TwinSys cemented	RM Pressfit cup	908	2721.6	17	0.62	0.36	1.00
Elite plus	Charnley	298	3068.4	19	0.62	0.37	0.97
Versys cemented	ZCA	391	3231.1	20	0.62	0.38	0.96
CPT	Duraloc	212	1954.5	12	0.61	0.32	1.07
TwinSys uncemented	RM cup	122	494.3	3	0.61	0.13	1.77
Spectron	R3 porous	347	660.3	4	0.61	0.17	1.55
Wagner cone stem	Fitmore	61	503.2	3	0.60	0.12	1.74
Exeter	CLS Expansion	129	1346.4	8	0.59	0.26	1.17
Accolade	Trident	1867	12596.3	74	0.59	0.46	0.74
CLS	Continuum TM	275	511.7	3	0.59	0.12	1.71
CLS	Monoblock Acetabular Cup	80	513.5	3	0.58	0.12	1.71
TwinSys uncemented	RM Pressfit cup	3338	11990.6	69	0.58	0.45	0.73
Lateral straight stem	Muller PE cup	188	1565.6	9	0.57	0.26	1.09
Lateral straight stem	Weber	57	522.6	3	0.57	0.12	1.68
Exeter	Osteolock	836	8958.7	51	0.57	0.42	0.75
Accolade	Tritanium	152	351.5	2	0.57	0.07	2.06
Exeter	Bio-clad poly	113	1101.2	6	0.54	0.20	1.19
Elite plus	Elite Plus Ogee	110	928.1	5	0.54	0.17	1.26
CPT	ZCA	526	4299.3	23	0.53	0.34	0.80
CLS	Fitmore	2027	13977.7	74	0.53	0.42	0.66
Charnley	Charnley Cup Ogee	303	3050.3	16	0.52	0.30	0.85
Exeter	Trilogy	213	2308.0	12	0.52	0.27	0.91
Exeter V40	Pinnacle	1204	3873.2	20	0.52	0.32	0.80
Spectron	Fitmore	78	778.8	4	0.51	0.14	1.32
Exeter V40	Morscher	630	4901.4	25	0.51	0.33	0.75
CLS	Weill ring	106	1176.9	6	0.51	0.19	1.11
Muller	Morscher	56	589.8	3	0.51	0.10	1.49
C-stem AMT	Pinnacle	686	1598.8	8	0.50	0.22	0.99
Exeter V40	Trilogy	2002	9885.8	49	0.50	0.37	0.66
CLS	Morscher	1682	15866.8	78	0.49	0.39	0.61

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Exeter	1617	10867.6	53	0.49	0.37	0.64
Spectron	Mallory-Head	152	1260.5	6	0.48	0.17	1.04
Exeter V40	Trident	5914	28724.2	136	0.47	0.40	0.56
Spectron	Trident	78	636.2	3	0.47	0.10	1.38
Synergy Porous	Reflection porous	1154	6534.8	30	0.46	0.31	0.66
C-Stem	Elite Plus Ogee	55	439.3	2	0.46	0.06	1.64
TwinSys cemented	RM cup	148	881.9	4	0.45	0.12	1.16
Exeter V40	Muller PE cup	94	661.6	3	0.45	0.09	1.33
Versys	Trilogy	272	2867.4	13	0.45	0.24	0.78
Exeter V40	Monoblock Acetabular Cup	123	1108.1	5	0.45	0.15	1.05
Elite plus	Elite Plus LPW	282	2454.9	11	0.45	0.22	0.80
Stemsys	DeltaMotion Cup	243	685.0	3	0.44	0.09	1.28
Exeter	Morscher	551	6419.7	28	0.44	0.29	0.63
Exeter V40	Contemporary	5362	30130.6	128	0.42	0.35	0.51
Exeter V40	Osteolock	270	2392.8	10	0.42	0.20	0.77
Exeter	Muller PE cup	119	1231.6	5	0.41	0.13	0.95
MS 30	Muller PE cup	462	3702.0	15	0.41	0.23	0.67
Charnley	Charnley	456	4263.4	17	0.40	0.23	0.64
Muller	Muller PE cup	1687	13816.8	55	0.40	0.30	0.52
Muller	Fitmore	55	259.6	1	0.39	0.01	2.15
CCA	CCB	703	4215.7	16	0.38	0.22	0.62
Exeter V40	Bio-clad poly	110	547.2	2	0.37	0.04	1.32
Muller	ZCA	135	548.0	2	0.36	0.04	1.32
CCA	RM Pressfit cup	131	842.6	3	0.36	0.07	1.04
MS 30	Trilogy	194	844.8	3	0.36	0.07	1.04
Exeter V40	Reflection cemented	651	2582.2	9	0.35	0.16	0.66
Versys cemented	Trilogy	237	2026.7	7	0.35	0.14	0.71
Exeter V40	Reflection porous	430	2086.7	7	0.34	0.13	0.69
AML	Duraloc	53	597.9	2	0.33	0.04	1.21
Friendly	Delta-PF Cup	159	922.5	3	0.33	0.07	0.95
Corail	Ultima	135	947.8	3	0.32	0.07	0.93
MS 30	Fitmore	1344	6778.5	20	0.30	0.18	0.46
Exeter V40	ZCA	53	344.0	1	0.29	0.01	1.62
Muller	Weber	337	2498.9	7	0.28	0.11	0.58
Avenir Muller uncemented	RM cup	105	357.9	1	0.28	0.01	1.56
Exeter V40	RM Pressfit cup	1056	3604.0	10	0.28	0.13	0.51
Exeter V40	Fitmore	433	1487.5	4	0.27	0.07	0.69
Muller	RM Pressfit cup	248	1167.8	3	0.26	0.05	0.75
Exeter V40	CCB	339	1175.5	3	0.26	0.05	0.75

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Accolade	Pinnacle	180	801.8	2	0.25	0.03	0.90
Basis	Reflection porous	105	412.8	1	0.24	0.01	1.35
MS 30	RM Pressfit cup	83	468.1	1	0.21	0.01	1.19
TwinSys cemented	CCB	309	1037.5	2	0.19	0.02	0.70
Corail	Delta-PF Cup	78	534.5	1	0.19	0.00	1.04
Exeter V40	CLS Expansion	88	755.1	1	0.13	0.00	0.74
Corail	Reflection porous	140	762.7	1	0.13	0.00	0.73
Spectron	Biomex acet shell porous	68	769.3	1	0.13	0.00	0.72
Accolade	Muller PE cup	114	872.2	1	0.11	0.00	0.64
TwinSys uncemented	Delta-PF Cup	370	1212.5	1	0.08	0.00	0.46
Muller	ZCA all-poly cup	107	189.9	0	0.00	0.00	1.94
Stemsys	Agilis Ti-por	104	89.6	0	0.00	0.00	4.12
Accolade II	Tritanium	96	58.3	0	0.00	0.00	6.33
Avenir Muller uncemented	Tritanium	91	235.2	0	0.00	0.00	1.57
Synergy Porous	Delta-PF Cup	87	354.5	0	0.00	0.00	1.04
Exeter	Trident	84	922.4	0	0.00	0.00	0.40
MS 30	ZCA all-poly cup	79	98.9	0	0.00	0.00	3.73
Corail	DeltaMotion Cup	74	137.0	0	0.00	0.00	2.69
Exeter V40	Delta-TT Cup	67	93.5	0	0.00	0.00	3.95
CLS	Pinnacle	65	276.7	0	0.00	0.00	1.33
Standard straight stem	Muller PE cup	63	467.3	0	0.00	0.00	0.79
Exeter V40	Weber	53	417.3	0	0.00	0.00	0.88
Exeter V40	ZCA all-poly cup	53	60.5	0	0.00	0.00	6.10

*Those marked with an * in the above table have revision rates significantly higher than the overall rate of 0.72 /100 ocys @ the 95% confidence interval. There are several other combinations with high revision rates but without statistical significance because of the wide CIs.*

*Those marked with a # as well as an * indicate those combinations used during 2013.*

It is noteworthy that 42% of the ASR combinations have been revised.

Revisions versus Hip Prostheses Combinations and Fixation Method Sorted on Number of Implantations

Minimum of 50 primary registered arthroplasties

Fully Cemented

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Contemporary	5,362	30,130.6	128	0.42	0.35	0.51
Spectron	Reflection cemented	2,940	24,361.7	222	0.91	0.80	1.04
Muller	Muller PE cup	1,687	13,816.8	55	0.40	0.30	0.52
Exeter V40	Exeter	1,617	10,867.6	53	0.49	0.37	0.64
Exeter	Contemporary	1,551	15,684.2	144	0.92	0.77	1.08
Exeter	Exeter	1,326	12,864.6	89	0.69	0.56	0.85
CCA	CCB	703	4,215.7	16	0.38	0.22	0.62
Exeter V40	Exeter X3	682	932.2	6	0.64	0.24	1.40
Exeter V40	Reflection cemented	651	2,582.2	9	0.35	0.16	0.66
CPT	ZCA	526	4,299.3	23	0.53	0.34	0.80
MS 30	Muller PE cup	462	3,702.0	15	0.41	0.23	0.67
Charnley	Charnley	456	4,263.4	17	0.40	0.23	0.64
Versys cemented	ZCA	391	3,231.1	20	0.62	0.38	0.96
Exeter V40	CCB	339	1,175.5	3	0.26	0.05	0.75
Muller	Weber	337	2,498.9	7	0.28	0.11	0.58
TwinSys cemented	CCB	309	1,037.5	2	0.19	0.02	0.70
Charnley	Charnley Cup Ogee	303	3,050.3	16	0.52	0.30	0.85
Elite plus	Charnley	298	3,068.4	19	0.62	0.37	0.97
Elite plus	Elite Plus LPW	282	2,454.9	11	0.45	0.22	0.80
C-Stem AMT	Marathon cemented	242	657.0	5	0.76	0.25	1.78
Lateral straight stem	Muller PE cup	188	1,565.6	9	0.57	0.26	1.09
Muller	ZCA	135	548.0	2	0.36	0.04	1.32
MS 30	Contemporary	128	955.1	7	0.73	0.29	1.51
Exeter	Muller PE cup	119	1,231.6	5	0.41	0.13	0.95
Exeter	Bio-clad poly	113	1,101.2	6	0.54	0.20	1.19
Elite plus	Elite Plus Ogee	110	928.1	5	0.54	0.17	1.26
Exeter V40	Bio-clad poly	110	547.2	2	0.37	0.04	1.32
Muller	ZCA all-poly cup	107	189.9	0	0.00	0.00	1.94
Exeter V40	Muller PE cup	94	661.6	3	0.45	0.09	1.33
MS 30	ZCA all-poly cup	79	98.9	0	0.00	0.00	3.73
CCA	Contemporary	74	705.2	10	1.42	0.68	2.61
Contemporary	Contemporary	71	764.6	10	1.31	0.63	2.41
Spectron	Muller PE cup	66	571.1	6	1.05	0.39	2.29
Standard straight stem	Muller PE cup	63	467.3	0	0.00	0.00	0.79
CPT	ZCA all-poly cup	61	117.8	1	0.85	0.02	4.73

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Lateral straight stem	Weber	57	522.6	3	0.57	0.12	1.68
C-Stem	Elite Plus Ogee	55	439.3	2	0.46	0.06	1.64
Exeter V40	Weber	53	417.3	0	0.00	0.00	0.88
Exeter V40	ZCA	53	344.0	1	0.29	0.01	1.62
Exeter V40	ZCA all-poly cup	53	60.5	0	0.00	0.00	6.10

Uncemented

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	Pinnacle	4,596	15,237.4	112	0.74	0.61	0.88
TwinSys uncemented	RM Pressfit cup	3,338	11,990.6	69	0.58	0.45	0.73
CLS	Fitmore	2,027	13,977.7	74	0.53	0.42	0.66
Accolade	Trident	1,867	12,596.3	74	0.59	0.46	0.74
CLS	Morscher	1,682	15,866.8	78	0.49	0.39	0.61
Summit	Pinnacle	1,296	5,299.6	54	1.02	0.77	1.33
CLS	CLS Expansion	1,263	11,126.7	88	0.79	0.63	0.97
TwinSys uncemented	Selexys TPS	1,227	5,035.7	65	1.29	1.00	1.65
Synergy Porous	Reflection porous	1,154	6,534.8	30	0.46	0.31	0.66
Synergy Porous	R3 porous	802	1,549.9	18	1.16	0.69	1.84
CLS	Duraloc	699	6,745.0	57	0.85	0.64	1.09
Corail	Duraloc	464	3,434.7	28	0.82	0.54	1.18
CLS	Trilogy	446	1,898.0	12	0.63	0.33	1.10
CLS	RM Pressfit cup	403	1,641.5	13	0.79	0.42	1.35
TwinSys uncemented	Delta-PF Cup	370	1,212.5	1	0.08	0.00	0.46
ABGII	Trident	342	2,612.9	20	0.77	0.47	1.18
Polarstem uncemented	Reflection porous	324	581.4	12	2.06	1.07	3.61
CLS	Reflection porous	313	1,573.2	12	0.76	0.39	1.33
S-Rom	Pinnacle	313	2,114.3	23	1.09	0.69	1.63
Femoral Stem Press Fit	Continuum TM	307	621.6	9	1.45	0.66	2.75
CBC Stem	RM Pressfit cup	281	1,068.8	12	1.12	0.58	1.96
CLS	Continuum TM	275	511.7	3	0.59	0.12	1.71
Polarstem uncemented	R3 porous	273	310.4	2	0.64	0.08	2.33
Versys	Trilogy	272	2,867.4	13	0.45	0.24	0.78
H-Max S	Delta-TT Cup	263	393.5	6	1.52	0.56	3.32
Stemsys	Fixa Ti Por	263	302.7	4	1.32	0.36	3.38
Stemsys	DeltaMotion Cup	242	684.8	3	0.44	0.09	1.28
Trabecular Metal Stem	Continuum TM	212	414.3	10	2.41	1.16	4.44
TwinSys uncemented	Trilogy	209	890.1	8	0.90	0.39	1.77

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Durom	198	1,241.1	30	2.42	1.63	3.45
CLS	Allofit	192	1,152.4	13	1.13	0.60	1.93
CBC Stem	Expansys shell	183	1,153.4	14	1.21	0.66	2.04
Accolade	Pinnacle	180	801.8	2	0.25	0.03	0.90
Avenir Muller uncemented	Continuum TM	160	331.4	8	2.41	1.04	4.76
CLS	Trident	159	1,244.1	11	0.88	0.44	1.58
Corail	ASR	156	834.7	69	8.27	6.43	10.46
Accolade	Tritanium	152	351.5	2	0.57	0.07	2.06
Corail	Reflection porous	140	762.7	1	0.13	0.00	0.73
ABGII	Duraloc	139	1,450.7	22	1.52	0.95	2.30
Femoral Stem Press Fit	Trilogy	138	598.9	4	0.67	0.18	1.71
Summit	Trilogy	132	635.6	4	0.63	0.17	1.61
S-Rom	ASR	130	618.3	82	13.26	10.55	16.46
Omnifit	Trident	126	1,035.8	11	1.06	0.53	1.90
TwinSys uncemented	RM cup	122	494.3	3	0.61	0.13	1.77
ABG	Duraloc	116	1,502.2	19	1.26	0.76	1.98
Corail	Trilogy	114	246.2	2	0.81	0.10	2.93
Synergy Porous	BHR Acetabular Cup	114	623.9	9	1.44	0.66	2.74
CLS	RM cup	113	768.2	13	1.69	0.90	2.89
Prodigy	Duraloc	113	1,201.6	15	1.25	0.70	2.06
Stemsys	RM Pressfit cup	113	146.9	1	0.68	0.02	3.79
Corail	Tritanium	111	167.7	2	1.19	0.14	4.31
Accolade II	Trident	109	57.3	1	1.74	0.04	9.72
ABGII	Delta-PF Cup	107	838.6	8	0.95	0.41	1.88
CLS	Weill ring	106	1,176.9	6	0.51	0.19	1.11
TwinSys uncemented	Continuum TM	106	233.4	3	1.29	0.27	3.76
Avenir Muller uncemented	RM cup	105	357.9	1	0.28	0.01	1.56
Mallory-Head	M2A	105	820.6	10	1.22	0.58	2.24
Stemsys	Agilis Ti-por	104	89.6	0	0.00	0.00	4.12
Corail	Continuum TM	101	130.3	2	1.53	0.19	5.54
Summit	Duraloc	101	795.5	5	0.63	0.20	1.47
Avenir Muller uncemented	Pinnacle	99	341.2	3	0.88	0.18	2.57
Accolade II	Tritanium	96	58.3	0	0.00	0.00	6.33
Corail	Monoblock Acetabular Cup	95	524.7	4	0.76	0.21	1.95
Anthology Porous	BHR Acetabular Cup	91	407.2	5	1.23	0.40	2.87
Avenir Muller uncemented	Tritanium	91	235.2	0	0.00	0.00	1.57
Summit	ASR	88	480.9	23	4.78	3.03	7.18

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Synergy Porous	Delta-PF Cup	87	354.5	0	0.00	0.00	1.04
H-Max M	Delta-TT Cup	86	269.5	2	0.74	0.09	2.68
CLS	Monoblock Acetabular Cup	80	513.5	3	0.58	0.12	1.71
Corail	Delta-PF Cup	78	534.5	1	0.19	0.00	1.04
S-Rom	Ultima	78	919.0	7	0.76	0.31	1.57
AML MMA	Duraloc	74	771.9	9	1.17	0.53	2.21
Corail	DeltaMotion Cup	74	137.0	0	0.00	0.00	2.69
Trabecular Metal Stem	Monoblock Acetabular Cup	74	474.0	3	0.63	0.13	1.85
ABG	ABGII	72	896.3	12	1.34	0.69	2.34
H-Max M	Delta-PF Cup	71	239.6	4	1.67	0.45	4.28
ABGII	Pinnacle	67	348.3	3	0.86	0.18	2.52
Anthology Porous	R3 porous	65	285.9	4	1.40	0.38	3.58
CLS	Pinnacle	65	276.7	0	0.00	0.00	1.33
Furlong	Furlong	64	509.5	5	0.98	0.32	2.29
Wagner cone stem	Fitmore	61	503.2	3	0.60	0.12	1.74
CBC Stem	Fitmore	59	327.9	5	1.53	0.50	3.56
CLS	Artek	59	572.6	22	3.84	2.41	5.82
AML	Duraloc	53	597.9	2	0.33	0.04	1.21
Corail	Trident	53	140.7	2	1.42	0.17	5.14
Tri-Lock BPS	Pinnacle	53	139.9	3	2.14	0.44	6.27
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	52	40.6	1	2.46	0.06	13.73

Hybrid

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	5,914	28,724.2	136	0.47	0.40	0.56
Spectron	Reflection porous	2,755	18,512.2	134	0.72	0.61	0.86
Exeter V40	Trilogy	2,001	9,885.3	49	0.50	0.37	0.66
MS 30	Fitmore	1,342	6,778.5	20	0.30	0.18	0.46
Exeter V40	Pinnacle	1,204	3,873.2	20	0.52	0.32	0.80
Spectron	Duraloc	1,153	10,979.3	125	1.14	0.95	1.36
Exeter V40	RM Pressfit cup	1,056	3,604.0	10	0.28	0.13	0.51
Exeter V40	Tritanium	1,031	1,749.6	17	0.97	0.57	1.56
Exeter V40	Duraloc	987	7,470.6	59	0.79	0.60	1.02
Exeter V40	Continuum TM	980	1,695.0	21	1.24	0.77	1.89
Muller	RM cup	916	7,631.3	57	0.75	0.57	0.97
TwinSys cemented	RM Pressfit cup	908	2,721.6	17	0.62	0.36	1.00
Exeter	Osteolock	836	8,958.7	51	0.57	0.42	0.75

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Morscher	787	7,282.5	48	0.66	0.49	0.87
CPT	Trilogy	691	3,667.6	35	0.95	0.66	1.33
C-Stem AMT	Pinnacle	684	1,597.9	8	0.50	0.22	0.99
Exeter V40	Morscher	630	4,901.4	25	0.51	0.33	0.75
Elite plus	Duraloc	608	5,275.0	77	1.46	1.15	1.82
Exeter	Duraloc	553	6,290.8	59	0.94	0.71	1.21
Exeter	Morscher	551	6,419.7	28	0.44	0.29	0.63
Exeter V40	Fitmore	433	1,487.5	4	0.27	0.07	0.69
Exeter V40	Reflection porous	430	2,086.7	7	0.34	0.13	0.69
CPT	Continuum TM	420	604.2	7	1.16	0.47	2.39
Spectron	R3 porous	347	660.3	4	0.61	0.17	1.55
Exeter V40	Osteolock	270	2,392.8	10	0.42	0.20	0.77
Muller	RM Pressfit cup	248	1167.8	3	0.26	0.05	0.75
Versys cemented	Trilogy	237	2,026.7	7	0.35	0.14	0.71
Exeter V40	R3 porous	217	295.4	2	0.68	0.08	2.45
Exeter	Trilogy	213	2,308.0	12	0.52	0.27	0.91
CPT	Duraloc	212	1,954.5	12	0.61	0.32	1.07
Spectron	Morscher	210	2,178.3	19	0.87	0.53	1.36
MS 30	Trilogy	194	844.8	3	0.36	0.07	1.04
Friendly	Delta-PF Cup	159	922.5	3	0.33	0.07	0.95
Spectron	Mallory-Head	152	1,260.5	6	0.48	0.17	1.04
TwinSys cemented	RM cup	148	881.9	4	0.45	0.12	1.16
CPT	Trident	145	1,020.8	11	1.08	0.54	1.93
MS 30	Continuum TM	145	268.3	2	0.75	0.09	2.69
Corail	Ultima	134	941.1	3	0.32	0.07	0.93
Exeter V40	Trabecular Metal Shell	134	427.1	8	1.87	0.81	3.69
CCA	RM Pressfit cup	131	842.6	3	0.36	0.07	1.04
Exeter	CLS Expansion	129	1,346.4	8	0.59	0.26	1.17
Exeter V40	Monoblock Acetabular Cup	123	1,108.1	5	0.45	0.15	1.05
CPT	Fitmore	119	430.7	7	1.63	0.65	3.35
Accolade	Muller PE cup	114	872.2	1	0.11	0.00	0.64
Muller	Trilogy	111	516.6	10	1.94	0.93	3.56
Muller	Continuum TM	108	183.3	2	1.09	0.13	3.94
Basis	Reflection porous	105	412.8	1	0.24	0.01	1.35
Standard straight stem	RM cup	92	788.0	6	0.76	0.28	1.66
Exeter V40	CLS Expansion	88	755.1	1	0.13	0.00	0.74
CPT	Monoblock Acetabular Cup	84	622.5	7	1.12	0.45	2.32
Exeter	Trident	84	922.4	0	0.00	0.00	0.40

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	RM Pressfit cup	83	468.1	1	0.21	0.01	1.19
CPT	Tritanium	80	219.7	3	1.37	0.28	3.99
Muller	Duraloc	79	822.3	8	0.97	0.42	1.92
Spectron	Fitmore	78	778.8	4	0.51	0.14	1.32
Spectron	Trident	78	636.2	3	0.47	0.10	1.38
Muller	Trident	75	522.1	6	1.15	0.42	2.50
Spectron	Biomex acet shell porous	68	769.3	1	0.13	0.00	0.72
Exeter V40	Delta-TT Cup	67	93.5	0	0.00	0.00	3.95
TwinSys cemented	Selexys TPS	65	191.5	4	2.09	0.57	5.35
CPT	Pinnacle	61	282.7	2	0.71	0.09	2.56
Muller	Morscher	56	589.8	3	0.51	0.10	1.49
MS 30	Duraloc	55	628.1	5	0.80	0.26	1.86
Muller	Fitmore	55	259.6	1	0.39	0.01	2.15
C-Stem	Duraloc	53	492.1	5	1.02	0.33	2.37
Muller	CLS Expansion	52	301.2	4	1.33	0.36	3.40
Friendly	Delta-TT Cup	50	136.6	2	1.46	0.18	5.29

Revision vs Different Liner/Cup Combinations vs Head size <=28mm or >28mm

CC = ceramic/ceramic; CP = ceramic/polyethylene; MM = metal/metal and MP = metal/polyethylene (Resurfacing hips excluded).

Uncemented Cups no Liner

Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CC	0	-	-	-	-	-
<=28	CP	3,368	24,272.2	143	0.59	0.50	0.69
<=28	MM	1,295	11,992.8	82	0.68	0.54	0.85
<=28	MP	4,669	31,221.2	180	0.58	0.50	0.67
>28	CC	464	1,024.7	4	0.39	0.11	1.00
>28	CP	1,408	2,887.8	7	0.24	0.10	0.50
>28	MM	1,571	9,193.0	302	3.29	2.93	3.68
>28	MP	2,031	7,479.1	43	0.57	0.42	0.77

The MM articulation >28mm head size had a significantly higher revision rate when compared to all other articulations.

Uncemented Cups with Liner

Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CC	699	4,762.9	40	0.84	0.60	1.14
<=28	CM	16	65.7	2	3.04	0.37	11.00
<=28	CP	5,762	39,597.4	303	0.77	0.68	0.86
<=28	MM	1,490	15,551.1	115	0.74	0.61	0.89
<=28	MP	18,535	12,8001.8	983	0.77	0.62	0.71
>28	CC	8,105	33,425.6	223	0.67	0.58	0.76
>28	CM	450	1,667.5	13	0.78	0.42	1.33
>28	CP	4,853	15,232.2	86	0.56	0.45	0.70
>28	MM	1,550	9,060.9	114	1.26	1.04	1.51
>28	MP	11,107	31,305.0	229	0.73	0.64	0.83

For head size <= 28mm the CC articulation had a significantly higher revision rate when compared to CP and MP; MP had a significantly higher revision rate when compared to MM despite overlap in the CIs.

For head size >28mm the MM articulation had a significantly higher revision rate when compared to CP.

Cemented Cups

Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CP	473	3,573.1	28	0.78	0.52	1.13
<=28	MP	18,619	139,427.8	863	0.62	0.52	0.60
>28	CP	138	545.1	4	0.73	0.20	1.88
>28	MM	9	51.0	2	3.92	0.48	14.17
>28	MP	2,998	9,219.4	43	0.47	0.34	0.63

No statistical significance among the groups.

Summary for Revision vs Bearing Surfaces

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	9,268	39,213.1	267	0.68	0.60	0.77
CM	466	1,733.2	15	0.87	0.48	1.43
CP	16,002	86,107.8	571	0.66	0.61	0.72
MM	5,915	45,848.7	615	1.34	1.24	1.45
MP	57,959	346,654.4	2341	0.68	0.57	0.62

The MM articulation has a significantly higher revision rate than CC, CP and MP

Revision vs Bearing Surface Articulations vs Head size 28mm, 32mm, 36mm & >36mm

Head Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CC	699	4,762.9	40	0.84	0.60	1.14
<=28	CM	16	65.7	2	3.04	0.37	11.00
<=28	CP	9,603	67,442.7	474	0.70	0.64	0.77
<=28	MM	2,785	27,543.8	197	0.72	0.62	0.82
<=28	MP	41,823	298,650.9	2,026	0.68	0.58	0.64
	Total	**54,926**	**398,466.0**	**2,739**	**0.69**	**0.66**	**0.71**
32	CC	2,926	14,870.9	93	0.63	0.50	0.77
32	CP	4,438	13,702.9	69	0.50	0.39	0.64
32	MM	480	2,743.2	23	0.84	0.53	1.26
32	MP	14,454	44,007.7	281	0.64	0.57	0.72
	Total	**22,298**	**75,324.7**	**466**	**0.62**	**0.56**	**0.68**
36	CC	4,734	17,672.3	122	0.69	0.57	0.82
36	CM	443	1,640.0	13	0.79	0.42	1.36
36	CP	1,959	4,961.2	28	0.56	0.38	0.82
36	MM	1,002	6,279.2	79	1.26	1.00	1.57
36	MP	1,645	3,826.3	34	0.89	0.62	1.24
	Total	**9,783**	**34,379.0**	**276**	**0.80**	**0.71**	**0.90**
>36	CC	909	1,907.0	12	0.63	0.33	1.10
>36	CM	7	27.6	0	0.00	0.00	13.39
>36	CP	2	1.0	0	0.00	1.00	378.47
>36	MM	1,648	9,282.5	316	3.40	3.04	3.80
>36	MP	27	88.6	0	0.00	0.00	4.16
	Total	**2593**	**11,306.6**	**328**	**2.90**	**2.60**	**3.23**

No MM articulations were recorded for 2013 except 6 in <=28 head size category.

Summary Revision Rates vs Head Size

Head Size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	54,926	398,466.0	2,739	0.69	0.59	0.64
32	22,298	75,324.7	466	0.62	0.44	0.54
36	9,783	34,379.0	276	0.80	0.71	0.90
>36	2,593	11,306.6	328	2.90	2.60	3.23

Head size > 36 mm (64% are Metal on Metal articulation) has a significantly higher revision rate compared to other 3 sizes and the 36 head size has a significantly higher revision rate than 32 and 28mm head sizes.

Revision Comparison Standard vs Cross linked Polyethylene

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CP	16,003	86,108.6	571	0.66	0.61	0.72
PS	6,696	55,345.5	403	0.73	0.66	0.80
PX	9,293	30,754.8	168	0.55	0.47	0.64
MP	57,959	346,654.4	2,341	0.68	0.57	0.62
PS	34,081	253,220.9	1,721	0.68	0.65	0.71
PX	23,878	93,433.5	620	0.66	0.61	0.72

PS= standard polyethylene PX = cross linked polyethylene
CP (ps) has a significantly higher revision rate compared to the px combination.

Revision vs Bearing Surfaces of Uncemented Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	7,364	31,527.0	227	0.72	0.63	0.82
CM	465	1,730.9	14	0.81	0.44	1.36
CP	10,249	50,469.0	341	0.68	0.61	0.75
MM	5,373	40,859.7	564	1.38	1.27	1.50
MP	10,641	50,393.6	430	0.85	0.77	0.94

The MM articulation has a significantly higher revision rate than CC, CP and MP.
CP has a significantly lower revision rate than MP.

Revision vs Bearing Surfaces of Fully Cemented prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CP	548	3,696.4	29	0.78	0.53	1.13
MM	7	43.6	1	2.30	0.06	12.79
MP	21,251	146,556.1	893	0.61	0.57	0.65

NB Hybrid fixation of prostheses is excluded from the above 2 tables.

Summary for Revision vs Bearing Surfaces

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	9,268	39,213.1	267	0.68	0.60	0.77
CM	466	1,733.2	15	0.87	0.48	1.43
CP	16,002	86,107.8	571	0.66	0.61	0.72
MM	5,915	45,848.7	615	1.34	1.24	1.45
MP	57,959	346,654.4	2,341	0.68	0.57	0.62

The MM articulation has a significantly higher revision rate than CC, CP and MP

Revision vs Monoblock Femoral Stems

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,296	12,292.1	51	0.41	0.31	0.55

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	13,798	88,331.0	918	1.04	0.97	1.11
55_64	23,088	142,667.5	1,223	0.86	0.81	0.91
65_74	30,634	182,183.1	1,194	0.66	0.62	0.69
GE75	24,538	127,434.4	579	0.45	0.42	0.49

Each age band has a significantly lower revision rate than the preceding one.

Revision vs Age Bands vs Bearing Surfaces

Bearing Surface	Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	LT55	3,548	15,404.87	119	0.77	0.64	0.92
	55_64	3,840	16,619.90	96	0.58	0.47	0.71
	65_74	1,719	6,710.78	50	0.75	0.55	0.98
	GE75	162	479.10	2	0.42	0.05	1.51
CM	LT55	176	647.05	3	0.46	0.10	1.35
	55_64	210	791.41	10	1.26	0.61	2.32
	65_74	71	266.23	2	0.75	0.09	2.71
	GE75	9	28.51	0	0.00	0.00	12.94
CP	LT55	3,133	19,448.41	157	0.81	0.69	0.94
	55_64	5,630	31,615.23	211	0.67	0.58	0.76
	65_74	5,239	26,592.92	158	0.59	0.51	0.69
	GE75	2,001	8,451.98	45	0.53	0.39	0.71
MM	LT55	2,874	23,783.66	297	1.25	1.11	1.40
	55_64	2,363	17,668.50	264	1.49	1.32	1.69
	65_74	637	4,187.50	49	1.17	0.87	1.55
	GE75	43	214.84	5	2.33	0.76	5.43
MP	LT55	3,821	26,684.38	322	1.21	1.08	1.35
	55_64	10,611	71,813.06	623	0.87	0.80	0.94
	65_74	22,069	136,208.99	896	0.66	0.62	0.70
	GE75	21,458	111,947.99	500	0.45	0.41	0.49

Overall the CP and CC are performing the best and the MM the worst of the bearing surfaces over all the age groups. This is further illustrated in the KM curve for uncemented components.

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
F	48,967	287,274.9	1,868	0.65	0.62	0.68
M	43,091	253,341.0	2,046	0.81	0.77	0.84

Males have a significantly higher revision rate than females

Revision vs Surgeon Annual Workload

Operations per Year	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT10	1,350	8,722.8	79	0.91	0.72	1.13
10_25	9,266	55,238.1	479	0.87	0.79	0.95
26_50	40,364	235,670.0	1,781	0.76	0.72	0.79
51_75	22,613	128,131.3	758	0.59	0.55	0.64
76_100	8,286	46,610.3	304	0.65	0.58	0.73
GE100	10,179	66,243.4	513	0.77	0.71	0.84

Those surgeons performing 51-75 arthroplasties a year have a significantly lower revision rate than those in the 3 lower categories.

Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	3,503	25,667.4	188	0.73	0.63	0.84
Posterior	58,303	333,758.0	2,480	0.74	0.71	0.77
Lateral	24,880	148,542.3	981	0.66	0.62	0.70
Troch	114	653.5	10	1.53	0.73	2.81

The posterior approach has a significantly higher revision rate than the lateral approach.

Revision for Dislocation vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	3,503	25,663.1	36	0.14	0.10	0.19
Posterior	58,303	333,703.3	758	0.23	0.19	0.22
Lateral	24,880	148,513.8	150	0.10	0.09	0.12
Troch	114	653.5	1	0.15	0.00	0.85
Total	86,800	508,533.7	945	0.19	0.16	0.18

The posterior approach has a significantly higher revision rate for dislocation than the lateral approach.

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	23,270	163,790.1	983	0.60	0.56	0.64
Uncemented	34,449	177,783.3	1,594	0.90	0.85	0.94
Hybrid	34,339	199,042.5	1,337	0.67	0.64	0.71

Uncemented hips have a significantly higher revision rate than either fully cemented or hybrid hips.

Revision by Arthroplasty Fixation vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55						
Cemented	652	5,469.2	98	1.79	1.45	2.18
Uncemented	10,090	59,747.2	575	0.96	0.89	1.04
Hybrid	3,056	23,109.9	245	1.06	0.93	1.20
55_64						
Cemented	2,353	19,862.1	209	1.05	0.91	1.20
Uncemented	12,646	67,988.3	627	0.92	0.85	1.00
Hybrid	8,089	54,806.5	387	0.71	0.64	0.78
65_74						
Cemented	8,286	65,131.8	407	0.62	0.57	0.69
Uncemented	8,581	38,424.1	304	0.79	0.70	0.89
Hybrid	13,767	78,597.0	483	0.61	0.56	0.67
>75						
Cemented	11,979	73,289.1	269	0.37	0.32	0.41
Uncemented	3,132	11,603.2	88	0.76	0.61	0.93
Hybrid	9,427	42,494.7	222	0.52	0.46	0.60

For age band <55 age band uncemented and hybrid hips have a significantly lower revision rate than cemented hips, but there is no significant difference between the first two.

For the 55-64 age band hybrid hips have a significantly lower revision rate than cemented and uncemented hips.

For the 65-74 and >74 age bands both cemented and hybrid hips have significantly lower revision rates than uncemented hips.

In addition, for the >74 age band, cemented hips have a significantly lower revision rate than hybrid and uncemented hips.

Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	10,050	40,425.1	363	0.90	0.81	1.00
2	34,591	133,441.2	963	0.72	0.53	0.61
3	13,486	47,990.6	343	0.71	0.64	0.79
4	501	1,415.1	16	1.13	0.65	1.84

ASA 1 has a significantly higher revision rate than ASA 2 and 3.

Revision vs Public / Private Hospitals

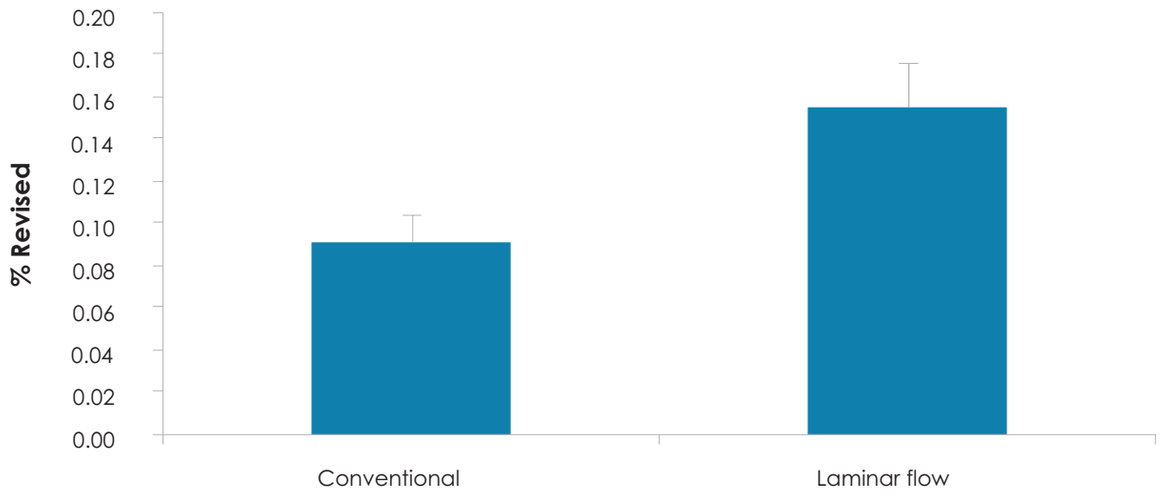
Public/Private	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Public	31,302	116,104.8	832	0.72	0.51	0.59
Private	27,326	107,167.2	853	0.80	0.60	0.70

There is a significantly higher revision rate for hip arthroplasty performed in private hospitals

Revision for Deep Infection within 6 months vs Theatre Environment

Theatre	Total Number	Number revised	%	Std Error
Conventional	53,503	49	0.092	0.013
Laminar flow	32,284	50	0.152	0.022

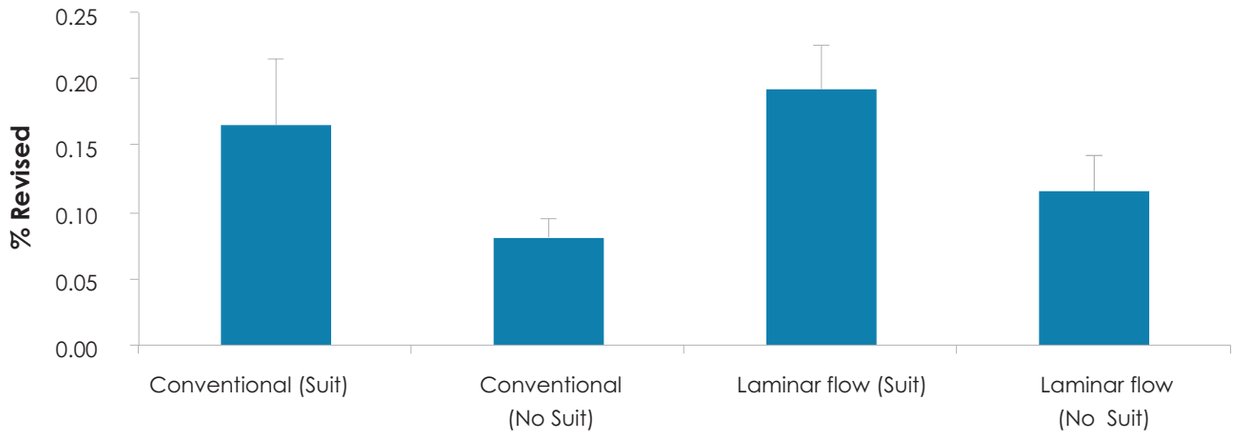
% Revision for Deep Infection Within 6 Months



There is a significant difference in revision rates for deep infection within 6 months of surgery between conventional and laminar flow theatres.

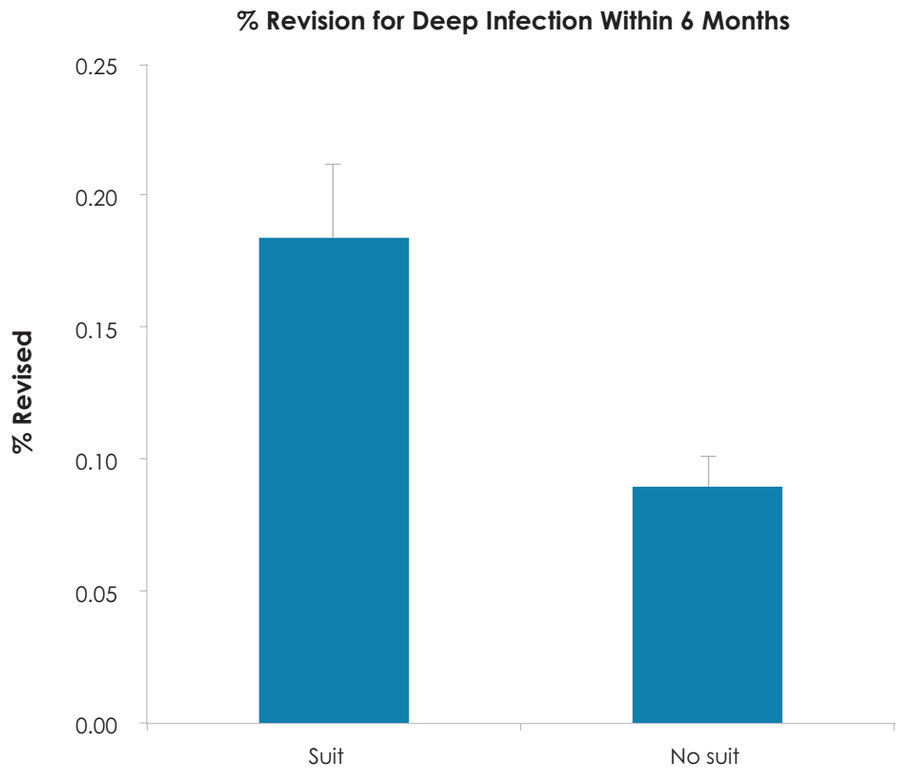
		Total Number	Number revised	%	Std Error
Conventional	Suit	6,680	11	0.165	0.050
	no suit	46,823	38	0.081	0.013
Laminar flow	Suit	16,683	32	0.192	0.034
	no suit	15,601	18	0.115	0.027

% Revision for Deep Infection Within 6 Months



There is a significant difference in the revision rates between conventional/no suit and laminar flow/suit environments. There is 2.4 times the risk for revision in the latter compared to the former environment.

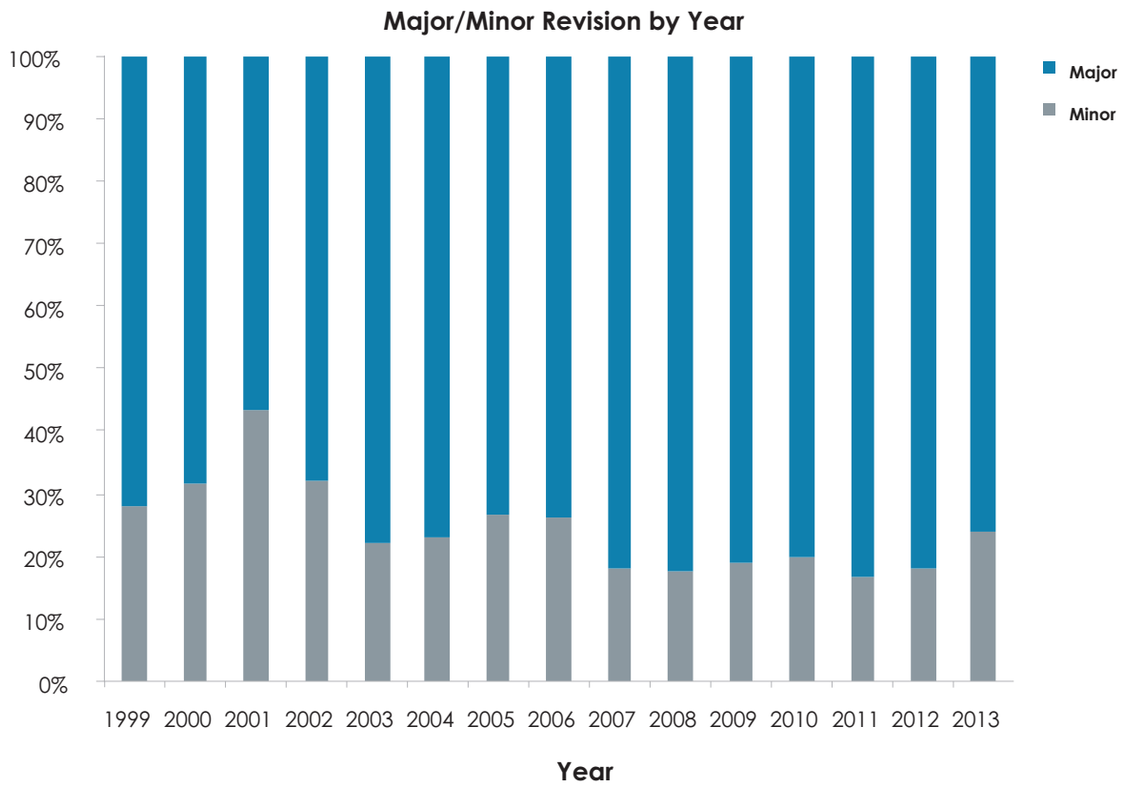
	Total Number	Number revised	%	Std Error
Suit	23,363	43	0.184	0.028
no suit	62,424	56	0.090	0.012



Furthermore there is a significant increase in revision rates (2.1 x) when suits are used in either conventional or laminar flow theatres.

From the above data it would appear that the use of space suits in either theatre environment significantly increases the risk of deep infection within the first 6 months following hip arthroplasty and that there is no advantage to using laminar flow theatres for primary hip arthroplasty.

Comparison of Major vs Minor Revisions by Year



A major revision is defined as revision of acetabulum and/or femur including any of minor components and minor revision as change of head and/or liner only.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Minor	28.10%	31.50%	43.20%	32.20%	21.90%	23.10%	26.80%	26.20%	18.20%	17.80%	18.80%	19.70%	16.80%	18.20%	23.70%
Major	71.90%	68.50%	56.80%	67.80%	78.10%	76.90%	73.20%	73.80%	81.80%	82.20%	81.20%	80.30%	83.20%	81.80%	76.30%

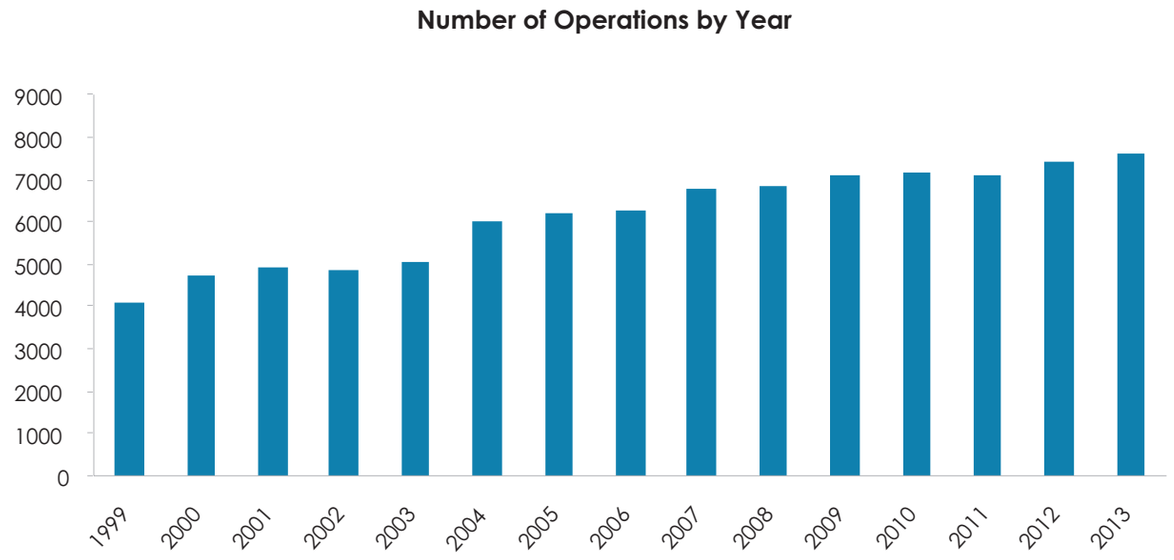
Re revisions for Major vs Minor revisions

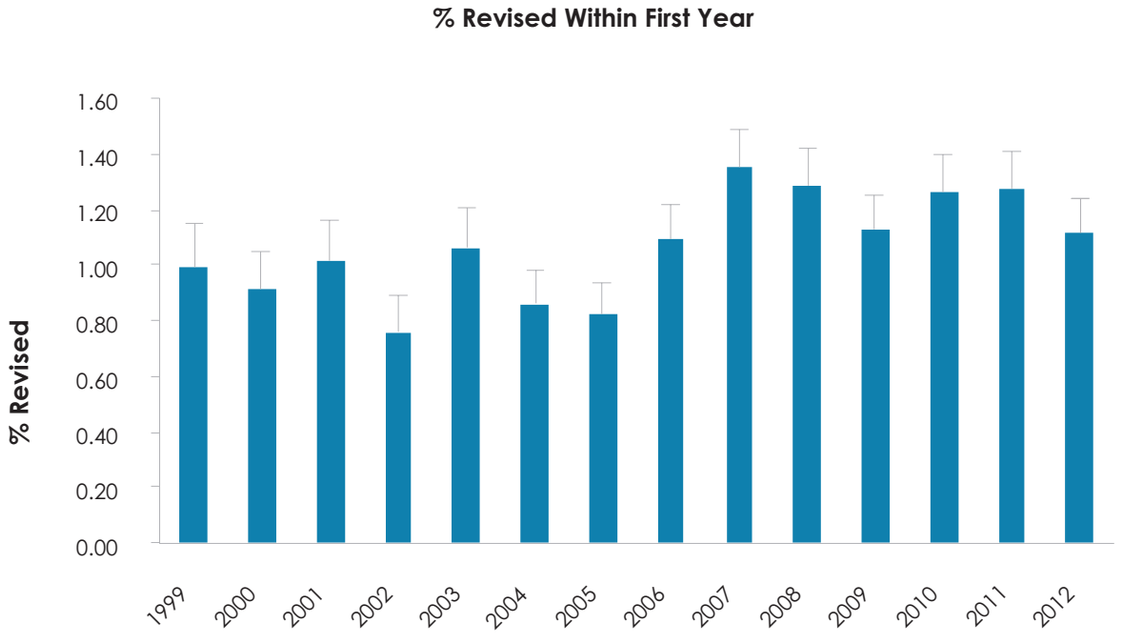
	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	824	3,223.38	128	3.97	3.31	4.72
Major	3,056	10,919.94	358	3.28	2.95	3.64

There is a significantly higher re-revision rate for minor compared to major revisions despite overlap of C.I.s (p=0.02).

Percentage of hips revised in the first year

The following two bar graphs show that the percentage of hips revised in the first year after arthroplasty dropped in 2012 to a similar level as 2009.





Resurfacing Arthroplasty
All Patients

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,429	6,737.9	88	1.31	1.05	1.61

There is a significantly higher revision rate (almost 2x) compared to conventional hip arthroplasty (0.72/100 comp yrs.)

Resurfacing Prosthesis vs Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Adept	4	23.1	0	0	0	15.96
ASR	132	888.8	26	2.93	1.91	4.29
BHR	1,247	5,645.9	58	1.03	0.78	1.33
BMHR	27	83.6	1	1.20	0.03	6.66
Conserve Superfinish	3	13.6	0	0	0	27.13
Durom	4	38.3	0	0	0	9.64
Mitch TRH Resurfacing Head	12	44.6	3	6.73	1.39	19.66

The Mitch TRH and ASR have very significantly higher revision rates but none have been implanted since 2010

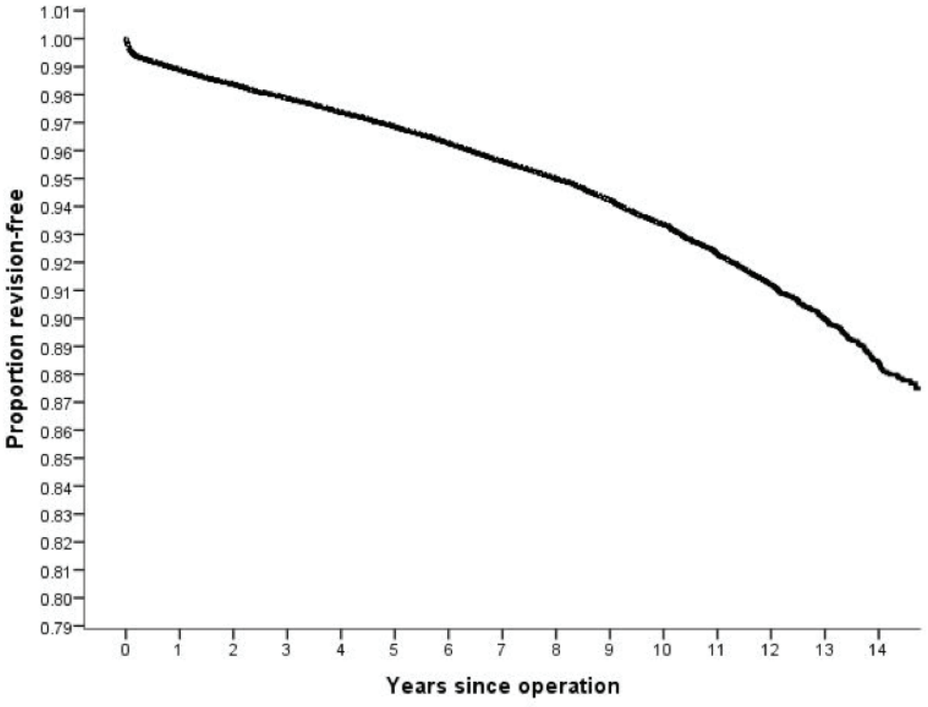
Head size vs Revision Rate

Hips resurfacing head size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=44	98	482.5	23	4.77	3.02	7.15
45-49	312	1,585.0	30	1.89	1.28	2.70
50-54	935	4,179.1	30	0.72	0.48	1.02
>=55	84	491.3	5	1.02	0.33	2.37
ALL	1,429	6,737.9	88.0	1.31	1.05	1.61

The <=44 mm head has a significantly higher revision rate than the 45-49mm head size, which in turn has a significantly higher revision rate than the 50-54mm head size.

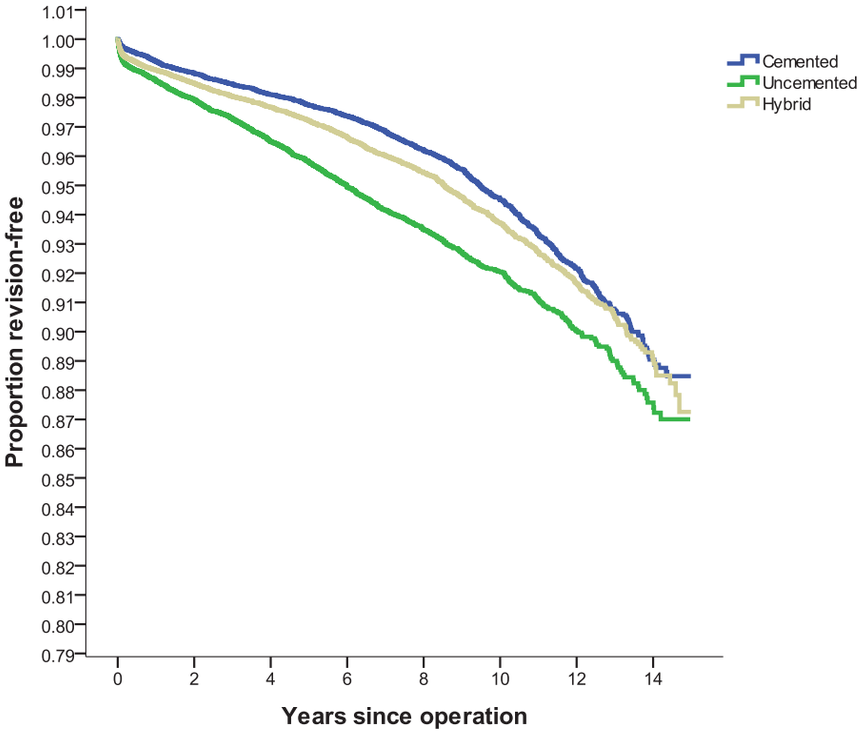
KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the years 1999 – 2013 with deceased patients censored at time of death.



Years	% Revision-free	No in each year
1	98.90	82,102
2	98.40	73,299
3	97.90	64,927
4	97.40	55,590
5	96.90	48,586
6	96.30	41,237
7	95.60	34,201
8	95.00	27,935
9	94.00	22,104
10	93.10	16,678
11	92.00	12,287
12	90.90	8,524
13	89.70	5,122
14	88.00	2,201

The KM analysis is to14yrs rather than 15 as too few registered hips were revised in 2013.



Cemented

Years	% Revision-free	No in each year
1	99.20	21,418
2	98.80	19,812
3	98.50	18,235
4	98.10	16,717
5	97.70	15,148
6	97.40	13,600
7	96.80	11,787
8	96.20	10,001
9	95.60	8,213
10	94.50	6,290
11	93.30	4,780
12	92.20	3,455
13	90.70	2,126
14	89.00	1,063

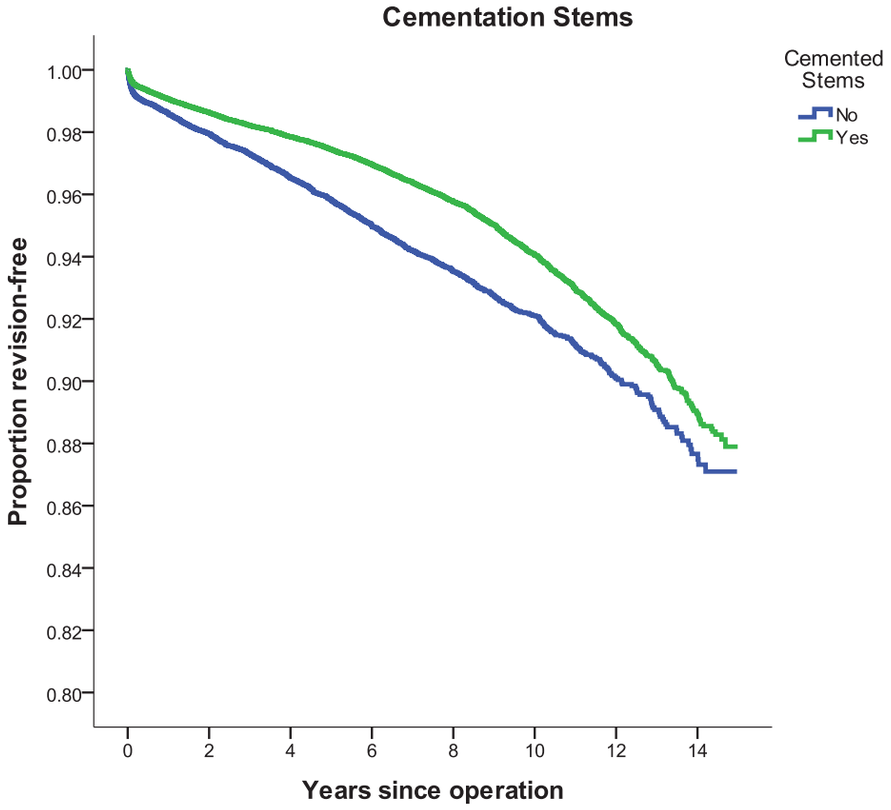
Uncemented

Years	% Revision-free	No in each year
1	98.60	30,325
2	97.90	26,698
3	97.30	23,105
4	96.50	19,206
5	95.80	15,490
6	95.00	12,385
7	94.20	9,736
8	93.50	7,496
9	92.70	5,746
10	92.10	4,261
11	91.10	3,011
12	90.00	2,023
13	89.00	1,215
14	87.60	588

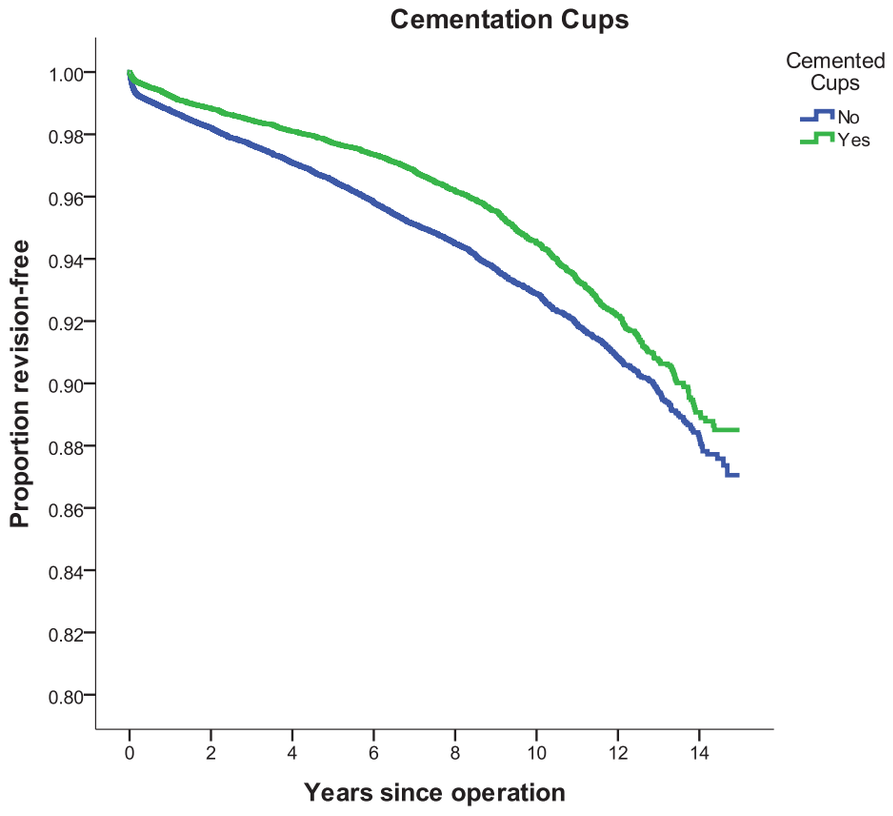
Hybrid

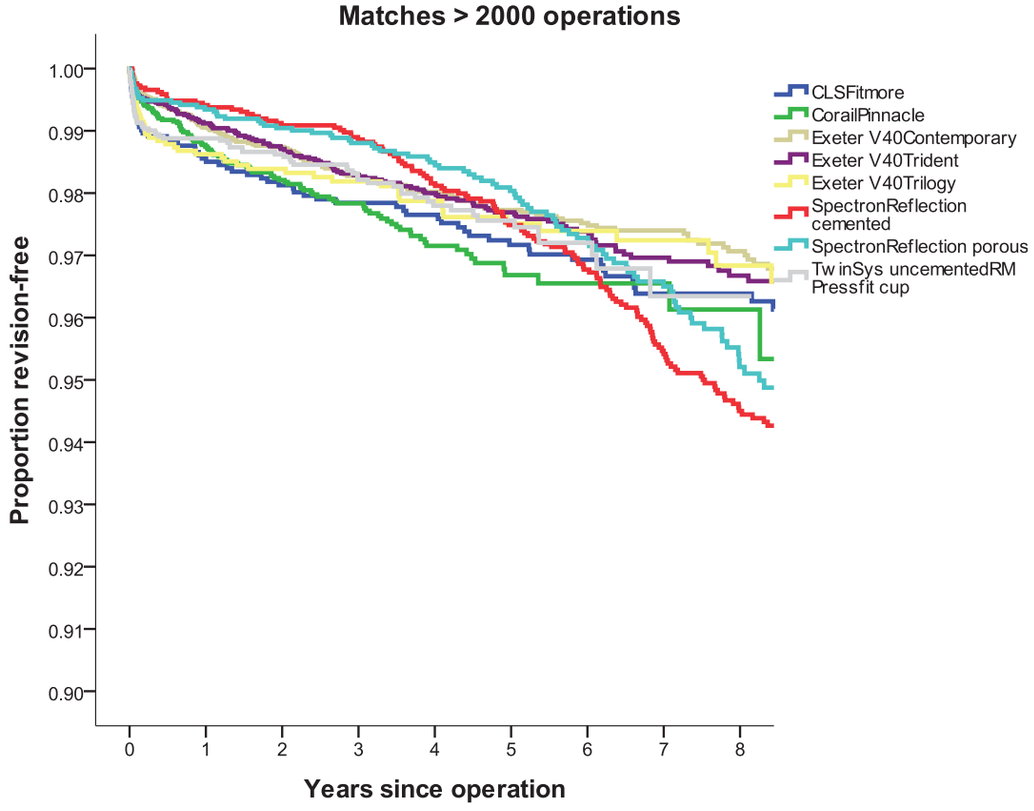
Years	% Revision-free	No in each year
1	98.90	30,368
2	98.50	26,792
3	98.00	23,588
4	97.70	20,755
5	97.20	17,966
6	96.60	15,323
7	96.00	12,678
8	95.40	10,440
9	94.60	8,208
10	93.70	6,154
11	92.70	4,505
12	91.70	3,073
13	90.50	1,799
14	89.00	691

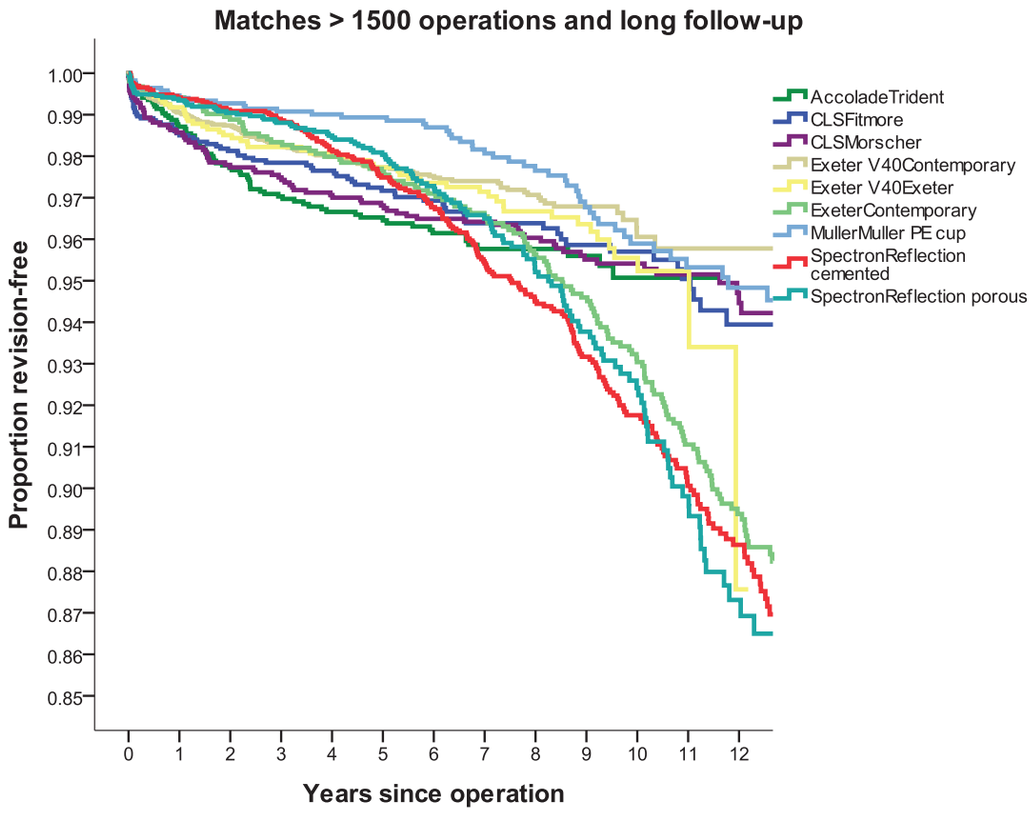
Survival cemented vs uncemented stems



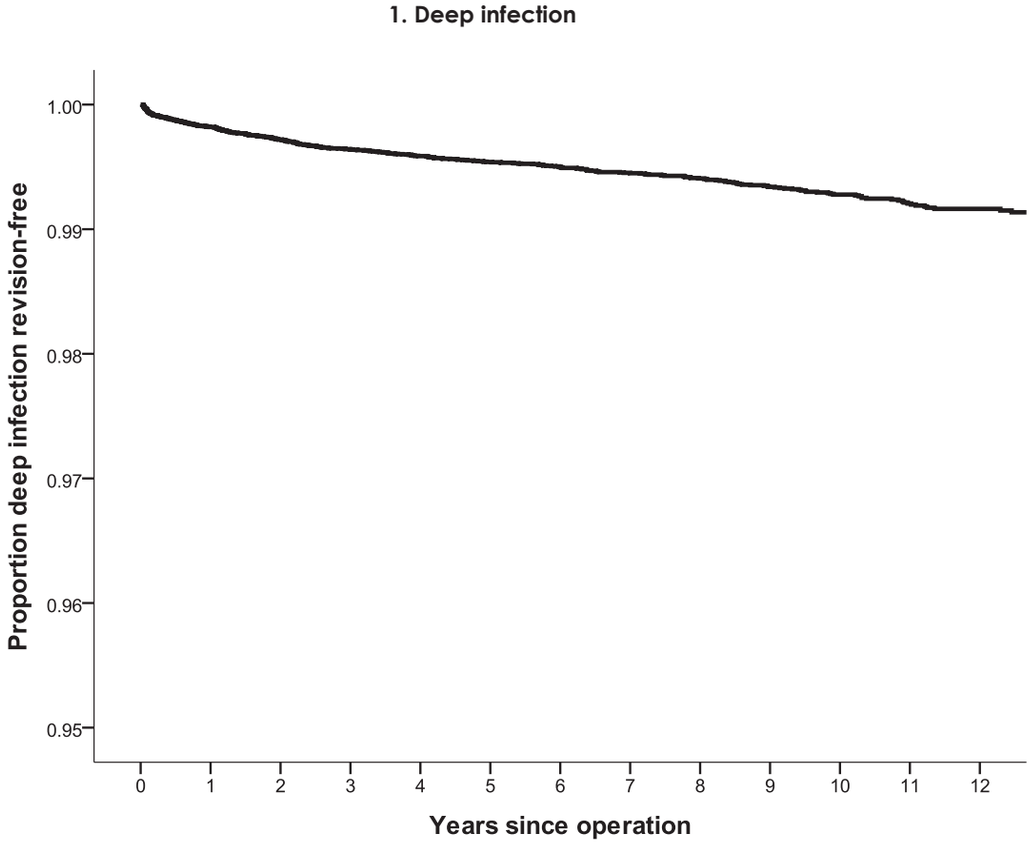
Survival cemented cups vs uncemented cups



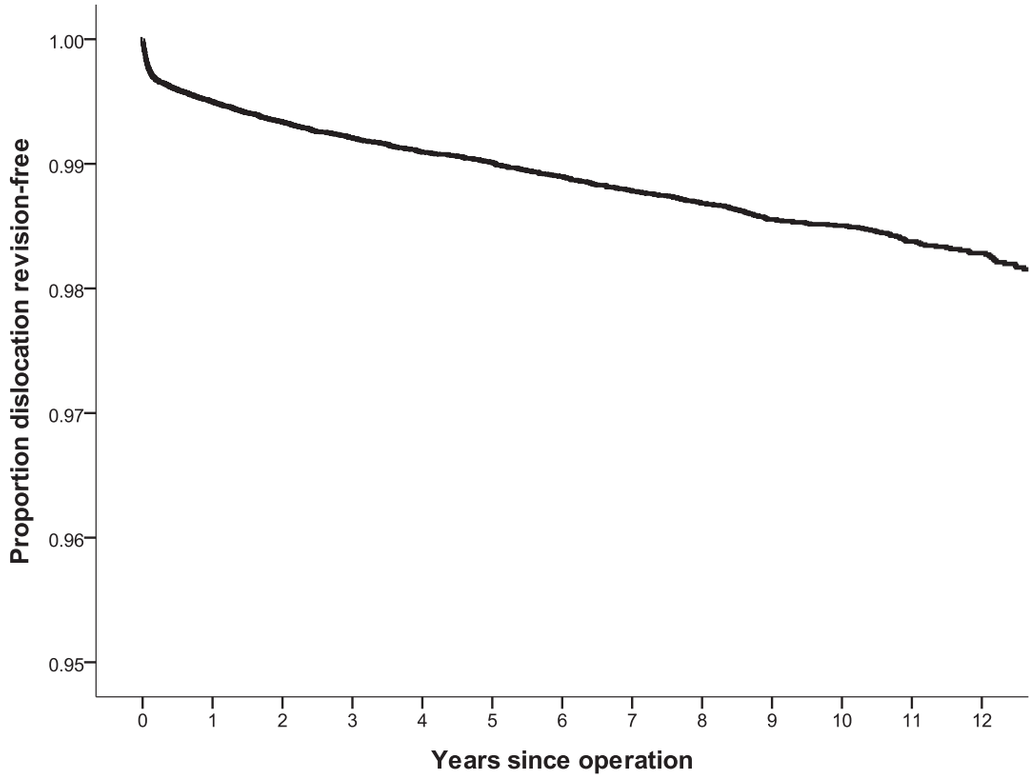




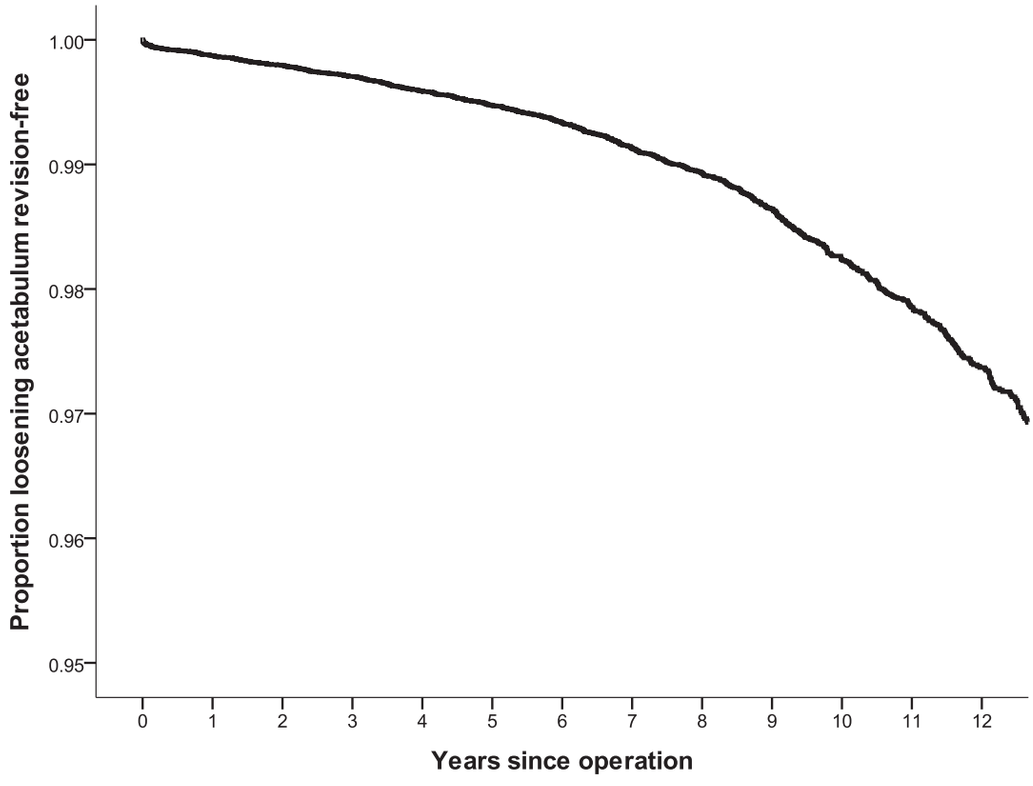
The following K M graphs are for the 6 main individual reasons for revision



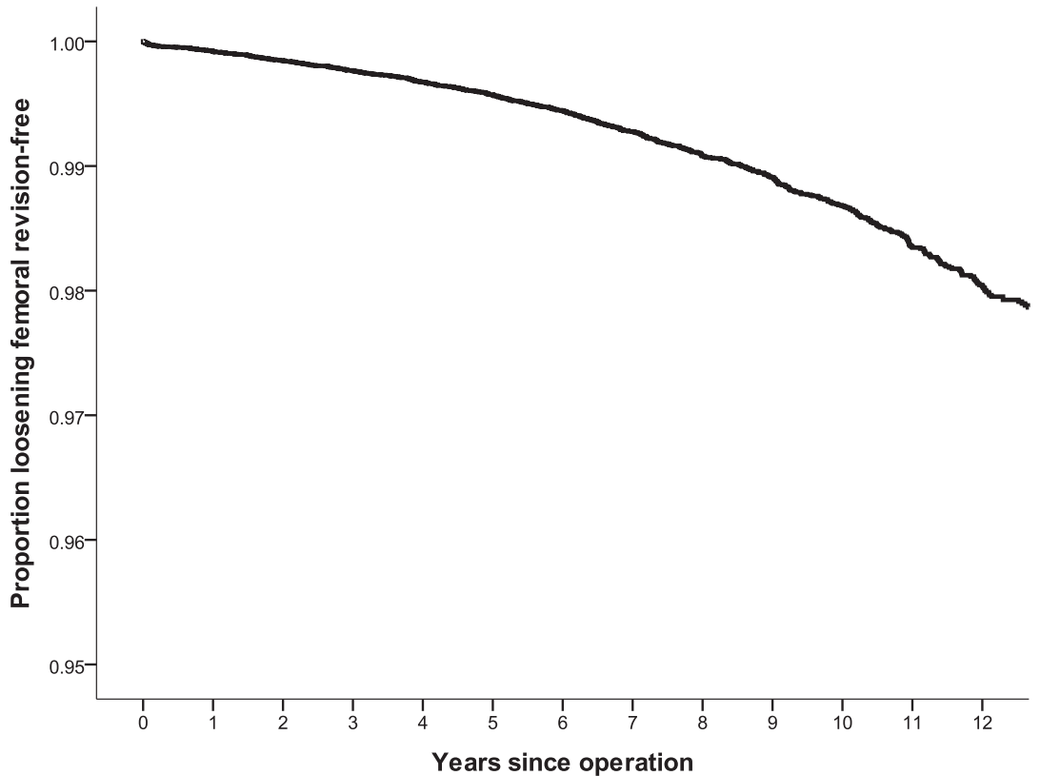
2. Dislocation



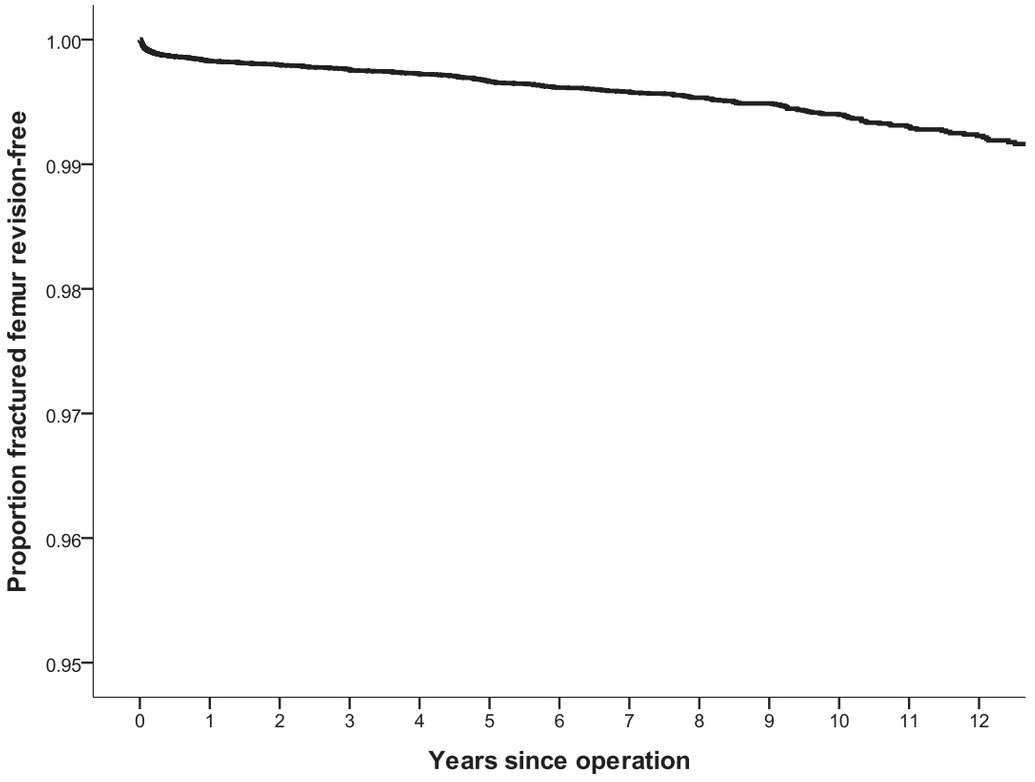
3. Loosening acetabular component



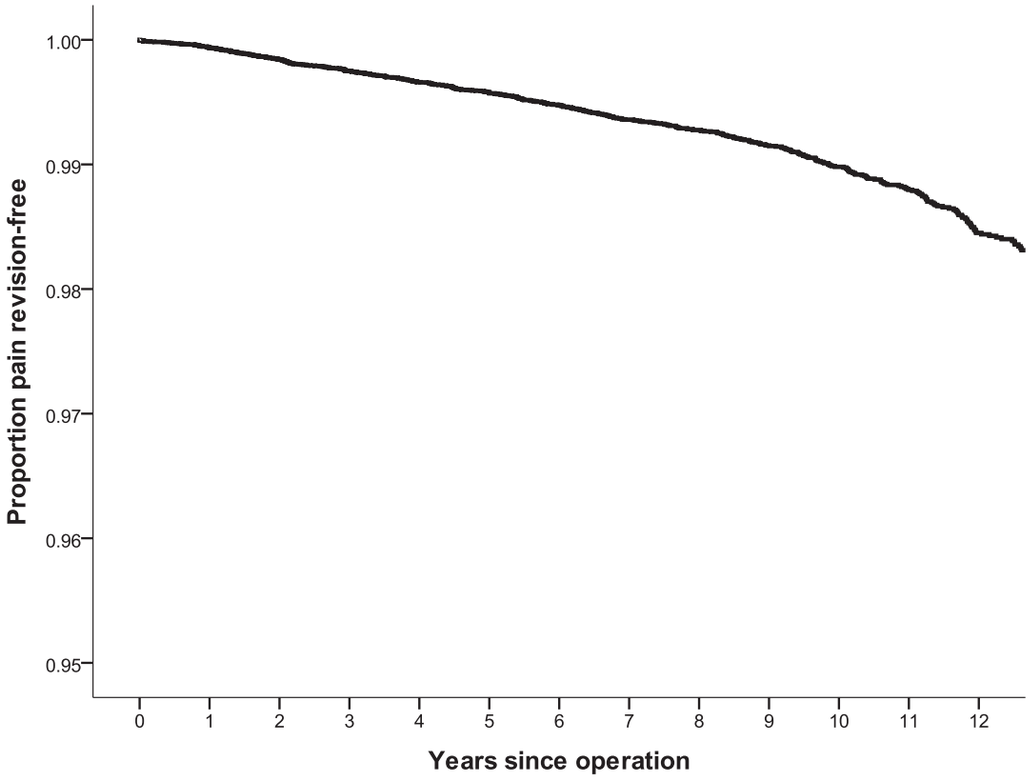
4. Loosening femoral component



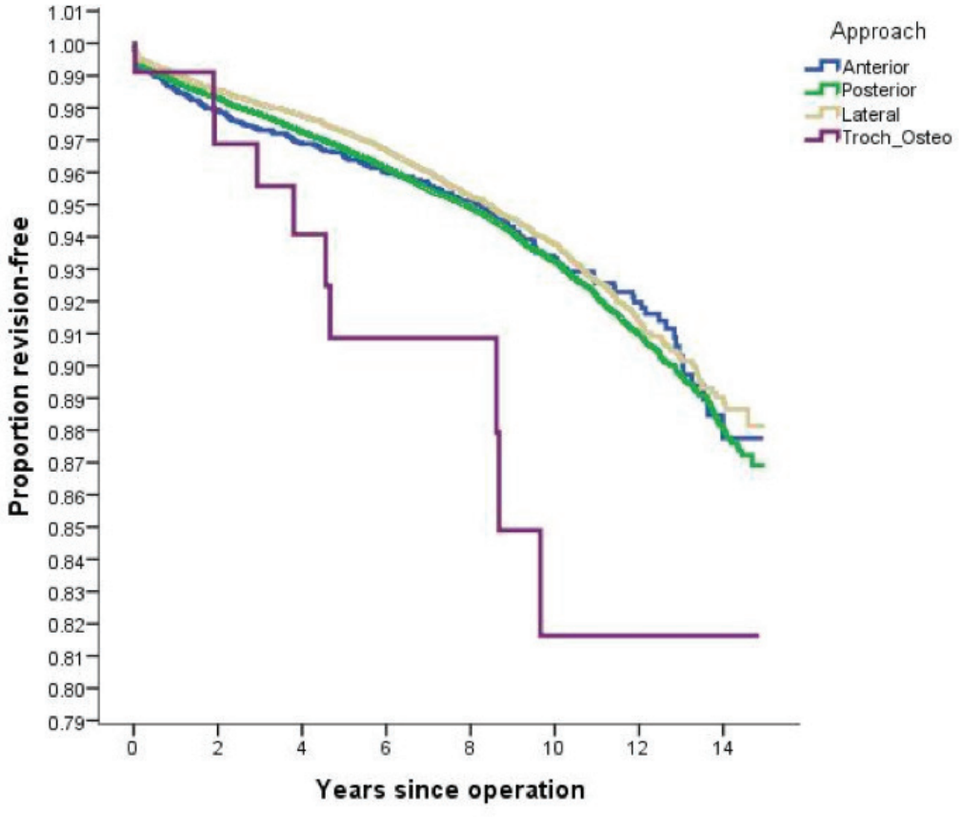
5. Fracture of femur



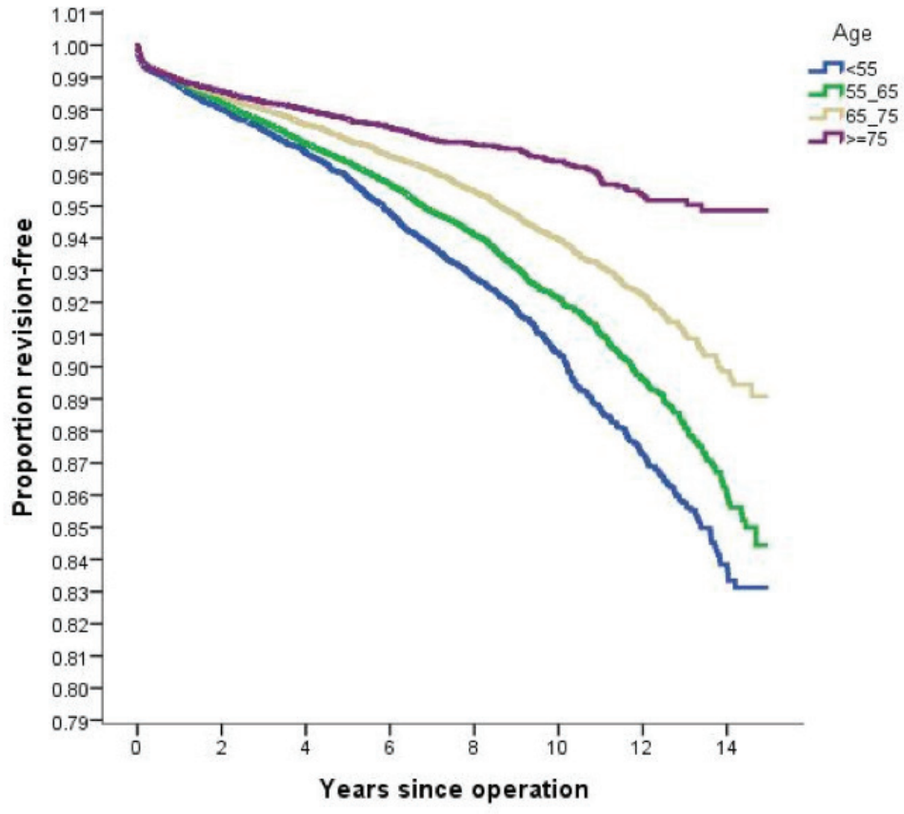
6. Pain



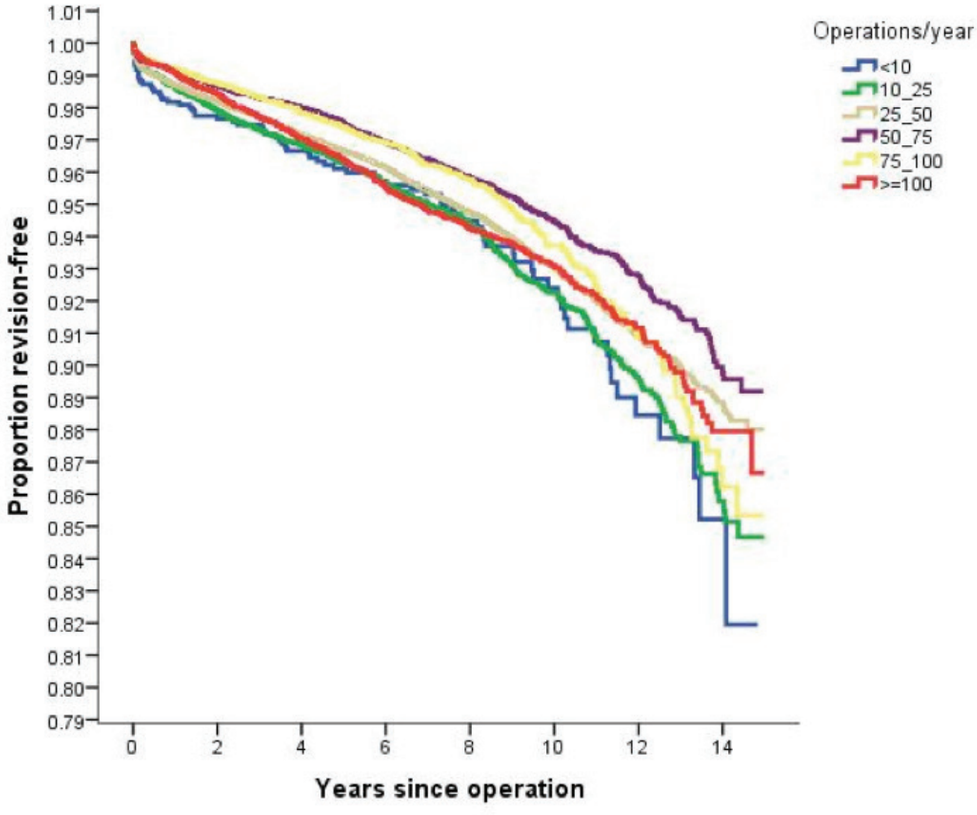
Survival for surgical approach



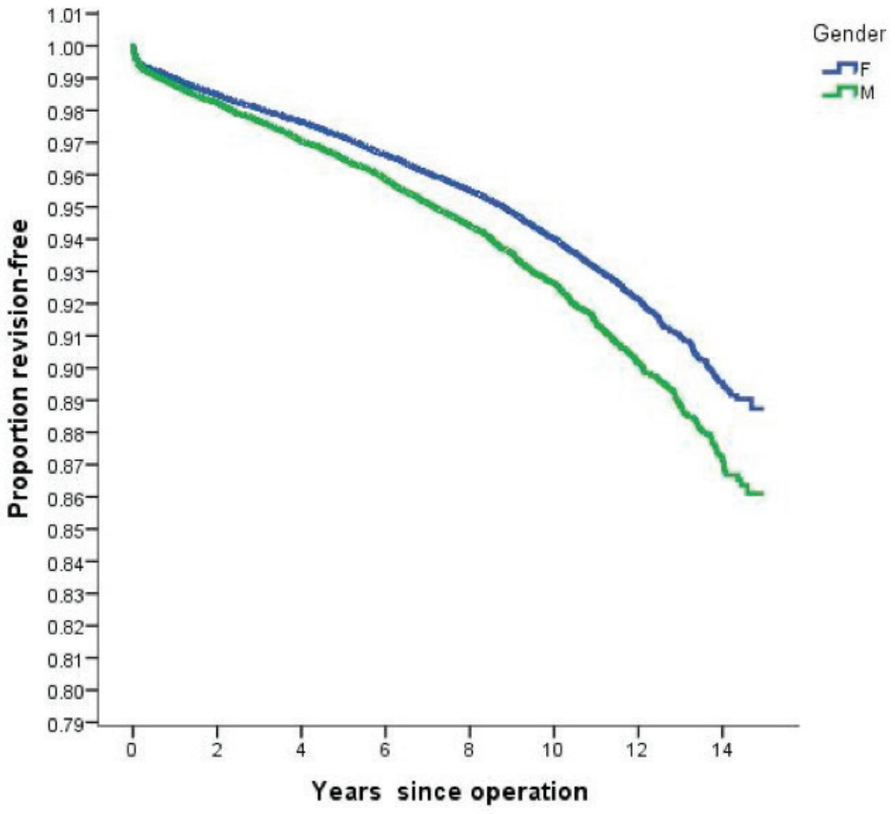
Survival for age bands



Survival for surgeon annual output



Survival male vs female



Re-revisions of conventional hips

Analysis was undertaken of hip re-revisions.

There were 490 registered conventional hip replacements that had been revised twice, 104 that had been revised three times, 27 that had been revised four times, 4 that had been revised 5 times and 1 that had been revised 6 times.

Second revision

Time between the first and second revisions averaged 708 days, with a range of 1 – 5144 and a standard deviation of 864. This compares to an average of 1,633 days between the primary and first revision.

Reason for revision

Dislocation	157
Deep infection	136
Loosening femoral component	64
Loosening acetabulum component	59
Pain	57
Fracture femur	27

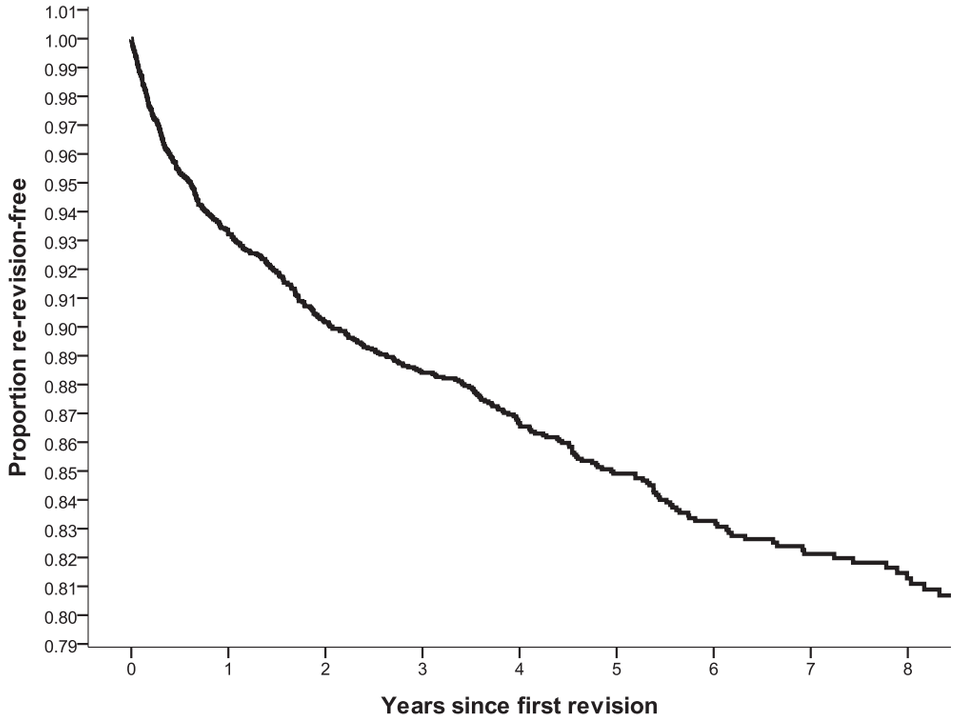
Revision

Change of head	315
Change of acetabulum	169
Change of liner	227
Change of all	128
Change of femoral	125

Re-revisions

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
3,914	14,320.7	490	3.42	3.13	3.74

The re- revision rate is highly significant when compared to the primary revision rate of 0.72 /100 component years.



Years	% re-revision free
1	93.20
2	90.20
3	88.40
4	86.70
5	84.90
6	83.30
7	82.10
8	81.30

Third revision

The average time between second and third revisions for the 104 arthroplasties was 626 days with a range of 1 – 4451 and a standard deviation of 798.

Fourth revision

The average time between the third and fourth revisions for the 27 arthroplasties was 428 days, with a range of 14 – 3111 and a standard deviation of 696 days.

Fifth revision

There were 4 registered, with an average time to revision of 318 days.

Sixth revision

There was 1 registered with a time to revision of 297 days.

Overall it can be noted that the time between successive revisions steadily decreases.

Re- revisions of resurfacing hip replacements

There have been 15 re-revisions.

The average time between the first and second revisions was 489 days, with a range of 21 – 2085 and a standard deviation of 556.

This compares with an average of 1418 days between the primary resurfacing and the first revision.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS AND TEN YEARS POST-SURGERY

Questionnaires at six months post-surgery

At six months post-surgery a random selection of patients are sent the Oxford-12 questionnaire in order to achieve a response rate of 20% of the total which is deemed to be ample to provide powerful statistical analysis.

The new scoring system as recommended by the original authors has been adopted (see appendix 1).

There are 12 questions with the scores now ranging from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

In addition we have grouped the questionnaire responses according to the classification system published by Kalairajah et al, 2005 (see appendix 1).

This groups each score into four categories:

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the fifteen year period, and as at July 2014, there were 26,749 primary hip questionnaire responses registered six months post-surgery. The mean hip score was 40.57 (standard deviation 7.44, range 48 – 2).

Scoring	> 41	15,315
Scoring	34 -41	7,265
Scoring	27 -33	2,562
Scoring	< 27	1,613

At six months post-surgery, 84% had an excellent or good score.

Questionnaires at five years post surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at 5-years post-surgery.

This dataset represents sequential Oxford hip scores for 7,992 individual patients.

At five years post-surgery, 89% of these patients achieved an excellent or good score and had a mean of 42.45.

Questionnaires at ten years post surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at 10 years post-surgery.

This dataset represents sequential Oxford hip scores for 5,185 individual patients.

At ten years post-surgery, 87% of these patients achieved an excellent or good score and had a mean of 41.85.

Analysis of the individual questions at six months, five years and ten years post-surgery

Analysis of the individual questions showed that the most common persisting six month problem was limping (Q10). However, for the five year and ten year analyses the most common persisting problem was pain (Q1).

Percentage scoring 0 or 1 (worst categories) for each question at six-months (26,749), at five years (7,992) and at ten years post-surgery (5,185).

		6m	5y	10y
1	Moderate or severe pain from the operated hip	11	12	16
2	Only able to walk around the house or unable to walk before pain becomes severe	4	3	4
3	Extreme difficulty or impossible to get in and out of a car or public transport	2	2	3
4	Extreme difficulty or impossible to put on a pair of socks	9	5	7
5	Extreme difficulty or impossible to do the household shopping on your own	3	3	3
6	Extreme difficulty or impossible to wash and dry yourself	2	1	1
7	Pain interfering greatly or totally with your work	4	3	3
8	Very painful or unbearable to stand up from a chair after a meal	2	1	1
9	Sudden severe pain most or all of the time	2	1	2
10	Limping most or every day	12	8	8
11	Extreme difficulty or impossible to climb a flight of stairs	4	4	5
12	Pain from your hip in bed most (or every) nights	5	3	4

As noted in previous years there is little significant change between the six month, five and ten year scores which means the six month score is indicative of the medium term outcome. Limp and pain at night tend to diminish over time.

Revision hip questionnaire responses

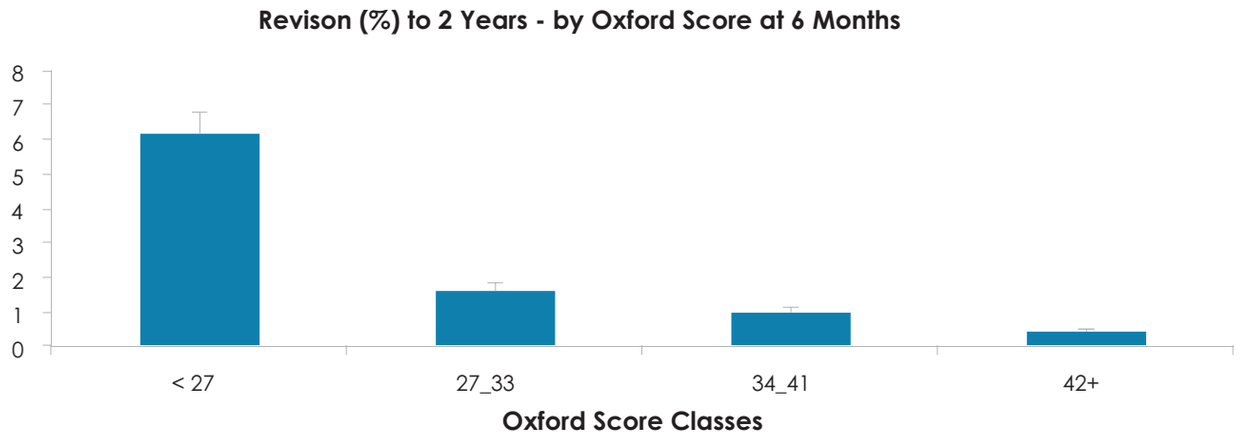
There were 6,880 revision hip responses with 65% achieving an excellent or good score. This group includes all revision hip procedures including revisions of primary arthroplasties performed prior to 1999. The mean revision hip score was 35.67 (standard deviation 9.56, range 48 – 3).

OXFORD 12 SCORE AS A PREDICTOR OF HIP ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at 6 months and 5 years post-surgery and arthroplasty revision within two years of the Oxford 12 questionnaire date.

Six month score and revision arthroplasty

By plotting the patients' six month scores in the Kalairajah groupings against the proportion of hips revised for that same group it demonstrates that there is an incremental increase in risk during the next 2 years related to the Oxford score. A patient with a score below 27 has 14 times the risk of a revision within 2 years compared to a person with a score >41.



Revision risk versus Kalairajah groupings of Oxford scores within two years of the 6 month score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	1,352	83	6.14	0.65
27_33	2,136	34	1.59	0.27
34_41	6,155	61	0.99	0.13
42+	13,270	60	0.45	0.06

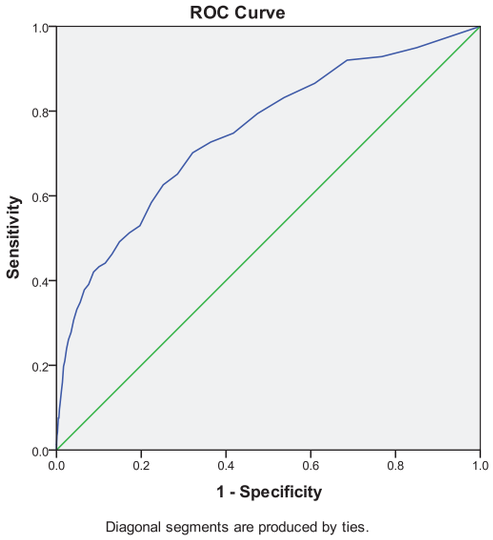
A person with a 6 month Oxford score >41 has a 0.45% risk of revision within two years compared to a 6.14% risk with a score of < 27

A ROC analysis has demonstrated that a patient with a score less than or equal to 38.5 has 5 times the risk of needing a revision within 2 years compared to a person with a score greater than 38.5.

Alternatively the ROC analysis predicted 70% of the revisions within 2 years from just the lowest 32% of Oxford scores.

A receiver operating characteristic (ROC) curve is a graphical representation of the trade-off between the false negative and false positive rates for every possible cut-off.

Equivalently, the ROC curve is the representation of the trade-offs between sensitivity and specificity. The more the curve climbs towards the upper left corner, the better the reliability of the test.



Five year score and revision arthroplasty

As with the six month scores, plotting the patients' 5 year scores in the Kalairajah groupings against the proportion of hips revised for that same group demonstrates that there is an incremental increase in risk during the next 2 years related to the Oxford score. A patient with a score below 27 has 16 times the risk of a revision within 2 years compared to a person with a score >41.

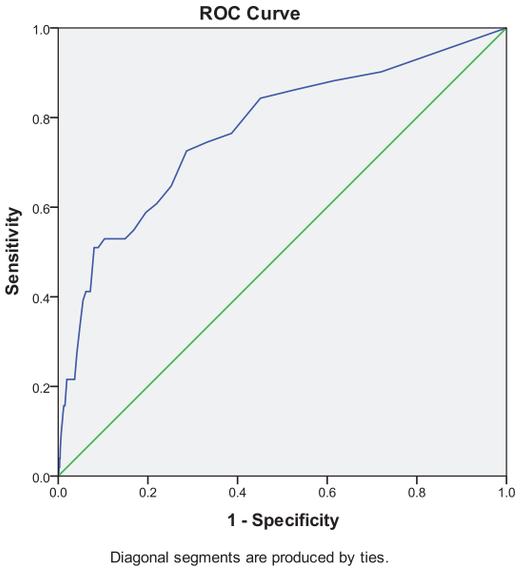
Revision risk versus Kalairajah groupings of Oxford scores within two years of the 5 year score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	239	14	5.86	1.52
27_33	346	13	3.76	1.02
34_41	1,001	10	1.00	0.31
42+	3,874	14	0.36	0.10

A person with a 5 year Oxford score >42 has a 0.35 % risk of revision within two years compared to a 5.21 % risk with a score < 27.
A person with a 5 year Oxford score >41 has a 0.36 % risk of revision within two years compared to a 5.86% risk with a score 27.

The ROC analysis at 5 years has demonstrated that a patient with a score less than or equal to 41.5 has 6.5 times the risk of needing a revision within 2 years compared to a person with a score greater than 41.5.

Alternatively, the ROC analysis predicted 73% of the revisions within 2 years from just the lowest 30% of Oxford scores.



Ten year score and revision arthroplasty

As with the six month and 5 year scores, plotting the patients' 10 year scores in the Kalairajah groupings against the proportion of hips revised for that same group demonstrates that there is an incremental increase in risk during the next 2 years related to the Oxford score. A patient with a score below 27 has 7 times the risk of a revision within 2 years compared to a person with a score >41.

Revision risk versus Kalairajah groupings of Oxford scores within two years of the 10 year score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	198	18	9.09	2.04
27_33	239	9	3.77	1.23
34_41	672	20	2.98	0.66
42+	2,225	30	1.35	0.24

A person with a 10 year Oxford score >41 has a 1.35% risk of revision within two years compared to a 9.09% risk with a score < 27.

Prediction of second revision from six month score following first revision

Plotting the patients' six month scores, following their first revision in the Kalairajah groupings, against the proportion of hips revised for that same group, again demonstrates that there is an incremental increase in risk during the next 2 years related to the Oxford score. A patient with a score below 27 has 7 times the risk of a revision within 2 years compared to a person with a score >41.

Second revision risk versus Kalairajah groupings of Oxford scores within two years of the 6 month post first revision score date.

Kalairajah Group	Revision to 2 yrs.	No. revised	%	Std error
< 27	292	66	22.60	2.45
27_33	260	20	7.69	1.65
34_41	413	23	5.57	1.13
42+	467	15	3.21	0.82

A person with a 6 month Oxford score >42 has a 3.21% risk of revision within two years compared to a 22.60% risk with a score < 27, which it is almost 4 times greater than for a primary hip.

KNEE ARTHROPLASTY

PRIMARY KNEE ARTHROPLASTY

The fifteen-year report analyses data for the period January 1999 – December 2013.There were 71,503 primary knee procedures registered, an additional 6,694 compared to last year's report.

This includes 292 patello-femoral prostheses with 49 registered in 2013, compared to 36 in 2012, representing a 5% increase over 2012.

1999	2,429
2000	3,014
2001	3,059
2002	2,896
2003	3,047
2004	4,103
2005	5,024
2006	5,157
2007	5,762
2008	5,604
2009	6,016
2010	6,089
2011	6,253
2012	6,346
2013	6,694

There was a 5.3% increase in registrations for 2013 compared to 1.5% for 2012.

Data Analysis

Age and sex distribution

The average age for a knee replacement was 68.35 years, with a range of 8.19 – 100.49 years.

All knee arthroplasty

	Female	Male
Number	37,018	34,485
Percentage	51.77	48.23
Mean age	68.68	68.00
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.87	9.38

Conventional knee arthroplasty

	Female	Male
Number	36,798	34,413
Percentage	51.67	48.33
Mean age	68.73	68.01
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.84	9.37

Patello-femoral arthroplasty

	Female	Male
Number	220	72
Percentage	75.34	24.66
Mean age	60.66	61.00
Maximum age	87.75	83.70
Minimum age	31.15	34.11
Standard dev.	11.39	11.57

Body Mass Index

For the four-year period 2010 - 2013, there were 13,459 BMI registrations for primary knee replacements. The average was 31.12 (obese) with a range of 15 – 65 and a standard deviation of 6.02.

Previous operation

None	59,671
Menisectomy	7,399
Osteotomy	1,209
Ligament reconstruction	835
Internal fixation for juxtarticular fracture	554
Synovectomy	134

Diagnosis

Osteoarthritis	67,340
Rheumatoid arthritis	1,812
Post fracture	749
Other inflammatory	621
Post ligament disruption/reconstruction	463
Avascular necrosis	256
Tumour	71

Approach

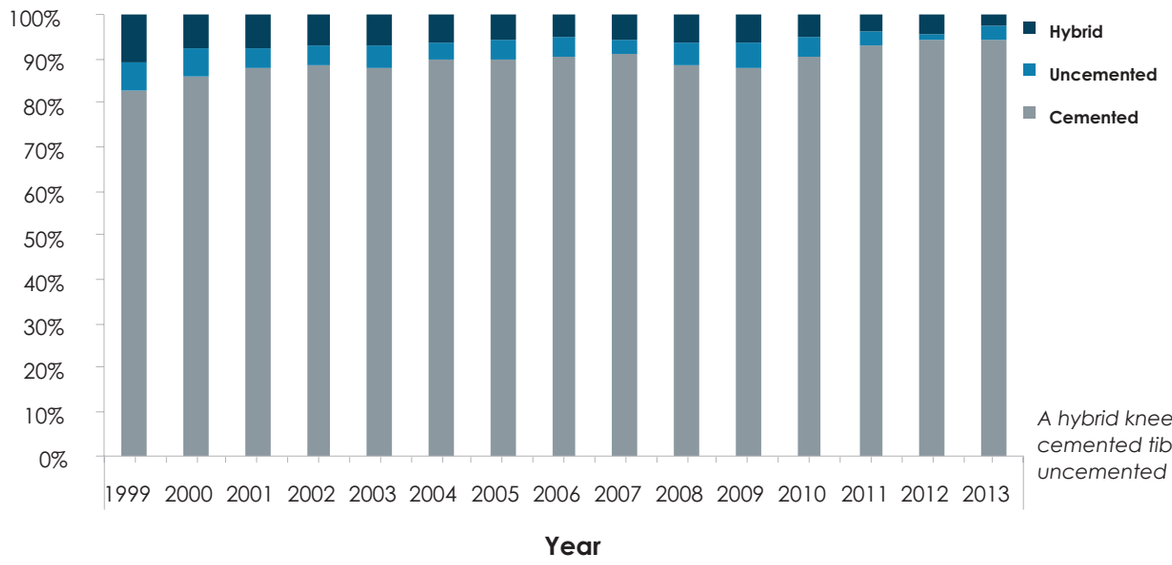
Medial parapatellar	64,621
Other	1,759
Lateral parapatellar	1,090
Image guided surgery	6,645
Minimally invasive surgery	146

Image guided surgery was added to the updated forms at the beginning of 2005 and in 2013 was used for 17% of primary knee arthroplasties, slightly up on 2012.

Bone graft

Femoral autograft	120
Femoral allograft	9
Femoral synthetic	6
Tibial autograft	78
Tibial allograft	18
Tibial synthetic	3

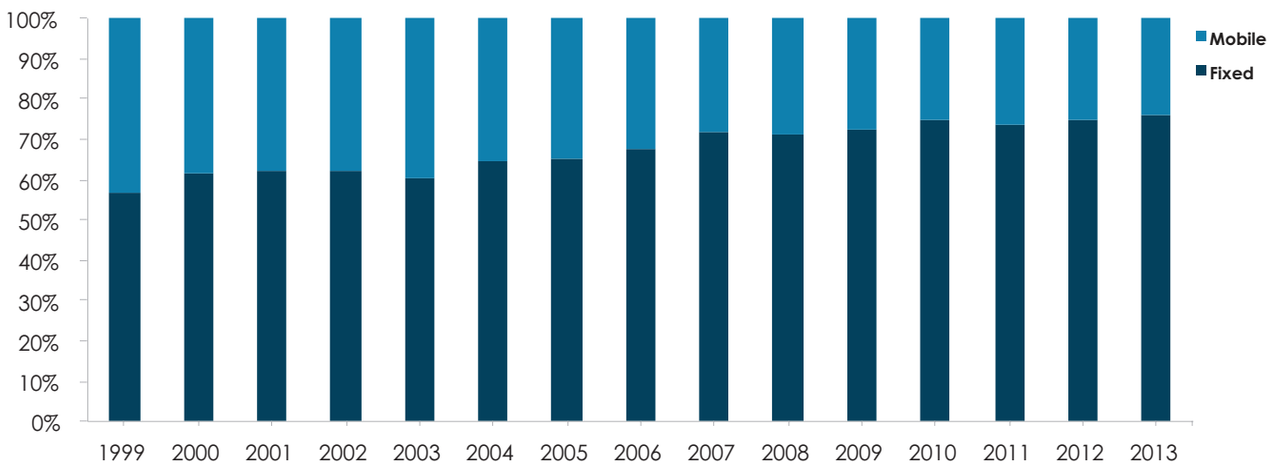
Comparison of proportion of cemented vs uncemented vs hybrid by year
Cementation Rates by Year



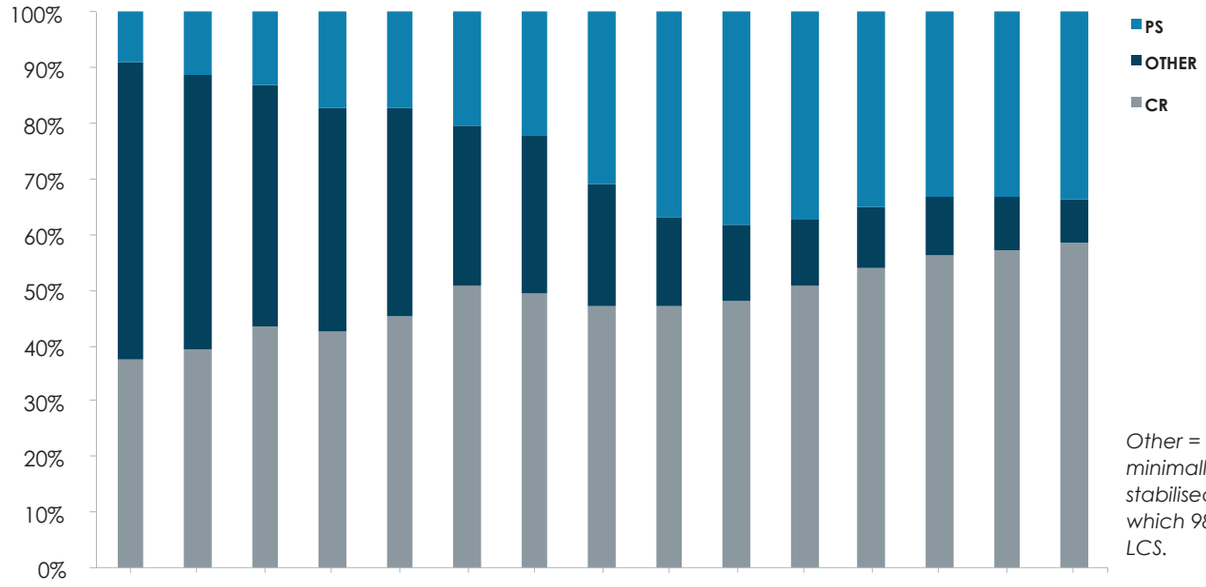
A hybrid knee has cemented tibia and uncemented femur.

Year

Proportion of Fixed vs Mobile Knees by Year



Proportion of Posterior Stabilized vs Cruciate Retaining vs Minimally Stabilized Knees by Year



Other = minimally stabilised of which 98% are LCS.

Cement

Femur cemented	64,951	91%
Antibiotic in cement	44,753	69%
Tibia cemented	67,866	95%
Antibiotic in cement	46,232	68%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	67,542	95%

A cephalosporin was used in 86% of arthroplasties.

Operating theatre

Conventional	39,880
Laminar flow	31,020
Space suits	23,062

In 2013, 49% of knee arthroplasties were performed in laminar flow theatres and space suits were used in 37%, similar to 2012.

ASA Class

This was introduced with the updated forms at the beginning of 2005. For the nine-year period 2005 – 2013, there were 49,480 (93%) primary knee procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient

ASA class 2: A patient with mild systemic disease

ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating

ASA class 4: A patient with an incapacitating disease that is a constant threat to life

ASA	Number	Percentage
1	5,730	12
2	31,493	63
3	12,036	24
4	221	1

Operative time (skin to skin in minutes)

Mean	84

Surgeon grade

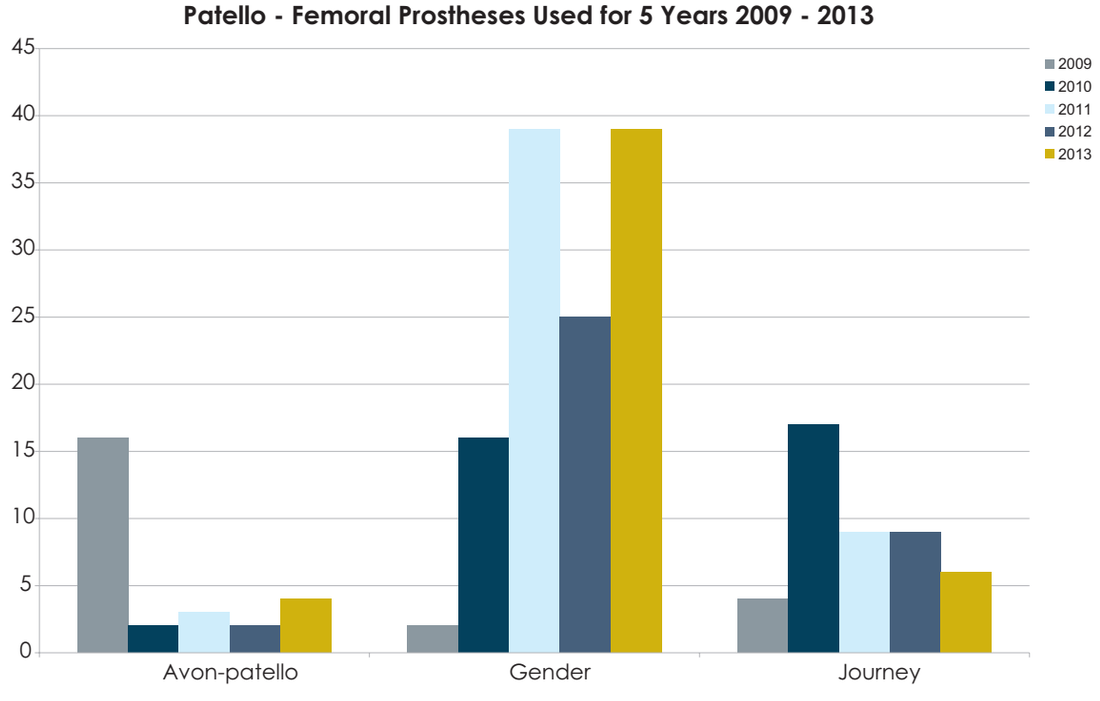
The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the nine-year period 2005 – 2013:

Consultant	46,130
Advanced trainee supervised	4,280
Basic trainee	1,209
Advanced trainee unsupervised	1,144

Prosthesis usage

Patello-femoral prostheses used in 2013

Gender	39
Journey	6
Avon patello	4



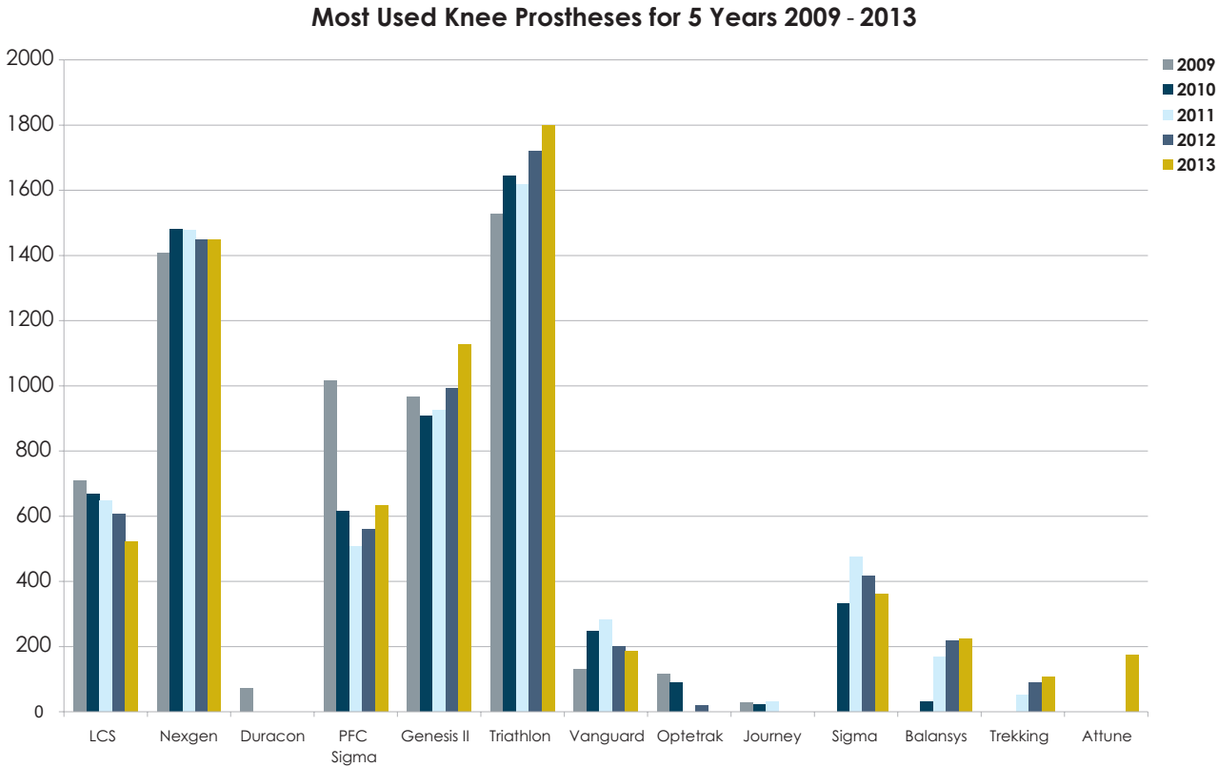
There are 292 patello-femoral procedures registered to 63 surgeons.

Conventional primary knees

Top 10 knee prostheses used in 2013

Triathlon	1799
Nexgen	1448
Genesis II	1126
PFC Sigma	633
LCS	520
Sigma	362
Balansys	224
Vanguard	186
Attune	173
Trekking	107

The same list as for 2012 except that Attune has displaced Optetrak.



Surgeon and hospital workload

Surgeons

In 2013, 206 surgeons performed 6,694 total knee replacements, an average of 36 procedures per surgeon.

33 surgeons (5 fewer than 2012) performed less than 10 procedures and 51 performed more than 40.

Hospitals

In 2013 primary knee replacement was performed in 55 hospitals. 28 were public hospitals and 27 were private.

For 2013 the average number of total knee replacements per hospital was 122.

REVISION KNEE ARTHROPLASTY

Revision is defined by the Registry as a new operation in a previously replaced knee joint, during which one or more of the components is exchanged, removed, manipulated or added. It includes arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as one revision.

Data analysis

For the fifteen-year period January 1999 – December 2013, there were 5,580 revision knee procedures registered. This is an additional 488 compared to last year's report.

The average age for a revision knee replacement was 69.59 years, with a range of 10.57 – 98.39 years.

Revision knees

	Female	Male
Number	2,693	2,887
Percentage	48.26	51.74
Mean age	69.95	69.25
Maximum age	95.80	98.39
Minimum age	10.57	15.49
Standard dev.	10.48	10.20

The percentage of revision knees to primary knees is 8% and a ratio of 1:13.

Body Mass Index

For the four-year period 2010 - 2013, there were 617 BMI registrations for revision knee replacements. The average BMI was 31.32(obese) with a range of 15 – 54 and a standard deviation of 6.01.

REVISION OF REGISTERED PRIMARY KNEE ARTHROPLASTIES

This section analyses data for revisions of the primary registered knee arthroplasties for the fifteen-year period.

There were 1,951 revisions of the 71,211 primary conventional knee replacements (2.7%) and 20 revisions of the 292 patello-femoral prostheses (6.9%).

Conventional knee replacement analysis

Time to revision

Mean	1,194 days
Maximum	5,219 days
Minimum	1 day
Standard deviation	1,086 days

Reason for revision

Pain	590
Deep infection	495
Loosening tibial component	454
Patellar resurfacing	467
Loosening femoral component	219
Loosening patellar component	37
Fracture tibia	31
Fracture femur	28

There is often more than 1 listed reason for revision and all are entered.

Analysis by time of the 5 main reasons for revision

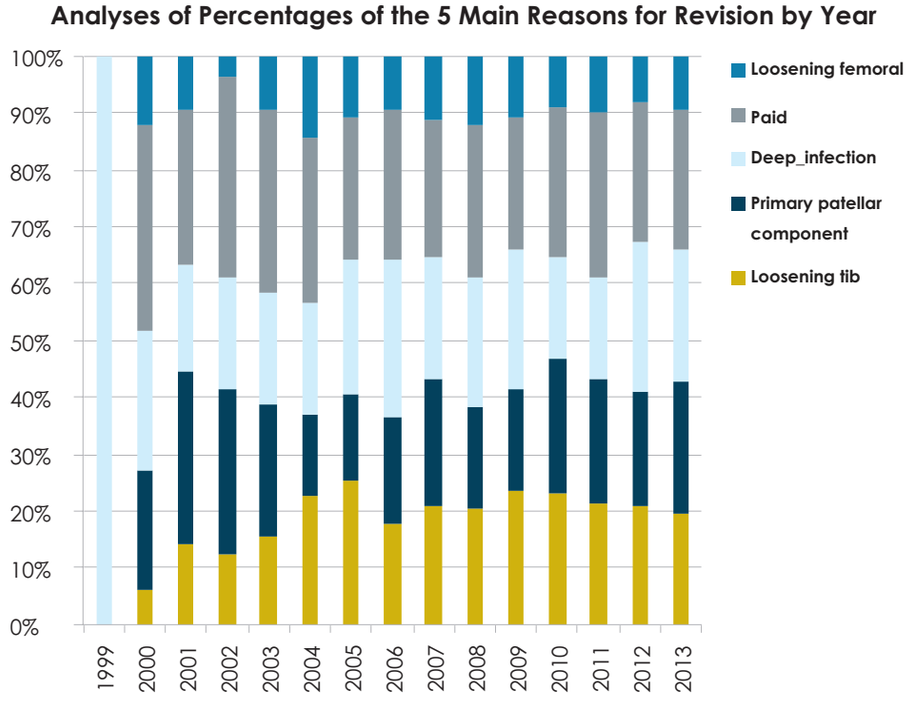
	Loosening tibial component		Primary patellar component		Deep infection		Pain		Loosening femoral	
Years	Count	%	Count	%	Count	%	Count	%	Count	%
0	10	2.20	11	2.40	120	24.20	23	3.90	3	1.40
1	24	5.30	66	14.10	75	15.20	76	12.90	11	5.00
2	55	12.10	155	33.20	103	20.80	178	30.20	27	12.30
3	70	15.40	79	16.90	56	11.30	99	16.80	22	10.00
4	61	13.40	57	12.20	49	9.90	65	11.00	19	8.70
5	50	11.00	30	6.40	20	4.00	40	6.80	32	14.60
6	38	8.40	13	2.80	17	3.40	24	4.10	16	7.30
7	42	9.30	11	2.40	19	3.80	20	3.40	23	10.50
8	32	7.00	11	2.40	13	2.60	16	2.70	20	9.10
9	16	3.50	8	1.70	6	1.20	12	2.00	11	5.00
10	22	4.80	4	0.90	7	1.40	7	1.20	10	4.60
11	12	2.60	11	2.40	5	1.00	17	2.90	9	4.10
12	13	2.90	7	1.50	4	0.80	5	0.80	10	4.60
13	9	2.00	4	0.90	0	0.00	8	1.40	5	2.30
14	0	0.00	0	0.00	1	0.20	0	0.00	1	0.50
Total	**454**	**100.00%**	**467**	**100.00%**	**495**	**100.00%**	**590**	**100.00%**	**219**	**100.00%**

1 = Pain, 2 = Deep infection, 3 = Primary patellar component, 4 = Loosening tibial component

Analyses of percentages of the 5 main reasons for revision by year

	Loosening tibial	Primary patellar component	Deep infection	Pain	Loosening femoral
Years	%	%	%	%	%
1999	0.00	0.00	50.00	0.00	0.00
2000	6.50	22.60	25.80	38.70	12.90
2001	16.10	33.90	21.40	30.40	10.70
2002	16.70	38.30	26.70	46.70	5.00
2003	20.00	29.30	25.30	41.30	12.00
2004	26.20	16.70	22.60	33.30	16.70
2005	27.60	16.20	25.70	27.60	11.40
2006	19.30	20.20	30.30	28.40	10.10
2007	24.20	25.80	24.20	28.00	12.90
2008	22.70	20.00	25.40	29.70	13.50
2009	27.20	20.40	28.30	26.70	12.60
2010	26.10	26.60	19.70	30.00	9.90
2011	24.20	24.70	20.50	32.60	11.20
2012	23.20	22.30	29.20	27.00	9.00
2013	23.30	27.80	27.40	29.30	11.30
Total					

NB each year column does not add up to 100% as often more than one cause for revision listed and there are other reasons for revision other than the 5 above listed in the registry.



Patello-Femoral Arthroplasty

Revision of patello-femoral knees

Of the 292 registered, 20 have been revised.

Average	1,232 days
Maximum	4,038 days
Minimum	126 days
Standard deviation	1,019 days

Reason for revision

Pain	9
Loosening patellar	2
Other	9

Patellar resurfacing

As noted previously, 68 %(48,542) of the 71,211registered conventional primary knees did not have the patella resurfaced and 32% (27,669) were resurfaced. Of the group that was not resurfaced, 465 subsequently had the patella resurfaced.

Statistical note

In the table below there are two statistical terms readers may not be familiar with:

Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in situ.

Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percent and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow up in calculating the revision rate. These rates are usually very low, hence it is expressed per 100 component years rather than per component year. Statisticians consider that this is a more accurate way of deriving a revision rate for comparison when analysing data with widely varying follow up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical Significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CIs) but sometimes significance can apply in the presence of CI overlap.

All Primary Total Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
71,211	394,014.2	1951	0.50	0.47	0.52

Revision Rate of Individual Knee Prostheses Sorted by Number of Arthroplasties

(Minimum of 50 arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Nexgen	15,827	84,325.5	449	0.53	0.48	0.58
LCS	12,899	92,403.2	495	0.54	0.49	0.59
Triathlon	11,473	38,728.0	166	0.43	0.37	0.50
Genesis II	10,088	50,732.1	244	0.48	0.42	0.55
PFC Sigma	8,916	52,088.8	214	0.41	0.36	0.47
Duracon	4,213	36,809.4	110	0.30	0.25	0.36
Vanguard	1,225	3,450.0	23	0.67	0.42	1.00
Sigma CR150	858	1,747.2	10	0.57	0.27	1.05
Scorpio	852	6,964.6	49	0.70	0.52	0.93
Maxim	822	7,372.6	35	0.47	0.33	0.66
Sigma	745	1,413.3	7	0.50	0.20	1.02
Optetrak	654	3,323.9	31	0.93	0.63	1.32

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Balansys	648	986.7	7	0.71	0.29	1.46
AGC	376	3,694.9	14	0.38	0.21	0.64
MBK	256	2,712.3	14	0.52	0.28	0.87
Insall/Burstein	249	2,549.2	46	1.80	1.32	2.41
Trekking	249	308.1	1	0.32	0.01	1.81
Attune	173	57.8	0	0.00	0.00	6.39
Advance	157	1,424.7	5	0.35	0.11	0.82
Journey	143	460.2	5	1.09	0.35	2.54
AMK	95	1,091.5	2	0.18	0.02	0.66
ROCC	66	385.4	3	0.78	0.16	2.27
Legion	53	82.7	1	1.21	0.031	6.736

There are 50 different types of knee prostheses in the Registry with 23(48%) with less than 10 registrations

Revision Rate of Individual Knee Prostheses Sorted by Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Insall/Burstein	249	2,549.2	46	1.80	1.32	2.41
Legion	53	82.7	1	1.21	0.03	6.74
Journey	143	460.2	5	1.09	0.35	2.54
Optetrak	654	3,323.9	31	0.93	0.63	1.32
ROCC	66	385.4	3	0.78	0.16	2.27
Balansys	648	986.7	7	0.71	0.29	1.46
Scorpio	852	6,964.6	49	0.70	0.52	0.93
Vanguard	1,225	3,450.0	23	0.67	0.42	1.00
Sigma CR150	858	1,747.2	10	0.57	0.27	1.05
LCS	12,899	92,403.2	495	0.54	0.49	0.59
Nexgen	15,827	84,325.5	449	0.53	0.48	0.58
MBK	256	2,712.3	14	0.52	0.28	0.87
Sigma	745	1,413.3	7	0.50	0.20	1.02
Genesis II	10,088	50,732.1	244	0.48	0.42	0.55
Maxim	822	7,372.6	35	0.47	0.33	0.66
Triathlon	11,473	38,728.0	166	0.43	0.37	0.50
PFC Sigma	8,916	52,088.8	214	0.41	0.36	0.47
AGC	376	3,694.9	14	0.38	0.21	0.64
Advance	157	1,424.7	5	0.35	0.11	0.82
Trekking	249	308.1	1	0.32	0.01	1.81
Duracon	4,213	36,809.4	110	0.30	0.25	0.36
AMK	95	1,091.5	2	0.18	0.02	0.66
Attune	173	57.8	0	0.00	0.00	6.39

The Insall/Burstein and Optetrak are the only knee prostheses that have significantly higher revision rates than the overall rate of 0.50/100 ocys @ the 95% confidence interval. The Optetrak was the only one implanted in 2013

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	64,308	350,301.9	1,657	0.47	0.45	0.50
Uncemented	2,963	18,353.8	163	0.89	0.76	1.04
Hybrid	3,940	25,358.5	131	0.52	0.43	0.61

Hybrid Knee: tibia cemented, femur uncemented

It is to be noted several variants of basically the same knee prosthesis type, e.g. Nexgen LCS, which are registered separately have been merged into the one group to enable comparable statistical analyses with other prostheses which may also have more than one variant but are registered as one or two prostheses.

Revision vs Arthroplasty Fixation for Fully Cemented Prostheses Sorted by Revision Rate

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Oxford Tricomp. Femoral	38	379.0	9	2.37	1.09	4.51
Insall/Burstein	249	2,549.2	46	1.80	1.32	2.41
Optetrak	281	1,521.7	19	1.25	0.75	1.95
Legion	53	82.7	1	1.21	0.03	6.74
Journey	143	460.2	5	1.09	0.35	2.54
Balansys	648	986.7	7	0.71	0.29	1.46
Scorpio	850	6,940.8	49	0.71	0.52	0.93
Vanguard	1,214	3,409.8	22	0.65	0.40	0.98
Sigma CR150	858	1,747.2	10	0.57	0.27	1.05
Nexgen	15,091	80,158.4	432	0.54	0.49	0.59
MBK	247	2,623.8	14	0.53	0.29	0.90
Genesis II	10,035	50,264.1	241	0.48	0.42	0.54
Maxim	822	7,372.6	35	0.47	0.33	0.66
Triathlon	11,320	38,038.9	162	0.43	0.36	0.50
Sigma	669	1,181.6	5	0.42	0.36	0.50
LCS	8,809	66,140.1	280	0.42	0.38	0.48
PFC Sigma	8,356	49,597.6	200	0.40	0.35	0.46
AGC	376	3,694.9	14	0.38	0.21	0.64
Advance	157	1,424.7	5	0.35	0.11	0.82
Trekking	249	308.1	1	0.32	0.01	1.81
Duracon	3,432	29,647.2	90	0.30	0.24	0.37
AMK	95	1,091.5	2	0.18	0.02	0.66
Attune	173	57.8	0	0.00	0.00	6.39

The Insall/Burstein, Optetrak, Scorpio and Oxford Tricompartmental Femoral prostheses have significantly higher revision rates than the overall rate of 0.50/100 ocys at the 95% confidence.

Revision vs Arthroplasty for Hybrid Fixation of Prostheses Sorted by Revision Rate

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Sigma	76	231.6	2	0.86	0.10	3.12
Triathlon	151	680.3	4	0.59	0.16	1.51
PFC Sigma	553	2,457.1	14	0.57	0.31	0.96
LCS	1,889	13,005.0	71	0.55	0.43	0.69
Optetrak	373	1,802.2	12	0.49	0.21	0.97
Genesis II	51	463.6	2	0.43	0.05	1.56
Duracon	321	3,289.9	14	0.43	0.23	0.71
Nexgen	490	3,222.2	10	0.31	0.15	0.57

There are no significantly higher revision rates than the overall rate of 0.50/100 ocys at the 95% confidence.

Revision vs Arthroplasty Fixation for Fully Uncemented Prostheses Sorted by Revision Rate

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LCS	2,201	13,258.2	144	1.09	0.92	1.28
Nexgen	246	944.9	7	0.74	0.30	1.53
Duracon	460	3,872.4	6	0.15	0.06	0.34

The uncemented LCS prosthesis (85 implanted in 2013) has a significantly higher revision rate than the overall rate of 0.50/100 ocys at the 95% confidence.

Revision Rates for Fixed vs Mobile Bearing Knees

Prosthesis	Fixed/ Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
AGC	Fixed	376	3,694.9	14	0.38	0.21	0.64
AMK	Fixed	95	1,091.5	2	0.18	0.02	0.66
Balansys	Fixed	647	985.8	7	0.71	0.29	1.46
Duracon	Fixed	4,207	36,747.0	109	0.30	0.24	0.36
Genesis II	Fixed	10,088	50,732.1	244	0.48	0.42	0.55
Insall/Burstein	Fixed	249	2,549.2	46	1.80	1.32	2.41
Journey	Fixed	143	460.2	5	1.09	0.35	2.54
LCS	Mobile	12,899	92,403.2	495	0.54	0.49	0.59
Maxim	Fixed	822	7,372.6	35	0.47	0.33	0.66
MBK	Mobile	256	2,712.3	14	0.52	0.28	0.87
Nexgen	Fixed	13,113	72,374.4	392	0.54	0.49	0.60
Nexgen	Mobile	2,524	11,284.1	52	0.46	0.34	0.60
PFC Sigma	Fixed	5,341	33,193.3	136	0.41	0.34	0.48
PFC Sigma	Mobile	3,305	18,582.9	77	0.41	0.33	0.52
S-Rom	Mobile	5	6.9	0	0.00	0.00	53.28
Scorpio	Fixed	737	6,058.4	42	0.69	0.50	0.94
Scorpio	Mobile	104	846.2	5	0.59	0.19	1.38

Prosthesis	Fixed/ Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Sigma	Fixed	208	448.0	4	0.89	0.24	2.29
Sigma	Mobile	480	901.7	3	0.33	0.07	0.97
Sigma CR150	Fixed	169	398.1	4	1.00	0.27	2.57
Sigma CR150	Mobile	681	1,345.8	6	0.45	0.16	0.97
Trekking	Mobile	249	308.1	1	0.32	0.01	1.81
Triathlon	Fixed	11,124	37,534.2	161	0.43	0.37	0.50
Triathlon	Mobile	277	1,005.5	4	0.40	0.11	1.02
Attune	Fixed	40	13.3	0	0.00	0.00	27.72
Attune	Mobile	133	44.5	0	0.00	0.00	8.30

Just the Insall/Burstein has a significantly higher revision rate than the overall rate of 0.50/100 ocys at the 95% confidence.

Overall Revision Rates for Fixed vs Mobile Bearing Knees

Prosthe Fixed/Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Fixed	47,384	253,673.1	1202	0.47	0.45	0.50
Mobile	20,915	129,457.4	657	0.51	0.47	0.55

For the first time there is not a significantly higher revision rate for mobile bearing knees when compared to fixed bearing knees. It was not possible to determine fixed or mobile categories for all registered knees,which accounts for the 2,912 shortfall in the total number.

Revision Rates for Cruciate Retaining (CR) vs Posterior Stabilised (PS)

Prosthesis	CR/PS	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
AGC	PS	28	302.9	2	0.66	0.08	2.39
Balansys	CR	615	952.6	7	0.73	0.30	1.51
Balansys	PS	32	33.3	0	0.00	0.00	11.08
Congruency PS Femoral	PS	1	13.8	0	0.00	0.00	26.69
Genesis II	CR	5,404	33,416.1	126	0.38	0.31	0.45
Genesis II	PS	4,678	17,273.1	118	0.68	0.57	0.82
Insall/Burstein	PS	249	2,549.2	46	1.80	1.32	2.41
LCS	PS	65	181.8	0	0.00	0.00	2.03
Legion	PS	36	41.6	0	0.00	0.00	8.86
Maxim	CR	657	5,823.6	25	0.43	0.28	0.63
Maxim	PS	165	1,549.0	10	0.65	0.31	1.19
Nexgen	CR	6,962	40,985.6	170	0.41	0.35	0.48
Nexgen	PS	8,702	42,791.8	269	0.63	0.56	0.71
Optetrak	CR	430	2,173.4	13	0.60	0.32	1.02
Optetrak	PS	224	1,150.5	18	1.56	0.93	2.47
PFC Sigma	CR	6,970	40,980.8	146	0.36	0.30	0.42
PFC Sigma	PS	1,880	10,818.1	66	0.61	0.47	0.78

Prosthesis	CR/PS	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Scorpio	CR	739	6,142.4	43	0.70	0.51	0.94
Scorpio	PS	111	811.2	6	0.74	0.27	1.61
Sigma	CR	81	154.5	0	0.00	0.00	2.39
Sigma	PS	663	1,258.6	7	0.56	0.22	1.15
Sigma CR150	CR	858	1,747.2	10	0.57	0.27	1.05
Trekking	CR	95	128.9	1	0.78	0.02	4.32
Trekking	PS	154	179.2	0	0.00	0.00	2.06
Triathlon	CR	9,418	30,586.3	126	0.41	0.34	0.49
Triathlon	PS	2,050	8,132.9	40	0.49	0.35	0.67
Vanguard	CR	881	2,646.9	17	0.64	0.37	1.03
Vanguard	PS	339	794.7	6	0.75	0.28	1.64
Attune	CR	152	49.0	0	0.00	0.00	7.53
Attune	PS	21	8.8	0	0.00	0.00	41.88

Overall Revision Rates for Cruciate Retaining vs Posterior Stabilised vs Minimally Stabilised Knees

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CR	33,263	165,787.6	684	0.41	0.38	0.44
Minimally	13,155	95,327.5	512	0.54	0.49	0.59
PS	19,416	87,896.4	588	0.67	0.62	0.73

The LCS prostheses account for 98% of the minimally stabilised.
There is a significantly higher revision rate for posterior and minimally stabilised compared to cruciate retaining knee prostheses.

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	64,308	350,301.9	1,657	0.47	0.45	0.50
Uncemented	2,963	18,353.8	163	0.89	0.76	1.04
Hybrid	3,940	25,358.5	131	0.52	0.43	0.61

Uncemented knees have a significantly higher revision rate than either cemented or hybrid knees. Further analyses have shown that it is loosening of the uncemented tibial component that is responsible for the higher revision rate.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	6,054	34,155.0	344	1.01	0.90	1.12
55_64	19,330	108,242.3	705	0.65	0.60	0.70
65_74	27,044	150,760.1	657	0.44	0.40	0.47
GE75	18,783	100,856.9	245	0.24	0.21	0.28

Each successive age band in ascending order has a significantly lower revision rate.

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	36,798	206,997.4	957	0.46	0.43	0.49
Male	34,413	187,016.8	994	0.53	0.50	0.57

The revision rate for males is significantly higher than for females.

Revision by Age Bands vs Arthroplasty Fixation

Cemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	5,039	27,421.6	251	0.92	0.81	1.04
55_64	17,066	93,487.1	592	0.63	0.58	0.69
65_74	24,781	136,365.0	593	0.43	0.40	0.47
GE75	17,422	93,028.2	221	0.24	0.21	0.27

Each successive age band in ascending order has a significantly lower revision rate.

Uncemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	526	3,796.1	62	1.63	1.25	2.09
55_64	1,028	6,679.1	65	0.97	0.75	1.24
65_74	924	5,399.5	29	0.54	0.36	0.77
GE75	485	2,479.1	7	0.28	0.11	0.58

The lowest age band has a significantly higher revision rate than the three highest bands

Hybrid	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	489	2,937.4	31	1.06	0.72	1.50
55_64	1,236	8,076.1	48	0.59	0.44	0.79
65_74	1,339	8,995.5	35	0.39	0.27	0.54
GE75	876	5,349.5	17	0.32	0.19	0.51

The lowest age band has a significantly higher revision rate than the two highest bands.

Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial	64,293	351,312.3	1,723	0.49	0.47	0.51
Lateral	1,076	6,878.5	43	0.63	0.45	0.84
Other	1,687	10,752.8	44	0.41	0.30	0.55

There is no significant difference among the three approaches.

Revision vs Image Guidance

Image Guided	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
No	64,568	371,418.3	1,831	0.49	0.47	0.52
Yes	6,643	22,595.9	120	0.53	0.44	0.64

There is no significant difference between the two groups.

Revision vs Surgeon Annual Output

Operations per year	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT10	1,595	10,184.6	48	0.47	0.35	0.62
10_25	16,173	93,837.9	502	0.53	0.49	0.58
25_50	33,942	190,129.7	927	0.49	0.46	0.52
50_75	12,350	63,058.3	302	0.48	0.43	0.54
75_100	4,043	20,347.7	89	0.44	0.35	0.54
GE100	3,099	16,389.1	83	0.51	0.40	0.63

There is no significant difference among the groups.

Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	5,656	21,897.0	131	0.60	0.50	0.71
2	31,353	120,696.2	649	0.54	0.50	0.58
3	12,004	44,893.1	245	0.55	0.48	0.62
4	221	759.9	6	0.79	0.29	1.72

There is no significant difference among the four classes.

Revision vs ASA public private hospitals

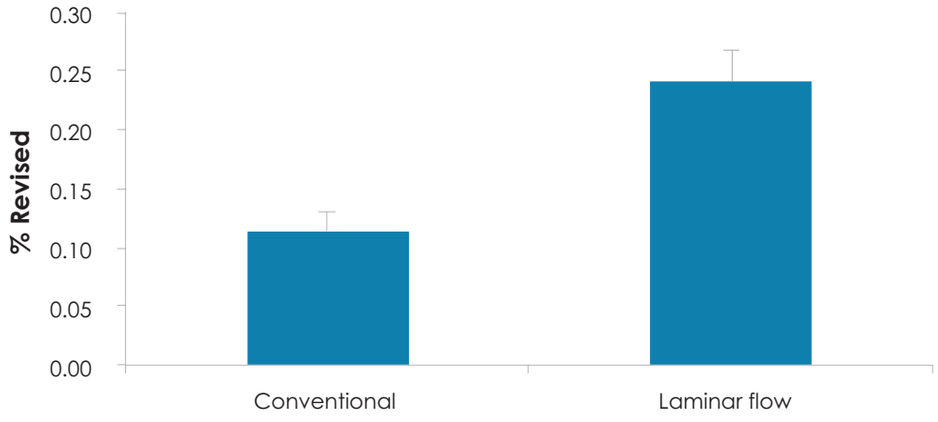
	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Public	25,553	97,051.1	547	0.56	0.52	0.61
Private	23,681	91,195.2	484	0.53	0.48	0.58

There is no significant difference between the two groups.

Revision for Deep Infection within 6 months versus Theatre Environment

Theatre Environment	Total Number	Number Revised	%	Std Error
Conventional	37,724	43	0.11399	0.01737
Laminar flow	29,159	70	0.24006	0.02866

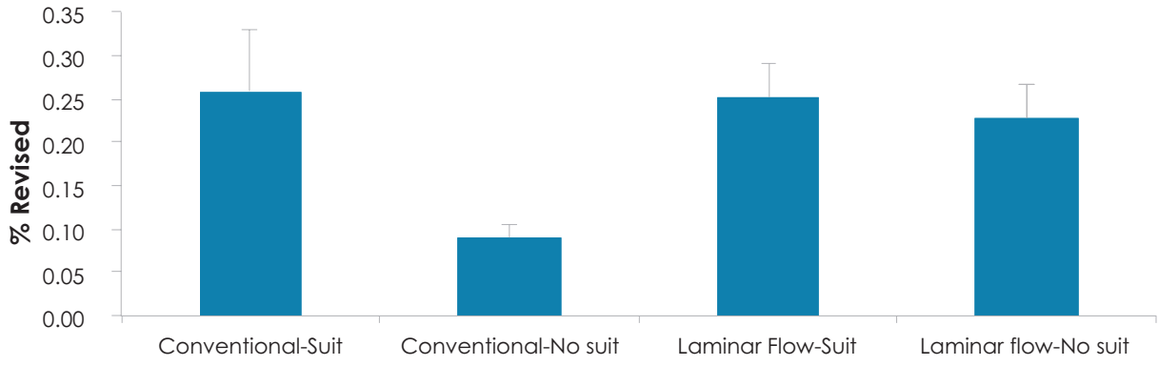
% Revision for Deep Infection Within 6 Months



As with hip arthroplasty there is a significant difference in knee revision rates (2x) for deep infection within 6 months of surgery between conventional and laminar flow theatres.

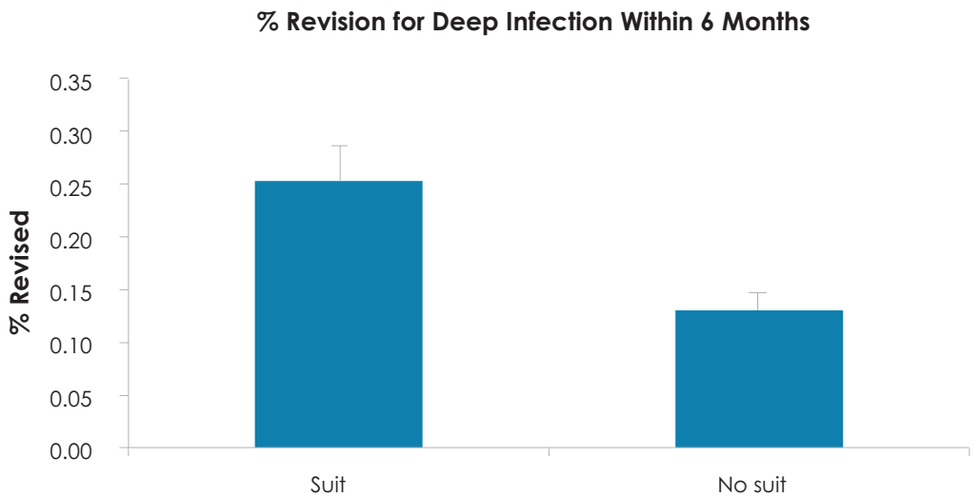
Theatre Environment	Suit/No Suit	Total Number	Number	%	Std Error
Conventional	Suit	5,402	14	0.25916	0.06917
	no suit	32,322	29	0.08972	0.01665
Laminar flow	Suit	15,937	40	0.25099	0.03963
	no suit	13,222	30	0.22689	0.04138

% Revision for Deep Infection Within 6 Months



There is a significant difference in the revision rates between conventional/no suit and the conventional/suit (2.9x) and laminar /suit (2.8x) environments.

	Total Number	Number Revised	%	Std Error
Suit	21,339	54	0.25306	0.03439
no suit	45,544	59	0.12955	0.01685

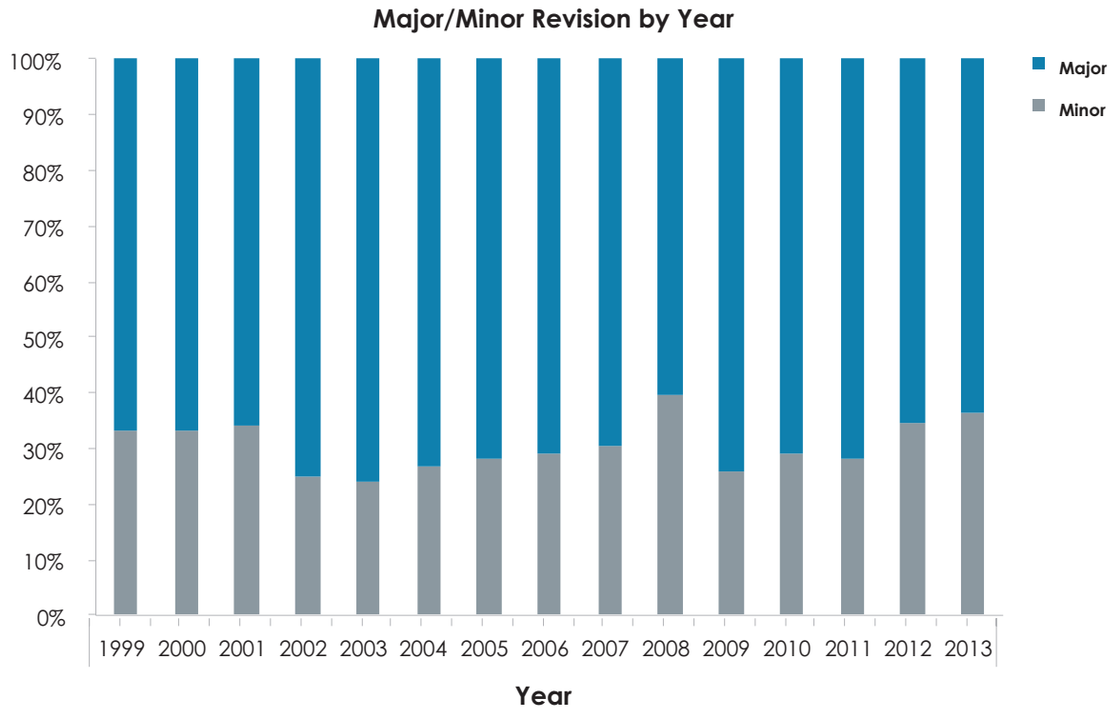


Furthermore there is a significant increase in revision rates (2 x) when suits are used in either conventional or laminar flow theatres.

From the above data it would seem that, similar to hip arthroplasty, the use of space suits significantly increases the risk of deep infection within the first 6 months following the arthroplasty and that there is no advantage to using laminar flow theatres.

Comparison of Major vs Minor Revisions by Year

A major revision is defined as revision of tibial and/or femoral components, including any of minor components and minor revision as change of bearing and/or patellar components only.



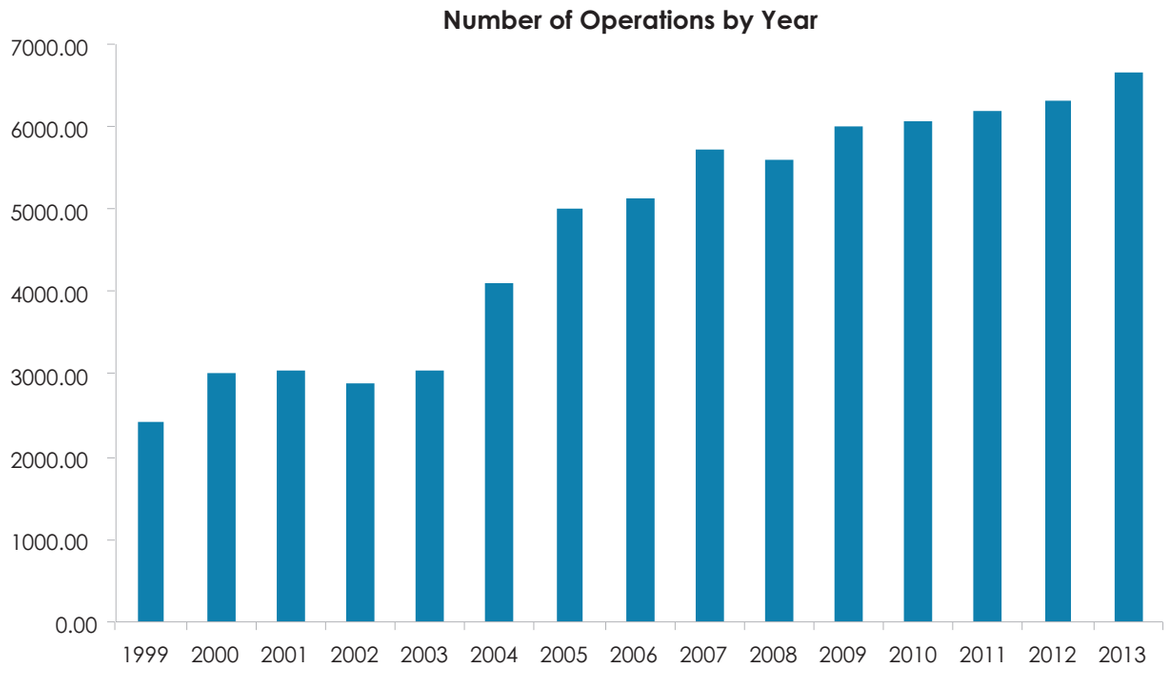
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Minor	Count	2	8	14	11	15	20	26	27	30	58	39	46	47	68	81	492
Major	Count	4	16	27	33	48	54	66	65	69	89	112	113	121	129	141	1087
	Count	6	24	41	44	63	74	92	92	99	147	151	159	168	197	222	1579

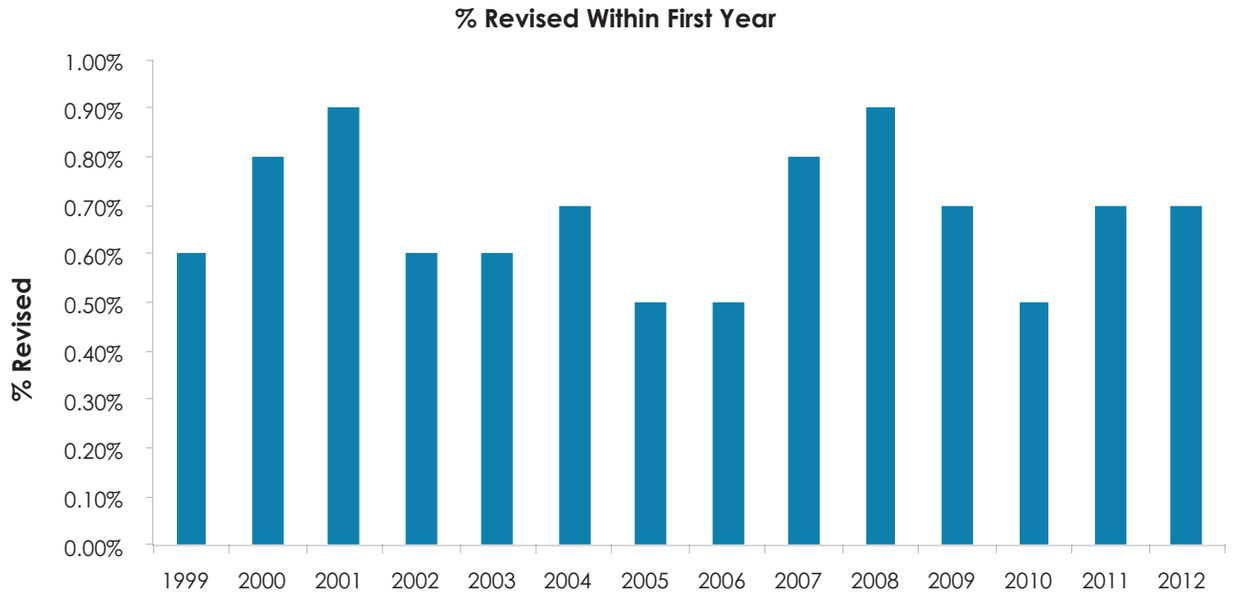
Re revisions for major vs minor knee revisions

Major/Minor	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	492	1,806.16	85	4.71	3.76	5.82
Major	1,087	4,463.36	136	3.05	2.56	3.60

There is a significantly higher re-revision rate for minor compared to major revisions

Percentage of Knees Revised in the First Year





Patello-Femoral Arthroplasty

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
292	1,129.2	20	1.77	1.08	2.74

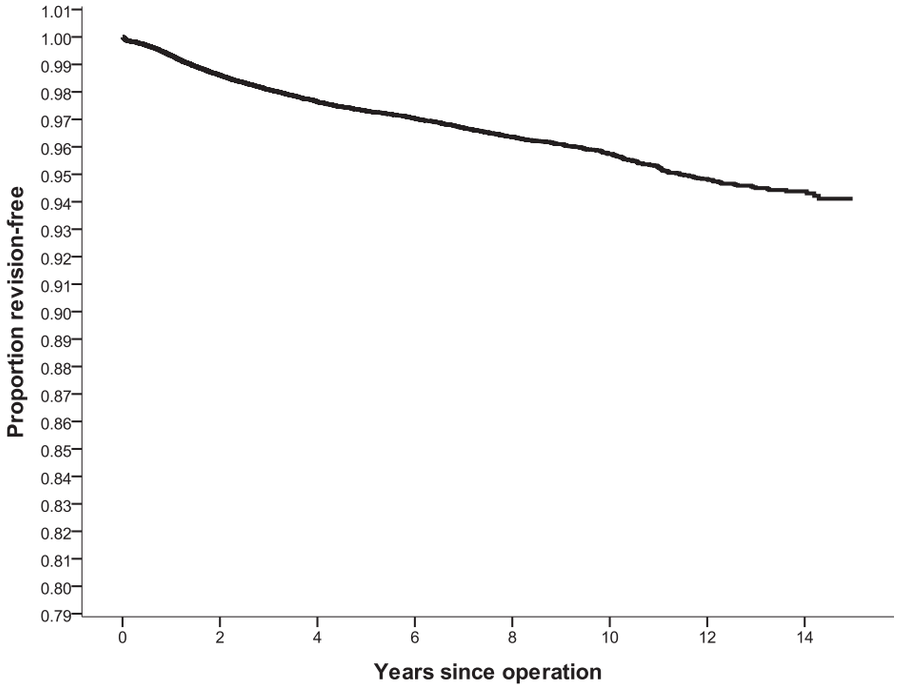
The revision rate is twice that for total knee arthroplasty.

Revised to:	
Total knee	16
Patello Femoral	2
Uniknee	2

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for years 1999 – 2013 with deceased patients censored at time of death

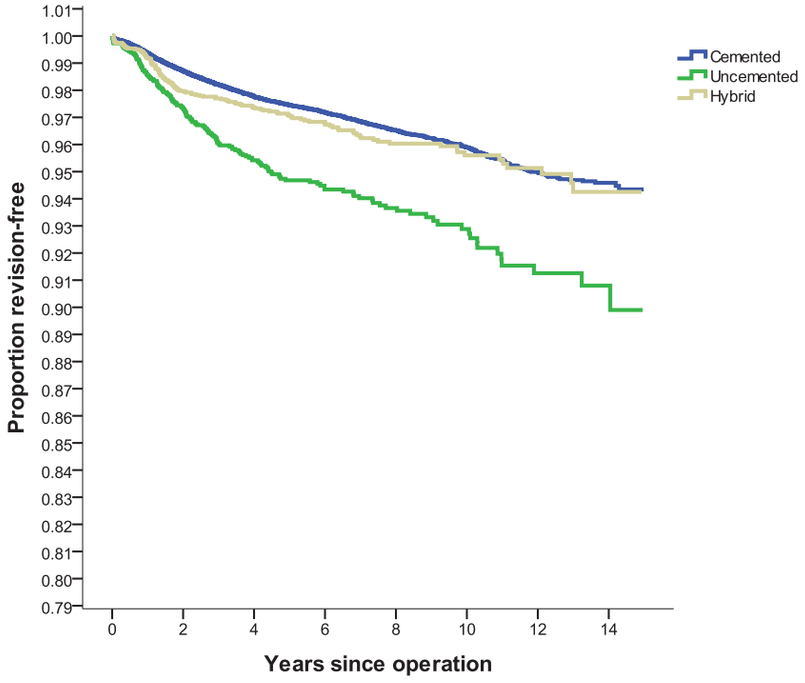
All Knees



Years	% Revision-free	No in each year
1	99.30	63,507
2	98.60	56,107
3	98.10	48,964
4	97.60	42,132
5	97.30	35,562
6	97.00	29,532
7	96.70	23,645
8	96.40	18,516
9	96.10	14,121
10	95.70	10,160
11	95.30	7,456
12	94.80	5,231
13	94.50	3,100
14	94.40	1,948

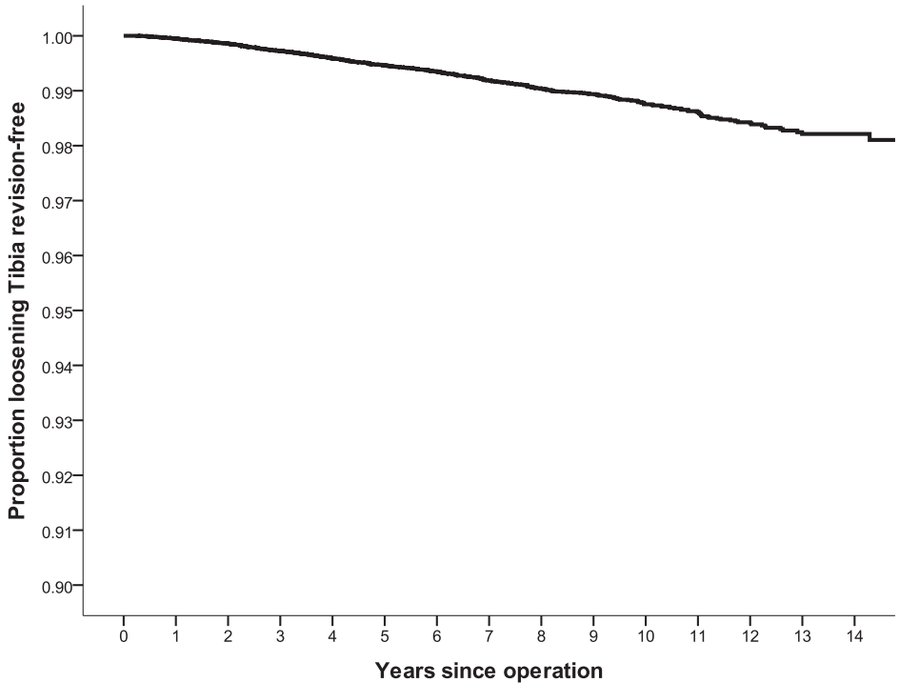
The KM analysis is to 14 years rather than 15 as too few registered knees were revised in 2013.

Cemented vs Uncemented vs Hybrid

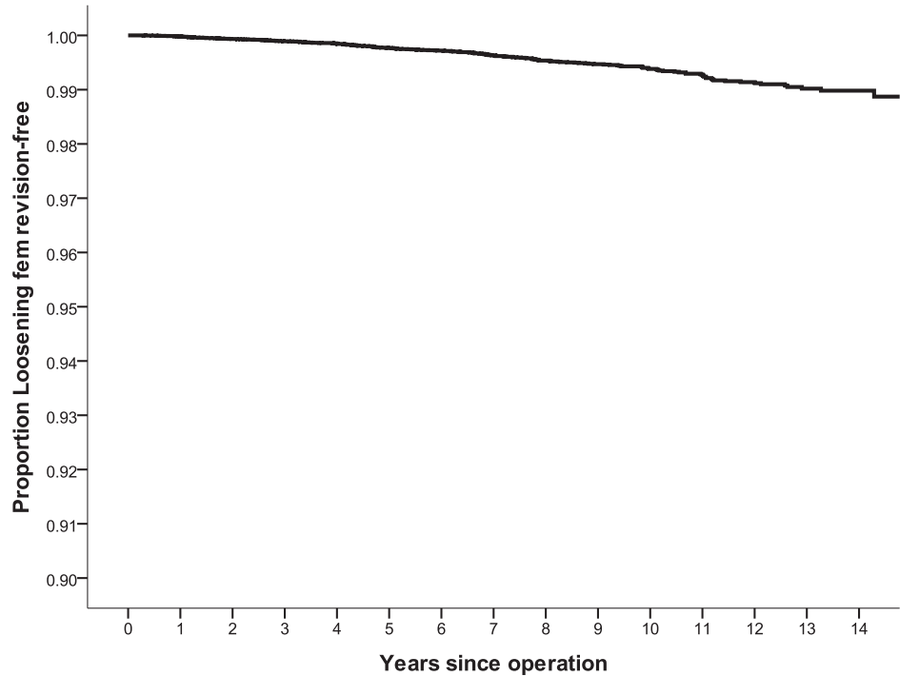


The following K M graphs are for the 5 main individual reasons for revision

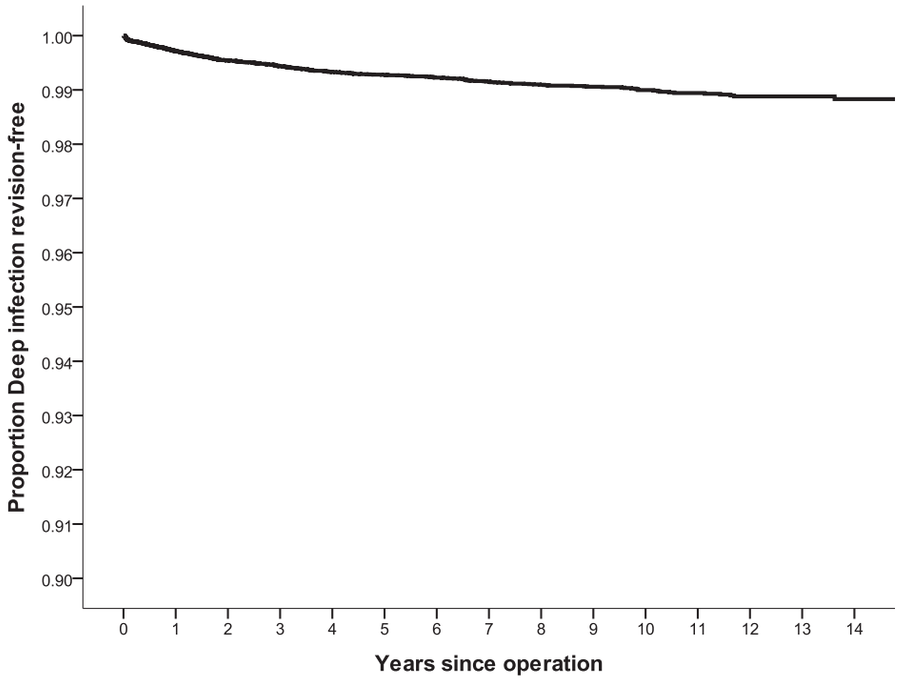
1. Tibial loosening



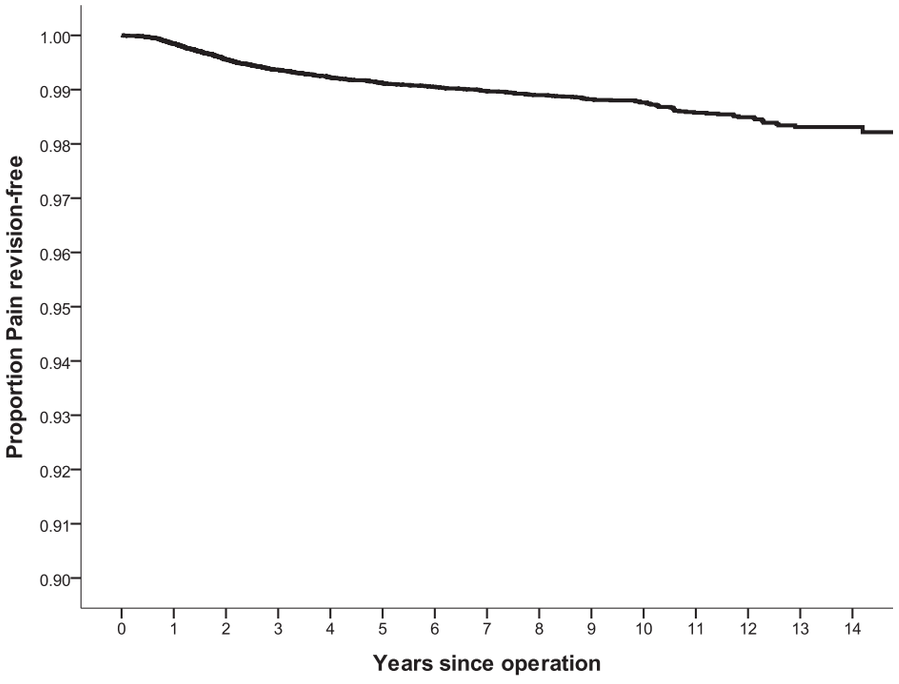
2. Femoral loosening



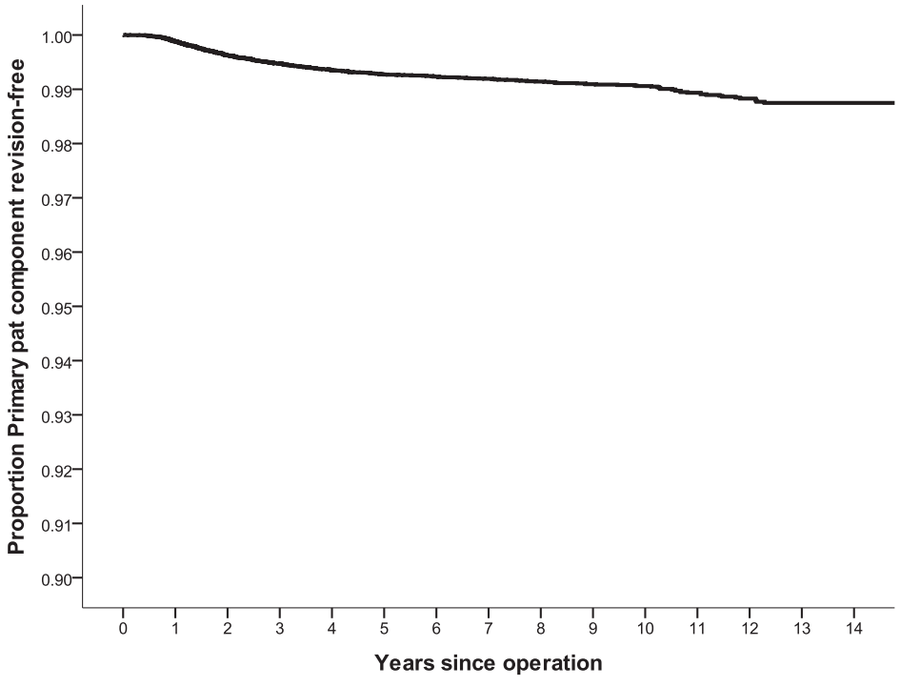
3. Deep infection



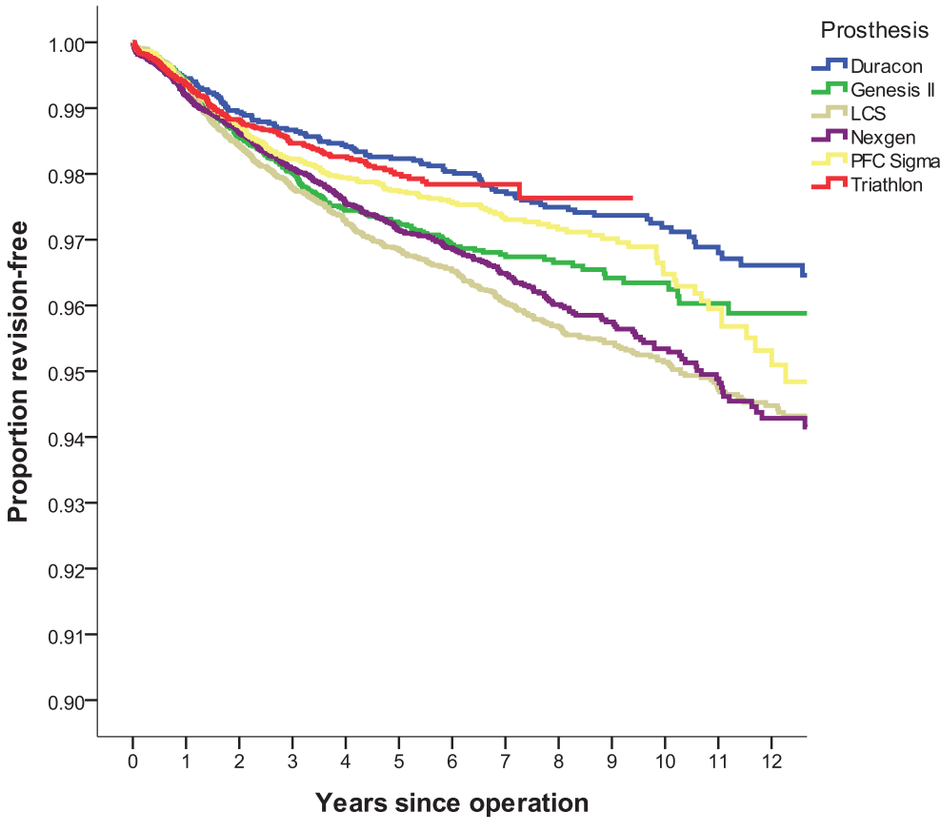
4. Pain



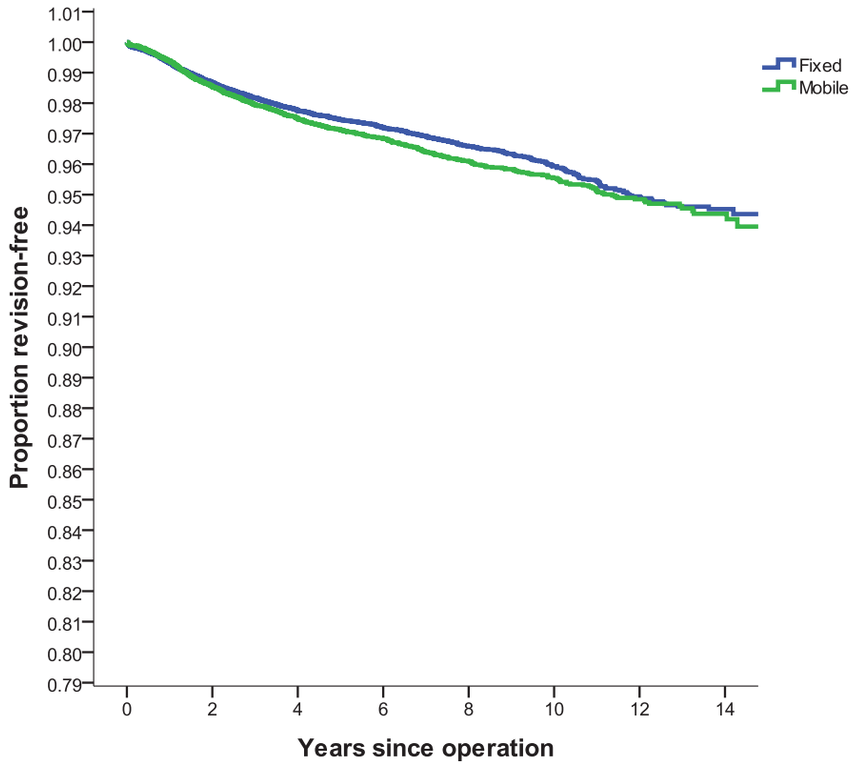
5. Patella



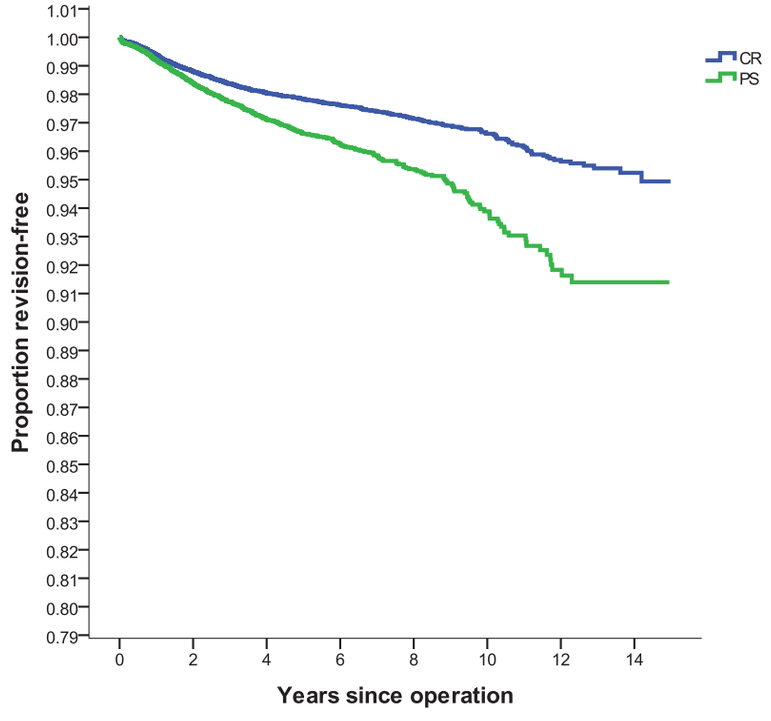
Survival Curve to 12 years for 6 knee prostheses



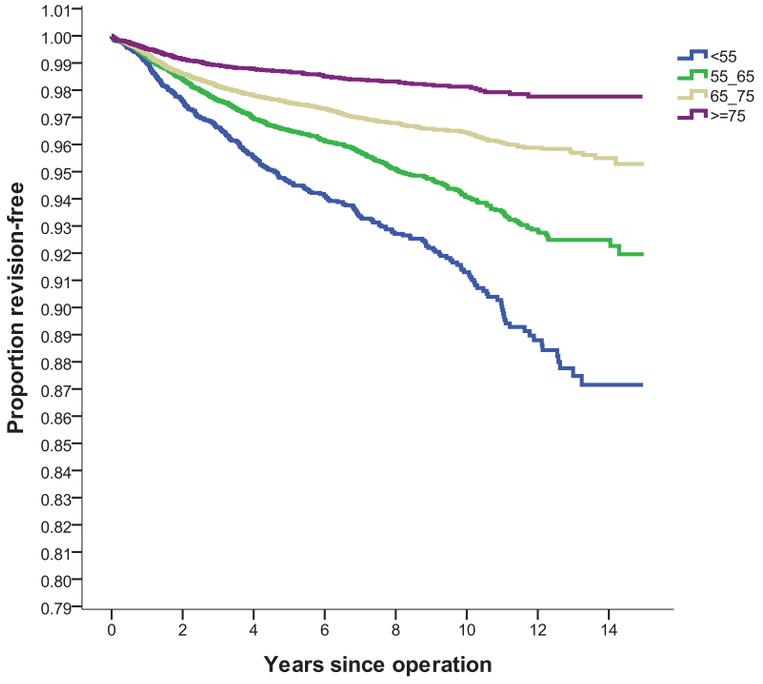
Fixed vs Mobile knees



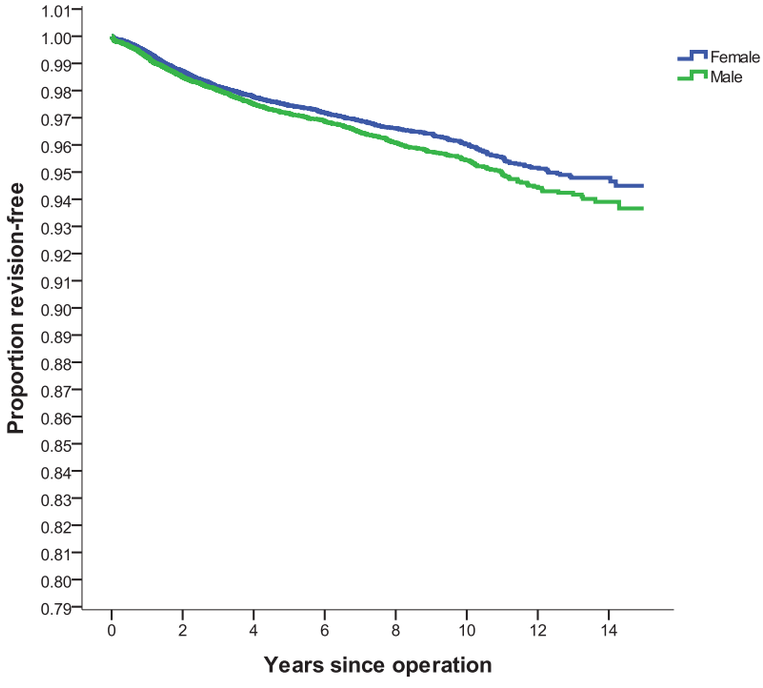
Posterior Stabilised vs Cruciate Retaining



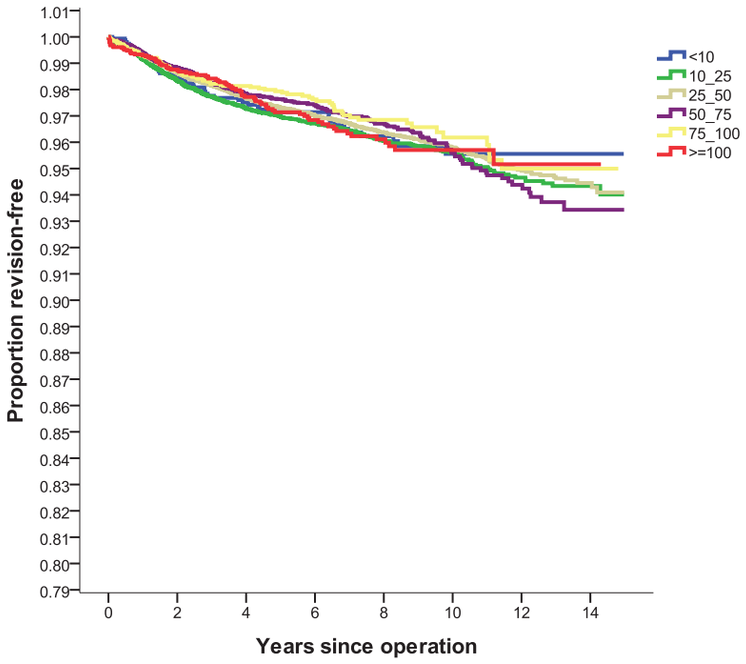
Survival for age bands



Survival for male vs female



Survival for for surgeon annual output



KNEE RE-REVISIONS

Analysis was undertaken of re-revisions. There were 269 registered primary knee revisions that had been revised twice, 43 that had been revised 3 times, 8 that had been revised 4 times, 2 that had been revised 5 times and 1 that had been revised 6 times.

Second revision

Time between the first and second revision for the 269 knee arthroplasties averaged 804 days, with a range of 2 – 4394 and a standard deviation of 859 days. This compares to an average of 1,194 days between primary and first revision arthroplasty.

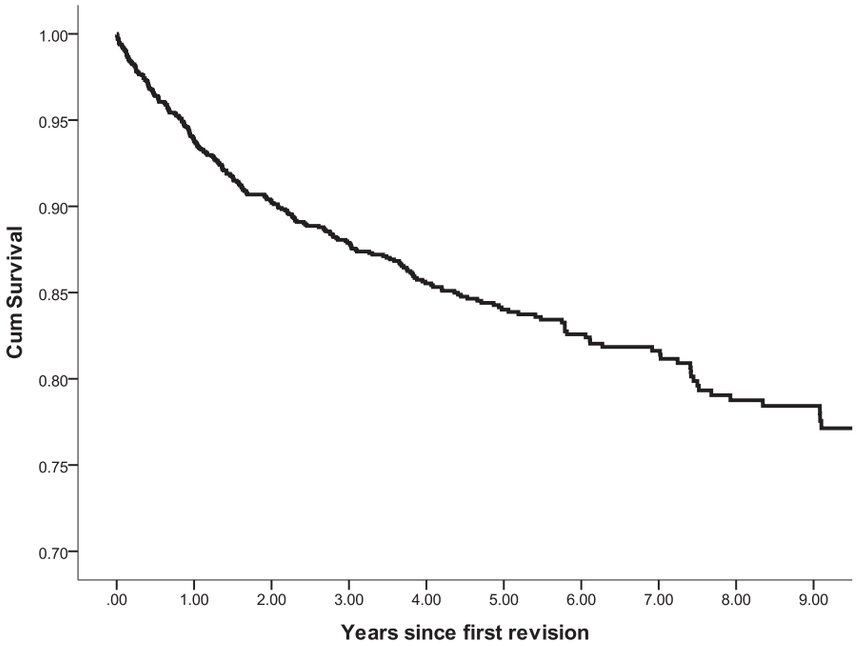
Reason for revision

Deep infection	120
Pain	64
Loosening tibial component	45
Loosening femoral component	37
Loosening patellar component	5
Fracture femur	1

Second Revisions

Number of primary revisions	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,951	7,785.2	269	3.46	3.05	3.89

Kaplan Meier survival curve for first revision knee arthroplasties



Years	Percentage re-revision free
1	93.80
2	90.30
3	87.90
4	85.50
5	84.00
6	82.60
7	81.60
8	78.80

Third revision

The average time between second and third revisions for the 43 knee arthroplasties was 648 days, with a range of 28 – 2,212 and a standard deviation of 557 days.

Fourth revision

The average time between third and fourth revisions for the 8 knee arthroplasties was 323 days, with a range of 23 – 1,454 and a standard deviation of 470 days.

Fifth revision

The average time between fourth and fifth revisions for the 2 knee arthroplasties was 353 days

Sixth revision

The time between fifth and sixth revision for the 1 knee arthroplasty was 162 days.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS AND TEN YEARS POST-SURGERY

Questionnaires at six months post surgery

At six months post-surgery a random selection of patients are sent the Oxford-12 questionnaire in order to achieve a response rate of 20% of the total which is deemed to be ample to provide powerful statistical analysis.

The new scoring system as recommended by the original authors has been adopted. (See appendix 1).

The scores now range from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

In addition we have grouped the questionnaire responses according to the classification system published by Kalairajah et al in 2005. (See appendix 1).

This groups each score into four categories:

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the fifteen-year period and as at July 2014, there were 21,997 primary knee questionnaire responses registered at six months post-surgery.

The mean knee score was 37.40 (standard deviation 8.09, range 48 – 1).

Scoring	> 41	8,292
Scoring	34 – 41	7,834
Scoring	27 – 33	3,425
Scoring	< 27	2,446

At six months post-surgery, 73% had an excellent or good score.

Questionnaires at five years post surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at five years post-surgery.

This dataset represents sequential Oxford knee scores for 7,815 individual patients.

At five years post-surgery, 83% of patients achieved an excellent or good score and had a mean of 40.13.

Questionnaires at ten years post surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at ten years post-surgery.

This dataset represents sequential Oxford knee scores for 3,688 individual patients.

At ten years post-surgery, 81% of patients achieved an excellent or good score and had a mean of 39.71.

Analysis of the individual questions at six months, five years and ten years post-surgery

Analysis of the individual questions showed that the most common persisting problem was difficulty with kneeling (Q4).

Percentage scoring 0 or 1(worst categories) for each question out of the group of (21,997) primary knee responses at six-months, (7,815) at five years and (3,688) at ten years.

		6 mths %	5 yrs %	10 yrs %
1	Moderate or severe pain from the operated knee	13	8	8
2	Only able to walk around the house or unable to walk before pain becomes severe	5	4	4
3	Extreme difficulty or impossible to get in and out of a car or public transport	4	4	5
4	Extreme difficulty or impossible to kneel down and get up afterwards	42	38	42
5	Extreme difficulty or impossible to do the household shopping on your own	4	4	5
6	Extreme difficulty or impossible to wash and dry yourself	1	1	2
7	Pain interfering greatly or totally with your work	5	4	4
8	Very painful or unbearable to stand up from a chair after a meal	4	2	2
9	Most of the time or always feeling that the knee might suddenly "give way"	2	2	2
10	Limping most or every day	11	7	7
11	Extreme difficulty or impossible to walk down a flight of stairs	7	6	8
12	Pain from your knee in bed most or every nights	10	5	4

As noted in previous years there is little significant change between the six month, five and ten year scores which means the six month score is indicative of the medium term outcome. Limp and pain at night tend to diminish over time.

Revision knee questionnaire responses

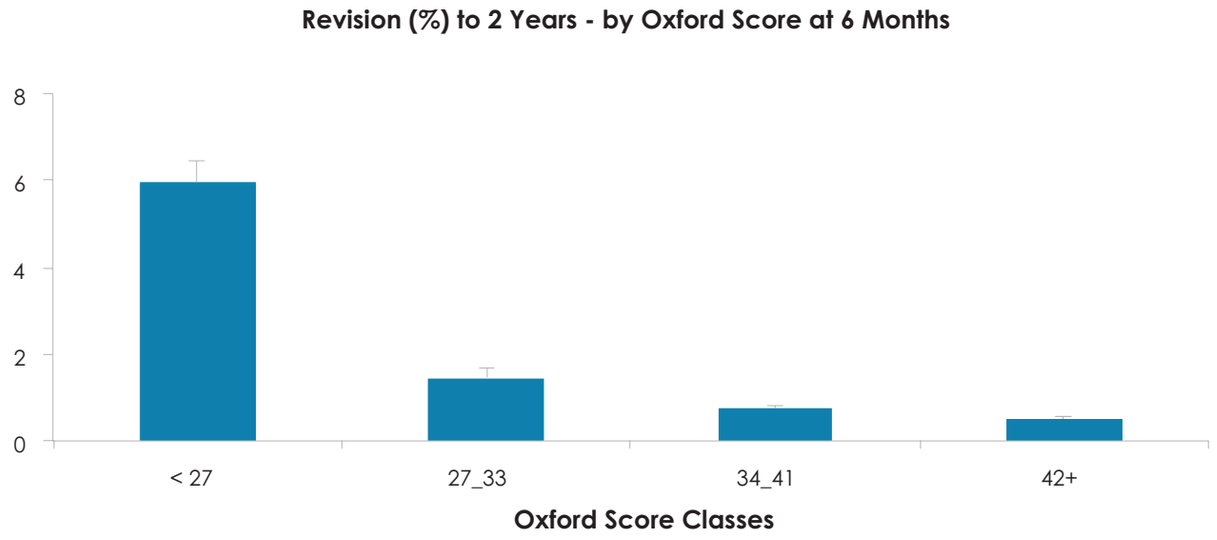
There were 2,876 revision hip responses with 53% achieving an excellent or good score. This group includes all revision knee procedures. The mean revision hip score was 33.04 (standard deviation 10.05, range 48 – 3)

OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at 6 months and 5 years post-surgery and arthroplasty revision within two years of the Oxford 12 questionnaire date.

Six month score and revision arthroplasty

By plotting the patients six month scores in the Kalairajah groupings, against the proportion of knees revised for that same group it demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 12 times the risk of a revision within two years compared to a person with a score >41.



Revision risk versus Kalairajah groupings of Oxford scores within two years of the 6 month score date

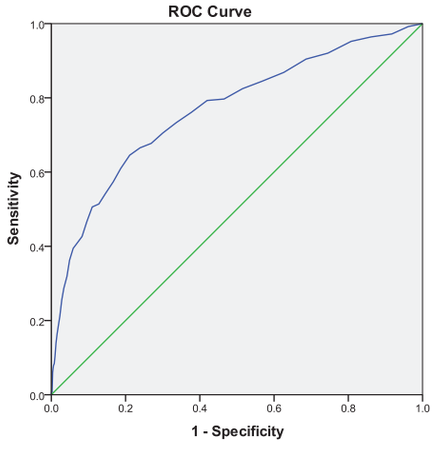
Kalairajah group	No in group	No. revised	%	Std error
< 27	2,135	127	5.95	0.51
27_33	2,937	43	1.46	0.22
34_41	6,552	48	0.73	0.11
42+	6,841	33	0.48	0.08

A person with an Oxford score >42 has a 0.48% risk of revision within two years compared to a 5.95% risk with a score of 27 or less.

A ROC analysis has demonstrated that a patient with a score less than or equal to 32.5 has 6 times the risk of needing a revision within two years compared to a person with a score greater than 32.5.

Alternatively the ROC analysis predicted 71% of the revisions within two years from just the lowest 30% of Oxford scores.

ROC curve at six months versus revision within two years



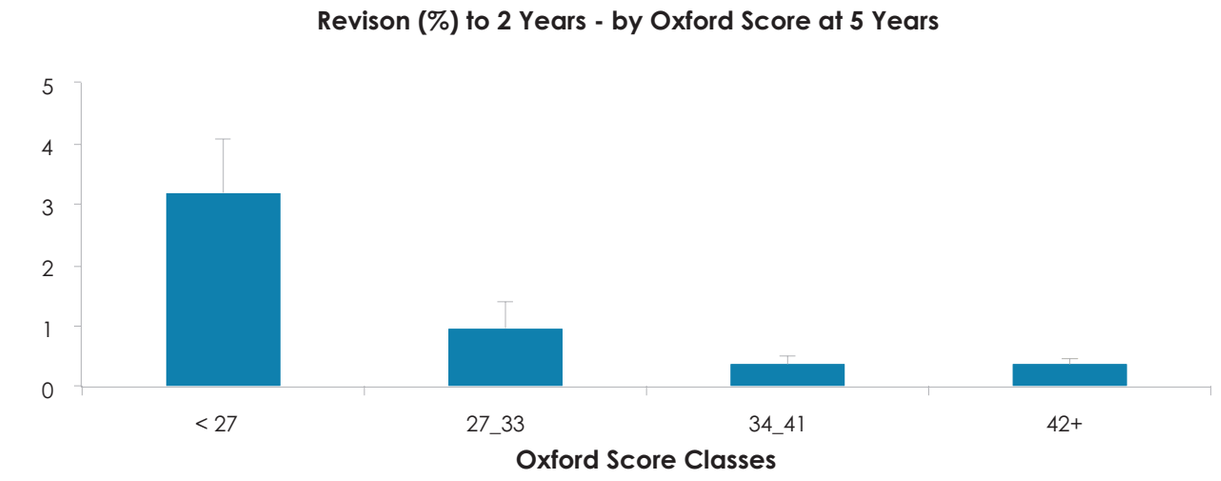
Diagonal segments are produced by ties.

A receiver operating characteristic (ROC) curve is a graphical representation of the trade-off between the false negative and false positive rates for every possible cut-off.

Equivalently, the ROC curve is the representation of the trade-offs between sensitivity and specificity. The more the curve climbs towards the upper left corner, the better the reliability of the test.

Five year score and revision arthroplasty

As with the six month scores, plotting the patients' five year scores in the Kalairajah groupings against the proportion of knees revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has nine times the risk of a revision within two years compared to a person with a score >33.



Revision risk versus Kalairajah groupings of Oxford scores within two years of the five year score date.

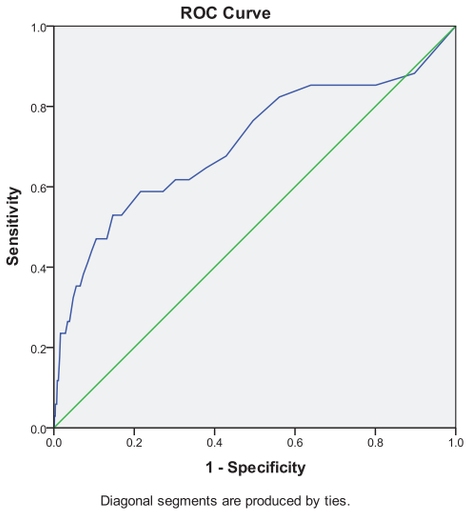
Kalairajah group	No in group	No. revised	%	Std error
< 27	407	13	3.19	0.87
27_33	516	5	0.97	0.43
34_41	1,400	5	0.36	0.16
42+	3,077	11	0.36	0.11

A person with an Oxford score >33 has a 0.36% risk of revision within two years compared to a 3.19% risk with a score of 27 or less.

The ROC analysis at five years has demonstrated that a patient with a score less than or equal to 35.5 has five times the risk of needing a revision within two years compared to a person with a score greater than 35.5.

Alternatively the ROC analysis predicted 62% of the revisions within two years from just the lowest 30% of Oxford scores.

ROC curve at five years versus revision within two years

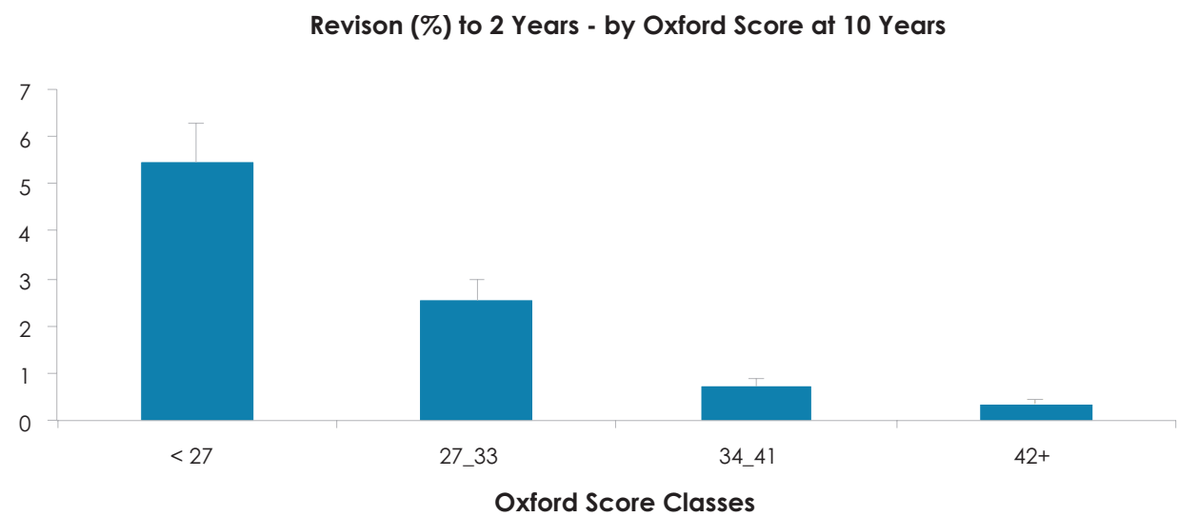


A receiver operating characteristic (ROC) curve is a graphical representation of the trade-off between the false negative and false positive rates for every possible cut-off.

Equivalently, the ROC curve is the representation of the trade-offs between sensitivity and specificity. The more the curve climbs towards the upper left corner, the better the reliability of the test.

Ten year score and revision arthroplasty

As with the six month and five year scores, plotting the patients' ten year scores in the Kalairajah groupings against the proportion of knees revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 15.5 times the risk of a revision within two years compared to a person with a score >41.

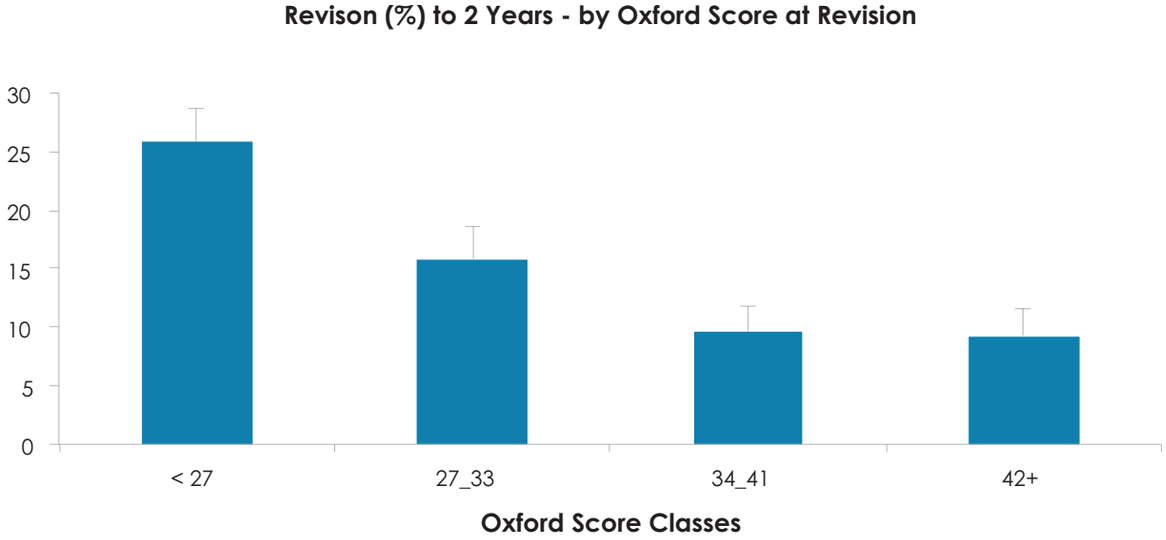


Kalairajah groups	No in group	No. revised	%	Std error
< 27	184	10	5.43	1.67
27_33	238	6	2.52	1.02
34_41	568	4	0.70	0.35
42+	1127	4	0.35	0.18

A person with an Oxford score >42 has a 0.48% risk of revision within two years compared to a 5.95% risk with a score of 27 or less.

Prediction of second revision from six month score following first revision

By plotting the patients six month scores following their first revision in the Kalairajah groupings, against the proportion of knees revised for that same group it again demonstrates that there is an incremental increase in risk during the next 2 years related to the Oxford score. A patient with a score below 27 has 3 times the risk of a revision within 2 years compared to a person with a score >41



Second revision risk versus Kalairajah groupings of Oxford scores within two years of the six month post- first revision score date.

Kalairajah groups	No in group	No. revised	%	Std error
< 27	255	66	25.88	2.74
27_33	177	28	15.82	2.74
34_41	207	20	9.66	2.05
42+	151	14	9.27	2.36

A person with a six month Oxford score >42 has a 9.27% risk of revision within two years compared to a 25.88% risk with a score < 27.

UNICOMPARTMENTAL KNEE ARTHROPLASTY

PRIMARY UNICOMPARTMENTAL KNEE ARTHROPLASTY

The **fourteen** year report analyses data for the period January 2000 – December 2013. There were 8,311 unicompartmental knee procedures registered, an additional 725 compared to 2012 and this represents a 0.7% increase over 2012.

2000	340
2001	430
2002	533
2003	634
2004	634
2005	558
2006	584
2007	576
2008	540
2009	628
2010	602
2011	609
2012	720
2013	725

Data Analysis

Age and sex distribution

The average age for a unicompartmental knee replacement was 66.31 years, with a range of 18.28 – 94.71 years.

	Female	Male
Number	3,766	4,347
Percentage	46.42	53.58
Mean age	66.13	66.47
Maximum age	94.71	93.42
Minimum age	18.28	35.24
Standard dev.	10.11	9.10

Body Mass Index

For the four year period 2010 - 2013, there were 1,858 BMI registrations for unicompartmental knee replacements. The average was 29.54 with a range of 17 – 52.8 and a standard deviation of 4.85.

Previous operation

None	6,476
Menisectomy	1,233
Ligament reconstruction	34
Internal fixation	27
Osteotomy	27
Synovectomy	4

Diagnosis

Osteoarthritis	7,932
Avascular necrosis	61
Post ligament disruption	38
Other inflammatory	21
Rheumatoid arthritis	14
Post fracture	13
Tumour	2

Approach

Medial	6,129
Minimally invasive surgery	1,994
Other	205
Lateral	170
Image guided surgery	48

Image guided surgery was added to the updated forms at the beginning of 2005, but unlike the total knee arthroplasty, has never become popular.The minimally invasive approach remains steady at 31%.

Cement

Femur cemented	6,294	78%
Antibiotic in cement	3,991	48%
Tibia cemented	6,474	80%
Antibiotic in cement	4,119	64%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	7,804	96%

Operating theatre

Conventional	5,765
Laminar flow	2,258
Space suits	1,996

ASA Class

This was introduced with the updated forms at the beginning of 2005.

For the nine year period 2005 – 2013, there were 5,229 (94%) unicompartmental knee procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient
ASA class 2: A patient with mild systemic disease
ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating
ASA class 4: A patient with an incapacitating disease that is a constant threat to life

ASA	Number	Percentage
1	1,015	19
2	3,372	65
3	830	15
4	12	1

Operative time (skin to skin)

Mean	77 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised.

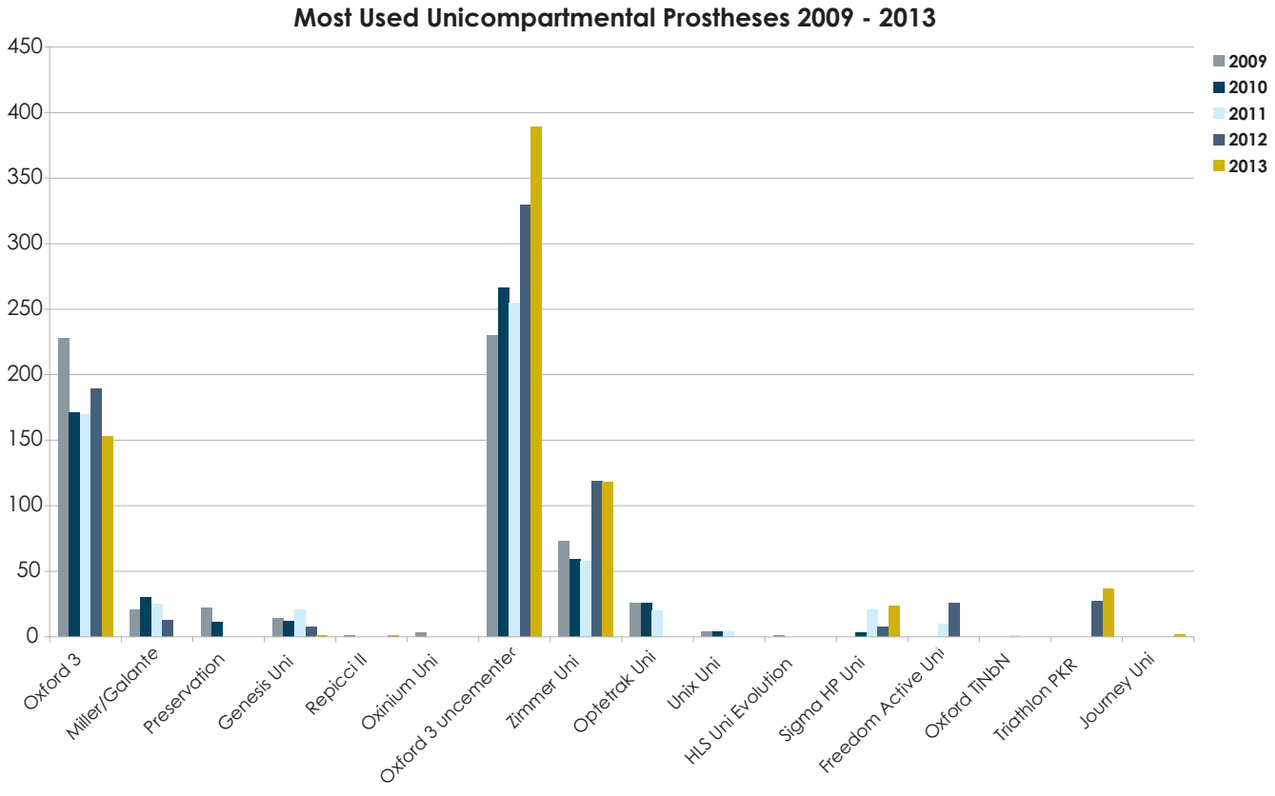
The following figures are for the nine- year period 2005 – 2013.

Consultant	5,251
Advanced trainee supervised	259
Advanced trainee unsupervised	13
Basic trainee	11

Prosthesis usage

Unicompartmental knee prostheses used in 2013

Oxford 3 uncemented	389
Oxford 3	153
Zimmer Uni	118
Triathlon PKR	37
Sigma HP Uni	24
Journey Uni	2
Repicci II	1
Genesis Uni	1



Surgeon and hospital workload

Surgeons

In 2013, 76 surgeons (5 fewer than 2012) performed 725 unicompartmental knee replacements, an average of nine procedures per surgeon. 33 surgeons (11 fewer than 2012) performed less than five procedures and ten performed more than 15 procedures.

Hospitals

In 2013, unicompartmental knee replacements were performed in 43 hospitals; 24 were public and 19 were private.

For 2013, the average number of unicompartmental knee replacements per hospital was 17.

REVISION OF REGISTERED PRIMARY UNICOMPARTMENTAL ARTHROPLASTIES

This section analyses the data for revision of unicompartmental knee replacement over the thirteen-year period.

Revision is defined by the Registry as a new operation in a previously partially replaced knee joint during which one or more of the components are exchanged, removed, manipulated or added. It includes arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as one revision.

There were 588 revisions of the 8,113 registered unicompartmental knee replacements (7%). A further 59 had a second revision, 8 a third revision and 1 a fourth revision.

494 of the 588 (84%) were revised to total knee replacements and 94 (16%) were revised to further unicompartmental replacements.

Time to revision

Mean	1,442 days
Maximum	4,954 days
Minimum	10 days
Standard deviation	1,193 days

Reason for revision

Pain	209
Loosening tibial component	113
Loosening femoral component	86
Deep infection	24
Fracture tibia	20
Fracture femur	2

There is sometimes more than one reason listed for revision and all are registered.

Analysis by time of the three main reasons for revision

	Loosening fem		Loosening tib		Pain	
Years	Count	Pain	Count	%	Count	%
0	0	0.00	9	8.00	10	4.80
1	12	14.00	17	15.00	26	12.40
2	17	19.80	32	28.30	57	27.30
3	7	8.10	9	8.00	29	13.90
4	15	17.40	8	7.10	13	6.20
5	5	5.80	9	8.00	22	10.50
6	6	7.00	4	3.50	11	5.30
7	3	3.50	10	8.80	10	4.80
8	7	8.10	6	5.30	11	5.30
9	5	5.80	2	1.80	6	2.90
10	3	3.50	5	4.40	8	3.80
11	3	3.50	2	1.80	3	1.40
12	1	1.20	0	0.00	1	0.50
13	2	2.30	0	0.00	2	1.00
Total	86	100.	113	100.	209	100

Statistical note

In the table below there are two statistical terms readers may not be familiar with:

Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in place.

Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percent and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow-up in calculating the revision rate. These rates are usually very low, hence are expressed per 100 component years rather than per component year. Statisticians consider that this is a more accurate way of deriving a revision rate

for comparison when analysing data with widely varying follow-up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CIs) but sometimes significance can apply in the presence of CI overlap.

All Primary Unicompartmental Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
8,113	46,383.3	588	1.27	1.17	1.37

Revision Rate of Individual Unicompartmental Knee Prostheses Sorted Alphabetically

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
EIUS Uni Knee	22	149.2	0	0.00	0.00	2.47
Freedom Active Uni	36	58.8	4	6.81	1.85	17.43
Genesis Uni	359	2,539.6	36	1.42	0.99	1.96
HLS Uni Evolution	1	0.5	1	193.25	4.89	1,076.74
Journey Uni	2	0.9	0	0.00	0.00	410.78
LCS Uni	6	53.7	2	3.73	0.45	13.46
Miller/Galante	710	5,625.7	53	0.94	0.71	1.23
Optetrak Unicondylar Cemented	101	414.4	5	1.21	0.39	2.82
Oxford 3	3,779	26,005.0	356	1.37	1.23	1.52
Oxford 3 uncemented	1,769	5,023.8	36	0.72	0.00	0.99
Oxford TiNbN coated	1	2.5	0	0.00	0.00	150.38
Oxinium Uni	33	182.8	10	5.47	2.62	10.06
Preservation	484	3,556.3	53	1.49	1.12	1.95
Repicci II	98	965.3	16	1.66	0.00	2.69
Sigma HP Uni	56	85.3	0	0.00	0.00	4.32
Triathlon PKR	111	194.9	3	1.54	0.32	4.50
Unix Uni	14	47.5	2	4.21	0.51	15.19
Zimmer Unicompartmental Knee	531	1,477.3	11	0.74	0.37	1.33

The Oxinium, the Freedom Active and the Oxford 3 unis all have significantly higher revision rates, but despite widely varying revision rates for the other prostheses there are no significant differences because of the relatively small numbers and wide CIs. No oxinium unis were recorded for 2013.

The uncemented Oxford Uni has a significantly lower revision rate than the overall mean of 1.27 /100ocys.

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	6,275	40,957.8	544	1.33	1.22	1.44
Uncemented	1,620	4,708.7	38	0.81	0.57	1.11
Hybrid	218	716.8	6	0.84	0.31	1.82

The uncemented unis have a significantly lower revision rate than cemented unis.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	981	5,670.2	93	1.64	1.32	2.01
55_64	2,792	16,119.3	267	1.66	1.46	1.87
65_74	2,736	15,962.6	161	1.01	0.86	1.18
GE75	1,604	8,631.3	67	0.78	0.60	0.99

There are statistically significant higher revision rates for the two lower age groups compared to the higher two.

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
F	3,766	21,972.3	292	1.33	1.18	1.49
M	4,347	24,411.1	296	1.21	1.08	1.36

There is no significant difference in revision rates between males and females.

Revision vs Surgeon Annual Workload

Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	3,829	23,518.3	350	1.49	1.34	1.65
>=10	4,282	22,858.7	237	1.04	0.91	1.18

Those surgeons performing <10 per year have a significantly higher revision rate.

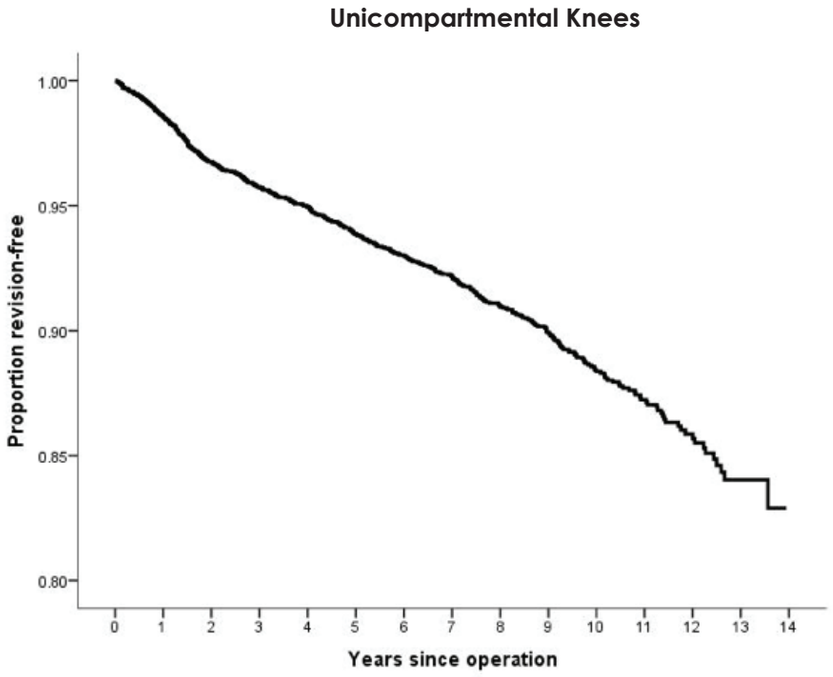
Revision vs Surgical Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Standard parapatellar	6,119	36,845.6	498	1.35	1.24	1.48
Minimally Invasive	1,994	9,537.8	90	0.94	0.76	1.16

The minimally invasive technique has a significantly lower revision rate.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 14 years from 2000 to 2013, with deceased patients censored at time of death.



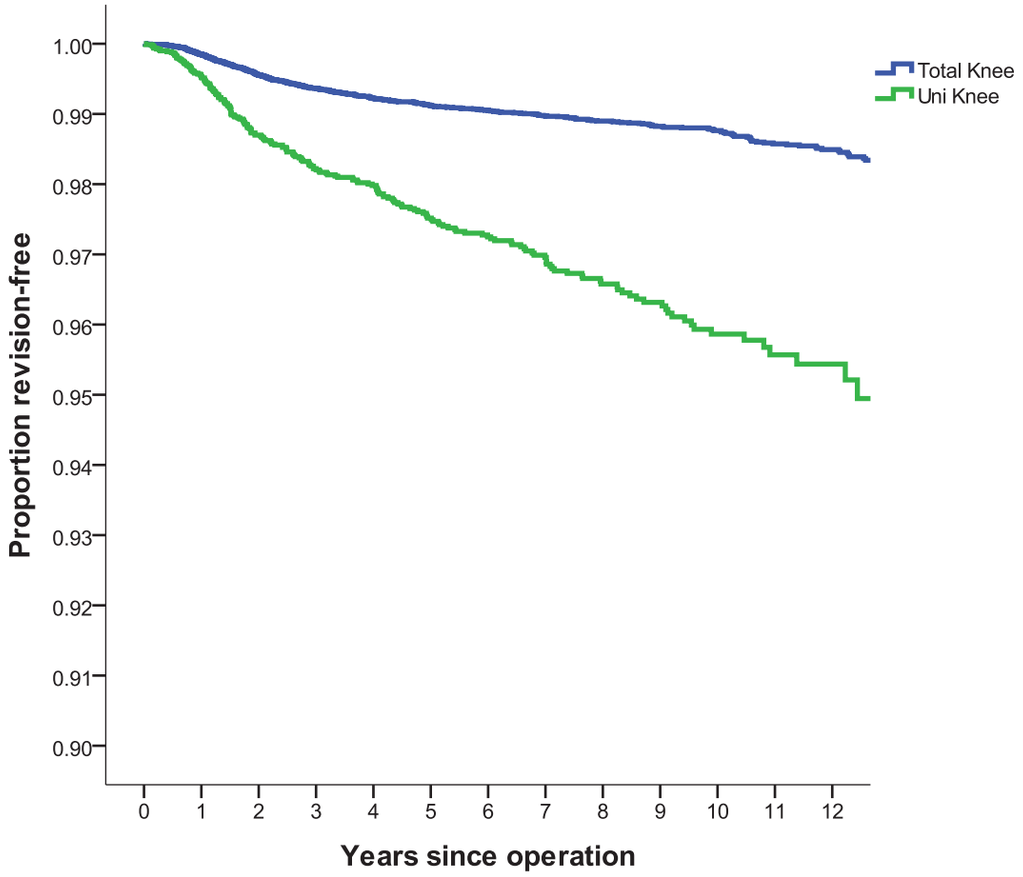
Years	% Revision-free	Number
1	98.50	7,240
2	96.80	6,392
3	95.70	5,662
4	95.00	4,944
5	93.90	4,239
6	93.00	3,646
7	92.20	3,043
8	90.90	2,454
9	89.90	1,926
10	88.40	1,357
11	87.20	890
12	85.90	527

Note: Numbers too few for accurate percentage survival beyond 12 years.

Re Revisions	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Revised to full	494	2,243.5	40	1.78	1.27	2.43
Revised to Uni	94	367.7	10	2.72	1.30	5.00

When compared to the primary total knee arthroplasty revision rate of 0.50 at the 95% confidence interval there is a significantly increased revision rate when a unicompartmental arthroplasty is converted to a total knee arthroplasty. This statistic is even more significant following conversion of a unicompartmental to a further unicompartmental arthroplasty. Further evidence is that the average six month Oxford score following conversion of a unicompartmental to total arthroplasty is similar to that for a revised primary total knee arthroplasty.

Survivorship of Uniknee revised to Total Knee for pain alone vs revised Total Knee (also revised for pain alone)



Total vs UniKnees	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total	71,211	394,014.2	591	0.15	0.14	0.16
UniKnees	8,113	46,383.3	209	0.45	0.39	0.52

There is a significantly better survivorship for total knees revised for pain alone than for uniknees revised to total knees for pain alone but overall for both groups the survival at 12 years is still very good and this may reflect that there is no indication for further revision even if pain persists.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS AND TEN YEARS POST-SURGERY

At six months post-surgery all patients are sent the Oxford-12 questionnaire.

The new scoring system as recommended by the original authors has been adopted (See appendix one).

There are 12 questions, with the scores now ranging from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

In addition we have grouped the questionnaire responses according to the classification system published by Kalairajah et al, 2005 (See appendix 1). This groups each score into four categories:

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the fourteen year period and as at July 2014, there were 5,537 unicompartmental knee questionnaire responses registered at six months post-surgery. The mean unicompartmental knee score was 39.47 (standard deviation 7.27, range 3 – 48).

Scoring	> 41	2734
Scoring	34 -41	1080
Scoring	27 -33	631
Scoring	< 27	364

At six months post-surgery, 82% had an excellent or good score.

Questionnaires at five years post surgery

Patients who had a registered six month questionnaire and who had not had revision surgery were sent a further questionnaire at five years post-surgery.

This dataset represents sequential Oxford knee scores for 2,034 individual patients.

At five years post-surgery, 88 % of patients had achieved an excellent or good score and had a mean of 41.38.

Questionnaires at ten years post-surgery

All patients who had a six-month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at ten years post-surgery.

This dataset represents sequential Oxford knee scores for 740 individual patients.

At ten years post-surgery, 83% of patients achieved an excellent or good score and had a mean of 40.52.

Analysis of the individual questions at six months, five years and ten years post-surgery

Analysis of the individual questions showed that the most common persisting problem was kneeling (Q4).

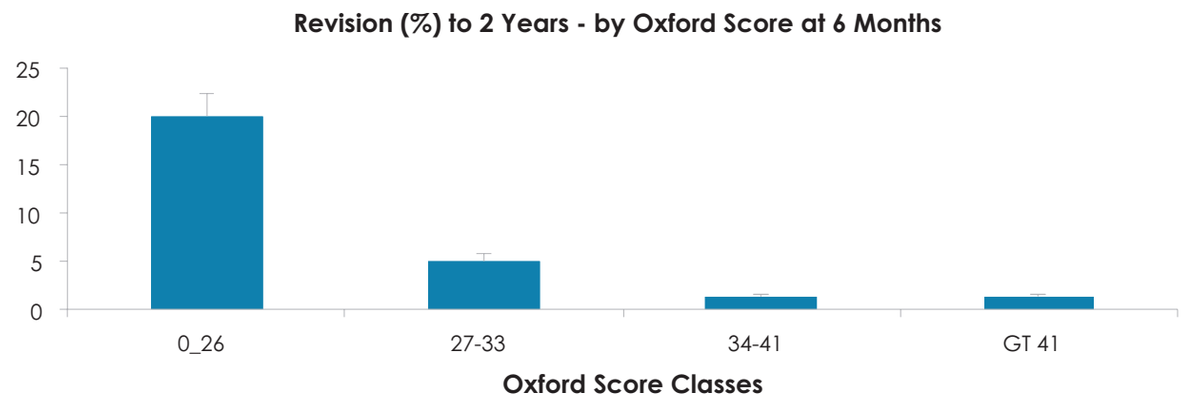
Percentage scoring 0 or 1 for each question out of the group of 5,537 at six months post-surgery and 2,034 at five years and 740 at ten years.

		6m%	5y%	10y%
1	Moderate or severe pain from the operated knee	10	8	9
2	Only able to walk around the house or unable to walk before pain becomes severe	3	2	3
3	Extreme difficulty or impossible to get in and out of a car or public transport	2	1	2
4	Extreme difficulty or impossible to kneel down and get up afterwards	30	27	29
5	Extreme difficulty or impossible to do the household shopping on your own	1	2	3
6	Extreme difficulty or impossible to wash and dry yourself	0.4	0.4	0.4
7	Pain interfering greatly or totally with your work	3	3	
8	Very painful or unbearable to stand up from a chair after a meal	3	2	2
9	Most of the time or always feeling that the knee might suddenly "give way"	1	1	3
10	Limping most or every day	7	5	5
11	Extreme difficulty or impossible to walk down a flight of stairs	3	3	4
12	Pain from your knee in bed most or every nights	7	4	5

OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at six months and arthroplasty revision within two years of the Oxford 12 questionnaire date.

Plotting the patients' six month scores in the Kalairajah groupings against the proportion of knees revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 15 times the risk of a revision within two years compared to a person with a score of 34-41



Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date

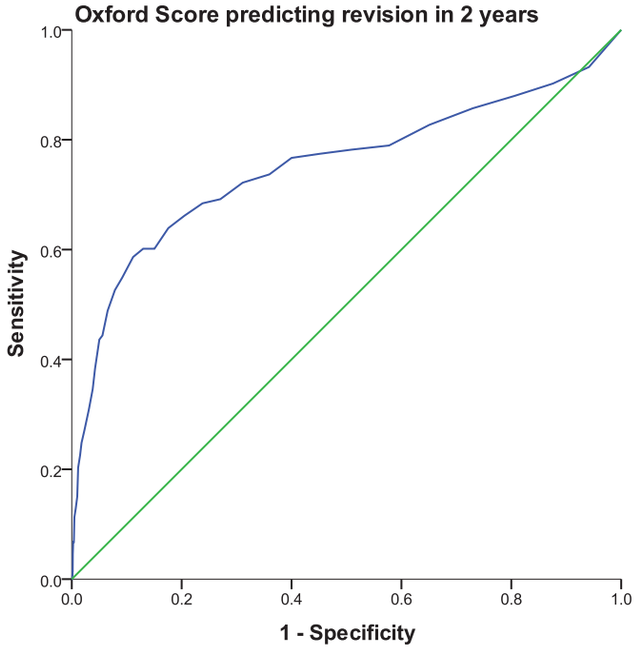
Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	295	59	20.00	2.33
27-33	533	26	4.88	0.93
34-41	1,430	19	1.33	0.30
GT 41	2,102	29	1.38	0.25

A person with an Oxford score >41 has a 1.38% risk of revision within two years compared to a 20.00% risk with a score of < 27.

A ROC analysis has demonstrated that a patient with a score less than 32 has nine times the risk of needing a revision within two years compared to a person with a score greater than or equal to 32.

Alternatively, the ROC analysis predicted 70% of the revisions within two years from just the lowest 30% of Oxford scores.

A receiver operating characteristic (ROC) curve is a graphical representation of the trade-off between the false negative and false positive rates for every possible cut-off. Equivalently, the ROC curve is the representation of the trade-offs between sensitivity and specificity. The more the curve climbs towards the upper left corner, the better the reliability of the test.



Diagonal segments are produced by ties.

ANKLE ARTHROPLASTY

PRIMARY ANKLE ARTHROPLASTY

The **fourteen-** year report analyses data for the period January 2000 – December 2013. There were 1,058 primary ankle procedures registered, an additional 113 compared to last year's report and this represents a 5% increase over 2012.

2000	17
2001	28
2002	28
2003	26
2004	48
2005	70
2006	81
2007	79
2008	107
2009	119
2010	125
2011	109
2012	108
2013	113

Data Analysis

Age and sex distribution

The average age for an ankle replacement was 65.56 years, with a range of 32.32 – 90.26 years.

	Female	Male
Number	401	657
Percentage	37.90	62.10
Mean age	63.49	66.82
Maximum age	86.86	90.26
Minimum age	32.32	34.15
Standard dev.	9.53	8.55

Body Mass Index

For the four-year period 2010 - 2013, there were 210 BMI registrations for primary ankle replacements. The average was 28.21 with a range of 17 – 43 and a standard deviation of 4.18.

Previous operation

None	834
Internal fixation for juxtarticular fracture	108
Arthrodesis	31
Osteotomy	20

Diagnosis

Osteoarthritis	781
Post trauma	183
Rheumatoid arthritis	99
Other inflammatory	17
Avascular necrosis	2

Approach

Anterior	924
Anterolateral	34
Other	10

Bone graft

Tibia autograft	37
Tibia allograft	3
Tibia synthetic	1
Talus autograft	6
Talus allograft	3

Cement

Tibia cemented	15
Antibiotic in cement	7
Talus cemented	7
Antibiotic in cement	4

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	1,018 (96%)

Operating theatre

Conventional	548
Laminar flow	498
Space suits	199

ASA Class

This was introduced with the updated forms at the beginning of 2005.

For the nine-year period 2005 -2013, there were 804 (88%) primary ankle procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient
ASA class 2: A patient with mild systemic disease
ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating
ASA class 4: A patient with an incapacitating disease that is a constant threat to life

ASA	Number
1	158
2	499
3	144
4	3

Operative time (skin to skin)

Mean	122 minutes

Surgeon grade

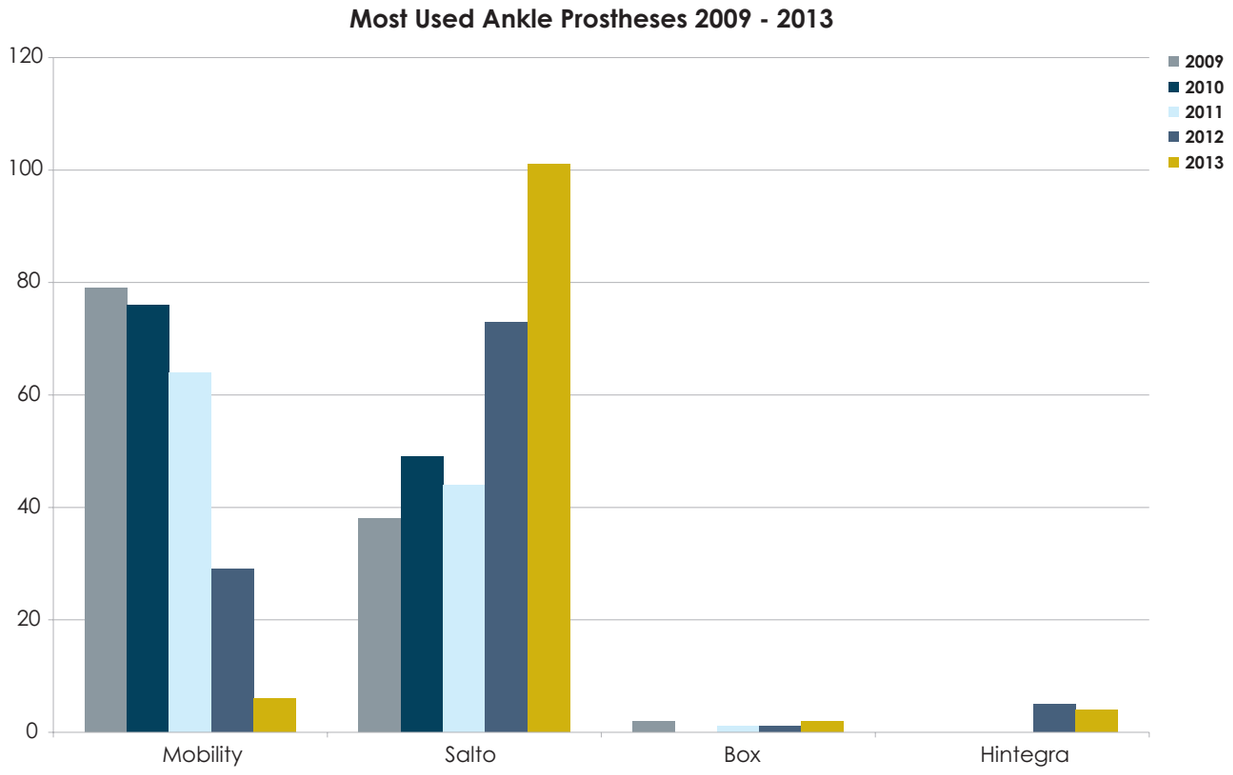
The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the nine-year period 2005 -2013.

Consultant	907
Advanced trainee supervised	5

Prosthesis usage

Ankle prostheses used in 2013

Salto	101
Mobility	6
Hintegra	4
Box	2



Surgeon and hospital workload

Surgeons

In 2013, 19 surgeons performed 113 primary ankle procedures, an average of six procedures per surgeon. Two surgeons performed more than 15 procedures and two performed one procedure.

Hospitals

In 2013, primary ankle replacement was performed in 28 hospitals. 13 were public and 15 were private.

	Female	Male
Number	37	64
Percentage	36.63	63.37
Mean	63.63	65.46
Maximum age	81.68	83.06
Minimum age	42.13	40.15
Standard dev.	10.74	7.78

REVISION ANKLE ARTHROPLASTY

Revision is defined by the Registry as a new operation in a previously replaced ankle joint, during which one or more of the components are exchanged, removed, manipulated or added. It includes arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as one revision.

Data Analysis

For the fourteen-year period January 2000– December 2013, there were 101 revision ankle procedures registered.

The average age for an ankle revision was 64.79 years, with a range of 40.15 – 83.06.

REVISION OF REGISTERED PRIMARY ANKLE ARTHROPLASTIES

This section analyses data for revisions of primary ankle procedures for the fourteen- year period.

There were 69 revisions of the primary group of 1,058 (6.5%).

Time to revision

Mean	1,306 days
Maximum	4,683 days
Minimum	21 days
Standard deviation	999 days

Reason for revision

Pain	37
Loosening talar component	22
Loosening tibial component	16
Deep infection	5

Analysis by time of the 3 main reasons for revision

	Loosening talar component		Pain		Loosening tibial	
Years	Count	%	Count	%	Count	%
0	2	9.1	1	2.7	0	0.0
1	1	4.5	2	5.4	1	6.3
2	2	9.1	11	29.7	5	31.3
3	4	18.2	5	13.5	2	12.5
4	3	13.6	4	10.8	2	12.5
5	5	22.7	6	16.2	2	12.5
6	3	13.6	3	8.1	0	0.0
7	1	4.5	2	5.4	1	6.3
8	0	0.0	1	2.7	1	6.3
9	0	0.0	1	2.7	1	6.3
10	1	4.5	1	2.7	0	0.0
11	0	0.0	0	0.0	0	0.0
12	0	0.0	0	0.0	0	0.0
13	0	0.0	0	0.0	1	6.3
Total	**22**	**100.00%**	**37**	**100.00%**	**16**	**100.00%**

Statistical note

In the table below there are two statistical terms readers may not be familiar with:

Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in place..

Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percent and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow up in calculating the revision rate. These rates are usually very low, hence it is expressed per 100 component years rather than per component year. Statisticians consider that this is a more accurate way of deriving a revision rate for comparison when analysing data with widely varying follow-up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CIs) but sometimes significance can apply in the presence of CI overlap.

All Primary Ankle Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
1,058	4,858.1	69	1.42	1.11	1.80

Revision vs Prosthesis Type Sorted in Alphabetical Order

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Agility	119	1,094.2	18	1.65	0.97	2.60
Box	6	14.2	0	0.00	0.00	25.94
Hintegra	9	10.2	0	0.00	0.00	36.08
Mobility	449	1,981.0	34	1.72	1.19	2.40
Ramses	11	86.7	2	2.31	0.28	8.34
Salto	417	1,287.5	8	0.62	0.27	1.22
STAR	47	384.3	7	1.82	0.73	3.75

The Salto continues to greatly outperform all the other prostheses with respect to revision rate.

Revision vs Gender

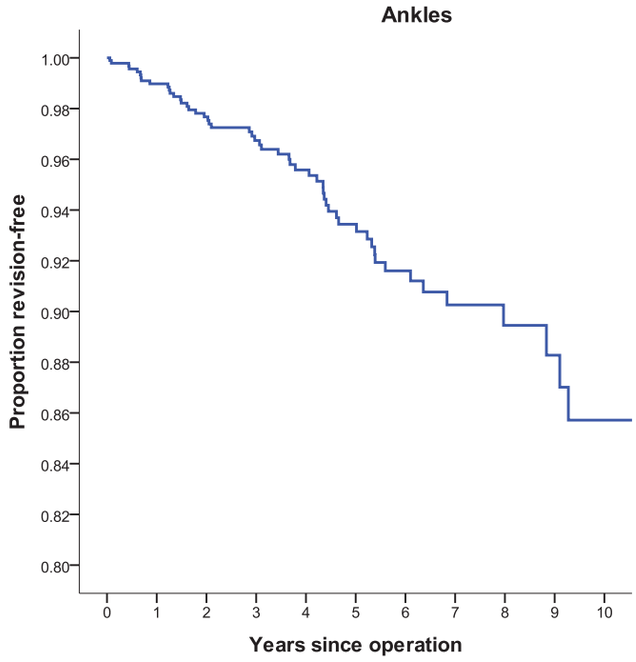
Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	401	1,888.1	27	1.43	0.94	2.08
Males	657	2,970.0	42	1.41	1.02	1.91

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	120	585.7	15	2.56	1.43	4.22
55_64	368	1,809.2	26	1.44	0.94	2.11
65_74	410	1,833.4	25	1.36	0.88	2.01
GE75	160	629.8	3	0.48	0.10	1.39

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 14 years from 2000 to 2013, with deceased patients censored at time of death.



Years	% Revision-free	No in each year N
1	99.00%	944
2	97.30%	799
3	96.10%	678
4	95.00%	574
5	93.10%	453
6	91.40%	313
7	90.10%	242
8	89.20%	165

There are insufficient numbers to give an accurate revision- free percentage beyond eight years.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS AND FIVE YEARS POST-SURGERY

At six months post-surgery patients are sent an outcome questionnaire. This is modelled on the Oxford 12 for the hip and is not validated.

The same scoring system has been adopted as recommended by the authors of the Oxford 12 hip questionnaire.

The scores now range from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

We have grouped the questionnaire responses based on the scoring system published by Kalairajah et al, 2005 (see appendix1). This groups each score into four categories:

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the fourteen year period and as at July 2014, there were 798 primary ankle questionnaire responses registered at six months post-surgery. The mean primary ankle score was 33.51 (standard deviation 9.56, range 2 – 48).

Scoring	> 41	191
Scoring	34 -41	266
Scoring	27 -33	149
Scoring	< 27	192

At six months post-surgery, 57% had an excellent or good score.

Questionnaires at five years post surgery

All patients who had a six-month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at five years post-surgery. There were 220 primary ankle questionnaire responses registered at five years post-surgery.

At five years post-surgery, 68% achieved an excellent or good score.

Analysis of the individual questions

Analysis of the individual questions showed that the main persisting concerns were pain, having to use an orthotic insert Q4), limping (Q6), and swelling of the foot (Q10)..

Percentage scoring 0 or 1 for each question (721) at six months.

		%
1	Moderate or severe pain from the operated ankle	22
2	Only able to walk around the house or unable to walk before the pain becomes severe	6
3	Extreme difficulty or impossible to walk on uneven ground	14
4	Most of the time or always have to use an orthotic	21
5	Pain greatly or totally interferes with usual work	15
6	Limping most or every day	33
7	Extreme difficulty or impossible to climb a flight of stairs	6
8	Pain from your ankle in bed most or every night(s)	7
9	Pain from your ankle greatly or totally interferes with usual recreational activities	22
10	Have swelling of your foot most or all of the time	31
11	Very painful or unbearable to stand up from a chair after a meal	6
12	Sudden severe pain from your ankle most or every day	5

Revision ankle questionnaire responses

There were 45 revision ankle responses with 33% achieving an excellent or good score. This group includes all revision ankle responses. The mean revision ankle score was 28.82 (standard deviation 10.62, range 8 – 48).

SHOULDER ARTHROPLASTY

PRIMARY SHOULDER ARTHROPLASTY

The **fourteen-**year report analyses data for the period January 2000 – December 2013. There were 5,528 primary shoulder procedures registered, an additional 745 compared to last year's report and this represents a 6.7% increase over 2012.

2000	122
2001	162
2002	193
2003	225
2004	280
2005	293
2006	366
2007	400
2008	457
2009	514
2010	494
2011	579
2012	698
2013	745

Of the 5,528 shoulder registrations, 1,532 are hemi shoulder replacements, 2,143 are conventional total shoulder replacements, 1,553 are reverse shoulder replacements, 196 are partial resurfacing shoulder replacements, 103 are total resurfacing replacements and one is a humeral sphere. This is a new category for 2013.

Data Analysis

Age and sex distribution

The average age for all patients with a shoulder arthroplasty was 70.79 years, with a range of 15.63 – 99.36 years.

All shoulder arthroplasty

	Female	Male
Number	3,510	2,018
Percentage	63.49	36.51
Mean age	72.39	67.99
Maximum age	97.71	99.36
Minimum age	15.63	21.83
Standard dev.	9.79	10.43

Hemiarthroplasty

	Female	Male
Number	1,019	513
Percentage	66.51	33.49
Mean age	71.74	66.13
Maximum age	97.71	99.36
Minimum age	15.63	25.83
Standard dev.	11.02	12.15

Conventional total shoulder arthroplasty

	Female	Male
Number	1,369	774
Percentage	63.88	36.12
Mean age	70.91	67.35
Maximum age	94.62	89.11
Minimum age	26.64	29.38
Standard dev.	8.90	8.47

Reverse shoulder arthroplasty

	Female	Male
Number	990	563
Percentage	63.75	36.25
Mean age	76.22	73.46
Maximum age	96.82	92.65
Minimum age	40.70	49.41
Standard dev.	7.41	7.47

Partial resurfacing arthroplasty

	Female	Male
Number	70	126
Percentage	35.71	64.29
Mean age	58.60	55.73
Maximum age	87.06	86.12
Minimum age	20.70	21.83
Standard dev.	14.61	11.35

Total resurfacing arthroplasty

	Female	Male
Number	61	42
Percentage	59.22	40.78
Mean age	70.77	65.75
Maximum age	86.79	80.55
Minimum age	53.18	45.16
Standard dev.	7.62	8.26

Humeral sphere

One female patient aged 50.11 years.

Previous operation

None	4,673
Internal fixation for juxtarticular fracture	140
Previous stabilisation	106
Osteotomy	4

Diagnosis

Osteoarthritis	2,986
Cuff tear arthropathy	1,001
Acute fracture prox. humerus	578
Rheumatoid arthritis	462
Post old trauma	341
Avascular necrosis	171
Post recurrent dislocation	75
Other inflammatory	56

Approach

Deltopectoral	4,874
Deltoid split	129
Other	16

Bone graft

Humeral autograft	95
Humeral allograft	18
Humeral synthetic	3
Glenoid autograft	62
Glenoid allograft	9

Cement

Humerus cemented	1,412
Antibiotic in cement	863
Glenoid cemented	1,450
Antibiotic in cement	1,010

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	5,184 (94%)

Operating theatre

Conventional	3,370
Laminar flow	2,081
Space suits	955

ASA Class

This was introduced with the updated forms at the beginning of 2005.

For the nine-year period 2005 – 2013 there were 4,298 (95%) shoulder procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient
ASA class 2: A patient with mild systemic disease
ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating
ASA class 4: A patient with an incapacitating disease that is a constant threat to life

ASA	Number	Percentage
1	387	9
2	2,380	55
3	1,479	35
4	52	1

Operative time (skin to skin in minutes)

	Mean
Hemi	109
Total Sh.	128
Partial R.	95
Total R.	126
Reverse	119

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised.

The following figures are for the nine-year period 2005 – 2013.

Consultant	4,334
Advanced trainee supervised	219
Advanced trainee unsupervised	13
Basic trainee	1

Top 10 shoulder prostheses 2013

SMR	317
Delta Xtend Reverse	144
Global AP	77
Aequalis	44
Global	40
Aequalis reversed	34
Bigliani/Flatow	26
Global CAP resurfacing	18
Epoca	12

Surgeon and hospital workload

Surgeons

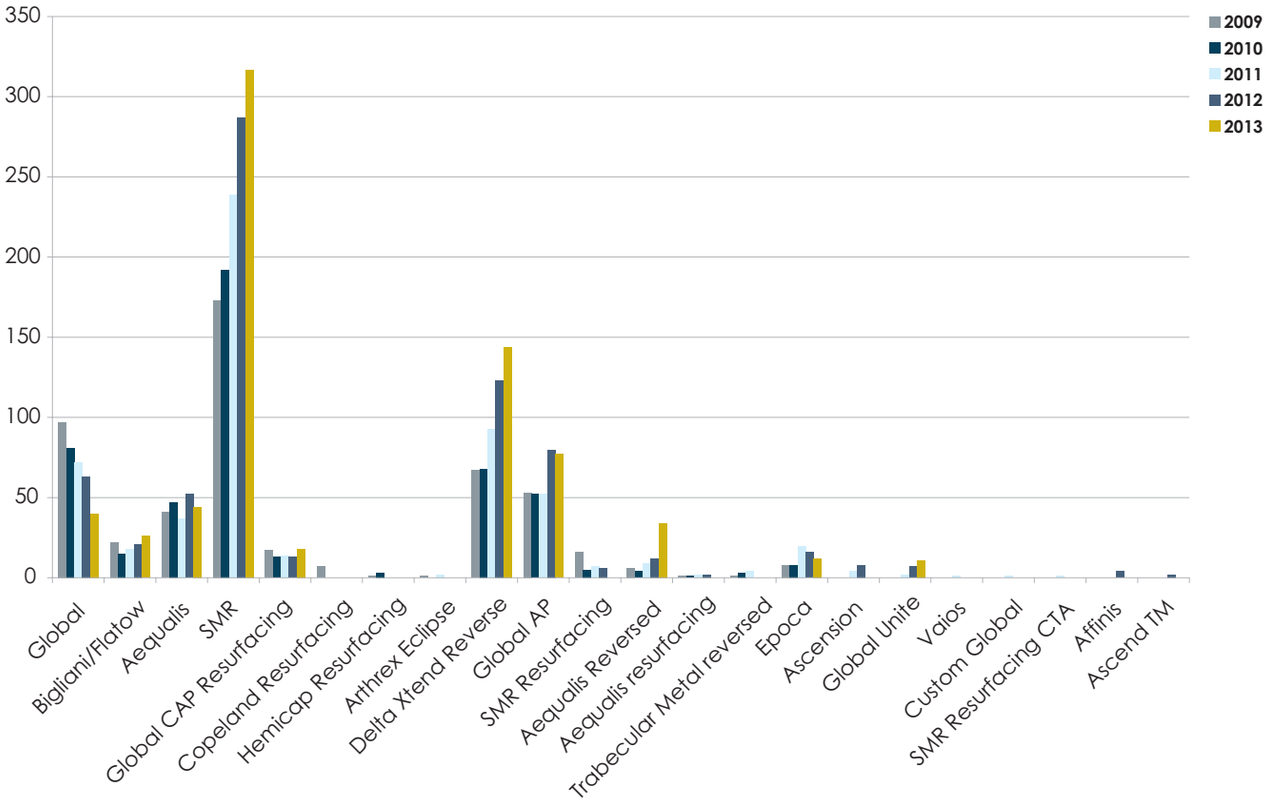
In 2013, 80 surgeons performed 745 shoulder procedures, an average of 9 procedures per surgeon. 10 surgeons performed more than 20 procedures and 19 surgeons performed 1 procedure.

Hospitals

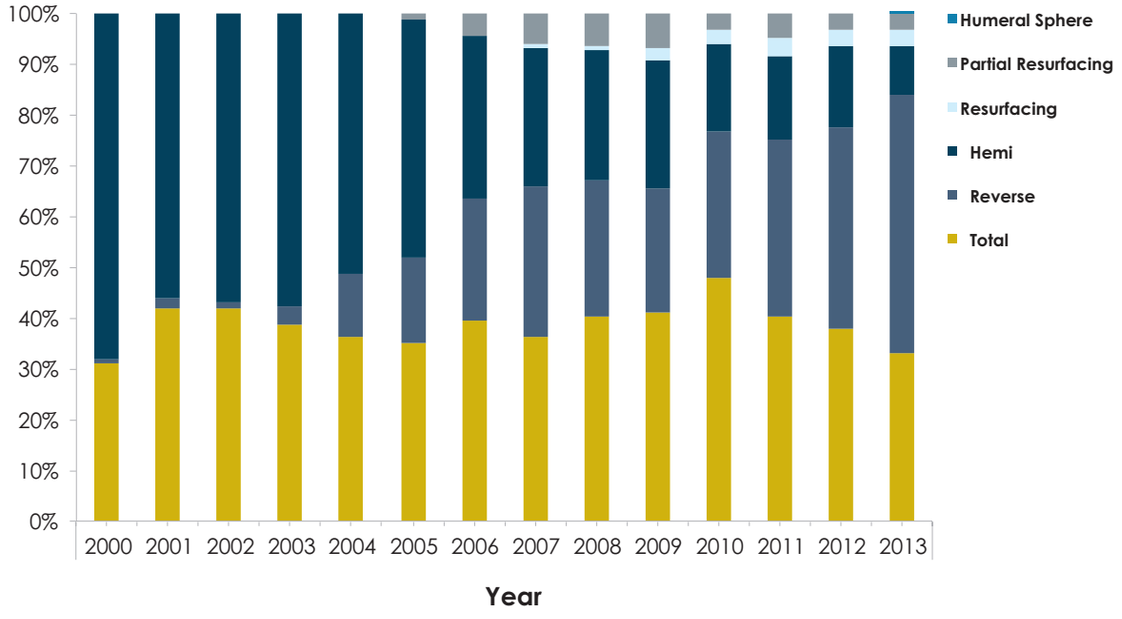
In 2013, shoulder replacement was performed in 50 hospitals. 27 were public and 23 were private.

For 2013 the average number of shoulder replacements per hospital was 15.

Most Used Shoulder Prostheses 2009 - 2013



Percentages of the Different Types of Shoulder Prostheses Used by Year



REVISION SHOULDER ARTHROPLASTY

Revision is defined by the Registry as a new operation in a previously replaced shoulder joint during which one or more of the components are exchanged, removed, manipulated or added. It includes excision, arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as one revision.

Data Analysis

For the fourteen- year period January 2000 – December 2013, there were 436 revision shoulder procedures registered.

The average age for a shoulder revision was 68.37 years with a range of 24.05 – 89.95 years.

	Female	Male
Number	246	190
Percentage	56.42	43.58
Mean	69.85	66.46
Maximum age	89.95	88.46
Minimum age	33.20	24.05
Standard dev.	11.15	10.64

REVISION OF REGISTERED PRIMARY SHOULDER ARTHROPLASTIES

This section analyses data for revisions of primary shoulder procedures for the fourteen-year period.

There were 254 revisions of the primary group of 5,528(4.6%). There were 29 procedures that had been revised twice and 3 that had been revised 3 times.

Time to revision

Mean	873 days
Maximum	3,850 days
Minimum	0 days
Standard deviation	874 day

Reason for revision

Pain	61
Dislocation/instability anterior	48
Sub acromial cuff impingement	43
Loosening glenoid	35
Deep infection	20
Loosening humeral	10
Instability posterior	7
Sub acromial tuberosity impingement.	4
Fracture humerus	3
Loosening both	2

Analysis by time for the 5 main reasons for revision

	Loosening glenoid		Dislocation		Deep infection		Pain		Sub acromial Cuff		Loosening Humeral	
Years	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	5	14.3	26	54.2	4	20	2	3.3	2	4.7	1	10
1	4	11.4	4	8.3	2	10	11	18.0	4	9.3	1	10
2	9	25.7	8	16.7	8	40	18	29.5	13	30.2	1	10
3	4	11.4	3	6.3	3	15	10	16.4	9	20.9	1	10
4	2	5.7	2	4.2	2	10	6	9.8	3	7.0	2	20
5	1	2.9	2	4.2	1	5	5	8.2	2	4.7	1	10
6	1	2.9	2	4.2	0	0	1	1.6	3	7.0	3	30
7	3	8.6	0	0.0	0	0	4	6.6	2	4.7	0	0
8	0	0.0	0	0.0	0	0	0	0.0	2	4.7	0	0
9	1	2.9	1	2.1	0	0	2	3.3	0	0.0	0	0
10	4	11.4	0	0.0	0	0	2	3.3	2	4.7	0	0
11	1	2.9	0	0.0	0	0	0	0	1	2.3	0	0
Total	**35**		**48**		**20**		**61**		**43**		**10**	

1 = loosening glenoid, 2 = dislocation, 3 = deep infection, 4 = pain, 5 sub acromial cuff impingement, 6 = loosening humeral

Statistical note

In the table below there are two statistical terms readers may not be familiar with:

Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in place..

Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percent and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow up in calculating the revision rate. These rates are usually very low, hence are expressed per 100 component years rather than per component year. Statisticians consider

that this is a more accurate way of deriving a revision rate for comparison when analysing data with widely varying follow up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CIs) but sometimes significance can apply in the presence of CI overlap.

All Total Shoulder Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
5,528	24,335.3	254	1.04	0.92	1.18

Revision rate of Shoulder Prostheses vs Arthroplasty Type

Operation Type	No. Ops.	Observed	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total	2,143	9,871.6	89	0.90	0.72	1.11
Reverse	1,553	4,524.5	50	1.11	0.82	1.46
Hemi	1,532	8,961.5	99	1.10	0.90	1.34
Resurfacing	103	232.4	0	0.00	0.00	1.59
Partial resurfacing	196	745.2	16	2.15	1.23	3.49
Humeral Sphere	1	0.1	0	0.00	0.00	5182.17

There is a significantly higher revision rate for Partial Resurfacing compared to the overall mean and Conventional Total Arthroplasty.

Revision Rate of Individual Shoulder Prostheses Sorted on Alphabetical Order

Prothesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95%	Exact 95% confidence interval	
Conventional Total	Aequalis	280	1,265	11	0.87	0.43	1.6
	Affinis	2	7	0	0.00	0.00	56.7
	Anatomical	35	349	0	0.00	0.00	1.1
	Arthrex Eclipse	1	3	0	0.00	0.00	146.3
	Ascend TM	2	2	0	0.00	0.00	224.6
	Bi-Angular	8	68	0	0.00	0.00	5.5
	Bigliani/Flatow	252	1,651	6	0.36	0.13	0.8
	Cofield 2	21	200	0	0.00	0.00	1.8
	Delta Xtend Reverse	1	2	0	0.00	0.00	195.0
	Epoca Humeral stem	4	14	0	0.00	0.00	27.1
	Global	497	2,686	11	0.41	0.20	0.7
	Global AP	272	646	1	0.15	0.00	0.9
	Humeral stem	1	1	0	0.00	0.00	274.4
	Neer 3	2	23	0	0.00	0.00	15.8
	Neer II	12	131	0	0.00	0.00	2.8
	Osteonics humeral component	49	404	5	1.24	0.40	2.9
	Simpliciti TM	5	3	0	0.00	0.00	146.6
	SMR	694	2,388	55	2.30	1.74	3.0
	Univers 3D	5	30	0	0.00	0.00	12.1

Prothesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95%	Exact 95% confidence interval	
Reverse	Aequalis	3	0	0	0.00	0.00	1,604.0
	Aequalis Reversed	61	138	1	0.72	0.02	4.0
	Aequalis Reversed Fracture	11	9	0	0.00	0.00	39.5
	Affinis	3	4	0	0.00	0.00	103.5
	Comprehensive	1	0	0	0.00	0.00	1,513.9
	Delta	55	394	2	0.51	0.06	1.8
	Delta Xtend Reverse	577	1,376	20	1.45	0.89	2.2
	SMR	831	2,571	27	1.05	0.69	1.5
	Trabecular Metal Reverse	10	28	0	0.00	0.00	13.0
	Vaios	1	3	0	0.00	0.00	136.6
Hemi	Aequalis	131	724	9	1.24	0.57	2.4
	Aequalis Reversed	1	2	0	0.00	0.00	160.6
	Affinis	2	0	0	0.00	0.00	1,020.7
	Anatomical	19	195	0	0.00	0.00	1.9
	Arthrex Eclipse	2	10	0	0.00	0.00	36.2
	Ascend TM	1	2	0	0.00	0.00	234.7
	Bi-Angular	19	186	2	1.08	0.13	3.9
	Bigliani/Flatow	137	986	12	1.22	0.63	2.1
	Bio-modular	1	7	1	14.00	0.35	78.0
	Cofield 2	50	474	0	0.00	0.00	0.8
	Delta	1	7	0	0.00	0.00	50.7
	Delta Xtend Reverse	17	39	3	7.76	1.60	22.7
	Global	719	4,456	42	0.94	0.68	1.3
	Global AP	61	141	1	0.71	0.02	3.9
	Global Unite	20	18	1	5.71	0.14	31.8
	MRS Humeral	4	14	0	0.00	0.00	26.5
	Neer II	24	198	0	0.00	0.00	1.9
	Osteonics humeral component	43	348	2	0.57	0.07	2.1
	Randelli	1	8	0	0.00	0.00	44.8
	SMR	277	1,138	26	2.28	1.49	3.3
	Trabecular Metal Reverse	1	4	0	0.00	0.00	87.2
	Univers 3D	1	4	0	0.00	0.00	96.6
Total Resurfacing	Aequalis Resurfacing Head	10	27	0	0.00	0.00	13.8
	Epoca Head	48	96	0	0.00	0.00	3.8
	Global CAP Resurfacing	43	104	0	0.00	0.00	3.5
	SMR Resurfacing	2	5	0	0.00	0.00	69.3

Prothesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95%	Exact 95% confidence interval	
Partial resurfacing	Aequalis Resurfacing Head	1	3	0	0.00	0.00	131.1
	Arthrex Eclipse	3	7	2	28.85	3.49	104.2
	Ascension	20	27	0	0.00	0.00	13.5
	Copeland Resurfacing	19	91	2	2.19	0.27	7.9
	Custom Global Cap	1	2	0	0.00	0.00	152.9
	Epoca Head	12	26	1	3.85	0.10	21.5
	Global CAP Resurfacing	87	415	6	1.45	0.53	3.1
	Global Humeral Head	1	1	0	0.00	0.00	298.1
	Hemicap Resurfacing	6	29	0	0.00	0.00	12.8
	SMR Resurfacing	40	122	3	2.45	0.51	7.2
	SMR Resurfacing CTA	6	21	2	9.56	1.16	34.5

There are widely varying revision rates, most of which do not reach statistical significance. The stand out is SMR Conventional which has a markedly higher revision rate than the other main Conventional prostheses.

Revision vs Glenoid Fixation

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
UnCemented	751	2620.8	53	2.02	1.51	2.65
Cemented	1,393	7250.8	36	0.50	0.35	0.69

The uncemented glenoids have a significantly higher revision rate. However, the fact that a glenoid component had been entered as revised does not necessarily mean it had failed or had to be replaced.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	370	1,873.7	39	2.08	1.48	2.85
55_64	1,033	4,791.5	74	1.54	1.21	1.94
65_74	2,055	9,106.8	87	0.96	0.77	1.18
GE75	2,070	8,563.3	54	0.63	0.47	0.82

The lower two age bands have a significantly higher revision rate than the higher two.

Revision vs Prosthesis Group vs Age Bands

Prosthesis	Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total	LT55	109	496.2	15	3.02	1.69	4.99
	55_64	498	2188.3	27	1.23	0.81	1.80
	65_74	934	4361.5	33	0.76	0.52	1.06
	GE75	603	2825.7	14	0.50	0.27	0.83
Reverse	LT55	11	25.4	2	7.89	0.96	28.49
	55_64	152	464.9	9	1.94	0.89	3.67
	65_74	550	1545.7	20	1.29	0.79	2.00
	GE75	840	2488.5	19	0.76	0.46	1.19
Hemi	LT55	166	1030.8	15	1.46	0.81	2.40
	55_64	293	1819.7	35	1.92	1.34	2.68
	65_74	480	2954.5	28	0.95	0.63	1.37
	GE75	593	3156.5	21	0.67	0.41	1.02
Resurfacing	LT55	4	9.7	0	0.00	0.00	37.96
	55_64	27	72.6	0	0.00	0.00	5.08
	65_74	50	99.7	0	0.00	0.00	3.70
	GE75	22	50.4	0	0.00	0.00	7.32
Partial resurfacing	LT55	80	311.6	7	2.25	0.90	4.63
	55_64	63	246.0	3	1.22	0.25	3.56
	65_74	41	145.5	6	4.12	1.51	8.98
	GE75	12	42.1	0	0.00	0.00	8.76

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	3,510	15,772.9	150	0.95	0.80	1.12
Male	2,018	8,562.4	104	1.21	0.99	1.47

There is no significant difference between the two groups.

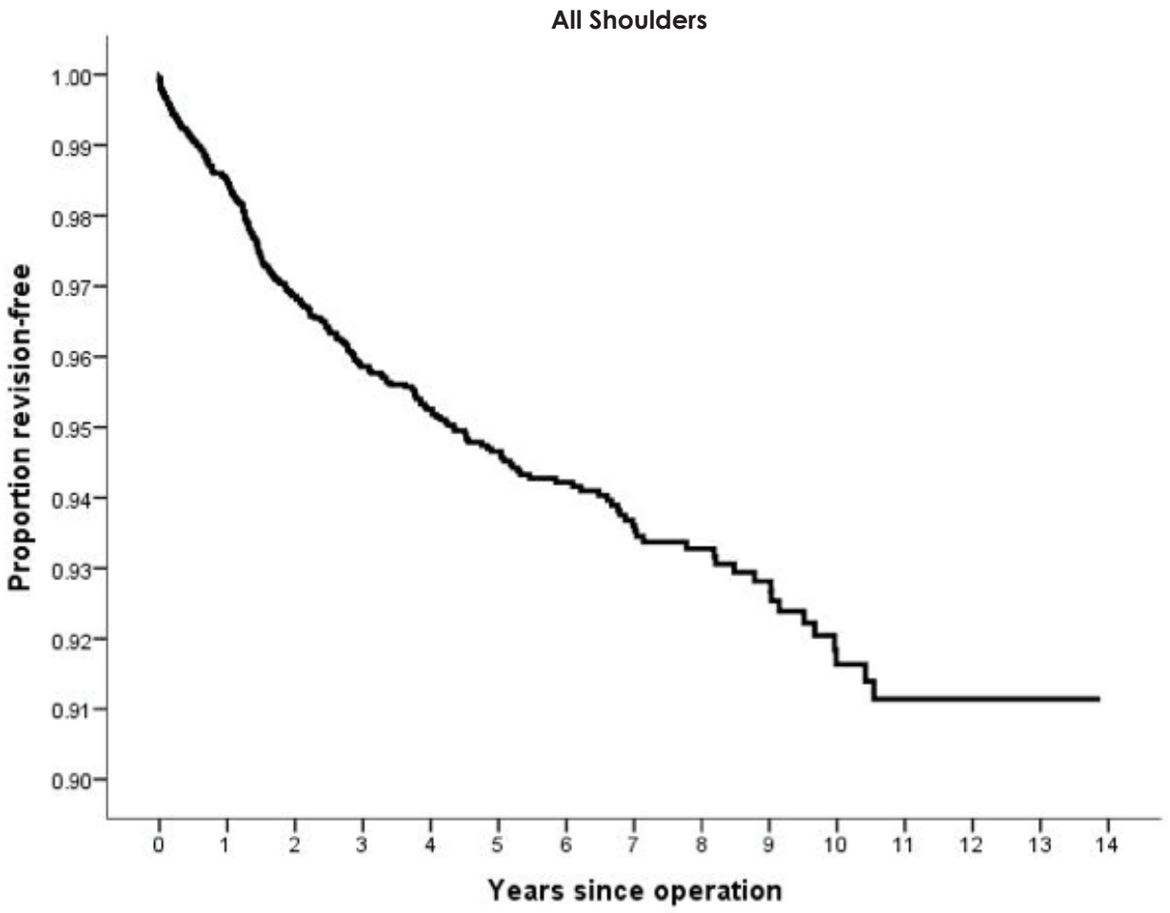
Revision vs Surgeon Annual Workload

Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	2,575	11,379.4	133	1.17	0.98	1.39
>=10	2,953	12,955.9	121	0.93	0.77	1.12

There is no significant difference between the two groups.

KAPLAN MEIER CURVES

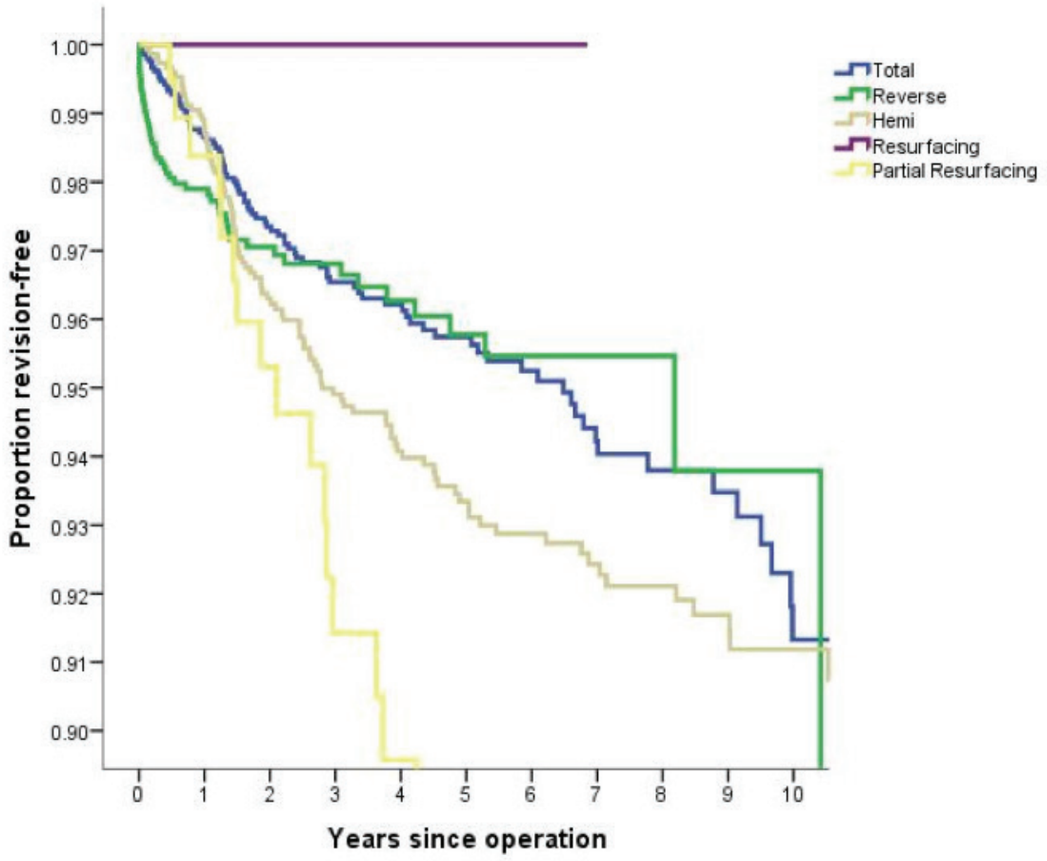
The following Kaplan Meier survival analyses are for the 14 years from 2000 to 2013, with deceased patients censored at time of death.



Years	% Revision-free	N
1	98.50%	4,644
2	96.90%	3,841
3	95.90%	3,171
4	95.30%	2,629
5	94.70%	2,113
6	94.20%	1,682
7	93.60%	1,236
8	93.30%	964
9	92.80%	715
10	91.60%	445

There are insufficient numbers to give an accurate revision free percentage beyond ten years.

Survival curves for different shoulder categories



PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTH, FIVE YEARS AND TEN YEARS POST-SURGERY

Questionnaires at six months post-surgery

At six months post-surgery patients are sent the Oxford-12 questionnaire.

The new scoring system has been adopted as recommended by the original authors.

The scores now range from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

We have grouped the questionnaire responses based on the scoring system as published by Kalairajah et al, in 2005 (See appendix 1) .This groups each score into four categories:

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the thirteen-year period and as at July 2014, there were 3,714 shoulder questionnaire responses registered at six months post-surgery.

The mean shoulder score was 36.23 (standard deviation 9.59, range 2 – 48)

Scoring	> 41	1,359
Scoring	34 - 41	1,161
Scoring	27 - 33	578
Scoring	<27	616

At six months post-surgery, 68% had an excellent or good score.

Questionnaires at five years post-surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery, were sent a further questionnaire at five years post-surgery.

This dataset represents sequential Oxford shoulder scores for 1,012 individual patients.

At five years post-surgery, 77% of these patients achieved an excellent or good score and had a mean of 39.30.

Questionnaires at ten years post-surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery, were sent a further questionnaire at ten years post-surgery.

This dataset represents sequential Oxford shoulder scores for 167 individual patients.

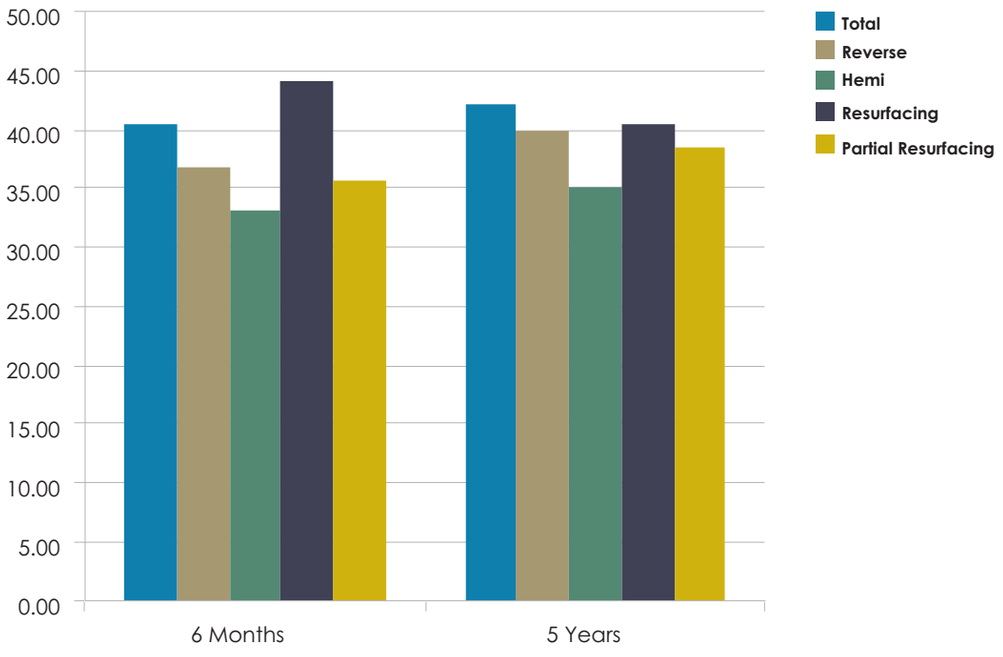
At ten years post-surgery, 71% of these patients achieved an excellent or good score and had a mean of 37.91.

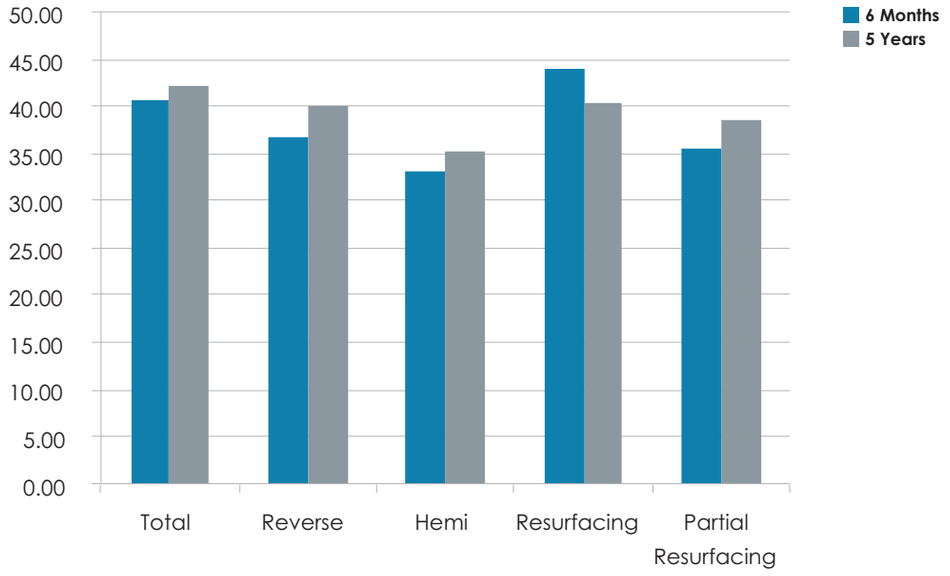
6 Month and Five Year Oxford Scores for the Different Arthroplasty Types

Prosthesis type	Time Post-Surgery	Mean Score	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Conventional Total	6 Months	40.56	0.39	39.80	41.32
	5 Years	42.05	0.39	41.28	42.82
Reverse	6 Months	36.84	0.61	35.63	38.04
	5 Years	39.95	0.62	38.73	41.16
Hemi	6 Months	33.20	0.47	32.28	34.12
	5 Years	35.07	0.47	34.14	36.00
Resurfacing	6 Months	44.00	4.86	34.46	53.54
	5 Years	40.33	4.91	30.70	49.97
Partial Resurfacing	6 Months	35.65	1.65	32.41	38.89
	5 Years	38.54	1.67	35.27	41.81

Conventional Total and Resurfacing Head types have significantly higher 6 month and 5 year scores.

Comparison of 6 Month and 5 Year Scores for Different Arthroplasty Types





Analysis of the individual questions

Analysis of the individual questions showed that there were persisting concerns with pain, brushing hair (Q7) and hanging clothes in a wardrobe (Q9).

Percentage scoring 0 or 1 for each question out of the group of 3,714 at six-months and 1,012 at five-years.

		6mth %	5yr %
1	The worst pain from the shoulder is severe or unbearable	16	10
2	Usually have moderate or severe pain from the operated shoulder	20	12
3	Extreme difficulty or impossible to get in and out of a car or public transport	3	2
4	Extreme difficulty or impossible to use a knife and fork at the same time	4	2
5	Extreme difficulty or impossible to do the household shopping on your own	7	6
6	Extreme difficulty or impossible to carry a tray containing a plate of food across a room	8	6
7	Extreme difficulty or impossible to brush or comb hair with the operated arm	17	11
8	Extreme difficulty or impossible to dress yourself because of your operated shoulder	6	3
9	Extreme difficulty or impossible to hang clothes in a wardrobe using operated arm	16	12
10	Extreme difficulty or impossible to wash and dry under both arms	9	6
11	Pain from operated shoulder greatly or totally interfering with usual work	12	10
12	Pain from shoulder in bed most or every night(s)	15	10

Revision shoulder questionnaire responses

There were 197 revision shoulder responses with 49% achieving There were 234 revision shoulder responses with 46% achieving an excellent or good score. This group includes all revision shoulder responses. The mean revision shoulder score was 30.88 (standard deviation 10.41, range 3 – 48).

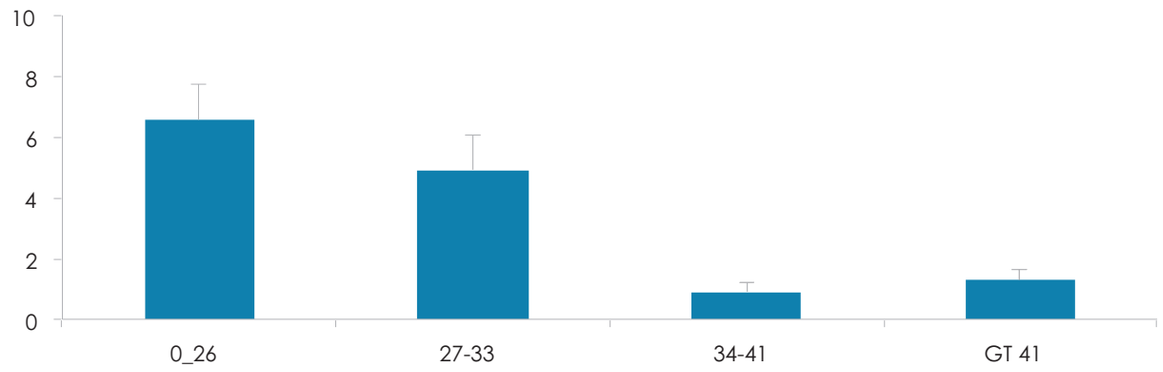
OXFORD 12 SCORE AS A PREDICTOR OF SHOULDER ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at 6 months and arthroplasty revision within two years of the Oxford 12 questionnaire date.

Six month score and revision arthroplasty

Plotting the patients' six month scores in the Kalairajah groupings against the proportion of shoulders revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score, although it is not as clear cut as for the hips and knees. A patient with a score below 27 has 7 times the risk of a revision within two years compared to a person with a score of 34-41..

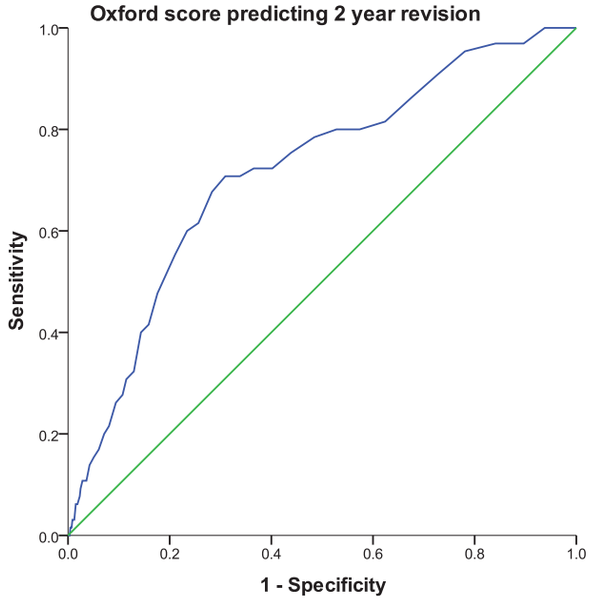
Revision (%) to 2 Years -by Oxford Score at 6 Months



Revision risk versus Kalairajah groupings of Oxford scores within two years of the 6 month score date

Kalairajah group	No in group	No. revised	%	Std error
0_26	413	27	6.54	1.22
27-33	386	19	4.92	1.10
34-41	772	7	0.91	0.34
GT 41	927	12	1.29	0.37

A person with an Oxford score >41 has a 1.29% risk of revision within two years compared to a 6.54% risk with a score <27.



Diagonal segments are produced by ties.

A person with an Oxford score >41 has a 1.29% risk of revision within two years compared to a 6.54% risk with a score <27.

A ROC analysis has demonstrated that a patient with a score less than or equal to 34 has five times the risk of needing a revision within two years compared to a person with a score greater than 34.

A receiver operating characteristic (ROC) curve is a graphical representation of the trade-off between the false negative and false positive rates for every possible cut-off. Equivalently, the ROC curve is the representation of the trade-offs between sensitivity and specificity. The more the curve climbs towards the upper left corner, the better the reliability of the test.

ELBOW ARTHROPLASTY

PRIMARY ELBOW ARTHROPLASTY

The **fourteen**-year report analyses data for the period January 2000 – December 2013. There were 409 primary elbow procedures registered, an additional 22 compared to 2012 and this represents an 8% decrease over 2012.

2000	17
2001	29
2002	32
2003	23
2004	28
2005	30
2006	31
2007	36
2008	40
2009	34
2010	30
2011	33
2012	24
2013	22

Data Analysis

Age and sex distribution

The average age for an elbow replacement was 66.38 years, with range of 15.16 – 92.41 years.

	Female	Male
Number	317	92
Percentage	77.51	22.49
Mean age	66.86	64.75
Maximum age	92.41	91.73
Minimum age	36.38	15.16
Standard dev.	11.86	13.50

Previous operation

None	348
Internal fixation for juxtarticular fracture	18
Synovectomy+-removal radial head	13
Debridement	10
Osteotomy	2
Ligament reconstruction	1
Interposition arthroplasty	1

Diagnosis

Rheumatoid arthritis	227
Post fracture	114
Osteoarthritis	51
Other inflammatory	8
Post dislocation	6
Post ligament disruption	4

Approach

Posterior	257
Medial	81
Lateral	27

Bone graft

Humeral autograft	30
Humeral allograft	3
Humeral synthetic	1
Ulnar autograft	2

Cement

Humerus cemented	381	
Antibiotic in cement	279	(73%)
Ulna cemented	359	
Antibiotic in cement	258	(72%)
Radius cemented	22	
Antibiotic in cement	21	(96%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	378	(92%)

Operating theatre

Conventional	281
Laminar flow	124
Space suits	58

ASA Class

This was introduced with the updated forms at the beginning of 2005.

For the nine-year period 2005 – 2013, there were 257 (92%) primary elbow procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient

ASA class 2: A patient with mild systemic disease

ASA class 3: A patient with severe systemic disease that limits activity but is not incapacitating

ASA class 4: A patient with an incapacitating disease that is a constant threat to life

ASA	Number
1	8
2	117
3	127
4	5

Operative time (skin to skin)

Mean	138 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised.

The following figures are for the nine- year period 2005 – 2013.

Consultant	274
Advanced trainee supervised	7
Advanced trainee unsupervised	3

Surgeon and hospital workload

In 2013, 20 surgeons performed 22 primary elbow procedures. Two surgeons performed two operations and 18 surgeons performed one operation each.

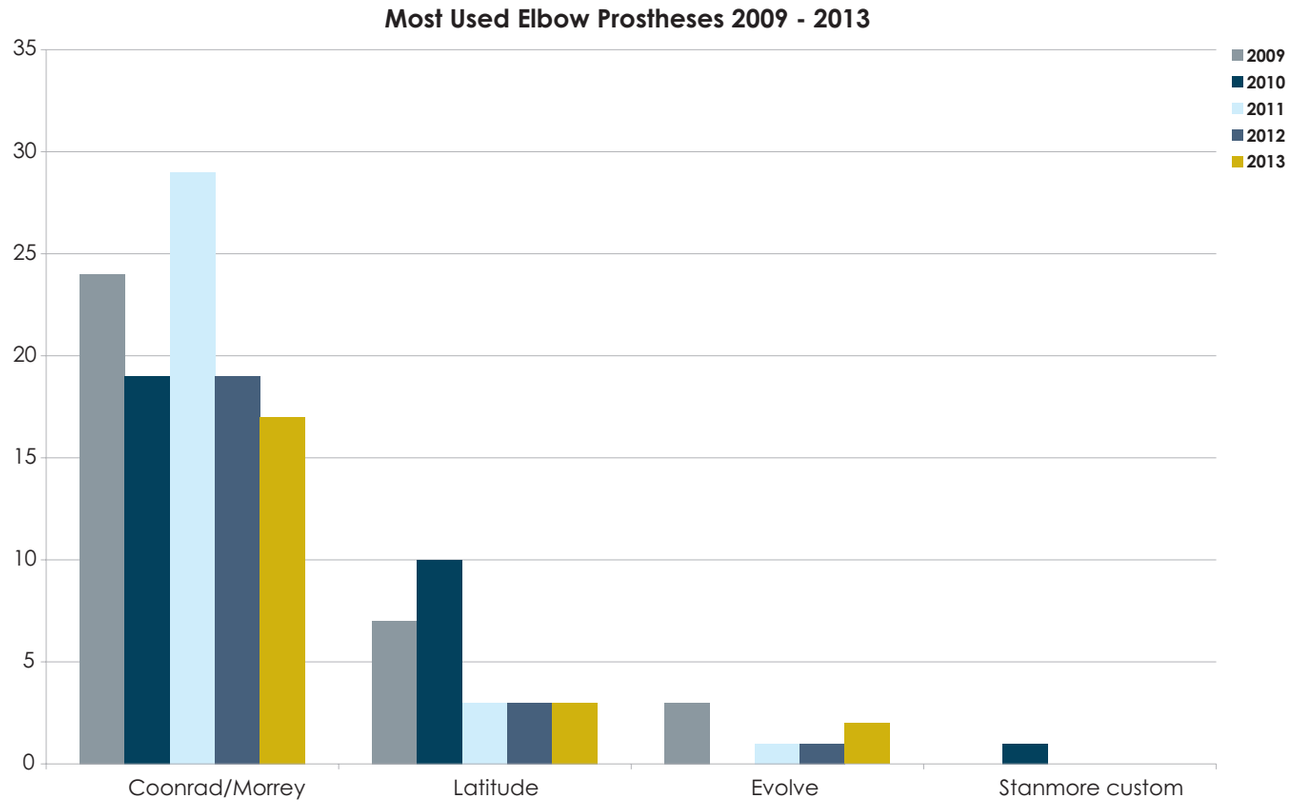
Hospitals

In 2013, primary elbow replacement was performed in 15 hospitals, of which 13 were public and two were private.

Prosthesis usage

Elbow prostheses used in 2013

Coonrad/Morrey	17
Latitude	3
Evolve	2



REVISION ELBOW ARTHROPLASTY

Revision is defined by the Registry as a new operation in a previously replaced elbow joint during which one or more of the components are exchanged, removed, manipulated or added. It includes arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as one revision.

Data Analysis

For the fourteen-year period January 2000 – December 2013, there were 70 revision elbow procedures registered. This is an additional three compared to last year's report.

The average age for a revision elbow replacement was 65.55 years, with a range of 30.97 – 88.95 years.

	Female	Male
Number	51	19
Percentage	72.86	27.14
Mean	65.56	65.54
Maximum age	88.95	84.17
Minimum age	42.23	30.97
Standard dev.	9.50	12.56

REVISION OF REGISTERED PRIMARY ELBOW ARTHROPLASTIES

TThis section analyses data for revisions of primary elbow procedures for the fourteen-year period January 2000 – December 2013.

There were 22 revisions of the primary group of 409 (5.9%).

There were five that had been revised twice and one that had been revised three times.

Time to revision

Mean	1,080 days
Maximum	3,912 days
Minimum	62 days
Standard deviation	910 days

Reason for revision

Loosening humeral component	8
Loosening ulnar component	6
Deep infection	6
Pain	3
Loosening radial head component	2
Fracture humerus	2
Fracture ulna	1

Analysis by time for the 3 main reasons for revision

	Loosening humeral		Loosening Ulna		Deep infection	
Years	Count	%	Count	%	Count	%
0	0	0.00	0	0.00	0	0.00
1	0	0.00	0	0.00	0	0.00
2	2	25.00	0	0.00	3	50.00
3	3	37.50	3	50.00	1	16.70
4	2	25.00	2	33.30	0	0.00
5	0	0.00	0	0.00	0	0.00
6	0	0.00	0	0.00	0	0.00
7	0	0.00	0	0.00	1	16.70
8	0	0.00	0	0.00	0	0.00
9	0	0.00	0	0.00	1	16.70
10	0	0.00	0	0.00	0	0.00
11	1	12.50	1	16.70	0	0.00
Total	**8**	**100.00%**	**6**	**100.00%**	**6**	**100.00%**

Statistical note

In the table below there are two statistical terms readers may not be familiar with:

i) Observed component years

This is the number of registered primary procedures multiplied by the number of years each component has been in place.

ii) Rate/100 component years

This is equivalent to the yearly revision rate expressed as a percent and is derived by dividing the number of prostheses revised by the observed component years multiplied by 100. It therefore allows for the number of years of post-operative follow up in calculating the revision rate. These rates are usually very low, hence it is expressed per 100 component years rather than per component year. Statisticians consider that this is a more accurate way of deriving a revision rate for comparison when analysing data with widely varying follow-up times. It is also important to note the confidence intervals. The closer they are to the estimated revision rate/100 component years, the more precise the estimate is.

Statistical Significance

Where it is stated that a difference among results is significant the p value is 0.05 or less. In most of these situations this is because there is no overlap of the confidence intervals (CIs) but sometimes significance can apply in the presence of CI overlap

All Primary Total Elbow Replacements

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
409	2,240.0	24	1.07	0.69	1.59

Revision Rate of Individual Prostheses Sorted in Alphabetic Order

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Acclaim	16	115.4	4	3.47	0.94	8.88
Coonrad/Morrey	294	1,662.1	11	0.66	0.33	1.18
Evolve Stem	10	33.9	0	0.00	0.00	10.88
Kudo	18	131.3	3	2.28	0.47	6.68
Latitude	69	287.1	6	2.09	0.77	4.55
Sorbie Questor	1	6.8	0	0.00	0.00	54.09
Stanmore custom implant	1	3.4	0	0.00	0.00	107.45

Although not statistically significant, the Coonrad Morrey has a much lower revision rate than most of the other prostheses.

Revision vs Gender

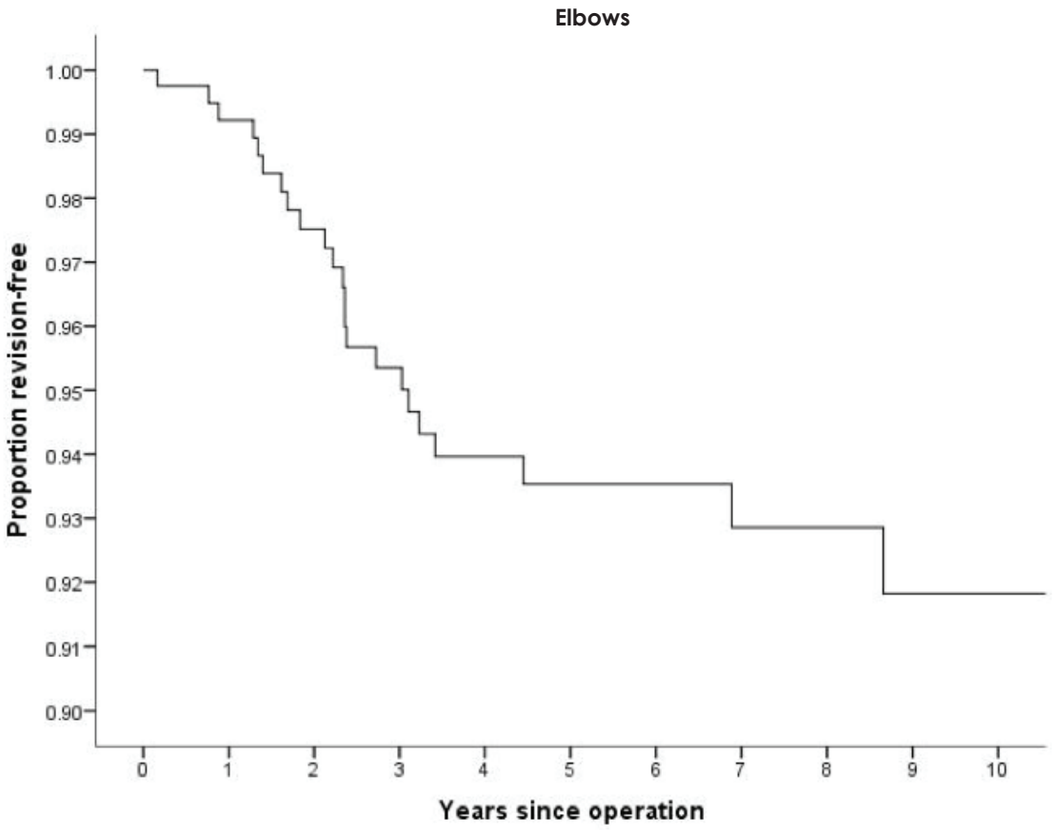
Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	317	1,847.0	16	0.87	0.50	1.41
Males	92	393.1	8	2.04	0.88	4.01

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	75	476.9	4	0.84	0.23	2.15
55_64	110	651.7	8	1.23	0.53	2.42
65_74	111	587.8	9	1.53	0.70	2.91
GE75	113	523.6	3	0.57	0.12	1.67

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 14 years from 2000 to 2013, with deceased patients censored at time of death.



Years	% Revision-free	N
1	99.20%	372
2	97.50%	332
3	95.40%	293
4	94.00%	265

There are insufficient numbers to give an accurate revision free percentage beyond four years.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX-MONTHS POST SURGERY

Questionnaires at six months post surgery

At six months post-surgery patients are sent an outcome questionnaire. This is modelled on the Oxford-12 for the hip and is not validated.

The same scoring system has been adopted as recommended by the authors of the Oxford 12 hip questionnaire.

The scores now range from 4 to 0. A score of 48 is the best, indicating normal function. A score of 0 is the worst, indicating the most severe disability.

We have grouped the questionnaire responses based on the scoring system published by Kalairajah et al, 2005 (appendix1).

Category 1	>41	excellent
Category 2	34 – 41	good
Category 3	27 – 33	fair
Category 4	< 27	poor

For the fourteen-year period and as at July 2014, there were 283 primary elbow responses registered at six months post-surgery.

The mean primary elbow score was 37.28 (standard deviation 9.67, range 7 – 48)

Scoring	> 41	129
Scoring	34 - 41	71
Scoring	27 - 33	39
Scoring	<27	44

At six months post-surgery, 71% had an excellent or good score.

Questionnaires at five-year post-surgery

All patients who had a six- month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at five years post-surgery.

At five years post-surgery, 90% of 69 achieved an excellent or good score.

Analysis of the individual questions

Analysis of the individual questions showed that >10% of patients scored poorly in over half the questions.

Percentage scoring 0 or 1 for each question at six months out of 270 responses.

		6mth
1	The worst pain from the elbow is severe or unbearable	11
2	Extreme difficulty or impossible to dress yourself because of your operated elbow	6
3	Extreme difficulty or impossible to lift a teacup safely with your operated arm	6
4	Extreme difficulty or impossible to get your hand to your mouth	4
5	Extreme difficulty or impossible to carry the household shopping with your operated arm	17
6	Extreme difficulty or impossible to carry a tray containing a plate of food across a room	12
7	Extreme difficulty or impossible to brush or comb hair with the affected arm	13
8	Usually have moderate or severe pain from the operated elbow	12
9	Extreme difficulty or impossible to hang clothes in a wardrobe using operated arm	9
10	Extreme difficulty or impossible to wash and dry under both arms	9
11	Pain from operated elbow greatly or totally interfering with usual work or hobbies	13
12	Pain from elbow in bed most or every night(s)	7
12	Pain from elbow in bed most or every nights	

Revision shoulder questionnaire responses

There were 33 revision elbow responses with 61% achieving an excellent or good score. This group includes all revision elbow responses. The mean revision elbow score was 35.21 (standard deviation 9.92, range 13 – 48).

LUMBAR DISC REPLACEMENT

PRIMARY LUMBAR DISC REPLACEMENT

This report analyses data for the **twelve**-year period January 2002 – December 2013.There were 149 lumbar disc replacements registered, an additional 7 compared to last year's report.

2002 - 2008	94
2009	17
2010	18
2011	11
2012	2
2013	7

Data Analysis

The average age for a lumbar disc replacement was 40.36 years, with a range of 24.07 – 62.19 years.

	Female	Male
Number	71	78
Percentage	47.65	52.35
Mean age	40.42	40.31
Maximum age	62.19	60.71
Minimum age	24.07	27.19
Standard dev.	8.66	7.29

Disc replacement levels

L3/4	20
L4/5	102
L5/S1	32

Fusion levels

L3/4	2
L4/5	12
L5/S1	55

Previous operation

Discectomy	27
L3/4	0
L4/5	14
L5/S1	17
Fusion	11
ALIF	1
L3/4	0
L4/5	4
L5/S1	11

Diagnosis

Degenerative disc disease

L3/4	11
L4/5	61
L5/S1	81
Other	4

Annular tear MRI scan

L3/4	13
L4/5	66
L5/S1	26
Other	1

Discogenic pain on discography

L3/4	20
L4/5	84
L5/S1	63
Other	1

Approach

Retroperitoneal midline	135
Retroperitoneal lateral	3
Transperitoneal	2
Other- mini open horizontal	2

Intraoperative complications

Damage to major veins	13
Subsidence	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	121

Operating theatre

Conventional	85
Laminar flow	63
Spacesuits	2

Operative time (skin to skin)

Mean	137 minutes

Surgeon grade

Consultant	149

REVISION OF REGISTERED PRIMARY LUMBAR DISC REPLACEMENTS

This section analyses data for revisions of primary lumbar disc replacements for the **eleven**-year period.

The figures are the same as last three years. There have been no further revisions or re- revisions registered.

There were 2 revisions of the primary group of 142 lumbar disc replacements (1.4%) and 1 re-revision.

Time to revision

Mean	457 days
Maximum	672 days
Minimum	242 days

Reason for revision

Pain	2
Loss of spinal alignment	1

Oswestry Disability Index

There are 10 sections. For each section, the total score is 5: if the first statement is marked the score = 0; if the last statement is marked, the score = 5. Intervening statements are scored according to rank.

If more than one box is marked in each section, take the highest score.

If all 10 sections are completed, the score is calculated as follows:

Example:
16 (total scored)/50(total possible score) x 100 = 32%

Pre operative scores

Modified Roland and Morris	n = 117
Mean	15
Maximum	66
Minimum	1
Standard deviation	7
Oswestry Disability Index	n = 44
Mean	57
Maximum	82
Minimum	30
Standard deviation	13

Post operative score

Oswestry Disability Index	n =24
Mean	23
Maximum	58
Minimum	0
Standard deviation	17

CERVICAL DISC REPLACEMENT

This report analyses data for the ten-year period January 2004 – December 2013. There were 226 primary cervical disc replacements registered to 19 surgeons.

2004	1
2005	13
2006	14
2007	13
2008	25
2009	32
2010	24
2011	46
2012	31
2013	27

Data Analysis

The average age for a cervical disc replacement was 44.30 years, with a range of 24.92 – 65.76 years.

	Female	Male
Number	95	131
Percentage	42.04	57.96
Mean age	45.57	43.38
Maximum age	65.76	61.07
Minimum age	27.73	24.92
Standard dev.	7.72	7.59

Disc replacement levels

C3/4	10
C4/5	18
C5/6	123
C6/7	104
C7T1	2
Other	2

Previous operation

Foraminotomy	7
Adjacent level fusion	15
Adjacent level disc arthroplasty	1
Discectomy	3
Other	3

Diagnosis

Foraminotomy	9
Adjacent level fusion	15
Adjacent level disc arthroplasty	2
Other	6

Approach

Anterior right	153
Anterior left	27
Other	2

Intra operative complications

Equipment failure	1
Removal of implant	1
Tear jugular vein	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	173

Operating theatre

Conventional	115
Laminar flow	108
Spacesuits	1

Operative time (skin to skin)

Mean	123 minutes

Surgeon grade

Consultant	226

Revision Cervical disc replacement

There was one revision cervical disc replacement registered.

There were no revisions of the 226 primary cervical disc replacements.

Neck Disability Index Scoring

There are 10 sections. For each section, the total score is 5: if the first statement is marked the score = 0; if the last statement is marked, the score = 5. Intervening statements are scored according to rank.

If more than one box is marked in each section, take the highest score.

If all 10 sections are completed, the score is calculated as follows:

Example: 16 (total scored)/50(total possible score) x 100 = 32%

If one section is missed (or not applicable) the score is calculated:

Example: 16 (total scored)/45(total possible score) x 100 = 35.5%

0 is the best score and 100 is the worst score.

Pre-operative score

Neck Disability Index	108
Mean	46
Maximum	92
Minimum	2
Standard deviation	20

Post-operative score

Neck Disability Index	56
Mean	24
Maximum	72
Minimum	0
Standard deviation	12

APPENDIX 1 - OXFORD 12 QUESTIONNAIRE REFERENCES

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Questionnaire on the perceptions of patients about shoulder surgery

Jill Dawson, Ray Fitzpatrick, Andrew Carr. J Bone Joint Surg B. 1996 July; 78(4) 593-600

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APPENDIX 3 - PROTHESIS INVENTORY

Hips		
	Stems	Cups
Stryker	Accolade	Trident
	Accolade II	Tritanium
	Exeter V40	Contemporary
	ABG II	Exeter X3 rimfit
	Securfit	Exeter
DePuy	Elite plus	Charnley
	Summit	Duraloc
	Charnley	Pinnacle
	Corail	
	C-stem	
	Trilock	
	Proxima	
	Silent	
	S-rom	
	ASR	
Zimmer	TM	Fitek
	ML Taper	Fitmore
	Avenir Muller	Morscher
	CLS	ZCA
	CPT	Trilogy
	MS30	Continum
	Versys	
	Muller	
Smith & Nephew	Spectron	
	Basis	Reflection cemented
	Polar uncemented	Reflection porus
	Synergy Porus	Polar cemented
	Anthology Porus	Polar uncemented
	Empirion Porus	EP uncemented
	Echelon Porus	R3 porus
	SL Plus	BHR porus
	BHR resurfacing	
	CPCS	

Mathys	Twinsys cemented	Selexys
	TwinSys uncemented	RM
	CCA	CCB
	CCB	
Biomet	Bi metric	Exceed Ring lock
Lima	H Max S stem	Delta TT
	H Max C stem	Delta PF

Knees		
Stryker	Duracon	
	Scorpio	
	Triathlon	
	Avon PF	
Biomet	AGC	
	Maxim	
	Vanguard	
DePuy	LCS	
	PFC Sigma	
	LSC PFJ	
	PFC	
	S-Rom Nollies	
	Attune	
Global Ortho	MBK	
S&N	Genesis II	
	Genesis Oxinium	
	Journey	
	Journey II	
	Legion	
Zimmer	Insall Bernstein	
	Nexgen	

Orthotec	Optetrak
	Themis
Mathys	Balansys
Advanced Surgical Technologies	

Unicompartmental Knees	
Stryker	Eius
	Unix
	Triathlon PKR
Biomet	Oxford cemented
	Oxford cementless
	Repecci II
Zimmer	Miller Galanti
	Zimmer Uni
DePuy	Preservation
	Sigma partial
S&N	Genesis Uni
	Oxinium Uni

Shoulders	
DePuy	Global
	Delta
Lima	SMR
Orthotec	Hemicap resurfacing
Rem Systems	Aequalis
Zimmer	Bigliani/Flatow
	Neer
Biomet	Copeland Resurfacing

Ankles	
DePuy	Agility
	Mobility
Orthotec	Ramses
REM Systems	Salto
Link	Star

Elbows	
Zimmer	Coonrad/Morrey
DePuy	Acclaim
Biomet	Kudo
	Discovery Elbow
REM Systems	Latitude

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Replacement Hip
Free Phone 0800-274-989 **Total Hip Arthroplasty θ** **Resurfacing Arthroplasty θ**
31.05.2010

Date: .....

Patient Name:

Address:

Consultant: .....

BMI:.....

[If different from patient label]

Side:..... **

Hospital: .....

Town/City

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

θ None
θ Internal fixation for juxtarticular fractures
θ Osteotomy
θ Arthrodesis
θ Other: .....

DIAGNOSIS

θ Osteoarthritis
θ Rheumatoid arthritis
θ Other inflammatory
θ Acute fracture NOF
θ Developmental dysplasia/dislocation
θ Old fracture NOF
θ Post-acute dislocation
θ Avascular necrosis
θ Tumour
θ Other: Name: .....

APPROACH θ Image guided surgery θ Minimally invasive surgery
θ Anterior θ Posterior θ Lateral θ Trochanteric osteotomy

FEMUR

Please do not fold

ACETABULUM

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT - ACETABULUM

θ Allograft
θ Autograft θ Synthetic

FEMORAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Femur θ Acetabulum θ Antibiotic brand: .....

θ SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name: .....ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin.....** **Finish skin.....**

PRIMARY OPERATING SURGEON

θ Consultant θ Adv Trainee Unsupervised θ Adv Trainee Supervised **Year.....** θ Basic Trainee

*****NB*** ***If bilateral procedure two completed forms are required***

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Revision Hip Joint

Free Phone 0800-274-989
07.04.2005

Date: .....

Side:..... **

Patient Name:

Address:

Consultant: .....
m patient label]
Hospital: .....
Town/City: .....

Tick Appropriate Boxes

REASON FOR REVISION

- θ **Loosening acetabular component**
- θ **Loosening femoral component**
- θ **Dislocation**
- θ **Pain**
- θ **Previous hemiarthroplasty**
- θ **Deep infection**
- θ **Fracture femur**
- θ **Removal of components**
- θ **Other: Name:** .....

Date Index Operation: .....

If re-revision - Date previous revision: .....

REVISION

- θ **Change of femoral component**
- θ **Change of acetabular component**
- θ **Change of head**
- θ **Change of liner**
- θ **Change of all components**

APPROACH θ **Image guided surgery** θ **Minimally invasive surgery**
θ **Anterior** θ **Posterior** θ **Lateral** θ **Trochanteric osteotomy**

FEMUR

Please do not fold

bar-coded label

ACETABULUM

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR
θ **Allograft** θ **Synthetic**
θ **Autograft**

BONE GRAFT - ACETABULUM
θ **Allograft** θ **Synthetic**
θ **Autograft**

FEMORAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT
θ **Femur** θ **Acetabulum** θ **Antibiotic brand:** .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE
θ **Conventional** θ **Laminar flow or similar** θ **Space suits**

SKIN TO SKIN TIME ***mins*** **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON
θ **Adv Trainee Supervised**
θ **Consultant** θ **Adv Trainee Supervised** **Year**..... θ **Basic Trainee**

NB** ***If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Replacement Knee
Free Phone 0800-274-989 θ Total Knee Arthroplasty θ Unicompartmental θ Patellofemoral
31.05.2010

Date: .....
BMI:.....
Side:..... **

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

θ None
θ Internal fixation for juxtarticular fracture
θ Ligament reconstruction
θ Menisectomy
θ Synovectomy
θ Osteotomy
θ Other: Name: .....

DIAGNOSIS

θ Osteoarthritis
θ Rheumatoid arthritis
θ Other inflammatory
θ Tumour
θ Post fracture
θ Post ligament disruption/reconstruction
θ Avascular necrosis
θ Other: Name:
.....

APPROACH θ Image guided surgery θ Minimally invasive surgery
θ Medial parapatellar θ Lateral parapatellar θ Other

FEMUR

Please do not fold

TIBIA

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

θ Allograft
θ Autograft
θ Synthetic

BONE GRAFT - TIBIA

θ Allograft
θ Autograft
θ Synthetic

PATELLA

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Femur θ Tibia θ Patella θ Antibiotic brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE
θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin.....** **Finish skin.....**

PRIMARY OPERATING SURGEON
θ Consultant θ Adv Trainee Unsupervised θ Adv Trainee Supervised **Year.....** θ Basic Trainee

*****NB*** ***If bilateral procedure two completed forms are required***

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Revision Knee Joint

Free Phone 0800-274-989

07.04.2005

Date: .....

Side:..... **

Patient Name:

Address:

Consultant: .....
[If different from patient label]

Hospital: .....

Town/City:.....

Tick Appropriate Boxes

REASON FOR REVISION

- θ Loosening femoral component
- θ Loosening tibial component
- θ Loosening patellar component
- θ Pain
- θ Previous Unicompartmental
- θ Deep infection
- θ Fracture femur
- θ Fracture tibia
- θ Other details: .....

Date Index Operation: .....

If re-revision - Date previous revision: .....

REVISION

- θ Change of femoral component
- θ Change of tibial component
- θ Change of patellar component
- θ Addition of patellar component
- θ Change of tibial polyethylene only
- θ Change of all components
- θ Removal of components
- θ Other

APPROACH θ Image guided surgery θ Minimally invasive surgery

θ Medial parapatellar θ Lateral parapatellar θ Other

FEMUR

Please do not fold

TIBIA

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT – FEMUR

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT – TIBIA

θ Allograft
θ Autograft θ Synthetic

PATELLA

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Femur θ Tibia θ Patella θ Antibiotic brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

PRIMARY OPERATING SURGEON

θ Consultant θ Adv Trainee Unsupervised θ Adv Trainee Supervised Year..... θ Basic Trainee

****NB If bilateral procedure two completed forms are required***

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Replacement Shoulder
0800-274-989 θ Total shoulder Arthroplasty θ Hemiarthroplasty θ Reverse Shoulder
06.05.2009

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City.....

Side:..... **

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

θ None
θ Internal fixation for juxtarticular fracture
θ Previous stabilisation
θ Osteotomy
θ Arthrodesis
θ Other: Name: .....

DIAGNOSIS

θ Rheumatoid arthritis
θ Osteoarthritis
θ Other inflammatory
θ Acute fracture proximal humerus
θ Post recurrent dislocation
θ Avascular necrosis
θ Cuff tear arthropathy
θ Post old trauma
θ Other: Name: .....

APPROACH

θ Deltopectoral θ Other : specify

HUMERUS

Please do not fold

GLENOID

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT - GLENOID

θ Allograft
θ Autograft θ Synthetic

HUMERAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK ALL LABELS ON REVERSE SIDE

CEMENT

θ Humerus θ Glenoid θ Antibiotic brand: .....

θ SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name: ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

PRIMARY OPERATING SURGEON

θ Consultant θ Adv Trainee Unsupervised θ Adv Trainee Supervised Year..... θ Basic Trainee

NB** ***If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Revision Shoulder

Free Phone 0800-274-989
07.04.2005

Date: .....

Side:..... **

Tick Appropriate Boxes

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

REASON FOR REVISION

- θ Loosening glenoid component
- θ Loosening humeral component
- θ Loosening both components
- θ Dislocation/instability anterior
- θ Instability posterior
- θ Subacromial tuberosity impingement
- θ Subacromial cuff impingement/tear
- θ Fracture humerus
- θ Deep infection
- θ Pain
- θ Other: Name: .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- θ Change of head only
- θ Change of humeral component
- θ Change of glenoid component
- θ Change of liner (glenoid non cemented)
- θ Change of all components
- θ Remove glenoid
- θ Remove humerus
- θ Removal of components
- θ Other Specify: .....

APPROACH

θ Deltopectoral θ Other: specify

HUMERUS

Please do not fold

GLENOID

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

θ Allograft θ Synthetic
θ Autograft

BONE GRAFT - GLENOID

θ Allograft θ Synthetic
θ Autograft

HUMERAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Humerus θ Glenoid θ Antibiotic brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME ***mins*** **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ Adv Trainee Unsupervised θ Consultant θ Adv Trainee Supervised Year..... θ Basic Trainee

NB *If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Replacement Ankle

Free Phone 0800-274-989
31.05.2010

Date: .....

BMI:.....

Side:..... **

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City.....

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

θ None
θ Internal fixation for juxtarticular fractures
θ Osteotomy
θ Arthrodesis
θ Other: Name: .....

DIAGNOSIS

θ Osteoarthritis
θ Rheumatoid arthritis
θ Other inflammatory
θ Post trauma
θ Avascular necrosis talus
θ Other: Name:
.....

APPROACH

θ Anterior θ Anterio-lateral θ Other

TIBIA

Please do not fold

TALUS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT - TALUS

θ Allograft
θ Autograft θ Synthetic

AUGMENTS

Please do not fold

FUSION DISTAL TFJ

STICK ALL LABELS ON REVERSE SIDE

CEMENT

θ Tibia θ Talus θ Antibiotic Brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name: ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ Consultant Trainee
θ Adv Trainee Unsupervised
θ Adv Trainee Supervised
θ Basic
Year.....

NB** ***If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES **TO BE RETAINED IN THEATRE SUITE**

NEW ZEALAND JOINT REGISTRY
Revision Ankle Joint

Free Phone 0800-274-989 **07.04.2005**

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]

Side:..... **

Hospital:.....

Town/City: .....

Tick Appropriate Boxes

REASON FOR REVISION

- θ **Loosening talar component**
- θ **Loosening tibial component**
- θ **Dislocation**
- θ **Pain**
- θ **Deep infection**
- θ **Fracture talus**
- θ **Fracture tibia**
- θ **Dislocations**
- θ **Other details:** .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- θ **Change of talar component**
- θ **Change of tibial component**
- θ **Change of polyethylene only**
- θ **Change of all components**
- θ **Removal of components**
- θ **Other Name:** .....

APPROACH

θ **Anterior** θ **Anterio-lateral** θ **Posterior**

TIBIA

Please do not fold

TALUS

Please do not fold

STICK ALL LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

θ **Allograft**
θ **Autograft** θ **Synthetic**

BONE GRAFT - TALUS

θ **Allograft**
θ **Autograft** θ **Synthetic**

AUGUMENTS

Please do not fold

FUSION DISTAL TFJ

Yes θ No θ

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ **Talus** θ **Tibia** θ **Antibiotic brand:** .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

θ **Conventional** θ **Laminar flow or similar** θ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ **Adv Trainee Unsupervised**
θ **Consultant** θ **Adv Trainee Supervised** **Year**..... θ **Basic Trainee**

NB** ***If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Replacement Elbow

Free Phone 0800-274-989
07.04.2005

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

Side:..... **

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

θ None
θ Internal fixation for juxtarticular fracture
θ Ligament reconstruction
θ Interposition arthroplasty
θ Debridement
θ Synovectomy ± removal radial head
θ Osteotomy
θ Other: Name: .....

DIAGNOSIS

θ Rheumatoid arthritis
θ Osteoarthritis
θ Other inflammatory
θ Post dislocation
θ Post fracture
θ Post ligament disruption
θ Other: Name: .....

APPROACH

θ Medial θ Lateral θ Posterior

HUMERUS

Please do not fold

ULNA

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT - ULNA

θ Allograft
θ Autograft θ Synthetic

RADIAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Humerus θ Ulna θ Radius θ Antibiotic brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ Consultant θ Adv Trainee Unsupervised θ Adv Trainee Supervised Year..... θ Basic Trainee

NB If bilateral procedure two completed forms are required

DO NOT PLACE IN PATIENT NOTES **TO BE RETAINED IN THEATRE SUITE**

NEW ZEALAND JOINT REGISTRY
Revision Elbow Joint

Free Phone 0800-274-989 **07.04.2005**

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City: .....

Side:..... **

Tick Appropriate Boxes

REASON FOR REVISION

- θ Loosening humeral component
- θ Loosening ulnar component
- θ Loosening radial head component
- θ Pain
- θ Deep infection
- θ Fracture humerus
- θ Fracture ulna
- θ Dislocations
- θ Other Name: .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- θ Change of humeral component
- θ Change of ulnar component
- θ Change of radial head component
- θ Change of all components
- θ Removal of components
- θ Other Name: .....

APPROACH

θ Medial θ Lateral θ Posterior

HU

Please do not fold

UL

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

θ Allograft
θ Autograft θ Synthetic

BONE GRAFT - ULNA

θ Allograft
θ Autograft θ Synthetic

RADIAL HEAD

Please do not fold

AUGMENTS

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

θ Humerus θ Ulna θ Radius θ Antibiotic brand: .....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ Adv Trainee Unsupervised
θ Consultant θ Adv Trainee Supervised Year..... θ Basic Trainee

***NB** *If bilateral procedure two completed forms are required*

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Cervical Disc Replacement

Free Phone 0800-274-989 **14.08.2008**

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

Tick Appropriate Boxes

ACC ☐ **ACC Claim No: .....**

LEVELS OF DISC REPLACEMENT

.....

θ C3/4 θ C6/7
θ C4/5 θ C7/T1
θ C5/6 Other .....

PRE OP PATIENT SCORE (NECK DISABILITY INDEX)

PREVIOUS OPERATION

θ Foreminotomy θ Adjacent Level Disc Arthroplasty
θ Adjacent Level Fusion θ Other.....

DIAGNOSIS

θ Acute Disc Prolapse
θ Chronic Spondylosis
θ Neck Pain
θ Other .....

APPROACH

θ Anterior Right θ Anterior Left θ Other
.....

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS

.....
.....

SYSTEMIC ANTIBIOTIC PROPHYLAXIS

θ Yes θ No

OPERATIVE THEATRE

θ Conventional θ Laminar flow or similar θ Space suits

SKIN TO SKIN TIME *mins* **Start skin.....** **Finish skin.....**

PRIMARY OPERATING SURGEON

θ Adv Trainee Unsupervised
θ Consultant θ Adv Trainee Supervised Year ..... θ Basic Trainee

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Revision Cervical Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital:

LEVEL OF REVISION

.....

θ **C3/4** θ **C6/7**

θ **C4/5** θ **C7/T1**

θ **C5/6** θ **Other:**

Tick Appropriate Boxes

Town/City: .....

ACC ☐ **ACC Claim No:** .....

REASON FOR REVISION

θ **Dislocation of component**
θ **Failure of component**
θ **Infection**
θ **Pain (Neck)**
θ **Adjacent level surgery**
θ **Additional decompression required**
θ **Heterotopic calcification**
θ **Other: Name:** .....

Date Index Operation: .....

If re-revision - Date previous revision: ...

REVISION

θ **Replace disc prosthesis (same)**
θ **Replace disc prosthesis (different)**
θ **Fuse**
θ **Removal only**
θ **Other:** .....

APPROACH θ **Image guided surgery** θ **Minimally invasive surgery**
θ **Anterior** θ **Posterior** θ **Lateral** θ **Trochanteric**

Osteotomy

IMPLANTS

Please do not fold

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

Please do not fold

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name .....

OPERATING THEATRE

θ **Conventional** θ **Laminar flow or similar** θ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

θ **Consultant** θ **Adv Trainee Unsupervised** θ **Adv Trainee Supervised** **Year**..... θ **Basic Trainee**

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Primary Lumbar Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City.....

Tick Appropriate Boxes **ACC** ☐**ACC Claim No.** .....

DISC REPLACEMENT Levels
θ **L3/4**
θ **L4/5**
θ **L5/S1**

FUSION Levels
θ **L3/4**
θ **L4/5**
θ **L5/S1**
Percentage score

PRE OP PATIENT SCORE
Modified Roland and Morris
Total number of "Yes" responses.....
Oswestry Score
Other .....

PREVIOUS OPERATION
θ **Discectomy** θ **L3/4** θ **L4/5** θ **L5/S1** θ **Other** .....
θ **Other** ..... θ **L3/4** θ **L4/5** θ **L5/S1**

DIAGNOSIS
1. Degenerative Disc disease (plain x-ray changes present) θ **L3/4** θ **L4/5** θ **L5/S1** θ **Other** .....
2. Annular tear MRI scan (normal plain x-ray) θ **L3/4** θ **L4/5** θ **L5/S1** θ **Other** .....
3. Discogenic pain on discography θ **L3/4** θ **L4/5** θ **L5/S1** θ **Other** .....

APPROACH
θ **Retroperitoneal midline abdominal wall incision**
θ **Retroperitoneal lateral abdominal wall incision**
θ **Transperitoneal**
θ **Other** .....

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS
.....

θ SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Yes θ **No** θ

OPERATIVE THEATRE
θ Conventional θ **Laminar flow or similar** θ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin** ..... **Finish skin** .....

PRIMARY OPERATING SURGEON

θ **Consultant** θ **Adv Trainee** **Year**..... θ **Basic Trainee**

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

NEW ZEALAND JOINT REGISTRY
Revision Lumbar Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: .....

Patient Name:

Address:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City: .....

Tick Appropriate Boxes **ACC** ☐ **ACC Claim No:** .....

REASON FOR REVISION

- θ **Loosening of components**
- θ **Dislocation of articulating core**
- θ **Loss of spinal alignment**
- θ **Pain**
- θ **Deep infection**
- θ **Fracture of vertebra**
- θ **Removal of components**
- θ **Other: Name:** .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- θ **Change of TDR components**
- θ **Change to Anterior Fusion**
- θ **Change of articulating core**
- θ **In-situ posterior instrumented fusion**

APPROACH

- θ **Retroperitoneal midline abdominal wall incision**
- θ **Retroperitoneal lateral abdominal wall incision**
- θ **Transperitoneal**
- θ **Other** .....
- θ **Posterior Approach for in-situ fusion**

NEW DISC REPLACEMENT Levels	**NEW FUSION Levels**	**PRE OP PATIENT SCORE**
		Modified Roland and Morris
θ **L3/4**	θ **L3/4**	**Total number of "Yes" responses**.....
θ **L4/5**	θ **L4/5**	***Oswestry Score***
θ **L5/S1**	θ **L5/S1**	**Percentage score**

Other .....

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS

.....

.....

θ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Yes θ **No** θ

OPERATIVE THEATRE
θ **Conventional** θ **Laminar flow or similar** θ **Space suits**

SKIN TO SKIN TIME ***mins*** **Start skin** ..... **Finish skin** .....

PRIMARY OPERATING SURGEON
θ **Consultant** θ **Adv Trainee** **Year**..... θ **Basic Trainee**

Patient Name: ..... **Date of Birth:** .....
Patient Address: ..... **Operating Surgeon:**.....
..... **Date of Surgery**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually had from your operated on hip?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on hip becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to put on a pair of socks, stockings or tights?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on hip interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on hip?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you had any sudden, severe pain - 'shooting', 'stabbing' or 'spasms' - from the affected operated on hip?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

10 Have you been limping when walking, because of your operated on hip?
- 4 Rarely/never
- 3 Sometimes or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on hip in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:** .....
Patient Address: ..... **Operating Surgeon:**.....
..... **Date of Surgery:**.....

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Please circle the SIDE on which you had your surgery performed Left Right

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- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on hip becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on hip?
- 4 No trouble at all
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- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to put on a pair of socks, stockings or tights?
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- 1 With extreme difficulty
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- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on hip interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on hip?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

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- 1 Most of the time
- 0 All of the time

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- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on hip in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:** .....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on knee?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on knee becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Could you kneel down and get up again afterwards on your operated knee?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on knee interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on knee?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you felt that your operated on knee might suddenly "give way" or let you down?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

10 Have you been limping when walking, because of your operated on knee?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Could you walk down one flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on knee in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on knee?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on knee becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Could you kneel down and get up again afterwards?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on knee interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on knee?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you felt that your operated on knee might suddenly "give way" or let you down?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

10 Have you been limping when walking, because of your operated on knee?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Could you walk down one flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on knee in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

Additional Information

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:**.....
Patient Address: ..... **Operating Surgeon:**.....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please **circle the number** which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on ankle?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on ankle becomes severe?
- 4 No pain up to 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk at all because of severe pain

3 Have you been able to walk on uneven ground?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 Extreme difficulty
- 0 No impossible

4 Have you had to use an orthotic (shoe insert), heel lift, or special shoes?
- 4 Never
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 Always

5 How much has pain from your ankle interfered with your usual work (including housework and hobbies)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

6 Have you been limping when walking because of your operated on ankle?
- 4 No days
- 3 Only one or two days
- 2 Some days
- 1 Most days
- 0 Every day

7 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 Impossible

8 Have you been troubled by pain from your operated on ankle in bed at night?
- 4 No nights
- 3 Only one or two nights
- 2 Some nights
- 1 Most nights
- 0 Every night

9 How much has pain from your operated on ankle interfered with your usual recreational activities?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

10 Have you had swelling of your foot?
- 4 None at all
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 All the time

11 After a meal (sat at a table) how painful has it been for you to stand up from a chair because of your operated on ankle?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

12 Have you had any sudden severe pain – shooting, stabbing or spasms from your operated on ankle?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

.....

□□I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone

Patient Name: ..... **Date of Birth:**.....
Patient Address: ..... **Operating Surgeon:** .....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on ankle?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on ankle becomes severe?
- 4 No pain up to 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk at all because of severe pain.

3 Have you been able to walk on uneven ground?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 Extreme difficulty
- 0 No impossible.

4 Have you had to use an orthotic (shoe insert), heel lift, or special shoes?
- 4 Never
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 Always

5 How much has pain from your ankle interfered with your usual work (including housework and hobbies)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

6 Have you been limping when walking because of your operated on ankle?
- 4 No days
- 3 Only one or two days
- 2 Some days
- 1 Most days
- 0 Every day

7 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 Impossible

8 Have you been troubled by pain from your operated on ankle in bed at night?
- 4 No nights
- 3 Only one or two nights
- 2 Some nights
- 1 Most nights
- 0 Every night

9 How much has pain from your operated on ankle interfered with your usual recreational activities?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you had swelling of your foot?
- 4 None at all
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 All the time

13 After a meal (sat at a table) how painful has it been for you to stand up from a chair because of your operated on ankle?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

12 Have you had any sudden severe pain – shooting, stabbing or spasms from your operated on ankle?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed, try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:** .....
Patient Address: ..... **Operating Surgeon:**.....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please **circle the number** which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm?** **Left** **Right**

Please circle the SIDE on which you had your surgery performed **Left** **Right**

1 How would you describe the ***worst*** pain you have had from your operated on shoulder?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 How would you describe the pain you ***usually*** have from your operated on shoulder?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to use a knife and fork at the same time?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 Have you had any trouble dressing yourself because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

10 Have you been able to wash and dry yourself under both arms?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

11 How much has pain from your operated on shoulder interfered with your usual work hobbies or recreational activities (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on shoulder in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

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REVISION SHOULDER REPLACEMENT - QUESTIONNAIRE

Patient Address: .....
.....

Operating urgeon:.....
Date of Surgery:.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm? Left Right**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the ***worst*** pain you have had from your operated on shoulder?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 How would you describe the pain you ***usually*** have from your operated on shoulder?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
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4 Have you been able to use a knife and fork at the same time?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 Have you had any trouble dressing yourself because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

10 Have you been able to wash and dry yourself under both arms?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

11 How much has pain from your operated on shoulder interfered with your usual work hobbies or recreational activities (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on shoulder in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

Patient Name: ..... **Date of Birth:**.....

Patient Address: ..... **Operating Surgeon:** .....

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We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm?** **Left** **Right**

Please circle the SIDE on which you had your surgery performed **Left** **Right**

1 How would you describe the ***worst*** pain you have had from your operated on elbow?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 Have you had any trouble dressing yourself because of your operated on elbow?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

3 Can you lift a teacup safely with your operated on arm?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
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- 0 Impossible to do

4 Have you been able to get your hand to your mouth?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
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5 Could you carry the household shopping with your operated on arm?
- 4 Yes, easily
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6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
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7 Could you brush/comb your hair with the affected arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 How would you describe the pain you ***usually*** have from your operated on elbow?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
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14 Have you been able to wash and dry yourself under both arms?
- 4 Yes, easily
- 3 With little difficulty
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15 How much has pain from your operated on elbow interfered with your usual work hobbies or recreational activities (including hobbies and housework)?
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