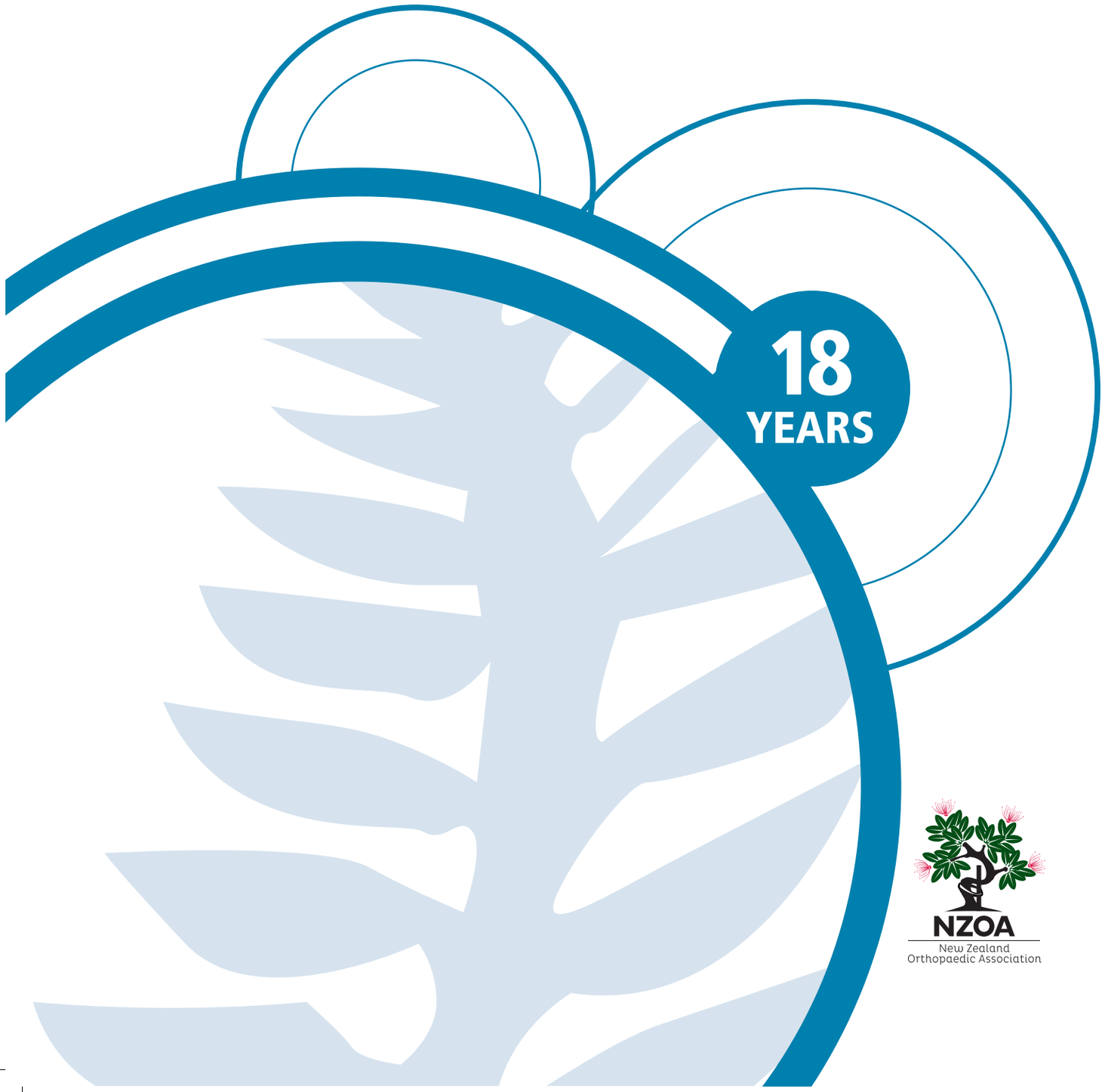
THE NEW ZEALAND JOINT REGISTRY

EIGHTEEN YEAR REPORT
JANUARY 1999 TO DECEMBER 2016



NZOA
New Zealand
Orthopaedic Association

Registry Board

Alastair Rothwell	Chairman and Registry Supervisor, Orthopaedic Surgeon
Peter Devane	Orthopaedic Surgeon
Simon Young	Orthopaedic Surgeon
Brendon Coleman	Orthopaedic Surgeon
Dawson Muir	Orthopaedic Surgeon
Andrew Oakley	Secretary New Zealand Orthopaedic Association, Orthopaedic Surgeon
Hugh Griffin	Orthopaedic Industry Liaison Association
Peter Larmer	Arthritis New Zealand
Andrea Pettett	CEO New Zealand Orthopaedic Association
Toni Hobbs	Registry Coordinator
Chris Frampton	Registry Statistician

Annual Report Editorial Committee

Alastair Rothwell	Registry Supervisor
Toni Hobbs	Registry Coordinator
Chris Frampton	Statistician
James Taylor	Hip and knee
Dawson Muir	Ankle
Khalid Mohammed	Shoulder and elbow

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

Date of Publication: October 2017

CONTENTS

EDITORIAL COMMENT

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

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.

The total number of registered joint arthroplasties at 31st of December 2016 was 259,859, which had been performed on 178,442 individual patients, of which 36,548 (21%) have died during the 18 year period.

The number of observed component years (ocys) contained within the Registry is now well in excess of one million. The increase of 20,417 registered joints for 2016 compared to the 19,586 in 2015 represents an overall annual gain of 4.2% compared to the percentage gain of 3.5%, in 2015. When compared to 2015 primary registrations the big gains were for ankles (18%); knees (6.8%); hips (4.9%) and unicompartmental knees (3.6%). There were decreases of 3.6% for shoulder and 5% for elbow registrations.

The proportion of knees to hips rose slightly from 46.4% in 2015 to 46.9% in 2016.

The mean BMIs are 31.19 (knees) and 28.92 (hips) but there are significant numbers of morbidly obese (BMI>40) people receiving arthroplasties.

As for previous years, analyses of revision data has been confined to primary registered arthroplasties.

Hip Arthroplasty

There are 118,993 primary hip arthroplasties in the Registry with an overall revision rate of 0.73 per 100 ocys (95% confidence interval; 0.71 -0.75) with a 17 year prosthesis survival of 85.10% (cemented 86.2%; uncemented 84.40% and hybrid 85.2%). In 2016, 46% of primary arthroplasties were uncemented, the same as for hybrid, with cemented at an all time low of 8%. However, the Kaplan Meier (KM) survival curves continue to demonstrate better longer term survival for fully cemented arthroplasties.

There are 1,020 hip prosthesis combinations in the Registry but only 207 (20%) with 50 or more registrations.

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 74 years. The data shows that overall the hybrid hip has the lowest revision rate.

The ceramic on plastic bearing surface continues to increase in popularity and rose to 37% of total in 2016. The proportion of the metal on metal articulation continues to decline and in 2016 was just 11% of total, all with head sizes <32 mm. The most popular head size overall remains the 32mm and in 2016 this was used in 61% of primary arthroplasties. However, the use of 36mm head sizes also increased1% in 2016, owing to the increasing use of the ceramic >36 mm head which has so far been vindicated as the revision rate remains low at a mean of 3.5 years. On the other hand, metal on metal articulations fare poorly when revision rates are analysed against head size, bearing surface materials, age bands and cemented/ uncemented/hybrid variants of the same prosthesis. Further reinforcement is from the survival curves for bearing surfaces.

In an earlier response to adverse publicity the revision rates for combinations with components manufactured from different companies (component mismatches) have been calculated for 10 "mismatches" with more than 500 implantations. Just the Spectron/Duraloc and the Exeter/Duraloc combinations have significantly higher revision rates than the overall rate of 0.73 /100 ocys @ the 95% confidence interval.

The use of cross linked polyethylene continues its upward trend, making up 91.2% of the total polyethylene in 2016.

The Corail/Pinnacle combination remains currently the most popular but the ExeterV40/ Trident combination has accumulated the most component years at 47,230 from 8,332 primary arthroplasties and has the very low revision rate of 0.45/100 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 again been calculated as well as the tables listing combinations by fixation method to make it easier for readers to determine the combination options used within the three types of prosthesis fixation. There is also the table of prosthesis combinations based on the femoral component which should help readers find specific combinations.

Three combinations, Twinsys cemented/Pinnacle, MLtaper/ TTDelta and Echo™bi-metric /ContinuumTM, which are still currently being used have revision rates significantly higher ($p<0.05$) than the overall rate of 0.73/100 ocys. All three reached the 50 implantation cut off for the first time and their very high revision rates, ranging from 7.37 to 2.40/100ocys are somewhat concerning.

It is also worth noting that the revision rate for the 1,297 monoblock stems which have been implanted for an average of 11 years is very low at 0.48/100 ocys.

Revision rates for X linked and standard polyethylene have again been compared for both metal and ceramic heads. This demonstrated that the combination of ceramic head with X linked polyethylene has a significantly lower revision rate compared to the standard polyethylene varieties used with both the metal and ceramic heads.

"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."

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 12 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.

Again this year the survival of minor (defined as replacement of liners, bearings, heads, patellae) versus major (defined as replacement of acetabular, femoral, or tibial components +/- minor components) revisions for both hips and knees have been compared. As was shown in previous years, the revision rate after a major revision is significantly better than for a minor revision for both hips and knees, thus suggesting that some minor revisions should have been full revisions.

Other analyses recently introduced, including yearly stacked graphs to demonstrate changes over the last 15 years of head size, bearing surfaces, polyethylene and reasons for revision, have again been included, as well as survival curves for; cemented/uncemented stems and cups, different head sizes, the different bearing surfaces and cross linked vs standard polyethylene. All graphically illustrate different survival trends.

Revision rate tables and survival curves for the five different BMI groupings demonstrate poorer prosthesis survival for the morbidly obese (BMI>40) group.

Resurfacing hip arthroplasty registrations continue to decline from the high of 203 in 2009 with just 70 registered in 2016. The revision rate has again fallen slightly to 1.22/100 ocys.

The number of primary hip arthroplasties revised within one year of implantation, although fluctuating year on year, has overall gradually increased and in 2016 reached 1.5% (1832) of those performed in 2015. The previous highest was 1.35% of those performed in 2007. The reasons for this increasing trend are currently being investigated. The same trend is not seen with knee arthroplasty.

The Best and the Worst Combinations

From the 18 years of accumulated data it is possible to recommend the generic component combinations which currently should provide the best long term survival. These are: acetabulum – cemented; bearing surfaces - ceramic head with X linked polyethylene liner; head size 32 mm; stem - cemented.

Conversely the component combinations to avoid are: acetabulum - uncemented metal; bearing surfaces - metal on metal; head size >= 36mm; stem - uncemented.

Knee Arthroplasty

93,497 primary knee arthroplasties have been registered totalling 593,588 ocys with the overall revision rate 0.50/100 ocys, (95% confidence interval; 0.48-0.51) and the excellent 17year survival of 92.90%.

As was done for recent annual reports 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 have also had variants but are registered as one or two prostheses.

There are 59 different types of knee prostheses in the Registry with 30 (50%) having fewer than 10 registrations.

The Triathlon remains as the current most popular prosthesis with the Attune holding second place. Calculation of revision rates for individual prostheses with a minimum of 50 arthroplasties shows that among the bigger registered numbers the Duracon, although no longer implanted, has the lowest revision rate of 0.31/100ocys. The Nexgen has the biggest number of registrations at 18,707 with 126,294 ocys and a revision rate of 0.53/100ocys. Three of the currently used prostheses, Balansys, Persona and the fully uncemented version of the LCS knee have significantly higher revision rates than the overall rate of 0.50/100 ocys @ the 95% confidence.

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. The PFC Sigma curve dropped significantly in years14 and 15.

Although uncemented knee arthroplasty represents just 4-5% of all primary knee arthroplasties it has a significantly higher revision rate 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 2016 was used in 21% of procedures, up from 15% in 2015. Comparison of revision rates for IG with non IG procedures demonstrates a rate of 0.50/100 ocys
for each.

The analyses comparing revision rates and 17 year survival of fixed versus mobile bearing knees continue to show that there is similar longer term survival for both versions.

Again this year, separate analyses for cruciate retaining versus posterior stabilised knee prostheses demonstrate that overall there are significantly higher revision rates for posterior stabilised prostheses. This is also graphically illustrated with the KM survival graphs.

There are 466 registered patello-femoral prostheses, with 49 added in 2016, compared to 61 in 2015. Forty-four (9.4%) have been revised and the revision rate at 2.06/100 ocys is four times that for total knee arthroplasty. All except five were revised to a total knee arthroplasty.

Again this year revision rate tables and survival curves are included for the five different BMI groupings and, like hip arthroplasty, the morbidly obese (BMI>40) group have statistically significant poorer prosthesis survival.

Unicompartmental knee arthroplasty

There are 10,474 registered primary unicompartmental prostheses with a total of 68,912 ocys, a mean revision rate of 1.24/100 ocys and a 15 year survival of 81.1%. Pain is the main reason for revision in almost 50% of cases. There were 838 registrations in 2016, a 3.6% increase over 2015.

Once again the Oxford uncemented prosthesis was very dominant, accounting for 60% of unicompartmental prostheses implanted in 2016. It also continues to have a low but yearly rising revision rate at 0.81/100 ocys. However, the lowest revision rate is currently the Zimmer unicompartmental prosthesis at 0.54/100 ocys. Both of these prostheses have a mean implantation time between 3 and 4 years (Oxford, 3.75 yrs; Zimmer 3.37yrs) compared to 8.6 years for the Oxford 3, which for many years was the most popular unicompartmental replacement and has a current revision rate of 1.38/100 ocys.

A KM survival curve further demonstrates the divergence of the Oxford 3 from the Oxford uncemented and Zimmer prostheses.

The use of the minimally invasive approach for the unicompartmental knee arthroplasty remains steady at approximately 25% but it actually rose to 29% in 2016. It is to be noted that the minimally invasive approach (although there is significant variation in the definition of the MIA) is associated with a significantly lower revision rate than the conventional medial parapatellar approach.

When a unicompartmental arthroplasty is converted to a total knee arthroplasty there is a significantly increased revision rate at 1.51/100ocys which is 3 times that of the primary total knee arthroplasty revision rate of 0.50 at the 95% confidence interval

The statistic is even more significant following revision of a unicompartmental to a further unicompartmental arthroplasty (11x).

Ankle arthroplasty

There are 1,380 primary registered ankle prostheses with a total of 7,655 ocys, a mean revision rate of 1.98/100 ocys and an 11 year survival of 79.5%.

There were 119 primary ankle arthroplasties registered in 2016 which was 18 more (18%) than the previous year. The Salto prosthesis totally overshadowed all others, accounting for 59% of the 2015 registrations although the Infinity, which had its debut in 2015, made the biggest gain in 2016. The Salto also has by far the lowest revision rate (1.34) with a mean implantation time of 4.3 years.

Shoulder arthroplasty

There are 8,250 registered primary shoulder prostheses with a total of 40,525 ocys, a mean revision rate of 0.99/100 ocys and a 13 year survival of 90.6%. There were 942 shoulder prostheses within 5 different categories registered during 2016, 3.6% down on 2015 which is the first annual decrease in registrations since 2010.

The stack graph showing the percentages of the different types of shoulder prostheses used per year demonstrates the evolution over time of the six categories. The reverse prostheses continue to gain in popularity and in 2016 accounted for 65% of the registered primary shoulders at the expense of the hemi and conventional total varieties.

With regard to revision rates, there is a significantly higher revision rate for Partial Resurfacing compared to all the other groups. This is also graphically illustrated in the KMs for the six different prosthesis categories. Revision rates also vary greatly among the large number of registered prostheses within the different categories but it is noteworthy that the conventional SMR with the L1 glenoid, which for some years has been among the most popular of the prosthesis options, has 3.5 times the revision rate of the long established Global; 5.5 times that of the Bigliani/Flatow and 7 times that of the Global AP conventional total prostheses.

Arthroplasties using uncemented glenoids continue to show 4 times the revision rate compared to those having cemented glenoids.

Elbow arthroplasty

There are 515 registered primary elbow prostheses with a total of 3,128 ocys, a mean revision rate of 1.12/100 ocys and a 10 year survival of 91.6%. Numbers registered in 2016 increased by 39, a decrease of 2 (5%) over 2015. The Nexel prosthesis which is the next generation of the popular Coonrad Morrey, accounted for 50% of the 2016 registrations.

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 to a conventional theatre without a space suit (1.7 & 2.5 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. In 2016 there was a dramatic reduction in the percentage of arthroplasties performed in laminar flow theatres for both hips (down 18% to 23%) and knees (down13% to 34%). There is no apparent reason for this sudden decline. There was, however minimal change in the percentage use of space suits.

Oxford 12 Questionnaire

Six month, 5, 10 and 15 year scores analyses of the individual score categories for primary hip and knee arthroplasties continue to demonstrate that the six-month score is indicative of the longer term outcome. In particular there has been no diminution for the percentage of people with residual pain and limp for both hips and knees and the ability to kneel for knees over the 15 years.

It is noteworthy that the 15 year scores still have a similar high percentage of excellent/good outcomes as the 6 month, 5 and 10 year outcomes. For the 2,452 15 year hip scores available for analysis, 86% had excellent/good scores, which compares favourably with the 84% at 6 months following primary arthroplasty. Similar findings are seen with the 1,794 available 15 year knee scores, with 79% excellent/good compared to 74% at 6 months post primary arthroplasty.

For revision arthroplasty scores at 6 months just 63% (hip) and 53% (knee) were excellent/good.

As noted in previous years, the statistically significant relationship between the six month, five and ten year scores and revision within two years of the score date for primary hips, knees (including unicompartmental) and shoulders (six months and five years only) has again been demonstrated.

With the very large number of recorded six month Oxford hip and knee scores the score groupings can be further broken down to demonstrate an even more convincing relationship between score and risk of revision within two years.

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.

This year Oxford score analyses for some of the larger number hip and knee prostheses have been undertaken and show that there is little score difference among these prostheses at six months and without exception they have higher (better) scores at five years. For all the knee scores the higher 5 year scores are not only statistically significant but also clinically significant when compared to the 6 month scores.

With regard to shoulder arthroplasty, Conventional Total and Resurfacing Head types have significantly higher six month and five year 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 as multiple podium presentations (see Appendix 2).

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

ACKNOWLEDGEMENTS

The Registry is very appreciative of the support from the following:

Canterbury District Health Board:

For accommodation and other facilities

Chris Lewis, Information Analyst, Ministry of Health:

For audit compliance information

Mike Wall, Alumni Software:

For continued monitoring and upgrading of database software

European Arthroplasty Registry:

For Logo Design

Deborah McPherson:

For formatting assistance

DH Designz:

Final design

FUNDING

The Registry wishes to acknowledge development and ongoing funding support from:

- ACCIDENT COMPENSATION CORPORATION
- CANTERBURY DISTRICT HEALTH BOARD
- MINISTRY OF HEALTH
- 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: Ruth Hanham

Dunedin Hospital
Dunedin 9016
Contact: Jennifer Larsen

Elective Surgery Centre
Takapuna 0740
Contact: Wings Chan

Gisborne Hospital
Gisborne 4010
Contact: Gretal McKenzie/ Candice Dowell

Grey Base Hospital
Greymouth 7840
Contact: Lynette Sweetman/ Arianne McKenzie

Hawkes Bay Hospital
Hastings 4120
Contact: Jacqueline Cornish

Hutt Hospital
Lower Hutt 5040
Contact: Margot Clapham/Tiria Te Aonui

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 Deoo

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

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: Jean Tutton

Waikato Hospital
Hamilton 3204
Contact: Lorraine Grainger

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 4540
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: 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: Karen Tijsen

Mercy Hospital
Dunedin 9054
Contact: Liz Cadman

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

Ormiston Hospital
Auckland 2016
Contact: Jaskaran Singh

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: Leanne Belgrave/Brendon Toole

Southern Cross North Harbour
Glenfield 0627
Contact: Sarah Young

Southern Cross Hospital
Rotorua 3015
Contact: Chris Mott

Southern Cross Hospital
Newtown, Wellington 6021
Contact: Marian Lee

St Georges Hospital
Christchurch 8014
Contact: Tania Chin

Wakefield Hospital
Newtown, Wellington 6021
Contact: Jan Kereopa

PROFILE OF THE AVERAGE NEW ZEALAND ORTHOPAEDIC SURGEON*

From our analyses, in 2016 the average orthopaedic surgeon performed:

41 Total hip arthroplasties

with 45% using uncemented,11% fully cemented and 44% hybrid prostheses; has a 86.2% survival at 16 years and a revision rate of 0.73 per 100 component years; 84% at six months, 89% at 5 years 87% at 10yrs and 86% at 15 years had an excellent or good Oxford score.

35 Total knee arthroplasties

with almost all cemented but only 12 with patellae resurfaced; has a 93.20% survival at 16 years and a revision rate of 0.49 per 100 component years; 74% at six months, 83% at 5 years, 82% at 10 years and 79% at 15 years had an excellent or good Oxford score.

11 Unicompartmental knee arthroplasties

with 57% uncemented; has an 83.29% survival at 14 years and a revision rate of 1.25 per 100 component years; 83% at six months, 88% at 5 years and 82% at ten years had an excellent or good Oxford score.

13 Shoulder arthroplasties

with a 2:1 split between reverse and total arthroplasty; 91.20% survival at 12 years and a revision rate of 1.04 per 100 component years; 69% at six months, 78% at 5 years and 73% at 10 years had excellent or good Oxford scores.

6 Total ankle arthroplasties

has an 81.43% survival at 10 years and a revision rate of 2.03 per 100 component years. Due to a change from Oxford derived to the Manchester-Oxford foot and ankle questionnaire in 2015 there are no PROM analyses.

2 Total elbow arthroplasties

has a 91.80% survival at nine years and a revision rate of 1.03 per 100 component years. Due to a change from Oxford derived to the validated Oxford elbow questionnaire in 2015 there are no PROM analyses.

Averages derived from the number of surgeons recorded performing the above procedures during 2016 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 recognizing 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.

Database

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 and 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.

In addition 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.

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 derived, but not validated, questionnaires developed for the elbow and ankle joints. All persons receiving total arthroplasty of the above joints, as well as unicompartmental knee arthroplasties, 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. In addition, any change in the pattern of returns from private hospitals is checked.

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 2016 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.

NZJR Staff

The current staff are Data Operators (1.6 FTEs); Registry coordinator (0.8 FTEs); Registry Supervisor (0.04 FTEs) and Statistician (0.04 FTEs).

NUMBER OF JOINTS ANALYSED
1ST JANUARY 1999- 31ST DECEMBER 2016

Number of procedures registered for the past 5 years

Procedure	18 years	17 years	16 years	15 years	14 years
Hip.primary	118,993	110,254	101,835	93,491	85,780
Knee.primary	93,963	86,198	78,898	71,506	64,812
Hip.revision	17,348	16,258	15,083	13,954	12,713
Knee.unicompartmental	10,474	9,636	8,826	8,114	7,388
Shoulder.primary	8,250	7,308	6,331	5,530	4,783
Knee.revision	7,390	6,742	6,122	5,580	5,092
Ankle.primary	1,380	1,261	1,160	1,058	945
Shoulder.revision	637	571	502	436	360
Elbow.primary	515	476	435	409	387
Cervical disc.primary	347	314	268	224	200
Ankle.revision	201	179	161	141	116
Lumbar disc.primary	156	153	151	149	142
Elbow.revision	90	81	78	70	67
Lumbar disc.revision	6	6	4	3	3
Cervical disc.revision	3	2	2	1	1
TOTAL	**259,859**	**239,442**	**219,856**	**200,666**	**182,789**

Bilateral joint replacements carried out under the same anaesthetic

Bilateral hips

2,249 patients (4,498 hips) 4% of primary hips

Bilateral knees

3,755 patients (7,510 knees) 8% of primary knees

Bilateral Unicompartmental knees

821 patients (1,642 knees) 16% of unicompartmental knees

Bilateral ankles

2 patients (4 ankles)

Bilateral shoulders

4 patients (8 shoulders)

During the 18 year period 178,442 individual patients were registered, of which 36,548 (21%) have died.

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

HIP ARTHROPLASTY

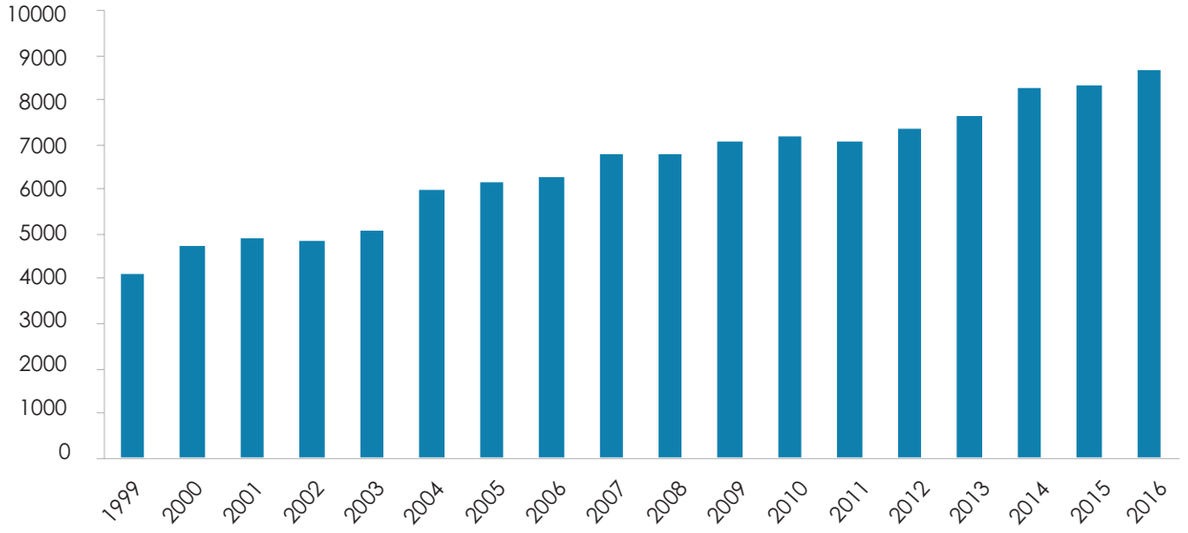
PRIMARY HIP ARTHROPLASTY

The **eighteen-year** report analyses data for the period January 1999 – December 2016. There were 118,993 primary hip procedures registered including 1,665 resurfacing arthroplasties. This is an additional 8,785 compared to last year's report and represents a 4.9% increase compared to the 0.3% for 2015.

Numbers of primary hips registered by Year

1999	4,114
2000	4,715
2001	4,932
2002	4,830
2003	5,058
2004	6,029
2005	6,322
2006	6,430
2007	6,962
2008	7,004
2009	7,306
2010	7,366
2011	7,220
2012	7,491
2013	7,711
2014	8,345
2015	8,373
2016	8,785

Number of operations by year



Data Analysis

Age and sex distribution

The average age for all patients with primary hip arthroplasty was 66.99 years, with a range of 13.43 – 100.95 years.

All hip arthroplasty

	Female	Male
Number	62,878	56,114
Percentage	52.84	47.16
Mean age	68.42	65.34
Maximum age	100.95	99.62
Minimum age	13.43	15.86
Standard dev.	11.51	11.50

Conventional hip arthroplasty

	Female	Male
Number	62,620	54,707
Percentage	53.37	46.63
Mean age	68.50	65.72
Maximum age	100.95	99.62
Minimum age	13.43	15.86
Standard dev.	11.46	11.36

Resurfacing hip arthroplasty

	Female	Male
Number	258	1,407
Percentage	15.50	84.50
Mean age	50.07	52.06
Maximum age	65.88	75.69
Minimum age	25.72	17.74
Standard dev.	7.15	8.50

Annual numbers for Resurfacing hips

2004	21
2005	138
2006	169
2007	188
2008	191
2009	203
2010	185
2011	142
2012	102
2013	90
2014	89
2015	77
2016	70

Body Mass Index

For the seven year period 2010 - 2016, there were 35,120 BMI registrations for primary hip replacements. The average was 28.92 with a range of 14 – 64.3 and a standard deviation of 5.61.

Previous operation

None	114,151
Internal fixation	2,215
Osteotomy	617
Arthrodesis	86

Diagnosis

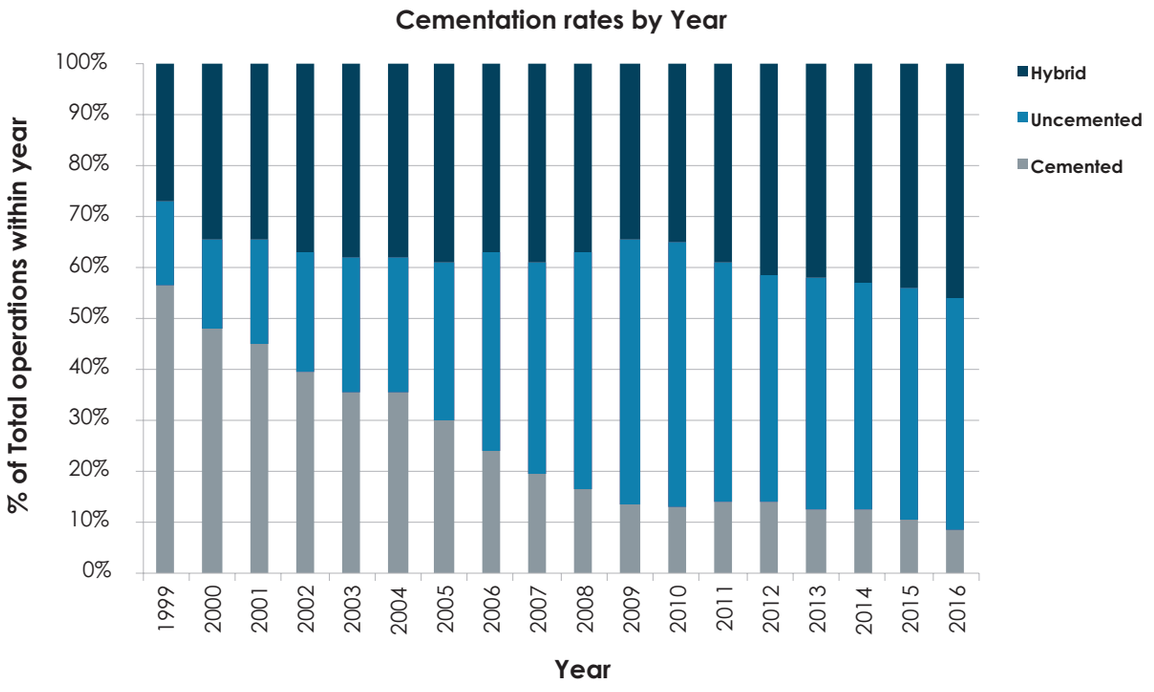
Osteoarthritis	104,115
Acute fracture NOF	4,449
Avascular necrosis	3,639
Developmental dysplasia	2,612
Rheumatoid arthritis	1,539
Old fracture NOF	1,438
Other inflammatory	860
Tumour	559
Post-acute dislocation	332

Approach

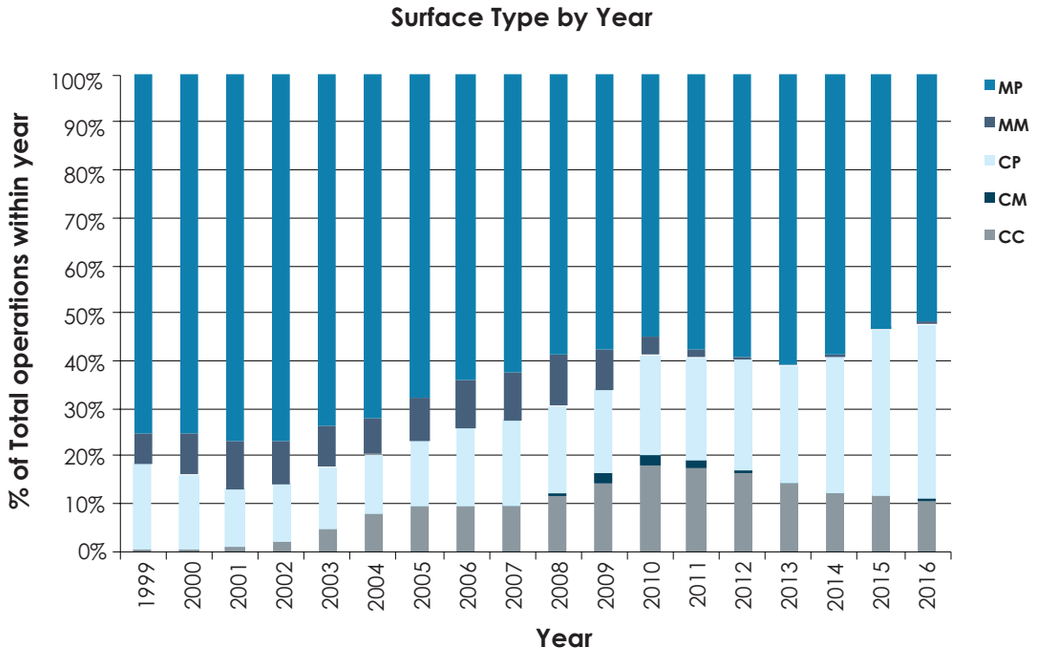
Posterior	77,234
Lateral	30,142
Anterior	4,245
Minimally invasive	1,844
Trochanteric osteotomy	205
Image guided surgery	507

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

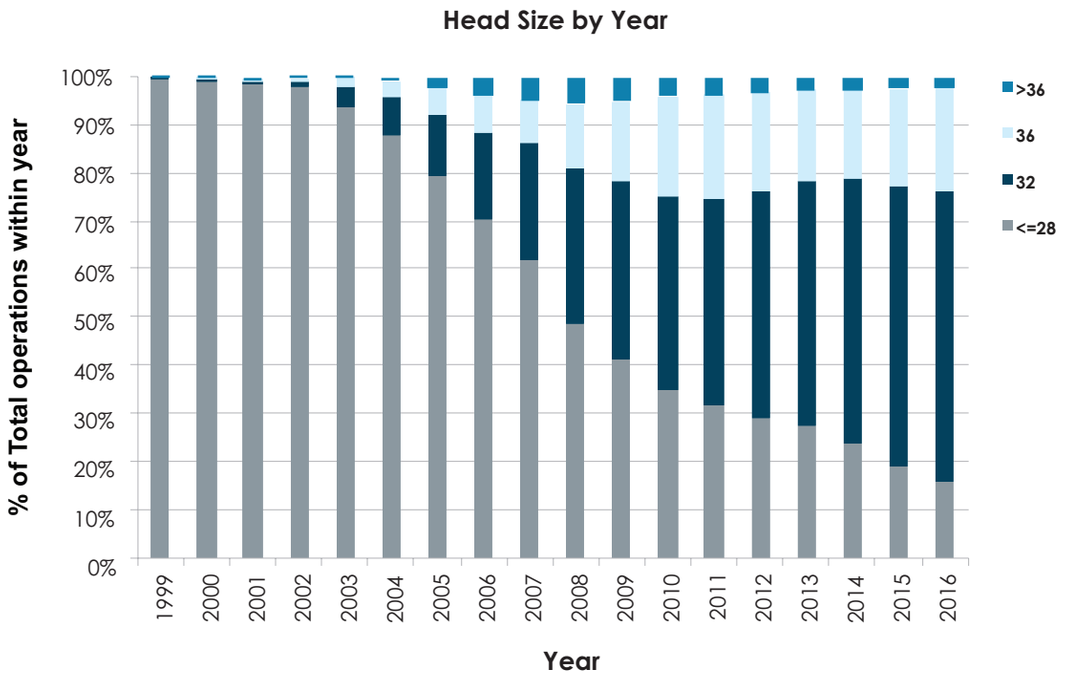


Comparison of different bearing surface usage over time



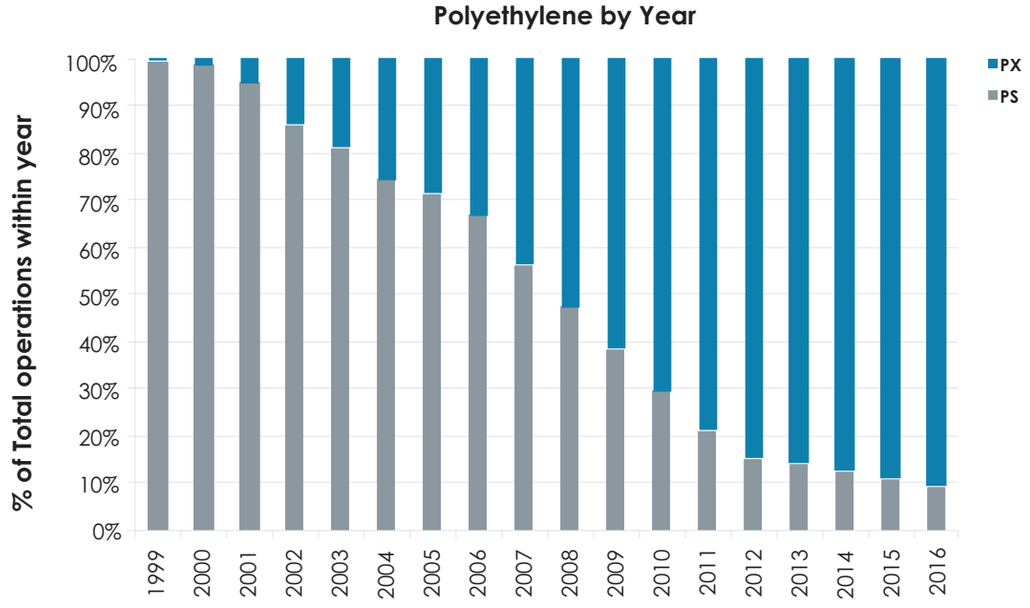
MP = metal/polyethylene; MM = metal/metal; CP = ceramic/polyethylene; CM = ceramic/metal & CC = ceramic/ceramic.

Comparison of head size usage over time



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

Comparison usage of standard vs cross linked polyethylene over time



PS = standard & PX = cross linked polyethylene

Bone graft

Femoral autograft	232
Femoral allograft	46
Femoral synthetic	8
Acetabular autograft	939
Acetabular allograft	123
Acetabular synthetic	6

Cement

Femur cemented	72,252 (61%)
Antibiotic in cement	47,933 (66%
Acetabulum cemented	26,660 (22%)
Antibiotic in cement	16,667 (63%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic:	114,103 (96%)

A cephalosporin was used in 89% of patients.

Operating theatre

Conventional	73,056
Laminar flow	44,097
Space suits	34,927

In 2016, 23% of arthroplasties were performed in laminar flow theatres, drastically down from 41% in 2015, and 31% were performed with space suits, the same as for 2015.

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	14,236	17
2	50,600	61
3	19,663	21
4	717	1

For the twelve-year period 2005 – 2016, there were 82,516 (92%) 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 twelve-year period 2005 – 2016.

Consultant	77,651
Advanced trainee supervised	7,380
Advanced trainee unsupervised	2,406
Basic trainee	1,754

Prosthesis usage

Conventional primary hips

Top 10 femoral components used in 2016

Exeter V40	3,229
Corail	1,241
C-Stem AMT	435
Stemsys	393
CPT	347
Accolade II	317
Twinsys uncemented	309
Polarstem uncemented	260
MS 30	256
CLS	244

The CLS and Polarstem uncemented replaced the Twinsys cemented and the Synergy Porous in the 2016 top10.

Top 10 acetabular components used in 2016

Pinnacle	1,953
RM Pressfit	1,088
Trident	1,077
Continuum TM	978
R3 porous	609
Tritanium	568
Fitmore	444
Trilogy	336
Contemporary	250
Exeter X3	238

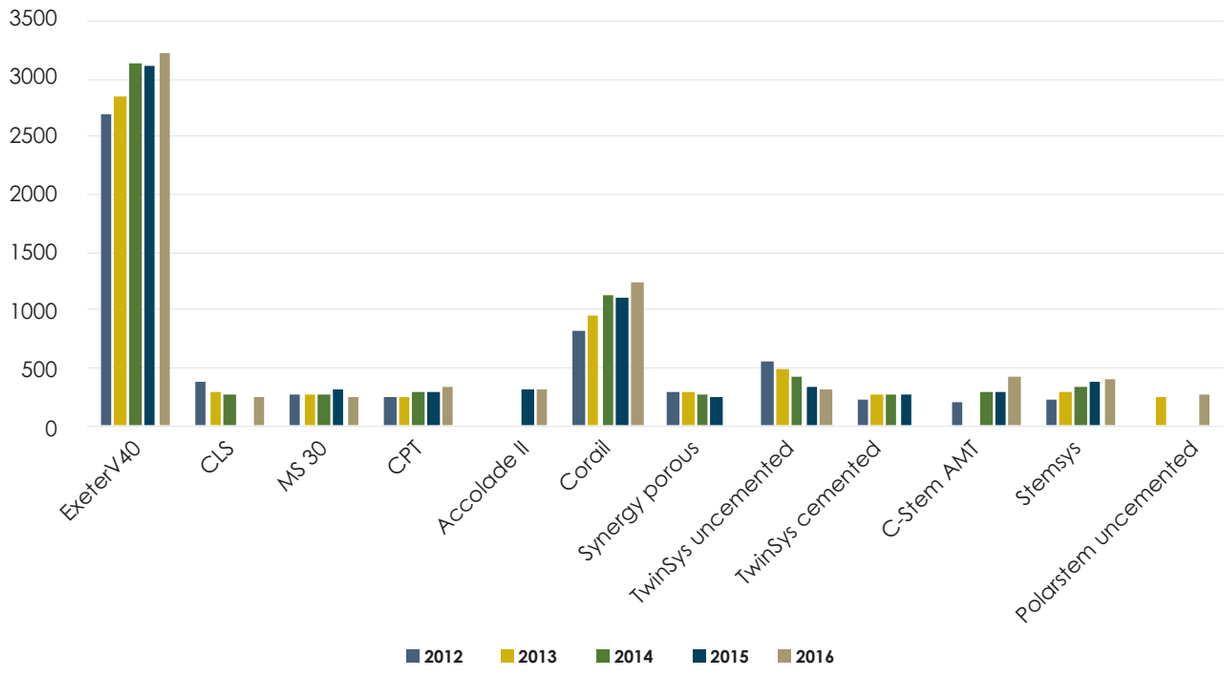
No change in the top 10 from 2015 but Continuum TM has dropped 2 places.

Top ten combinations used in 2016

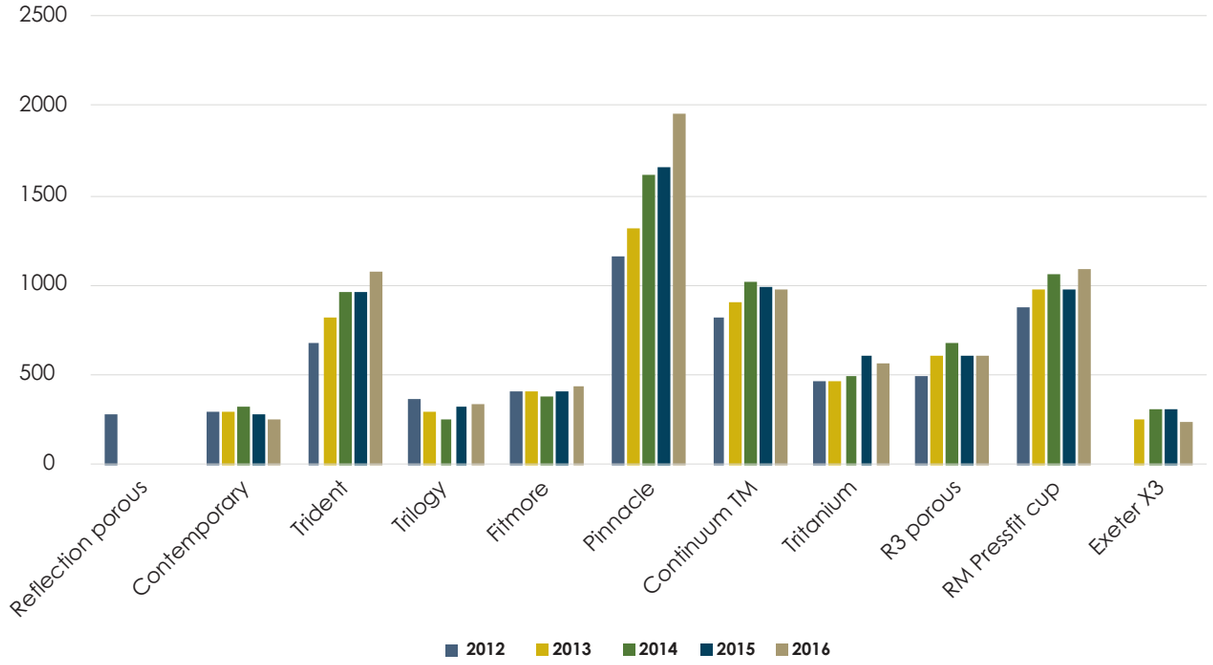
Femur	Acetabulum	All Years	2016
Corail	Pinnacle	7,486	1,051
Exeter V40	Trident	8,332	889
Exeter V40	Tritanium	2,255	416
C-Stem AMT	Pinnacle	1,598	358
Exeter V40	Continuum TM	1,962	306
Exeter V40	RM Pressfit cup	1,772	305
TwinSys uncemented	RM Pressfit cup	4,359	296
Exeter V40	Pinnacle	1,868	260
Polarstem uncemented	R3 porous	989	255
Exeter V40	Contemporary	6,178	246

The only change from 2015 is that the Exeter V 40/RM Pressfit cup has replaced the Exeter V 40/Exeter X3.

Most used femoral components per year for five years, 2012- 2016

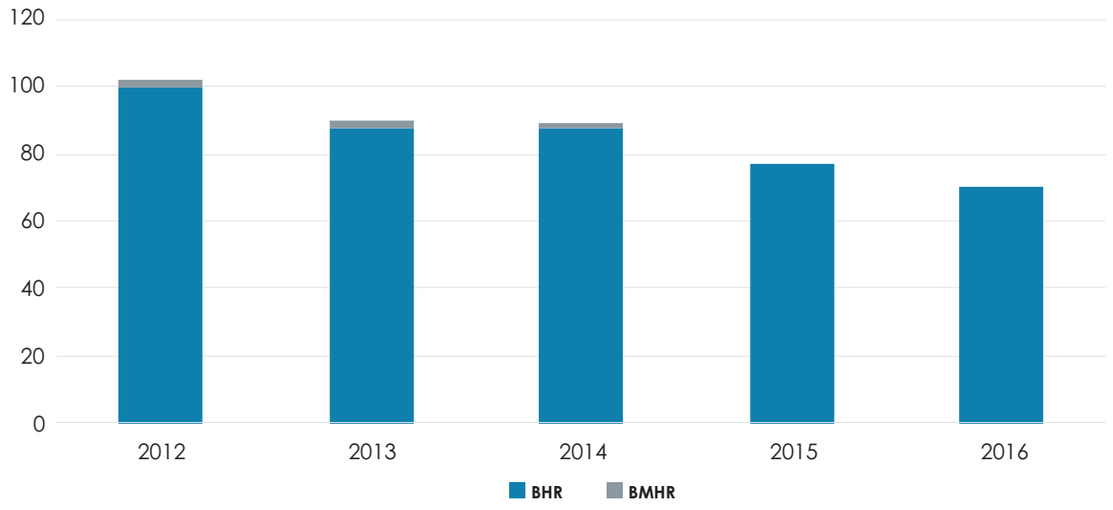


Most used acetabular components per year for five years (2012 - 2016)



Resurfacing hips components used in 2016	
BHR	70

Resurfacing Components for five years (2012-2016)



Surgeon and Hospital Workload

Surgeons

In 2016, 221 surgeons performed 8,785 total hip replacements, an average of 40 procedures per surgeon.

38 surgeons performed less than 10 procedures and 60 performed more than 50.

Hospitals

In 2016, primary hip replacement was performed in 51 hospitals, 27 public and 24 private.

The average number of total hip replacements per hospital was 171.

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 eighteen-year period January 1999 – December 2016, there were 17,348 revision hip procedures registered. This is an additional 1,097 compared to last year's report.

The average age for a revision hip replacement was 70.08 years, with a range of 17.52–100.28 years.

Revision hips

	Female	Male
Number	8,369	8,979
Percentage	48.24	51.76
Mean age	70.31	69.87
Maximum age	100.28	97.17
Minimum age	17.52	25.68
Standard dev.	12.04	10.84

The percentage of revision hips to primary hips is 12% and the ratio is 1:8.

Body Mass Index

For the 7 year period 2010 – 2016, there were 2,511 BMI registrations for revision hip replacements. The average BMI was 28.92 with a range of 15- 55 with a standard deviation of 5.65.

Revision of Registered Primary Hip Arthroplasties

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

There were 5,714 revisions of the 117,327 primary conventional hip replacements (4.9%) and 134 revisions of the 1,665 resurfacing hip replacements (8%) a total of 5,848 revisions.

Conventional hip arthroplasty analyses

Time to revision for conventional hips

Mean	1,963 days
Maximum	6,415 days
Minimum	0 days
Standard deviation	1,674 days

Reason for revision

Dislocation	1,284
Loosening acetabular component	1,246
Loosening femoral component	965
Pain	810
Deep infection	684
Fracture femur	616

Analysis of the six main reasons for revision by year after primary procedure

Years	Dislocation		Loosening Acetabulum		Loosening Femur		Deep infection		Pain		Fracture Femur	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	548	42.68	138	11.03	92	9.48	285	41.67	67	8.22	219	35.55
1	152	11.84	74	5.92	76	7.84	93	13.60	89	10.92	39	6.33
2	111	8.64	71	5.68	67	6.91	64	9.36	79	9.69	39	6.33
3	88	6.85	79	6.31	61	6.29	47	6.87	63	7.73	33	5.36
4	55	4.28	67	5.36	60	6.19	33	4.82	59	7.24	43	6.98
5	61	4.75	73	5.84	61	6.29	29	4.24	64	7.85	28	4.55
6	54	4.21	91	7.27	84	8.66	27	3.95	61	7.48	25	4.06
7	41	3.19	82	6.55	78	8.04	19	2.78	47	5.77	27	4.38
8	42	3.27	92	7.35	62	6.39	24	3.51	53	6.50	29	4.71
9	20	1.56	104	8.31	62	6.39	23	3.36	42	5.15	32	5.19
10	26	2.02	74	5.92	72	7.42	15	2.19	41	5.03	25	4.06
11	19	1.48	78	6.24	57	5.88	7	1.02	50	6.13	21	3.41
12	29	2.26	69	5.52	51	5.26	5	0.73	26	3.19	18	2.92
13	13	1.01	66	5.28	34	3.51	5	0.73	21	2.58	11	1.79
14	14	1.09	32	2.56	22	2.27	2	0.29	20	2.45	17	2.76
15	9	0.70	28	2.24	16	1.65	4	0.58	16	1.96	6	0.97
16	2	0.16	28	2.24	10	1.03	2	0.29	12	1.47	4	0.65
Total	**1,284**	**100.00**	**1,246**	**100.00**	**965**	**100.00**	**684**	**100.00**	**810**	**100.00**	**616**	**100.00**

The total number of 5605 for the 6 main reasons for revision is inflated to some extent because, as noted above, there is often more than one listed reason for revision and all are entered.

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

	Dislocation	Loosening Acetabulum	Loosening Femur	Deep infection	Pain	Fracture Femur
	%	%	%	%	%	%
1999	54.5	3.0	6.1	9.1	6.1	3.0
2000	61.8	7.3	10.9	16.4	5.5	3.6
2001	56.0	9.5	2.4	19.0	10.7	4.8
2002	44.9	20.2	7.9	14.6	16.9	3.4
2003	42.3	25.4	10.0	17.7	8.5	8.5
2004	33.8	20.9	20.3	17.6	9.5	9.5
2005	34.1	19.2	16.2	15.6	9.0	7.2
2006	32.7	22.0	21.5	9.8	7.9	8.9
2007	29.5	24.3	18.3	14.9	7.5	9.3
2008	24.9	26.7	19.5	11.2	10.0	12.2
2009	22.2	29.6	20.5	10.1	10.4	11.8
2010	21.6	25.8	19.6	12.2	16.6	10.9
2011	20.7	22.6	17.2	8.8	20.7	10.3
2012	17.3	23.9	16.7	8.7	18.4	9.9
2013	15.9	21.9	17.2	10.3	18.5	9.1
2014	15.6	18.8	17.2	11.1	13.3	12.7
2015	16.4	20.1	16.4	14.3	16.3	12.7
2016	16.9	17.8	15.2	13.1	13.5	14.4

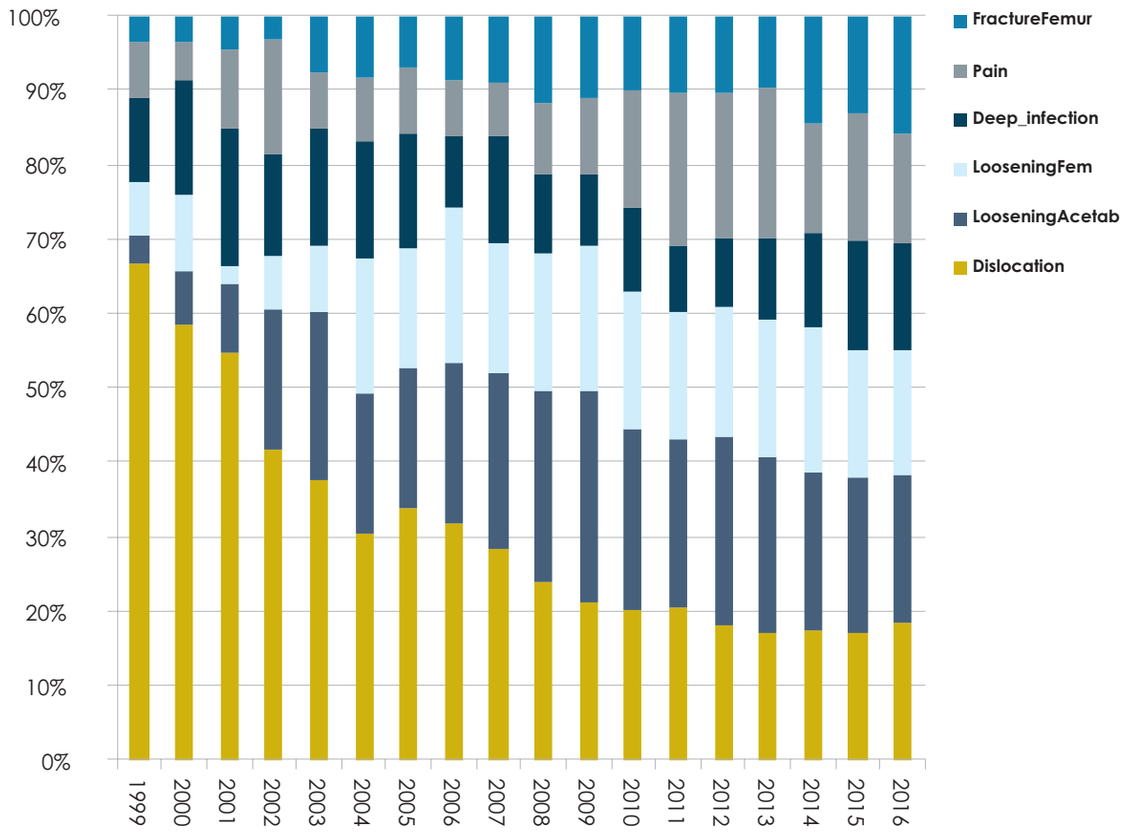
NB each year cross column does not add up to 100% as often more than one cause for revision is listed and there are other reasons for revision other than the six above listed in the registry.

Analyses of the numbers of the six main reasons for revision by year

	Dislocation	Loosening Acetabulum	Loosening Femur	Deep infection	Pain	Fracture Femur	Totals
	No.	No.	No.	No.	No.	No.	
1999	18	1	2	3	2	1	27
2000	34	4	6	9	3	2	58
2001	47	8	2	16	9	4	86
2002	40	18	7	13	15	3	96
2003	55	33	13	23	11	11	146
2004	50	31	30	26	14	14	165
2005	57	32	27	26	15	12	169
2006	70	47	46	21	17	19	220
2007	79	65	49	40	20	25	278
2008	82	88	64	37	33	40	344
2009	81	108	75	37	38	43	382
2010	87	104	79	49	67	44	430
2011	106	116	88	45	106	53	514
2012	91	126	88	46	97	52	500
2013	94	130	102	61	110	54	551
2014	87	105	96	62	74	71	495
2015	102	125	102	89	101	79	598
2016	104	110	94	81	83	89	561
Total	**1,284**	**1,251**	**970**	**684**	**815**	**616**	**5,620**

The number of revisions of primary hips has increased year on year. The total number of 5,620 is inflated to some extent because, as noted above, there is often more than one listed reason for revision and all are entered.

Comparison of the 6 main reasons for revision over time



Resurfaced Hip Analyses

There were 1,665 resurfacing hips registered for the period 2000 – 2016, and 134 (8%) have been revised.

Time to revision for resurfaced hips

Mean	1,886 days
Maximum	4,128 days
Minimum	10 days
Standard deviation	1,060 days

Reason for revision

Pain	44
Loosening acetabulum	16
Deep infection	14
Loosening femoral component	15
Fracture femur	12
Dislocation	2

Statistical note

n 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

Primary Hip Arthroplasties

All Primary Total Hip Arthroplasties (excluding Resurfacing arthroplasties)

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
117,327	782,387.5	5,714	0.73	0.71	0.75

There are 1,020 hip prosthesis combinations in the Registry; 607 (60%) have 10 or fewer registered procedures and 316 (31%) one only.

The tables below contain the analyses of the 207 (20%) 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 registrations)

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	8,332	47,229.3	211	0.45	0.39	0.51
Corail	Pinnacle	7,486	31,767.0	211	0.66	0.58	0.76
Exeter V40	Contemporary	6,178	41,880.4	192	0.46	0.40	0.53
TwinSys uncemented	RM Pressfit cup	4,359	21,970.9	139	0.63	0.53	0.75
Spectron	Reflection cemented	2,945	27,800.5	308	1.11	0.99	1.24
Spectron	Reflection porous	2,736	24,159.4	190	0.79	0.68	0.91
Exeter V40	Trilogy	2,487	15,385.4	65	0.42	0.33	0.54
Exeter V40	Tritanium	2,255	6,356.8	53	0.83	0.62	1.09
CLS	Fitmore	2,201	19,496.3	96	0.49	0.40	0.60
Exeter V40	Continuum TM	1,962	5,905.0	57	0.97	0.72	1.24
Exeter V40	Pinnacle	1,868	7,915.6	38	0.48	0.34	0.66
Accolade	Trident	1,860	17,345.4	88	0.51	0.41	0.63
Summit	Pinnacle	1,846	9,632.8	82	0.85	0.67	1.05
MS 30	Fitmore	1,826	10,809.3	34	0.31	0.22	0.44
Exeter V40	RM Pressfit cup	1,772	7,301.2	22	0.30	0.19	0.46
CLS	Morscher	1,682	20,127.7	97	0.48	0.39	0.59
Exeter V40	Exeter	1,636	13,802.7	73	0.53	0.41	0.66
C-Stem AMT	Pinnacle	1,598	4,609.9	39	0.85	0.60	1.16
Exeter	Contemporary	1,546	17,339.3	169	0.97	0.83	1.13
Exeter V40	Exeter X3	1,534	4,142.2	20	0.48	0.29	0.75
TwinSys cemented	RM Pressfit cup	1,446	5,813.4	30	0.52	0.34	0.73
Synergy Porous	R3 porous	1,439	4,825.2	47	0.97	0.72	1.30
Exeter	Exeter	1,324	14,318.2	105	0.73	0.60	0.89
CLS	CLS Expansion	1,261	13,892.1	106	0.76	0.62	0.92
TwinSys uncemented	Selexys TPS	1,227	8,310.7	108	1.30	1.06	1.56
Synergy Porous	Reflection porous	1,201	9,652.4	38	0.39	0.28	0.54
Spectron	Duraloc	1,138	12,641.1	157	1.24	1.05	1.45
CPT	Continuum TM	1,022	2,687.7	30	1.12	0.75	1.59

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Polarstem uncemented	R3 porous	989	2,129.5	15	0.70	0.39	1.16
Exeter V40	Duraloc	979	9,469.0	85	0.90	0.71	1.10
Exeter V40	Reflection cemented	851	4,338.6	16	0.37	0.21	0.60
CPT	Trilogy	831	5,272.5	48	0.91	0.67	1.21
Exeter	Osteolock	812	9,967.0	67	0.67	0.52	0.85
MS 30	Morscher	787	8,821.0	57	0.65	0.48	0.83
CCA	CCB	754	5,406.4	24	0.44	0.28	0.66
Lateral straight stem	Muller PE cup	748	6,733.6	36	0.53	0.37	0.74
Exeter V40	Fitmore	748	3,076.0	6	0.20	0.07	0.42
M/L Taper	Continuum TM	743	2,433.3	23	0.95	0.58	1.39
CLS	Duraloc	694	8,182.8	75	0.92	0.72	1.15
Exeter V40	Morscher	628	6,338.3	30	0.47	0.32	0.68
Standard straight stem	Muller PE cup	623	5,254.4	18	0.34	0.20	0.53
Elite plus	Duraloc	598	6,304.9	99	1.57	1.28	1.91
H-Max S	Delta-TT Cup	556	1,659.2	16	0.96	0.53	1.53
Exeter	Morscher	549	7,510.3	32	0.43	0.29	0.60
CLS	Continuum TM	545	1,712.9	16	0.93	0.51	1.48
CPT	ZCA	542	5,049.5	29	0.57	0.38	0.82
Accolade II	Tritanium	540	946.9	4	0.42	0.12	1.08
Exeter	Duraloc	539	7,064.5	96	1.36	1.10	1.66
Stemsys	Fixa Ti Por	538	1,484.4	8	0.54	0.23	1.06
Lateral straight stem	RM cup	533	4,582.5	38	0.83	0.59	1.14
CLS	Trilogy	532	3,204.7	17	0.53	0.31	0.85
CLS	RM Pressfit cup	510	2,902.5	20	0.69	0.41	1.04
Exeter V40	CCB	500	2,203.6	8	0.36	0.14	0.69
Exeter V40	Reflection porous	474	3,316.5	10	0.30	0.13	0.53
Accolade II	Trident	462	892.7	6	0.67	0.21	1.39
MS 30	Muller PE cup	459	4,163.4	14	0.34	0.18	0.56
Corail	Duraloc	455	4,402.0	42	0.95	0.69	1.29
Exeter V40	R3 porous	443	1,232.7	8	0.65	0.25	1.28
Trabecular Metal Stem	Continuum TM	415	1,345.6	16	1.19	0.68	1.93
TwinSys cemented	CCB	404	1,814.2	12	0.66	0.34	1.16
Spectron	R3 porous	404	1,712.3	5	0.29	0.08	0.64
CBC Stem	RM Pressfit cup	394	1,956.2	19	0.97	0.58	1.52
Versys cemented	ZCA	389	3,800.9	24	0.63	0.39	0.92
Stemsys	DeltaMotion Cup	382	1,550.5	5	0.32	0.09	0.71
TwinSys uncemented	Delta-PF Cup	363	2,237.7	1	0.04	0.00	0.21
S-Rom	Pinnacle	352	2,976.0	31	1.04	0.71	1.48

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Reflection porous	340	2,380.8	17	0.71	0.42	1.14
ABGII	Trident	336	3,413.6	25	0.73	0.47	1.08
Stemsys	Agilis Ti-por	335	749.1	6	0.80	0.25	1.65
Polarstem uncemented	Reflection porous	329	1,471.7	13	0.88	0.47	1.51
SL modular stem	RM cup	322	4,233.3	35	0.83	0.57	1.14
MS 30	Continuum TM	312	921.0	6	0.65	0.24	1.42
Elite plus	Charnley	297	3,451.2	21	0.61	0.37	0.91
C-Stem AMT	Marathon cemented	296	1,302.4	7	0.54	0.22	1.11
Lateral straight stem	Weber	287	2,641.2	9	0.34	0.16	0.65
MS 30	Trilogy	282	1,433.2	4	0.28	0.08	0.71
Elite plus	Elite Plus LPW	280	2,824.6	12	0.42	0.22	0.74
Versys	Trilogy	272	3,495.2	16	0.46	0.26	0.74
Stemsys	RM Pressfit cup	261	678.4	4	0.59	0.16	1.51
Exeter V40	Osteolock	260	2,796.4	13	0.46	0.23	0.77
Versys cemented	Trilogy	231	2,379.1	7	0.29	0.12	0.61
Stemsys	Delta-PF Cup	226	389.6	1	0.26	0.01	1.43
Corail	Continuum TM	225	595.3	4	0.67	0.18	1.72
Corail	Fitmore	212	387.6	4	1.03	0.28	2.64
Spectron	Morscher	209	2,553.6	26	1.02	0.65	1.47
M/L Taper	Trilogy	209	1,467.0	9	0.61	0.26	1.12
TwinSys uncemented	Trilogy	208	1,449.1	8	0.55	0.24	1.09
CPCS	R3 porous	208	427.2	2	0.47	0.03	1.50
Exeter	Trilogy	206	2,600.6	14	0.54	0.29	0.90
CPT	Duraloc	201	2,164.3	14	0.65	0.34	1.06
CLS	Durom	198	1,688.3	50	2.96	2.17	3.87
CLS	Allofit	192	1,625.1	18	1.11	0.66	1.75
CBC Stem	Expansys shell	183	1,554.4	23	1.48	0.94	2.22
Exeter V40	Trabecular Metal Shell	181	781.3	10	1.28	0.57	2.27
Accolade	Pinnacle	179	1,292.9	2	0.15	0.02	0.56
Lateral straight stem	RM Pressfit cup	173	1,011.0	3	0.30	0.06	0.87
Avenir Muller uncemented	Continuum TM	170	765.8	10	1.31	0.63	2.40
CPT	Fitmore	164	752.9	9	1.20	0.55	2.27
Corail	Trilogy	163	614.8	2	0.33	0.04	1.18
Friendly	Delta-PF Cup	162	1,352.0	5	0.37	0.10	0.81
CLS	Trident	160	1,539.7	12	0.78	0.40	1.36
M/L Taper	Trident	158	359.0	3	0.84	0.17	2.44
Corail	ASR	156	1,057.0	77	7.28	5.75	9.10
Accolade	Tritanium	151	781.4	2	0.26	0.03	0.92

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Summit	Trilogy	150	1,016.7	5	0.49	0.13	1.08
Echo(TM) Bi-metric	G7 acetabular shell	149	265.3	2	0.75	0.09	2.72
Spectron	Mallory-Head	148	1,549.1	7	0.45	0.18	0.93
TwinSys cemented	RM cup	148	1,241.6	4	0.32	0.09	0.82
Omnifit	Trident	145	1,544.5	12	0.78	0.40	1.36
CPT	Trident	142	1,358.4	11	0.81	0.40	1.45
Exeter V40	Delta-TT Cup	140	396.5	2	0.50	0.06	1.82
Standard straight stem	RM cup	138	1,382.5	10	0.72	0.35	1.33
Exeter V40	Bio-clad poly	138	806.0	5	0.62	0.20	1.45
Corail	Reflection porous	138	1,102.7	1	0.09	0.00	0.51
Standard straight stem	RM Pressfit cup	137	915.5	1	0.11	0.00	0.61
Corail	Tritanium	136	528.1	5	0.95	0.31	2.21
H-Max S	Delta-PF Cup	135	242.1	4	1.65	0.45	4.23
CCA	RM Pressfit cup	134	1,110.4	4	0.36	0.10	0.92
Standard straight stem	Weber	134	1,202.5	4	0.33	0.09	0.85
ABGII	Duraloc	132	1,657.5	32	1.93	1.32	2.73
S-Rom	ASR	130	733.1	94	12.82	10.36	15.69
TwinSys uncemented	Continuum TM	130	578.4	3	0.52	0.11	1.52
MS 30	Contemporary	128	1,141.6	8	0.70	0.30	1.38
Exeter	CLS Expansion	124	1,434.5	9	0.63	0.26	1.15
Exeter V40	Monoblock Acetabular Cup	123	1,394.8	5	0.36	0.12	0.84
TwinSys uncemented	RM cup	122	811.5	4	0.49	0.13	1.26
Corail	RM Pressfit cup	119	255.1	3	1.18	0.24	3.44
Exeter	Muller PE cup	119	1,382.8	6	0.43	0.16	0.94
ABG	Duraloc	115	1,721.0	34	1.98	1.37	2.76
Accolade	Muller PE cup	114	1,091.7	3	0.27	0.06	0.80
Synergy Porous	BHR Acetabular Cup	113	891.2	27	3.03	1.95	4.34
CLS	RM cup	113	1,021.7	15	1.47	0.82	2.42
Exeter	Bio-clad poly	113	1,213.6	6	0.49	0.16	1.02
Elite plus	Elite Plus Ogee	110	1,016.6	6	0.59	0.22	1.28
Prodigy	Duraloc	108	1,312.4	20	1.52	0.93	2.35
Mallory-Head	M2A	105	1,076.9	13	1.21	0.64	2.06
ABGII	Delta-PF Cup	105	1,091.1	10	0.92	0.41	1.63
Avenir Muller uncemented	RM cup	105	642.9	1	0.16	0.00	0.87
Basis	Reflection porous	103	655.3	1	0.15	0.00	0.85
Avenir Muller uncemented	Pinnacle	99	617.4	3	0.49	0.07	1.30
Summit	Duraloc	99	1,031.6	5	0.48	0.16	1.13

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Lateral straight stem	ZCA	98	623.0	1	0.16	0.00	0.89
Corail	Monoblock Acetabular Cup	95	778.0	4	0.51	0.14	1.32
Exeter V40	ZCA all-poly cup	95	272.7	0	0.00	0.00	1.35
Exeter V40	Muller PE cup	94	820.9	3	0.37	0.08	1.07
MS 30	ZCA all-poly cup	94	356.0	0	0.00	0.00	1.04
Anthology Porous	BHR Acetabular Cup	93	630.3	32	5.08	3.41	7.17
C-Stem AMT	RM Pressfit cup	92	283.7	3	1.06	0.22	3.09
CPT	ZCA all-poly cup	91	319.8	1	0.31	0.01	1.74
Avenir Muller uncemented	Tritanium	91	489.9	0	0.00	0.00	0.75
MS 30	RM Pressfit cup	89	662.5	4	0.60	0.16	1.55
Summit	ASR	88	646.9	33	5.10	3.51	7.16
Exeter V40	CLS Expansion	88	924.0	1	0.11	0.00	0.60
Synergy Porous	Delta-PF Cup	88	611.6	0	0.00	0.00	0.60
TwinSys cemented	Continuum TM	88	213.2	0	0.00	0.00	1.73
CPT	Tritanium	84	451.0	6	1.33	0.49	2.90
Exeter V40	ZCA	84	478.6	1	0.21	0.01	1.16
CPT	Monoblock Acetabular Cup	83	810.5	7	0.86	0.35	1.78
H-Max M	Delta-TT Cup	83	480.4	2	0.42	0.05	1.50
SL modular stem	Muller PE cup	83	1,031.7	2	0.19	0.02	0.70
Contemporary	Contemporary	81	969.1	11	1.14	0.57	2.03
Exeter	Trident	81	1,097.3	0	0.00	0.00	0.34
CLS	Monoblock Acetabular Cup	80	719.8	4	0.56	0.15	1.42
S-Rom	Ultima	78	1,109.3	12	1.08	0.56	1.89
Lateral straight stem	Continuum TM	78	338.6	2	0.59	0.07	2.13
Spectron	Fitmore	77	893.1	4	0.45	0.12	1.15
Corail	Delta-PF Cup	77	732.4	1	0.14	0.00	0.76
AML MMA	Duraloc	74	937.5	9	0.96	0.44	1.82
Trabecular Metal Stem	Monoblock Acetabular Cup	74	684.0	3	0.44	0.06	1.17
Corail	DeltaMotion Cup	74	359.0	0	0.00	0.00	1.03
CCA	Contemporary	73	728.9	10	1.37	0.66	2.52
Corail	Trident	73	324.4	3	0.92	0.19	2.70
CLS	Pinnacle	73	455.2	1	0.22	0.01	1.22
CLS	Tritanium	72	216.4	3	1.39	0.29	4.05
Spectron	Trident	72	732.1	3	0.41	0.08	1.20
Wagner cone stem	Fitmore	71	676.2	3	0.44	0.09	1.30
H-Max M	Delta-PF Cup	70	419.4	7	1.67	0.67	3.44
Lateral straight stem	ZCA all-poly cup	70	303.6	0	0.00	0.00	1.22

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
ABG	ABGII	69	985.8	15	1.52	0.85	2.51
Lateral straight stem	Trilogy	68	469.5	9	1.92	0.88	3.64
Spectron	Biomex acet shell porous	68	931.5	3	0.32	0.07	0.94
Anthology Porous	R3 porous	66	420.2	28	6.66	4.43	9.63
Stemsys	Polymax	66	65.4	1	1.53	0.04	8.52
Spectron	Muller PE cup	66	629.7	7	1.11	0.40	2.18
ABGII	Pinnacle	65	522.6	3	0.57	0.12	1.68
TwinSys cemented	Selexys TPS	64	354.9	5	1.41	0.46	3.29
Friendly	Delta-TT Cup	64	296.8	4	1.35	0.37	3.45
Taperloc Complete	G7 acetabular shell	64	47.7	0	0.00	0.00	7.73
M/L Taper	Delta-TT Cup	63	208.7	5	2.40	0.78	5.59
CPT	Pinnacle	63	431.4	2	0.46	0.06	1.67
C-Stem	Marathon cemented	63	170.0	0	0.00	0.00	2.17
Tri-Lock BPS	Pinnacle	62	309.9	3	0.97	0.13	2.58
Furlong	Furlong	62	624.6	6	0.96	0.35	2.09
CLS	Artek	59	658.7	24	3.64	2.33	5.42
CBC Stem	Fitmore	59	489.9	5	1.02	0.33	2.38
TwinSys cemented	Pinnacle	58	170.6	6	3.52	1.29	7.66
Taperloc Complete	RM Pressfit cup	57	25.3	1	3.95	0.10	22.00
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	208.2	1	0.48	0.01	2.68
Echo(TM) Bi-metric	Continuum TM	55	27.1	2	7.37	0.89	26.64
MS 30	Duraloc	54	676.6	6	0.89	0.33	1.93
C-Stem	Elite Plus Ogee	54	497.2	2	0.40	0.05	1.45
ABGII	RM Pressfit cup	53	99.6	3	3.01	0.62	8.80
Exeter V40	G7 acetabular shell	53	67.1	1	1.49	0.04	8.30
Exeter V40	Weber	53	508.6	1	0.20	0.00	1.10
C-Stem	Duraloc	52	579.9	5	0.86	0.28	2.01
AML	Duraloc	52	700.8	6	0.86	0.31	1.86
Standard straight stem	ZCA all-poly cup	50	212.0	1	0.47	0.00	2.63

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	733.1	94	12.82	10.36	15.69
*#Echo(TM) Bi-metric	Continuum TM	55	27.1	2	7.37	0.89	26.64
*Corail	ASR	156	1,057.0	77	7.28	5.75	9.10
*Anthology Porous	R3 porous	66	420.2	28	6.66	4.43	9.63
*Summit	ASR	88	646.9	33	5.10	3.51	7.16
*Anthology Porous	BHR Acetabular Cup	93	630.3	32	5.08	3.41	7.17
Taperloc Complete	RM Pressfit cup	57	25.3	1	3.95	0.10	22.00
*CLS	Artek	59	658.7	24	3.64	2.33	5.42
*#TwinSys cemented	Pinnacle	58	170.6	6	3.52	1.29	7.66
*Synergy Porous	BHR Acetabular Cup	113	891.2	27	3.03	1.95	4.34
ABGII	RM Pressfit cup	53	99.6	3	3.01	0.62	8.80
*CLS	Durom	198	1,688.3	50	2.96	2.17	3.87
*#M/L Taper	Delta-TT Cup	63	208.7	5	2.40	0.78	5.59
*ABG	Duraloc	115	1,721.0	34	1.98	1.37	2.76
*ABGII	Duraloc	132	1,657.5	32	1.93	1.32	2.73
*Lateral straight stem	Trilogy	68	469.5	9	1.92	0.88	3.64
H-Max M	Delta-PF Cup	70	419.4	7	1.67	0.67	3.44
H-Max S	Delta-PF Cup	135	242.1	4	1.65	0.45	4.23
*Elite plus	Duraloc	598	6,304.9	99	1.57	1.28	1.91
Stemsys	Polymax	66	65.4	1	1.53	0.04	8.52
*Prodigy	Duraloc	108	1,312.4	20	1.52	0.93	2.35
*ABG	ABGII	69	985.8	15	1.52	0.85	2.51
Exeter V40	G7 acetabular shell	53	67.1	1	1.49	0.04	8.30
*CBC Stem	Expansys shell	183	1,554.4	23	1.48	0.94	2.22
*CLS	RM cup	113	1,021.7	15	1.47	0.82	2.42
TwinSys cemented	Selexys TPS	64	354.9	5	1.41	0.46	3.29
CLS	Tritanium	72	216.4	3	1.39	0.29	4.05
CCA	Contemporary	73	728.9	10	1.37	0.66	2.52
*Exeter	Duraloc	539	7,064.5	96	1.36	1.10	1.66
Friendly	Delta-TT Cup	64	296.8	4	1.35	0.37	3.45
CPT	Tritanium	84	451.0	6	1.33	0.49	2.90
Avenir Muller uncemented	Continuum TM	170	765.8	10	1.31	0.63	2.40
*TwinSys uncemented	Selexys TPS	1,227	8,310.7	108	1.30	1.06	1.56
Exeter V40	Trabecular Metal Shell	181	781.3	10	1.28	0.57	2.27
*Spectron	Duraloc	1,138	12,641.1	157	1.24	1.05	1.45
Mallory-Head	M2A	105	1,076.9	13	1.21	0.64	2.06
CPT	Fitmore	164	752.9	9	1.20	0.55	2.27

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Trabecular Metal Stem	Continuum TM	415	1,345.6	16	1.19	0.68	1.93
Corail	RM Pressfit cup	119	255.1	3	1.18	0.24	3.44
Contemporary	Contemporary	81	969.1	11	1.14	0.57	2.03
*CPT	Continuum TM	1,022	2,687.7	30	1.12	0.75	1.59
Spectron	Muller PE cup	66	629.7	7	1.11	0.40	2.18
*Spectron	Reflection cemented	2,945	27,800.5	308	1.11	0.99	1.24
CLS	Allofit	192	1,625.1	18	1.11	0.66	1.75
S-Rom	Ultima	78	1109.3	12	1.08	0.56	1.89
C-Stem AMT	RM Pressfit cup	92	283.7	3	1.06	0.22	3.09
S-Rom	Pinnacle	352	2,976.0	31	1.04	0.71	1.48
Corail	Fitmore	212	387.6	4	1.03	0.28	2.64
CBC Stem	Fitmore	59	489.9	5	1.02	0.33	2.38
Spectron	Morscher	209	2,553.6	26	1.02	0.65	1.47
*Exeter	Contemporary	1,546	17,339.3	169	0.97	0.83	1.13
Synergy Porous	R3 porous	1,439	4,825.2	47	0.97	0.72	1.30
CBC Stem	RM Pressfit cup	394	1,956.2	19	0.97	0.58	1.52
Tri-Lock BPS	Pinnacle	62	309.9	3	0.97	0.13	2.58
Exeter V40	Continuum TM	1,962	5,905.0	57	0.97	0.72	1.24
H-Max S	Delta-TT Cup	556	1,659.2	16	0.96	0.53	1.53
Furlong	Furlong	62	624.6	6	0.96	0.35	2.09
AML MMA	Duraloc	74	937.5	9	0.96	0.44	1.82
Corail	Duraloc	455	4,402.0	42	0.95	0.69	1.29
Corail	Tritanium	136	528.1	5	0.95	0.31	2.21
M/L Taper	Continuum TM	743	2,433.3	23	0.95	0.58	1.39
CLS	Continuum TM	545	1,712.9	16	0.93	0.51	1.48
Corail	Trident	73	324.4	3	0.92	0.19	2.70
CLS	Duraloc	694	8,182.8	75	0.92	0.72	1.15
ABGII	Delta-PF Cup	105	1,091.1	10	0.92	0.41	1.63
CPT	Trilogy	831	5,272.5	48	0.91	0.67	1.21
Exeter V40	Duraloc	979	9,469.0	85	0.90	0.71	1.10
MS 30	Duraloc	54	676.6	6	0.89	0.33	1.93
Polarstem uncemented	Reflection porous	329	1,471.7	13	0.88	0.47	1.51
CPT	Monoblock Acetabular Cup	83	810.5	7	0.86	0.35	1.78
C-Stem	Duraloc	52	579.9	5	0.86	0.28	2.01
AML	Duraloc	52	700.8	6	0.86	0.31	1.86
Summit	Pinnacle	1,846	9,632.8	82	0.85	0.67	1.05
C-Stem AMT	Pinnacle	1,598	4,609.9	39	0.85	0.60	1.16
M/L Taper	Trident	158	359.0	3	0.84	0.17	2.44

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Tritanium	2,255	6,356.8	53	0.83	0.62	1.09
Lateral straight stem	RM cup	533	4,582.5	38	0.83	0.59	1.14
SL modular stem	RM cup	322	4,233.3	35	0.83	0.57	1.14
CPT	Trident	142	1,358.4	11	0.81	0.40	1.45
Stemsys	Agilis Ti-por	335	749.1	6	0.80	0.25	1.65
Spectron	Reflection porous	2,736	24,159.4	190	0.79	0.68	0.91
CLS	Trident	160	1,539.7	12	0.78	0.40	1.36
Omnifit	Trident	145	1,544.5	12	0.78	0.40	1.36
CLS	CLS Expansion	1,261	13,892.1	106	0.76	0.62	0.92
Echo(TM) Bi-metric	G7 acetabular shell	149	265.3	2	0.75	0.09	2.72
Exeter	Exeter	1,324	14,318.2	105	0.73	0.60	0.89
ABGII	Trident	336	3,413.6	25	0.73	0.47	1.08
Standard straight stem	RM cup	138	1,382.5	10	0.72	0.35	1.33
CLS	Reflection porous	340	2,380.8	17	0.71	0.42	1.14
Polarstem uncemented	R3 porous	989	2,129.5	15	0.70	0.39	1.16
MS 30	Contemporary	128	1,141.6	8	0.70	0.30	1.38
CLS	RM Pressfit cup	510	2,902.5	20	0.69	0.41	1.04
Exeter	Osteolock	812	9,967.0	67	0.67	0.52	0.85
Accolade II	Trident	462	892.7	6	0.67	0.21	1.39
Corail	Continuum TM	225	595.3	4	0.67	0.18	1.72
Corail	Pinnacle	7,486	31,767.0	211	0.66	0.58	0.76
TwinSys cemented	CCB	404	1,814.2	12	0.66	0.34	1.16
MS 30	Continuum TM	312	921.0	6	0.65	0.24	1.42
Exeter V40	R3 porous	443	1,232.7	8	0.65	0.25	1.28
CPT	Duraloc	201	2,164.3	14	0.65	0.34	1.06
MS 30	Morscher	787	8,821.0	57	0.65	0.48	0.83
TwinSys uncemented	RM Pressfit cup	4,359	21,970.9	139	0.63	0.53	0.75
Versys cemented	ZCA	389	3,800.9	24	0.63	0.39	0.92
Exeter	CLS Expansion	124	1,434.5	9	0.63	0.26	1.15
Exeter V40	Bio-clad poly	138	806.0	5	0.62	0.20	1.45
M/L Taper	Trilogy	209	1,467.0	9	0.61	0.26	1.12
Elite plus	Charnley	297	3,451.2	21	0.61	0.37	0.91
MS 30	RM Pressfit cup	89	662.5	4	0.60	0.16	1.55
Lateral straight stem	Continuum TM	78	338.6	2	0.59	0.07	2.13
Elite plus	Elite Plus Ogee	110	1,016.6	6	0.59	0.22	1.28
Stemsys	RM Pressfit cup	261	678.4	4	0.59	0.16	1.51
CPT	ZCA	542	5,049.5	29	0.57	0.38	0.82
ABGII	Pinnacle	65	522.6	3	0.57	0.12	1.68

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Monoblock Acetabular Cup	80	719.8	4	0.56	0.15	1.42
TwinSys uncemented	Trilogy	208	1,449.1	8	0.55	0.24	1.09
Stemsys	Fixa Ti Por	538	1,484.4	8	0.54	0.23	1.06
Exeter	Trilogy	206	2,600.6	14	0.54	0.29	0.90
C-Stem AMT	Marathon cemented	296	1,302.4	7	0.54	0.22	1.11
Lateral straight stem	Muller PE cup	748	6,733.6	36	0.53	0.37	0.74
CLS	Trilogy	532	3,204.7	17	0.53	0.31	0.85
Exeter V40	Exeter	1,636	13,802.7	73	0.53	0.41	0.66
TwinSys uncemented	Continuum TM	130	578.4	3	0.52	0.11	1.52
TwinSys cemented	RM Pressfit cup	1,446	5,813.4	30	0.52	0.34	0.73
Corail	Monoblock Acetabular Cup	95	778.0	4	0.51	0.14	1.32
Accolade	Trident	1,860	17,345.4	88	0.51	0.41	0.63
Exeter V40	Delta-TT Cup	140	396.5	2	0.50	0.06	1.82
Exeter	Bio-clad poly	113	1,213.6	6	0.49	0.16	1.02
TwinSys uncemented	RM cup	122	811.5	4	0.49	0.13	1.26
CLS	Fitmore	2,201	19,496.3	96	0.49	0.40	0.60
Summit	Trilogy	150	1,016.7	5	0.49	0.13	1.08
Avenir Muller uncemented	Pinnacle	99	617.4	3	0.49	0.07	1.30
Summit	Duraloc	99	1,031.6	5	0.48	0.16	1.13
Exeter V40	Exeter X3	1,534	4,142.2	20	0.48	0.29	0.75
CLS	Morscher	1,682	20,127.7	97	0.48	0.39	0.59
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	208.2	1	0.48	0.01	2.68
Exeter V40	Pinnacle	1,868	7,915.6	38	0.48	0.34	0.66
Exeter V40	Morscher	628	6,338.3	30	0.47	0.32	0.68
Standard straight stem	ZCA all-poly cup	50	212.0	1	0.47	0.00	2.63
CPCS	R3 porous	208	427.2	2	0.47	0.03	1.50
Exeter V40	Osteolock	260	2,796.4	13	0.46	0.23	0.77
CPT	Pinnacle	63	431.4	2	0.46	0.06	1.67
Exeter V40	Contemporary	6,178	41,880.4	192	0.46	0.40	0.53
Versys	Trilogy	272	3,495.2	16	0.46	0.26	0.74
Spectron	Mallory-Head	148	1,549.1	7	0.45	0.18	0.93
Spectron	Fitmore	77	893.1	4	0.45	0.12	1.15
Exeter V40	Trident	8,332	47,229.3	211	0.45	0.39	0.51
CCA	CCB	754	5,406.4	24	0.44	0.28	0.66
Wagner cone stem	Fitmore	71	676.2	3	0.44	0.09	1.30
Trabecular Metal Stem	Monoblock Acetabular Cup	74	684.0	3	0.44	0.06	1.17

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter	Muller PE cup	119	1,382.8	6	0.43	0.16	0.94
Exeter	Morscher	549	7,510.3	32	0.43	0.29	0.60
Elite plus	Elite Plus LPW	280	2,824.6	12	0.42	0.22	0.74
Exeter V40	Trilogy	2,487	15,385.4	65	0.42	0.33	0.54
Accolade II	Tritanium	540	946.9	4	0.42	0.12	1.08
H-Max M	Delta-TT Cup	83	480.4	2	0.42	0.05	1.50
Spectron	Trident	72	732.1	3	0.41	0.08	1.20
C-Stem	Elite Plus Ogee	54	497.2	2	0.40	0.05	1.45
Synergy Porous	Reflection porous	1,201	9,652.4	38	0.39	0.28	0.54
Friendly	Delta-PF Cup	162	1,352.0	5	0.37	0.10	0.81
Exeter V40	Reflection cemented	851	4,338.6	16	0.37	0.21	0.60
Exeter V40	Muller PE cup	94	820.9	3	0.37	0.08	1.07
Exeter V40	CCB	500	2,203.6	8	0.36	0.14	0.69
CCA	RM Pressfit cup	134	1,110.4	4	0.36	0.10	0.92
Exeter V40	Monoblock Acetabular Cup	123	1,394.8	5	0.36	0.12	0.84
Standard straight stem	Muller PE cup	623	5,254.4	18	0.34	0.20	0.53
Lateral straight stem	Weber	287	2,641.2	9	0.34	0.16	0.65
MS 30	Muller PE cup	459	4,163.4	14	0.34	0.18	0.56
Standard straight stem	Weber	134	1,202.5	4	0.33	0.09	0.85
Corail	Trilogy	163	614.8	2	0.33	0.04	1.18
Stemsys	DeltaMotion Cup	382	1,550.5	5	0.32	0.09	0.71
TwinSys cemented	RM cup	148	1,241.6	4	0.32	0.09	0.82
Spectron	Biomex acet shell porous	68	931.5	3	0.32	0.07	0.94
MS 30	Fitmore	1,826	10,809.3	34	0.31	0.22	0.44
CPT	ZCA all-poly cup	91	319.8	1	0.31	0.01	1.74
Exeter V40	Reflection porous	474	3,316.5	10	0.30	0.13	0.53
Exeter V40	RM Pressfit cup	1,772	7,301.2	22	0.30	0.19	0.46
Lateral straight stem	RM Pressfit cup	173	1,011.0	3	0.30	0.06	0.87
Versys cemented	Trilogy	231	2,379.1	7	0.29	0.12	0.61
Spectron	R3 porous	404	1,712.3	5	0.29	0.08	0.64
MS 30	Trilogy	282	1,433.2	4	0.28	0.08	0.71
Accolade	Muller PE cup	114	1,091.7	3	0.27	0.06	0.80
Stemsys	Delta-PF Cup	226	389.6	1	0.26	0.01	1.43
Accolade	Tritanium	151	781.4	2	0.26	0.03	0.92
CLS	Pinnacle	73	455.2	1	0.22	0.01	1.22
Exeter V40	ZCA	84	478.6	1	0.21	0.01	1.16
Exeter V40	Weber	53	508.6	1	0.20	0.00	1.10

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Fitmore	748	3,076.0	6	0.20	0.07	0.42
SL modular stem	Muller PE cup	83	1,031.7	2	0.19	0.02	0.70
Lateral straight stem	ZCA	98	623.0	1	0.16	0.00	0.89
Avenir Muller uncemented	RM cup	105	642.9	1	0.16	0.00	0.87
Accolade	Pinnacle	179	1,292.9	2	0.15	0.02	0.56
Basis	Reflection porous	103	655.3	1	0.15	0.00	0.85
Corail	Delta-PF Cup	77	732.4	1	0.14	0.00	0.76
Standard straight stem	RM Pressfit cup	137	915.5	1	0.11	0.00	0.61
Exeter V40	CLS Expansion	88	924.0	1	0.11	0.00	0.60
Corail	Reflection porous	138	1,102.7	1	0.09	0.00	0.51
TwinSys uncemented	Delta-PF Cup	363	2,237.7	1	0.04	0.00	0.21
Avenir Muller uncemented	Tritanium	91	489.9	0	0.00	0.00	0.75
C-Stem	Marathon cemented	63	170.0	0	0.00	0.00	2.17
Corail	DeltaMotion Cup	74	359.0	0	0.00	0.00	1.03
Exeter V40	ZCA all-poly cup	95	272.7	0	0.00	0.00	1.35
Exeter	Trident	81	1,097.3	0	0.00	0.00	0.34
Lateral straight stem	ZCA all-poly cup	70	303.6	0	0.00	0.00	1.22
MS 30	ZCA all-poly cup	94	356.0	0	0.00	0.00	1.04
Synergy Porous	Delta-PF Cup	88	611.6	0	0.00	0.00	0.60
Taperloc Complete	G7 acetabular shell	64	47.7	0	0.00	0.00	7.73
TwinSys cemented	Continuum TM	88	213.2	0	0.00	0.00	1.73

*Those marked with an * in the above table have revision rates significantly higher than the overall rate of 0.73 /100 ocys at the 95% confidence interval. Those also marked with an # had registrations in 2016 ie Twinsys cemented/Pinnacle, MLtaper/TTDelta and Echo™bi-metric /ContinuumTM .*

There are several other combinations with high revision rates but without statistical significance because of the wide CIs.

It is noteworthy that 55% of the ASR combinations have now been revised.

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

(Minimum of 50 primary registered arthroplasties)

Fully Cemented

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Contemporary	6,178	41,880.4	192	0.46	0.40	0.53
*Spectron	Reflection cemented	2,945	27,800.5	308	1.11	0.99	1.24
Exeter V40	Exeter	1,636	13,802.7	73	0.53	0.41	0.66
*Exeter	Contemporary	1,546	17,339.3	169	0.97	0.83	1.13
Exeter V40	Exeter X3	1,534	4,142.2	20	0.48	0.29	0.75
Exeter	Exeter	1,324	14,318.2	105	0.73	0.60	0.89
Exeter V40	Reflection cemented	851	4,338.6	16	0.37	0.21	0.60
CCA	CCB	754	5,406.4	24	0.44	0.28	0.66
Lateral straight stem	Muller PE cup	748	6,733.6	36	0.53	0.37	0.74
Standard straight stem	Muller PE cup	623	5,254.4	18	0.34	0.20	0.53
CPT	ZCA	542	5,049.5	29	0.57	0.38	0.82
Exeter V40	CCB	500	2,203.6	8	0.36	0.14	0.69
MS 30	Muller PE cup	459	4,163.4	14	0.34	0.18	0.56
TwinSys cemented	CCB	404	1,814.2	12	0.66	0.34	1.16
Versys cemented	ZCA	389	3,800.9	24	0.63	0.39	0.92
Elite plus	Charnley	297	3,451.2	21	0.61	0.37	0.91
C-Stem AMT	Marathon cemented	296	1,302.4	7	0.54	0.22	1.11
Lateral straight stem	Weber	287	2,641.2	9	0.34	0.16	0.65
Elite plus	Elite Plus LPW	280	2,824.6	12	0.42	0.22	0.74
Exeter V40	Bio-clad poly	138	806.0	5	0.62	0.20	1.45
Standard straight stem	Weber	134	1,202.5	4	0.33	0.09	0.85
MS 30	Contemporary	128	1,141.6	8	0.70	0.30	1.38
Exeter	Muller PE cup	119	1,382.8	6	0.43	0.16	0.94
Exeter	Bio-clad poly	113	1,213.6	6	0.49	0.16	1.02
Elite plus	Elite Plus Ogee	110	1,016.6	6	0.59	0.22	1.28
Lateral straight stem	ZCA	98	623.0	1	0.16	0.00	0.89
Exeter V40	ZCA all-poly cup	95	272.7	0	0.00	0.00	1.35
Exeter V40	Muller PE cup	94	820.9	3	0.37	0.08	1.07
MS 30	ZCA all-poly cup	94	356.0	0	0.00	0.00	1.04
CPT	ZCA all-poly cup	91	319.8	1	0.31	0.01	1.74
Exeter V40	ZCA	84	478.6	1	0.21	0.01	1.16
SL modular stem	Muller PE cup	83	1,031.7	2	0.19	0.02	0.70
Contemporary	Contemporary	81	969.1	11	1.14	0.57	2.03
CCA	Contemporary	73	728.9	10	1.37	0.66	2.52

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Lateral straight stem	ZCA all-poly cup	70	303.6	0	0.00	0.00	1.22
Spectron	Muller PE cup	66	629.7	7	1.11	0.40	2.18
C-Stem	Marathon cemented	63	170.0	0	0.00	0.00	2.17
C-Stem	Elite Plus Ogee	54	497.2	2	0.40	0.05	1.45
Exeter V40	Weber	53	508.6	1	0.20	0.00	1.10
Standard straight stem	ZCA all-poly cup	50	212.0	1	0.47	0.00	2.63

The Exeter/Contemporary and the Spectron/reflection cemented have revision rates significantly higher than the overall rate of 0.73 /100 ocys at the 95% confidence interval. Neither category had registrations in 2016. There are three other combinations with high revision rates but without statistical significance.

Uncemented

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	Pinnacle	7,486	31,767.0	211	0.66	0.58	0.76
TwinSys uncemented	RM Pressfit cup	4,359	21,970.9	139	0.63	0.53	0.75
CLS	Fitmore	2,201	19,496.3	96	0.49	0.40	0.60
Accolade	Trident	1,860	17,345.4	88	0.51	0.41	0.63
Summit	Pinnacle	1,846	9,632.8	82	0.85	0.67	1.05
CLS	Morscher	1,682	20,127.7	97	0.48	0.39	0.59
Synergy Porous	R3 porous	1,439	4,825.2	47	0.97	0.72	1.30
CLS	CLS Expansion	1,261	13,892.1	106	0.76	0.62	0.92
*TwinSys uncemented	Selexys TPS	1,227	8,310.7	108	1.30	1.06	1.56
Synergy Porous	Reflection porous	1,201	9,652.4	38	0.39	0.28	0.54
Polarstem uncemented	R3 porous	989	2,129.5	15	0.70	0.39	1.16
M/L Taper	Continuum TM	741	2,430.7	23	0.95	0.58	1.40
CLS	Duraloc	694	8,182.8	75	0.92	0.72	1.15
H-Max S	Delta-TT Cup	555	1,658.4	16	0.96	0.53	1.53
CLS	Continuum TM	545	1,712.9	16	0.93	0.51	1.48
Accolade II	Tritanium	540	946.9	4	0.42	0.12	1.08
Stemsys	Fixa Ti Por	536	1,483.4	8	0.54	0.23	1.06
CLS	Trilogy	532	3,204.7	17	0.53	0.31	0.85
CLS	RM Pressfit cup	510	2,902.5	20	0.69	0.41	1.04
Accolade II	Trident	462	892.7	6	0.67	0.21	1.39
Corail	Duraloc	455	4,402.0	42	0.95	0.69	1.29
Trabecular Metal Stem	Continuum TM	415	1,345.6	16	1.19	0.68	1.93

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CBC Stem	RM Pressfit cup	394	1,956.2	19	0.97	0.58	1.52
Stemsys	DeltaMotion Cup	381	1,549.9	5	0.32	0.09	0.71
TwinSys uncemented	Delta-PF Cup	363	2,237.7	1	0.04	0.00	0.21
S-Rom	Pinnacle	352	2,976.0	31	1.04	0.71	1.48
CLS	Reflection porous	340	2,380.8	17	0.71	0.42	1.14
ABGII	Trident	336	3,413.6	25	0.73	0.47	1.08
Stemsys	Agilis Ti-por	335	749.1	6	0.80	0.25	1.65
Polarstem uncemented	Reflection porous	329	1,471.7	13	0.88	0.47	1.51
Versys	Trilogy	272	3,495.2	16	0.46	0.26	0.74
Stemsys	RM Pressfit cup	260	677.7	4	0.59	0.16	1.51
Stemsys	Delta-PF Cup	226	389.6	1	0.26	0.01	1.43
Corail	Continuum TM	225	595.3	4	0.67	0.18	1.72
Corail	Fitmore	212	387.6	4	1.03	0.28	2.64
M/L Taper	Trilogy	209	1,467.0	9	0.61	0.26	1.12
TwinSys uncemented	Trilogy	208	1,449.1	8	0.55	0.24	1.09
*CLS	Durom	198	1,688.3	50	2.96	2.17	3.87
CLS	Allofit	192	1,625.1	18	1.11	0.66	1.75
*CBC Stem	Expansys shell	183	1,554.4	23	1.48	0.94	2.22
Accolade	Pinnacle	179	1,292.9	2	0.15	0.02	0.56
Avenir Muller uncemented	Continuum TM	170	765.8	10	1.31	0.63	2.40
Corail	Trilogy	163	614.8	2	0.33	0.04	1.18
CLS	Trident	160	1,539.7	12	0.78	0.40	1.36
M/L Taper	Trident	157	358.8	3	0.84	0.17	2.44
*Corail	ASR	156	1,057.0	77	7.28	5.75	9.10
Accolade	Tritanium	151	781.4	2	0.26	0.03	0.92
Summit	Trilogy	150	1,016.7	5	0.49	0.13	1.08
Echo(TM) Bi-metric	G7 acetabular shell	149	265.3	2	0.75	0.09	2.72
Corail	Reflection porous	138	1,102.7	1	0.09	0.00	0.51
Corail	Tritanium	136	528.1	5	0.95	0.31	2.21
H-Max S	Delta-PF Cup	134	241.3	4	1.66	0.45	4.24
*ABGII	Duraloc	132	1,657.5	32	1.93	1.32	2.73
*S-Rom	ASR	130	733.1	94	12.82	10.36	15.69
TwinSys uncemented	Continuum TM	130	578.4	3	0.52	0.11	1.52
Omnifit	Trident	122	1,313.3	11	0.84	0.39	1.45
TwinSys uncemented	RM cup	122	811.5	4	0.49	0.13	1.26
Corail	RM Pressfit cup	119	255.1	3	1.18	0.24	3.44
*ABG	Duraloc	115	1,721.0	34	1.98	1.37	2.76
*CLS	RM cup	113	1,021.7	15	1.47	0.82	2.42

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*Synergy Porous	BHR Acetabular Cup	113	891.2	27	3.03	1.95	4.34
*Prodigy	Duraloc	108	1,312.4	20	1.52	0.93	2.35
ABGII	Delta-PF Cup	105	1,091.1	10	0.92	0.41	1.63
Avenir Muller uncemented	RM cup	105	642.9	1	0.16	0.00	0.87
Mallory-Head	M2A	105	1,076.9	13	1.21	0.64	2.06
Avenir Muller uncemented	Pinnacle	99	617.4	3	0.49	0.07	1.30
Summit	Duraloc	99	1,031.6	5	0.48	0.16	1.13
Corail	Monoblock Acetabular Cup	95	778.0	4	0.51	0.14	1.32
*Anthology Porous	BHR Acetabular Cup	91	619.9	31	5.00	3.40	7.10
Avenir Muller uncemented	Tritanium	91	489.9	0	0.00	0.00	0.75
*Summit	ASR	88	646.9	33	5.10	3.51	7.16
Synergy Porous	Delta-PF Cup	88	611.6	0	0.00	0.00	0.60
H-Max M	Delta-TT Cup	83	480.4	2	0.42	0.05	1.50
CLS	Monoblock Acetabular Cup	80	719.8	4	0.56	0.15	1.42
S-Rom	Ultima	78	1,109.3	12	1.08	0.56	1.89
Corail	Delta-PF Cup	77	732.4	1	0.14	0.00	0.76
AML MMA	Duraloc	74	937.5	9	0.96	0.44	1.82
Corail	DeltaMotion Cup	74	359.0	0	0.00	0.00	1.03
Trabecular Metal Stem	Monoblock Acetabular Cup	74	684.0	3	0.44	0.06	1.17
CLS	Pinnacle	73	455.2	1	0.22	0.01	1.22
Corail	Trident	73	324.4	3	0.92	0.19	2.70
CLS	Tritanium	72	216.4	3	1.39	0.29	4.05
Wagner cone stem	Fitmore	71	676.2	3	0.44	0.09	1.30
H-Max M	Delta-PF Cup	70	419.4	7	1.67	0.67	3.44
ABG	ABGII	69	985.8	15	1.52	0.85	2.51
*Anthology Porous	R3 porous	66	420.2	28	6.66	4.43	9.63
Stemsys	Polymax	66	65.4	1	1.53	0.04	8.52
ABGII	Pinnacle	65	522.6	3	0.57	0.12	1.68
Taperloc Complete	G7 acetabular shell	64	47.7	0	0.00	0.00	7.73
*#M/L Taper	Delta-TT Cup	63	208.7	5	2.40	0.78	5.59
Furlong	Furlong	62	624.6	6	0.96	0.35	2.09
Tri-Lock BPS	Pinnacle	62	309.9	3	0.97	0.13	2.58
CBC Stem	Fitmore	59	489.9	5	1.02	0.33	2.38
*CLS	Artek	59	658.7	24	3.64	2.33	5.42
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	208.2	1	0.48	0.01	2.68
Taperloc Complete	RM Pressfit cup	57	25.3	1	3.95	0.10	22.00

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*#Echo(TM) Bi-metric	Continuum TM	55	27.1	2	7.37	0.89	26.64
ABGII	RM Pressfit cup	53	99.6	3	3.01	0.62	8.80
AML	Duraloc	52	700.8	6	0.86	0.31	1.86

*Those marked with an * in the above table have revision rates significantly higher than the overall rate of 0.73 /100 ocys @ the 95% confidence interval. Those also marked with a # had registrations in 2016. There are several other combinations with high revision rates but without statistical significance because of the wide CIs.*

Hybrid

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	8,332	47,229.3	211	0.45	0.39	0.51
Spectron	Reflection porous	2,736	24,159.4	190	0.79	0.68	0.91
Exeter V40	Trilogy	2,487	15,385.4	65	0.42	0.33	0.54
Exeter V40	Tritanium	2,255	6,356.8	53	0.83	0.62	1.09
Exeter V40	Continuum TM	1,962	5,905.0	57	0.97	0.72	1.24
Exeter V40	Pinnacle	1,868	7,915.6	38	0.48	0.34	0.66
MS 30	Fitmore	1,826	10,809.3	34	0.31	0.22	0.44
Exeter V40	RM Pressfit cup	1,772	7,301.2	22	0.30	0.19	0.46
C-Stem AMT	Pinnacle	1,598	4,609.9	39	0.85	0.60	1.16
TwinSys cemented	RM Pressfit cup	1,446	5,813.4	30	0.52	0.34	0.73
*Spectron	Duraloc	1,138	12,641.1	157	1.24	1.05	1.45
CPT	Continuum TM	1,021	2,687.2	30	1.12	0.74	1.57
Exeter V40	Duraloc	979	9,469.0	85	0.90	0.71	1.10
CPT	Trilogy	831	5,272.5	48	0.91	0.67	1.21
Exeter	Osteolock	812	9,967.0	67	0.67	0.52	0.85
MS 30	Morscher	787	8,821.0	57	0.65	0.48	0.83
Exeter V40	Fitmore	748	3,076.0	6	0.20	0.07	0.42
Exeter V40	Morscher	628	6,338.3	30	0.47	0.32	0.68
*Elite plus	Duraloc	598	6,304.9	99	1.57	1.28	1.91
Exeter	Morscher	549	7,510.3	32	0.43	0.29	0.60
*Exeter	Duraloc	539	7,064.5	96	1.36	1.10	1.66
Lateral straight stem	RM cup	533	4,582.5	38	0.83	0.59	1.14
Exeter V40	Reflection porous	474	3,316.5	10	0.30	0.13	0.53
Exeter V40	R3 porous	443	1,232.7	8	0.65	0.25	1.28
Spectron	R3 porous	404	1,712.3	5	0.29	0.08	0.64
SL modular stem	RM cup	322	4,233.3	35	0.83	0.57	1.14
MS 30	Continuum TM	312	921.0	6	0.65	0.24	1.42
MS 30	Trilogy	282	1,433.2	4	0.28	0.08	0.71
Exeter V40	Osteolock	260	2,796.4	13	0.46	0.23	0.77
Versys cemented	Trilogy	231	2,379.1	7	0.29	0.12	0.61
Spectron	Morscher	209	2,553.6	26	1.02	0.65	1.47

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CPCS	R3 porous	208	427.2	2	0.47	0.03	1.50
Exeter	Trilogy	206	2,600.6	14	0.54	0.29	0.90
CPT	Duraloc	201	2,164.3	14	0.65	0.34	1.06
Exeter V40	Trabecular Metal Shell	181	781.3	10	1.28	0.57	2.27
Lateral straight stem	RM Pressfit cup	173	1,011.0	3	0.30	0.06	0.87
CPT	Fitmore	164	752.9	9	1.20	0.55	2.27
Friendly	Delta-PF Cup	162	1,352.0	5	0.37	0.10	0.81
Spectron	Mallory-Head	148	1,549.1	7	0.45	0.18	0.93
TwinSys cemented	RM cup	148	1,241.6	4	0.32	0.09	0.82
CPT	Trident	142	1,358.4	11	0.81	0.40	1.45
Exeter V40	Delta-TT Cup	140	396.5	2	0.50	0.06	1.82
Standard straight stem	RM cup	138	1,382.5	10	0.72	0.35	1.33
Standard straight stem	RM Pressfit cup	137	915.5	1	0.11	0.00	0.61
CCA	RM Pressfit cup	134	1,110.4	4	0.36	0.10	0.92
Exeter	CLS Expansion	124	1,434.5	9	0.63	0.26	1.15
Exeter V40	Monoblock Acetabular Cup	123	1,394.8	5	0.36	0.12	0.84
Accolade	Muller PE cup	114	1,091.7	3	0.27	0.06	0.80
Basis	Reflection porous	103	655.3	1	0.15	0.00	0.85
C-Stem AMT	RM Pressfit cup	92	283.7	3	1.06	0.22	3.09
MS 30	RM Pressfit cup	89	662.5	4	0.60	0.16	1.55
Exeter V40	CLS Expansion	88	924.0	1	0.11	0.00	0.60
TwinSys cemented	Continuum TM	88	213.2	0	0.00	0.00	1.73
CPT	Tritanium	84	451.0	6	1.33	0.49	2.90
CPT	Monoblock Acetabular Cup	83	810.5	7	0.86	0.35	1.78
Exeter	Trident	81	1,097.3	0	0.00	0.00	0.34
Lateral straight stem	Continuum TM	78	338.6	2	0.59	0.07	2.13
Spectron	Fitmore	77	893.1	4	0.45	0.12	1.15
Spectron	Trident	72	732.1	3	0.41	0.08	1.20
*Lateral straight stem	Trilogy	68	469.5	9	1.92	0.88	3.64
Spectron	Biomex acet shell porous	68	931.5	3	0.32	0.07	0.94
Friendly	Delta-TT Cup	64	296.8	4	1.35	0.37	3.45
TwinSys cemented	Selexys TPS	64	354.9	5	1.41	0.46	3.29
CPT	Pinnacle	63	431.4	2	0.46	0.06	1.67
*#TwinSys cemented	Pinnacle	58	170.6	6	3.52	1.29	7.66

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Duraloc	54	676.6	6	0.89	0.33	1.93
Exeter V40	G7 acetabular shell	53	67.1	1	1.49	0.04	8.30
C-Stem	Duraloc	52	579.9	5	0.86	0.28	2.01

*Those marked with an * in the above table have revision rates significantly higher than the overall rate of 0.73 /100 ocys @ the 95% confidence interval. Those also marked with an # had registrations in 2016. There are several other combinations with high revision rates but without statistical significance because of the wide CIs.*

Prosthesis combinations based on femur in alphabetical order

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
ABG	Duraloc	115	1,721.0	34	1.98	1.37	2.76
ABG	ABGII	69	985.8	15	1.52	0.85	2.51
ABGII	RM Pressfit cup	53	99.6	3	3.01	0.62	8.80
ABGII	Duraloc	132	1,657.5	32	1.93	1.32	2.73
ABGII	Delta-PF Cup	105	1,091.1	10	0.92	0.41	1.63
ABGII	Trident	336	3,413.6	25	0.73	0.47	1.08
ABGII	Pinnacle	65	522.6	3	0.57	0.12	1.68
Accolade	Trident	1,860	17,345.4	88	0.51	0.41	0.63
Accolade	Muller PE cup	114	1,091.7	3	0.27	0.06	0.80
Accolade	Tritanium	151	781.4	2	0.26	0.03	0.92
Accolade	Pinnacle	179	1,292.9	2	0.15	0.02	0.56
Accolade II	Trident	462	892.7	6	0.67	0.21	1.39
Accolade II	Tritanium	540	946.9	4	0.42	0.12	1.08
AML	Duraloc	52	700.8	6	0.86	0.31	1.86
AML MMA	Duraloc	74	937.5	9	0.96	0.44	1.82
Anthology Porous	R3 porous	66	420.2	28	6.66	4.43	9.63
Anthology Porous	BHR Acetabular Cup	93	630.3	32	5.08	3.41	7.17
Avenir Muller uncemented	Continuum TM	170	765.8	10	1.31	0.63	2.40
Avenir Muller uncemented	Pinnacle	99	617.4	3	0.49	0.07	1.30
Avenir Muller uncemented	RM cup	105	642.9	1	0.16	0.00	0.87
Avenir Muller uncemented	Tritanium	91	489.9	0	0.00	0.00	0.75
Basis	Reflection porous	103	655.3	1	0.15	0.00	0.85
CBC Stem	Expansys shell	183	1,554.4	23	1.48	0.94	2.22
CBC Stem	Fitmore	59	489.9	5	1.02	0.33	2.38
CBC Stem	RM Pressfit cup	394	1,956.2	19	0.97	0.58	1.52
CCA	Contemporary	73	728.9	10	1.37	0.66	2.52
CCA	CCB	754	5,406.4	24	0.44	0.28	0.66
CCA	RM Pressfit cup	134	1,110.4	4	0.36	0.10	0.92

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Artek	59	658.7	24	3.64	2.33	5.42
CLS	Durom	198	1,688.3	50	2.96	2.17	3.87
CLS	RM cup	113	1,021.7	15	1.47	0.82	2.42
CLS	Tritanium	72	216.4	3	1.39	0.29	4.05
CLS	Allofit	192	1,625.1	18	1.11	0.66	1.75
CLS	Continuum TM	545	1,712.9	16	0.93	0.51	1.48
CLS	Duraloc	694	8,182.8	75	0.92	0.72	1.15
CLS	Trident	160	1,539.7	12	0.78	0.40	1.36
CLS	CLS Expansion	1,261	13,892.1	106	0.76	0.62	0.92
CLS	Reflection porous	340	2,380.8	17	0.71	0.42	1.14
CLS	RM Pressfit cup	510	2,902.5	20	0.69	0.41	1.04
CLS	Monoblock Acetabular Cup	80	719.8	4	0.56	0.15	1.42
CLS	Trilogy	532	3,204.7	17	0.53	0.31	0.85
CLS	Fitmore	2,201	19,496.3	96	0.49	0.40	0.60
CLS	Morscher	1,682	20,127.7	97	0.48	0.39	0.59
CLS	Pinnacle	73	455.2	1	0.22	0.01	1.22
Contemporary	Contemporary	81	969.1	11	1.14	0.57	2.03
Corail	ASR	156	1,057.0	77	7.28	5.75	9.10
Corail	RM Pressfit cup	119	255.1	3	1.18	0.24	3.44
Corail	Fitmore	212	387.6	4	1.03	0.28	2.64
Corail	Duraloc	455	4,402.0	42	0.95	0.69	1.29
Corail	Tritanium	136	528.1	5	0.95	0.31	2.21
Corail	Trident	73	324.4	3	0.92	0.19	2.70
Corail	Continuum TM	225	595.3	4	0.67	0.18	1.72
Corail	Pinnacle	7,486	31,767.0	211	0.66	0.58	0.76
Corail	Monoblock Acetabular Cup	95	778.0	4	0.51	0.14	1.32
Corail	Trilogy	163	614.8	2	0.33	0.04	1.18
Corail	Delta-PF Cup	77	732.4	1	0.14	0.00	0.76
Corail	Reflection porous	138	1,102.7	1	0.09	0.00	0.51
Corail	DeltaMotion Cup	74	359.0	0	0.00	0.00	1.03
CPCS	R3 porous	208	427.2	2	0.47	0.03	1.50
CPT	Tritanium	84	451.0	6	1.33	0.49	2.90
CPT	Fitmore	164	752.9	9	1.20	0.55	2.27
CPT	Continuum TM	1,022	2,687.7	30	1.12	0.75	1.59
CPT	Trilogy	831	5,272.5	48	0.91	0.67	1.21
CPT	Monoblock Acetabular Cup	83	810.5	7	0.86	0.35	1.78
CPT	Trident	142	1,358.4	11	0.81	0.40	1.45
CPT	Duraloc	201	2,164.3	14	0.65	0.34	1.06

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CPT	ZCA	542	5,049.5	29	0.57	0.38	0.82
CPT	Pinnacle	63	431.4	2	0.46	0.06	1.67
CPT	ZCA all-poly cup	91	319.8	1	0.31	0.01	1.74
C-Stem	Duraloc	52	579.9	5	0.86	0.28	2.01
C-Stem	Elite Plus Ogee	54	497.2	2	0.40	0.05	1.45
C-Stem	Marathon cemented	63	170.0	0	0.00	0.00	2.17
C-Stem AMT	RM Pressfit cup	92	283.7	3	1.06	0.22	3.09
C-Stem AMT	Pinnacle	1,598	4,609.9	39	0.85	0.60	1.16
C-Stem AMT	Marathon cemented	296	1,302.4	7	0.54	0.22	1.11
Echo(TM) Bi-metric	Continuum TM	55	27.1	2	7.37	0.89	26.64
Echo(TM) Bi-metric	G7 acetabular shell	149	265.3	2	0.75	0.09	2.72
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	208.2	1	0.48	0.01	2.68
Elite plus	Duraloc	598	6,304.9	99	1.57	1.28	1.91
Elite plus	Charnley	297	3,451.2	21	0.61	0.37	0.91
Elite plus	Elite Plus Ogee	110	1,016.6	6	0.59	0.22	1.28
Elite plus	Elite Plus LPW	280	2,824.6	12	0.42	0.22	0.74
Exeter	Duraloc	539	7,064.5	96	1.36	1.10	1.66
Exeter	Contemporary	1,546	17,339.3	169	0.97	0.83	1.13
Exeter	Exeter	1,324	14,318.2	105	0.73	0.60	0.89
Exeter	Osteolock	812	9,967.0	67	0.67	0.52	0.85
Exeter	CLS Expansion	124	1,434.5	9	0.63	0.26	1.15
Exeter	Trilogy	206	2,600.6	14	0.54	0.29	0.90
Exeter	Bio-clad poly	113	1,213.6	6	0.49	0.16	1.02
Exeter	Muller PE cup	119	1,382.8	6	0.43	0.16	0.94
Exeter	Morscher	549	7,510.3	32	0.43	0.29	0.60
Exeter	Trident	81	1,097.3	0	0.00	0.00	0.34
Exeter V40	G7 acetabular shell	53	67.1	1	1.49	0.04	8.30
Exeter V40	Trabecular Metal Shell	181	781.3	10	1.28	0.57	2.27
Exeter V40	Continuum TM	1,962	5,905.0	57	0.97	0.72	1.24
Exeter V40	Duraloc	979	9,469.0	85	0.90	0.71	1.10
Exeter V40	Tritanium	2,255	6,356.8	53	0.83	0.62	1.09
Exeter V40	R3 porous	443	1,232.7	8	0.65	0.25	1.28
Exeter V40	Bio-clad poly	138	806.0	5	0.62	0.20	1.45
Exeter V40	Exeter	1,636	13,802.7	73	0.53	0.41	0.66
Exeter V40	Delta-TT Cup	140	396.5	2	0.50	0.06	1.82
Exeter V40	Exeter X3	1,534	4,142.2	20	0.48	0.29	0.75
Exeter V40	Pinnacle	1,868	7,915.6	38	0.48	0.34	0.66
Exeter V40	Morscher	628	6,338.3	30	0.47	0.32	0.68

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Osteolock	260	2,796.4	13	0.46	0.23	0.77
Exeter V40	Contemporary	6,178	41,880.4	192	0.46	0.40	0.53
Exeter V40	Trident	8,332	47,229.3	211	0.45	0.39	0.51
Exeter V40	Trilogy	2,487	15,385.4	65	0.42	0.33	0.54
Exeter V40	Reflection cemented	851	4,338.6	16	0.37	0.21	0.60
Exeter V40	Muller PE cup	94	820.9	3	0.37	0.08	1.07
Exeter V40	CCB	500	2,203.6	8	0.36	0.14	0.69
Exeter V40	Monoblock Acetabular Cup	123	1,394.8	5	0.36	0.12	0.84
Exeter V40	Reflection porous	474	3,316.5	10	0.30	0.13	0.53
Exeter V40	RM Pressfit cup	1,772	7,301.2	22	0.30	0.19	0.46
Exeter V40	ZCA	84	478.6	1	0.21	0.01	1.16
Exeter V40	Weber	53	508.6	1	0.20	0.00	1.10
Exeter V40	Fitmore	748	3,076.0	6	0.20	0.07	0.42
Exeter V40	CLS Expansion	88	924.0	1	0.11	0.00	0.60
Exeter V40	ZCA all-poly cup	95	272.7	0	0.00	0.00	1.35
Friendly	Delta-TT Cup	64	296.8	4	1.35	0.37	3.45
Friendly	Delta-PF Cup	162	1,352.0	5	0.37	0.10	0.81
Furlong	Furlong	62	624.6	6	0.96	0.35	2.09
H-Max M	Delta-PF Cup	70	419.4	7	1.67	0.67	3.44
H-Max M	Delta-TT Cup	83	480.4	2	0.42	0.05	1.50
H-Max S	Delta-PF Cup	135	242.1	4	1.65	0.45	4.23
H-Max S	Delta-TT Cup	556	1,659.2	16	0.96	0.53	1.53
Lateral straight stem	Trilogy	68	469.5	9	1.92	0.88	3.64
Lateral straight stem	RM cup	533	4,582.5	38	0.83	0.59	1.14
Lateral straight stem	Continuum TM	78	338.6	2	0.59	0.07	2.13
Lateral straight stem	Muller PE cup	748	6,733.6	36	0.53	0.37	0.74
Lateral straight stem	Weber	287	2,641.2	9	0.34	0.16	0.65
Lateral straight stem	RM Pressfit cup	173	1,011.0	3	0.30	0.06	0.87
Lateral straight stem	ZCA	98	623.0	1	0.16	0.00	0.89
Lateral straight stem	ZCA all-poly cup	70	303.6	0	0.00	0.00	1.22
M/L Taper	Delta-TT Cup	63	208.7	5	2.40	0.78	5.59
M/L Taper	Continuum TM	743	2,433.3	23	0.95	0.58	1.39
M/L Taper	Trident	158	359.0	3	0.84	0.17	2.44
M/L Taper	Trilogy	209	1,467.0	9	0.61	0.26	1.12
Mallory-Head	M2A	105	1,076.9	13	1.21	0.64	2.06
MS 30	Duraloc	54	676.6	6	0.89	0.33	1.93
MS 30	Contemporary	128	1,141.6	8	0.70	0.30	1.38
MS 30	Continuum TM	312	921.0	6	0.65	0.24	1.42
MS 30	Morscher	787	8,821.0	57	0.65	0.48	0.83
MS 30	RM Pressfit cup	89	662.5	4	0.60	0.16	1.55

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Muller PE cup	459	4,163.4	14	0.34	0.18	0.56
MS 30	Fitmore	1,826	10,809.3	34	0.31	0.22	0.44
MS 30	Trilogy	282	1,433.2	4	0.28	0.08	0.71
MS 30	ZCA all-poly cup	94	356.0	0	0.00	0.00	1.04
Omnifit	Trident	145	1,544.5	12	0.78	0.40	1.36
Polarstem uncemented	Reflection porous	329	1,471.7	13	0.88	0.47	1.51
Polarstem uncemented	R3 porous	989	2,129.5	15	0.70	0.39	1.16
Prodigy	Duraloc	108	1,312.4	20	1.52	0.93	2.35
SL modular stem	RM cup	322	4,233.3	35	0.83	0.57	1.14
SL modular stem	Muller PE cup	83	1,031.7	2	0.19	0.02	0.70
Spectron	Duraloc	1,138	12,641.1	157	1.24	1.05	1.45
Spectron	Muller PE cup	66	629.7	7	1.11	0.40	2.18
Spectron	Reflection cemented	2,945	27,800.5	308	1.11	0.99	1.24
Spectron	Morscher	209	2,553.6	26	1.02	0.65	1.47
Spectron	Reflection porous	2,736	24,159.4	190	0.79	0.68	0.91
Spectron	Mallory-Head	148	1,549.1	7	0.45	0.18	0.93
Spectron	Fitmore	77	893.1	4	0.45	0.12	1.15
Spectron	Trident	72	732.1	3	0.41	0.08	1.20
Spectron	Biomex acet shell porous	68	931.5	3	0.32	0.07	0.94
Spectron	R3 porous	404	1,712.3	5	0.29	0.08	0.64
S-Rom	ASR	130	733.1	94	12.82	10.36	15.69
S-Rom	Ultima	78	1,109.3	12	1.08	0.56	1.89
S-Rom	Pinnacle	352	2,976.0	31	1.04	0.71	1.48
Standard straight stem	RM cup	138	1,382.5	10	0.72	0.35	1.33
Standard straight stem	ZCA all-poly cup	50	212.0	1	0.47	0.00	2.63
Standard straight stem	Muller PE cup	623	5,254.4	18	0.34	0.20	0.53
Standard straight stem	Weber	134	1,202.5	4	0.33	0.09	0.85
Standard straight stem	RM Pressfit cup	137	915.5	1	0.11	0.00	0.61
Stemsys	Polymax	66	65.4	1	1.53	0.04	8.52
Stemsys	Agilis Ti-por	335	749.1	6	0.80	0.25	1.65
Stemsys	RM Pressfit cup	261	678.4	4	0.59	0.16	1.51
Stemsys	Fixa Ti Por	538	1,484.4	8	0.54	0.23	1.06
Stemsys	DeltaMotion Cup	382	1,550.5	5	0.32	0.09	0.71
Stemsys	Delta-PF Cup	226	389.6	1	0.26	0.01	1.43
Summit	ASR	88	646.9	33	5.10	3.51	7.16
Summit	Pinnacle	1,846	9,632.8	82	0.85	0.67	1.05

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Summit	Trilogy	150	1,016.7	5	0.49	0.13	1.08
Summit	Duraloc	99	1,031.6	5	0.48	0.16	1.13
Synergy Porous	BHR Acetabular Cup	113	891.2	27	3.03	1.95	4.34
Synergy Porous	R3 porous	1,439	4,825.2	47	0.97	0.72	1.30
Synergy Porous	Reflection porous	1,201	9,652.4	38	0.39	0.28	0.54
Synergy Porous	Delta-PF Cup	88	611.6	0	0.00	0.00	0.60
Taperloc Complete	RM Pressfit cup	57	25.3	1	3.95	0.10	22.00
Taperloc Complete	G7 acetabular shell	64	47.7	0	0.00	0.00	7.73
Trabecular Metal Stem	Continuum TM	415	1,345.6	16	1.19	0.68	1.93
Trabecular Metal Stem	Monoblock Acetabular Cup	74	684.0	3	0.44	0.06	1.17
Tri-Lock BPS	Pinnacle	62	309.9	3	0.97	0.13	2.58
TwinSys cemented	Pinnacle	58	170.6	6	3.52	1.29	7.66
TwinSys cemented	Selexys TPS	64	354.9	5	1.41	0.46	3.29
TwinSys cemented	CCB	404	1,814.2	12	0.66	0.34	1.16
TwinSys cemented	RM Pressfit cup	1,446	5,813.4	30	0.52	0.34	0.73
TwinSys cemented	RM cup	148	1,241.6	4	0.32	0.09	0.82
TwinSys cemented	Continuum TM	88	213.2	0	0.00	0.00	1.73
TwinSys uncemented	Selexys TPS	1,227	8,310.7	108	1.30	1.06	1.56
TwinSys uncemented	RM Pressfit cup	4,359	21,970.9	139	0.63	0.53	0.75
TwinSys uncemented	Trilogy	208	1,449.1	8	0.55	0.24	1.09
TwinSys uncemented	Continuum TM	130	578.4	3	0.52	0.11	1.52
TwinSys uncemented	RM cup	122	811.5	4	0.49	0.13	1.26
TwinSys uncemented	Delta-PF Cup	363	2,237.7	1	0.04	0.00	0.21
Versys	Trilogy	272	3,495.2	16	0.46	0.26	0.74
Versys cemented	ZCA	389	3,800.9	24	0.63	0.39	0.92
Versys cemented	Trilogy	231	2,379.1	7	0.29	0.12	0.61
Wagner cone stem	Fitmore	71	676.2	3	0.44	0.09	1.30

*** The Muller femoral component has been relabelled the Lateral Straight Stem.*

Revision rates for combinations with components manufactured from different companies (component mismatches)

(Minimum of 500 implantations)

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trilogy	2,487	15,385.4	65	0.42	0.33	0.54
Exeter V40	Continuum TM	1,962	5,905.0	57	0.97	0.72	1.24
Exeter V40	Pinnacle	1,868	7,915.6	38	0.48	0.34	0.66
Exeter V40	RM Pressfit cup	1,772	7,301.2	22	0.30	0.19	0.46
Spectron	Duraloc	1,138	12,641.1	157	1.24	1.05	1.45
CLS	Duraloc	694	8,182.8	75	0.92	0.72	1.15
Exeter V40	Fitmore	748	3,076.0	6	0.20	0.07	0.42
Exeter V40	Morscher	628	6,338.3	30	0.47	0.32	0.68
Exeter	Duraloc	539	7,064.5	96	1.36	1.10	1.66
Lateral straight stem	RM cup	533	4,582.5	38	0.83	0.59	1.14

Just the Spectron/Duraloc and the Exeter/Duraloc combinations have significantly higher revision rates than the overall rate of 0.73 /100 ocys @ the 95% confidence interval.

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

Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CC	745	6,711.2	53	0.79	0.59	1.03
<=28	CM	30	126.7	2	1.58	0.19	5.70
<=28	CP	11,000	92,740.9	645	0.70	0.64	0.75
<=28	MM	2,898	34,792.7	257	0.74	0.65	0.83
<=28	MP	45,120	383,945.4	2,710	0.71	0.68	0.73
32	CC	3,491	23,836.1	138	0.58	0.49	0.68
32	CP	9,299	32,189.6	167	0.52	0.44	0.60
32	MM	480	4,014.7	39	0.97	0.69	1.33
32	MP	23,586	92,721.2	570	0.61	0.57	0.67
36	CC	6,399	33,515.4	197	0.59	0.51	0.68
36	CM	443	2,864.2	22	0.77	0.48	1.16
36	CP	4,101	13,202.1	78	0.59	0.47	0.74
36	MM	1,002	8,789.2	115	1.31	1.08	1.57
36	MP	2,885	9,587.3	76	0.79	0.62	0.99
>36	CC	1,523	5,492.9	27	0.49	0.32	0.72
>36	CM	7	48.6	0	0.00	0.00	7.60
>36	CP	4	12.2	0	0.00	0.00	30.34
>36	MM	1,648	12,759.0	473	3.71	3.38	4.06
>36	MP	32	149.1	1	0.67	0.00	3.74

Summary Revision Rates vs Head Size

Size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	58,484	478,449.6	3,359	0.70	0.68	0.73
32	31,630	122,777.6	750	0.61	0.57	0.66
36	13,000	55,288.3	400	0.72	0.65	0.80
>36	3,031	15,980.8	451	2.82	2.56	3.09

Head size > 36mm has a significantly higher revision rate compared to the other 3 sizes and the 32 mm head has a significantly lower revision rate than the <=28 mm head.

Revision Comparison Standard vs Cross linked Polyethylene

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	1,2159	69,560.2	415	0.60	0.54	0.66
CM	481	3,040.6	24	0.79	0.51	1.17
CP	24,410	138,157.1	890	0.64	0.60	0.69
PS	6,913	70,764.8	536	0.76	0.69	0.82
PX	17,469	67,310.5	354	0.53	0.47	0.58
MM	6,033	60,371.0	885	1.47	1.37	1.57
MP	71,636	486,493.8	3,357	0.69	0.67	0.71
PS	36,251	315,420.3	2,331	0.74	0.71	0.77
PX	35,385	171,073.5	1,026	0.60	0.56	0.64

PS = standard polyethylene PX = cross linked polyethylene

CP (PX) has a significantly lower revision rate compared to the PS combination and the MP (PS). The MM has a significantly higher revision rate than all the others.

Revision vs Bearing Surfaces of Uncemented Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	9,563	55,474.0	349	0.63	0.56	0.70
CM	471	3,023.1	23	0.76	0.48	1.14
CP	16,071	85,332.6	545	0.64	0.59	0.69
MM	5,383	53,864.6	810	1.50	1.40	1.61
MP	13,885	81,880.6	645	0.79	0.73	0.85

The MM articulation has a significantly higher revision rate than all the others. CC and CP have significantly lower revision rates 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	679	5,050.5	39	0.77	0.55	1.06
MM	7	53.7	2	3.73	0.45	13.46
MP	23,724	184,326.3	1,182	0.64	0.61	0.68

There is no significant difference between CP and MP bearing surfaces.

Revision vs Bearing Surfaces of Hybrid Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	2,596	14,086.1	66	0.47	0.36	0.60
CM	10	17.5	1	5.71	0.14	31.84
CP	7,660	47,774.0	306	0.64	0.57	0.72
MM	643	6,452.8	73	1.13	0.89	1.42
MP	34,027	220,286.9	1,530	0.69	0.66	0.73

The CC has a significantly lower revision rate than the MP and MM bearing surfaces.

Summary for Revision vs Bearing Surfaces

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	12,159	69,560.2	415	0.60	0.54	0.66
CM	481	3,040.6	24	0.79	0.51	1.17
CP	24,410	138,157.1	890	0.64	0.60	0.69
MM	6,033	60,371.0	885	1.47	1.37	1.57
MP	71,636	486,493.8	3,357	0.69	0.67	0.71

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

Revision vs Bearing Surface Options for 6 Acetabulae in common use

		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
RM Pressfit cup	M	333	2,699.5	22	0.81	0.50	1.21
	P	9,543	43,291.9	238	0.55	0.48	0.62
	PS	5,798	32,818.0	184	0.56	0.48	0.65
	PX	3,745	10,473.9	54	0.52	0.39	0.67
Pinnacle	C	2,814	13,639.7	79	0.58	0.46	0.72
	M	1,524	12,629.3	150	1.19	1.01	1.39
	PS	23	118.2	0	0.00	0.00	3.12
	PX	9,636	35,615.7	207	0.58	0.50	0.67
	P	9,659	35,733.9	207	0.58	0.50	0.66
R3 porous	C	866	3,262.1	9	0.28	0.13	0.52
	M	110	703.2	45	6.40	4.61	8.48
	P	2,712	7,220.9	53	0.73	0.55	0.96
Trident	C	2,420	20,210.2	96	0.48	0.38	0.58
	M	46	65.3	1	1.53	0.04	8.54
	P	9,623	57,446.3	304	0.53	0.47	0.59
Tritanium	C	89	348.3	1	0.29	0.01	1.60
	M	77	158.4	2	1.26	0.15	4.56
	P	3,261	9,727.3	75	0.77	0.61	0.97
Trilogy	C	69	766.4	5	0.65	0.21	1.52
	M	5	51.1	0	0.00	0.00	7.22
	PS	158	2,101.2	13	0.62	0.33	1.06
	PX	5,585	37,201.6	206	0.55	0.48	0.63
	P	5,743	39,302.9	219	0.56	0.49	0.64

C ceramic, M metal, P polyethylene, PS standard polyethylene, PX crosslinked polyethylene (there were relatively too few PS in 3 of the groups to split PS from PX).

The metal bearing surfaces have a significantly higher revision rate for the Pinnacle and R3 porous and although higher for RM pressfit, Trident and Tritanium do not reach statistical significance due to their relatively small numbers.

Revision vs Monoblock Femoral Stems

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,297	14,156.2	68	0.48	0.37	0.61

Revision vs Acetabulum types

Acetabulum type	No. Ops.	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Uncemented No Liner	18,389	128,308.0	1,095	0.85	0.80	0.91
Cemented	24,903	192,885.4	1,252	0.65	0.61	0.69
Uncemented with Liner	71,427	436,429.3	3,224	0.74	0.71	0.76

The fully cemented acetabulum has a significantly lower revision rate than the other two types.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	17,271	129,427.7	1,361	1.05	1.00	1.11
55-64	29,377	210,233.4	1,821	0.87	0.83	0.91
65-74	39,322	265,294.4	1,696	0.64	0.61	0.67
>=75	31,357	177,432.0	836	0.47	0.44	0.50

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	<55	4,711	27,089.2	178	0.66	0.56	0.76
	55-64	4,935	29,110.8	150	0.52	0.44	0.60
	65-74	2,291	12,352.9	81	0.66	0.52	0.81
	>=75	222	1,007.2	6	0.60	0.22	1.30
CM	<55	183	1,163.8	9	0.77	0.35	1.47
	55-64	211	1,353.8	11	0.81	0.41	1.45
	65-74	73	466.1	4	0.86	0.23	2.20
	>=75	14	56.9	0	0.00	0.00	6.48
CP	<55	4,695	30,014.3	243	0.81	0.71	0.92
	55-64	8,651	50,526.7	339	0.67	0.60	0.75
	65-74	8,025	43,661.8	229	0.52	0.46	0.60
	>=75	3,039	13,954.2	79	0.57	0.45	0.71
MM	<55	2,882	30,964.1	432	1.40	1.27	1.53
	55-64	2,380	23,285.6	373	1.60	1.44	1.77
	65-74	674	5,723.0	74	1.29	1.02	1.62
	>=75	97	398.3	6	1.51	0.55	3.28
MP	<55	4,521	37,211.3	468	1.26	1.15	1.38
	55-64	12,706	100,800.7	917	0.91	0.85	0.97
	65-74	27,296	193,348.5	1,256	0.65	0.61	0.69
	>=75	27,113	155,133.3	716	0.46	0.43	0.50

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	
Female	62,620	416,735.3	2,717	0.65	0.63	0.68
Male	54,707	365,652.2	2,997	0.82	0.79	0.85

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	
<10	1,638	12,242.4	123	1.00	0.84	1.20
10-24	12,348	82,853.9	659	0.80	0.74	0.86
25-49	49,833	335,677.7	2,586	0.77	0.74	0.80
50-74	26,512	172,471.3	1,092	0.63	0.60	0.67
75-99	15,352	87,159.1	571	0.66	0.60	0.71
>=100	11,644	91,983.0	683	0.74	0.69	0.80

Those surgeons performing 51-74 and 75-99 arthroplasties a year have a significantly lower revision rate than those in the three lower categories.

Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	4,091	33,440.9	257	0.77	0.68	0.87
Posterior	75,743	492,038.4	3,645	0.74	0.72	0.77
Lateral	29,775	209,761.3	1,398	0.67	0.63	0.70
Troch	135	884.4	14	1.58	0.87	2.66

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	25,888	204,920.4	1,305	0.64	0.60	0.67
Uncemented	45,911	283,361.4	2,398	0.85	0.81	0.88
Hybrid	45,528	294,105.7	2,011	0.68	0.65	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	716	6,815.2	128	1.88	1.57	2.23
55-64	2,517	24,944.7	286	1.15	1.02	1.29
65-74	9,001	81,893.1	552	0.67	0.62	0.73
>74	13,654	91,267.4	339	0.37	0.33	0.41
Uncemented						
<55	12,756	90,771.4	858	0.95	0.88	1.01
55-64	16,683	106,894.7	942	0.88	0.83	0.94
65-74	12,003	65,492.1	446	0.68	0.62	0.75
>74	4,469	20,203.2	152	0.75	0.64	0.88
Hybrid						
<55	3,799	31,841.1	375	1.18	1.06	1.30
55-64	10,177	78,394.0	593	0.76	0.70	0.82
65-74	18,318	117,909.2	698	0.59	0.55	0.64
>74	13,234	65,961.3	345	0.52	0.47	0.58

For the <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 and uncemented hips have a significantly lower revision rate than cemented.

For the 65-74 age band there is no significant difference in the revision rates among the 3 groups

For the >74 age band, cemented hips have a significantly lower revision rate than uncemented and hybrid hips and the latter has a significantly lower revision rate than uncemented hips.

Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	13,719	73,624.6	574	0.78	0.72	0.85
2	49,621	245,742.2	1,649	0.67	0.64	0.70
3	19,569	85,540.2	582	0.68	0.63	0.74
4	717	2,322.6	26	1.12	0.73	1.64

ASA 1 and 4 have a significantly higher revision rate than ASA 2

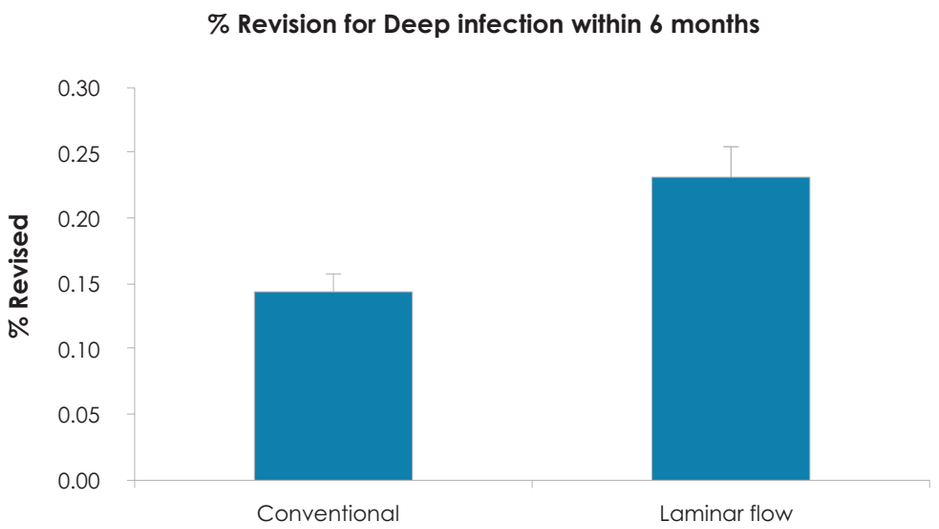
Revision vs BMI Status

BMI	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
< 19	299	775.0	5	0.65	0.21	1.51
19 - 24	7,575	21,498.9	142	0.66	0.56	0.78
25 - 29	13,447	38,399.7	238	0.62	0.54	0.70
30 - 39	12,157	33,808.5	241	0.71	0.63	0.81
40+	1,553	4,107.7	50	1.22	0.90	1.60

The 40+ group has a significantly higher revision rate than all the others.

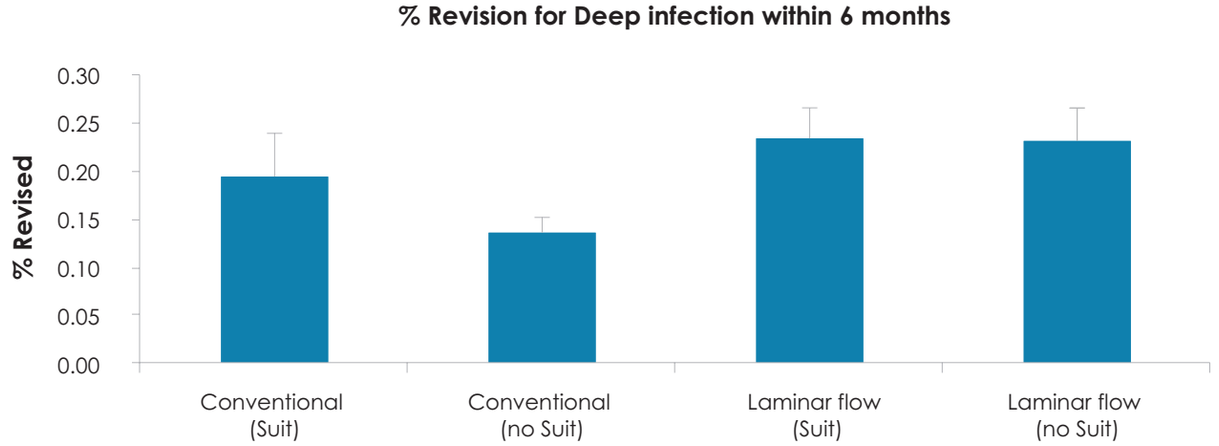
Revision for Deep Infection within six months vs Theatre Environment

Theatre	Total Number	Number revised	%	Std Error
Conventional	69,110	99	0.143	0.0144
Laminar flow	40,990	95	0.232	0.0238



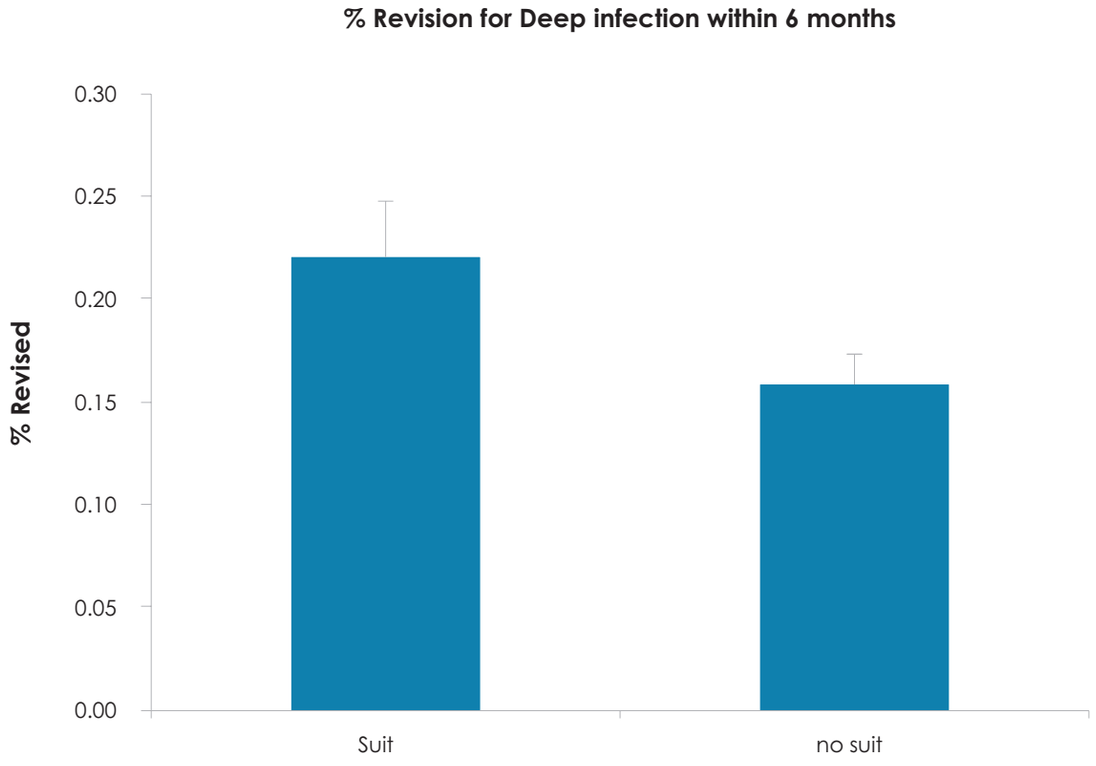
There is a significant difference in revision rates (1.6x) for deep infection within six months of surgery between conventional and laminar flow theatres.

		Total Number	Number revised	%	Std Error
Conventional	Suit	9,282	18	0.194	0.0457
	No suit	59,828	81	0.135	0.0150
Laminar flow	Suit	21,523	50	0.232	0.0328
	No suit	19,467	45	0.231	0.0344



There is a significant difference in revision rates (1.7x) for laminar flow/suit compared to conventional/no suit environments.

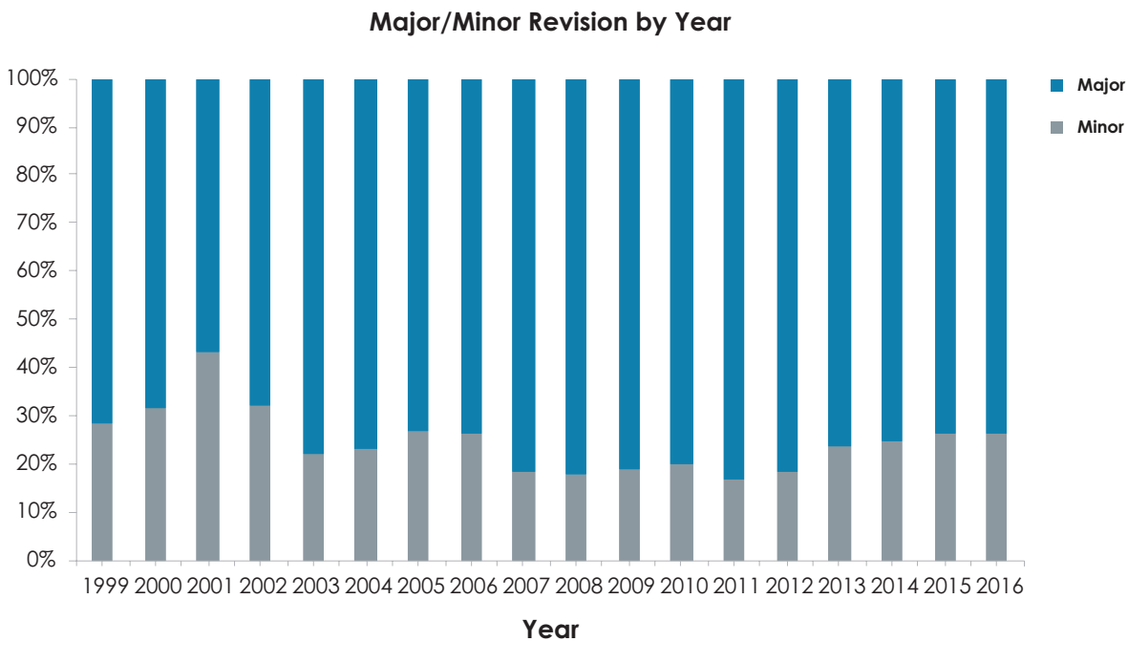
	Total Number	Number revised	%	Std Error
Suit	30,805	68	0.221	0.0267
no suit	79,295	126	0.159	0.0141



There is a significant increase in revision rates (1.4x) 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 six 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.

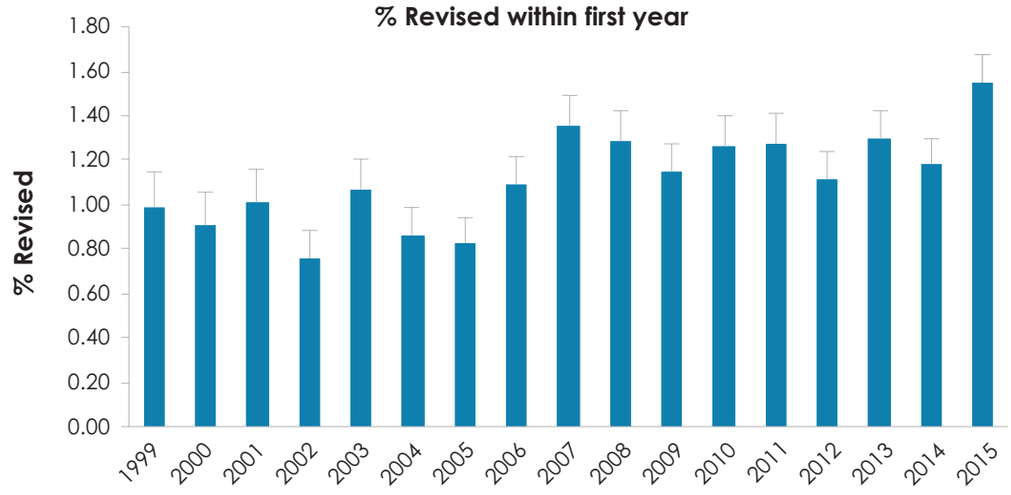
Re Revisions for Major vs Minor Revisions

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	1,288	5,483.1	217	3.96	3.45	4.52
Major	4,389	19,188.0	571	2.98	2.74	3.23

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

Percentage of hips revised in the first year

The following bar graph shows that the percentage of hips revised in the first year after arthroplasty rose in 2015 to 1.54%, the highest level yet.



Resurfacing Arthroplasty
All Patients

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,665	10,993.2	134	1.22	1.02	1.44

There is a significantly higher revision rate compared to conventional hip arthroplasty (0.73/100 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	35.1	0	0	0	10.50
ASR	132	1,177.3	39	3.31	2.36	4.53
BHR	1,482	9,475.2	89	0.94	0.75	1.16
BMHR	28	164.3	1	0.61	0.02	3.39
Conserve Superfinish	3	22.6	0	0	0	16.32
Durom	4	50.3	0	0	0	7.34
Mitch TRH Resurfacing Head	12	68.5	5	7.30	2.37	17.05

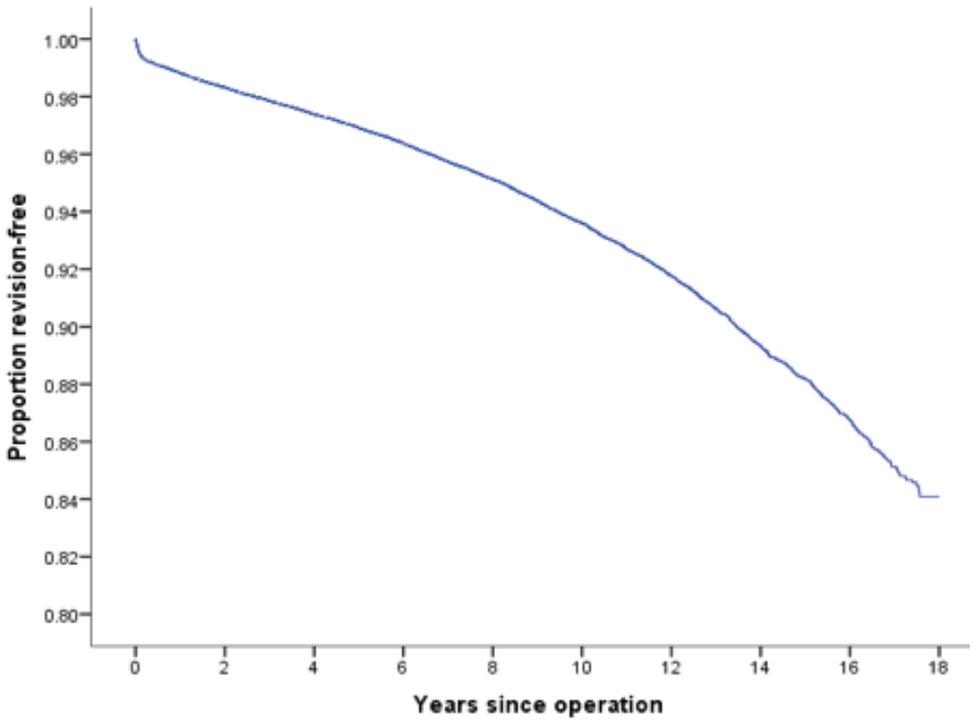
Head size vs Revision Rate

Hips resurfacing head size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=44	99	699.7	30	4.29	2.89	6.12
45-49	337	2,428.1	45	1.85	1.35	2.48
50-54	1,141	7,147.3	50	0.70	0.52	0.92
>=55	88	718.1	9	1.25	0.57	2.38
ALL	1,665	10,993.2	134	1.22	1.02	1.44

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.

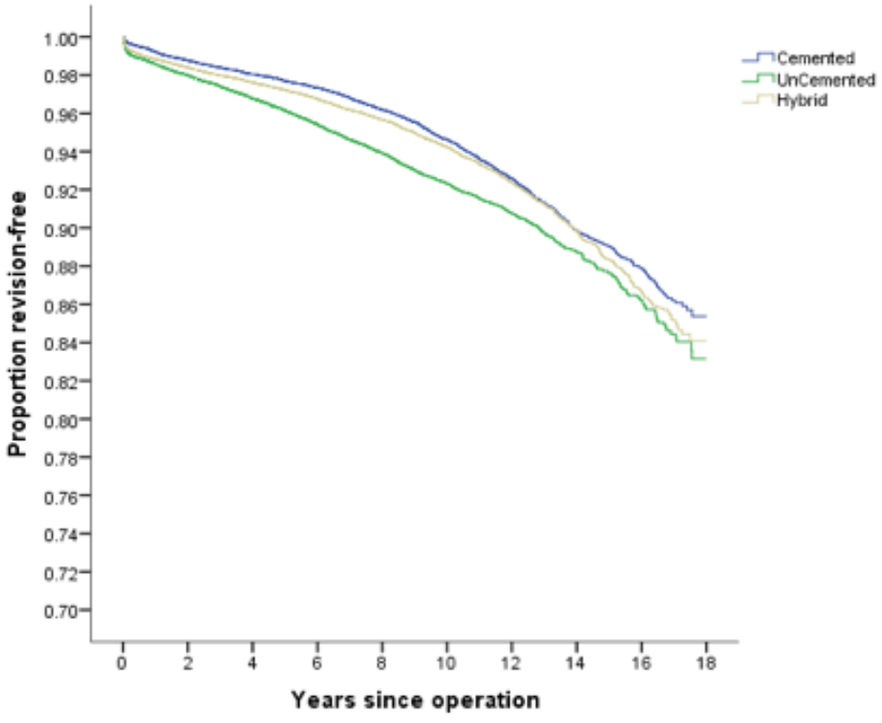
KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the years 1999 – 2016 with deceased patients censored at time of death.



Years	% Revision-free	No in each year
1	98.80	105,524
2	98.30	95,370
3	97.80	85,401
4	97.40	76,114
5	96.90	67,166
6	96.40	58,790
7	95.70	50,572
8	95.10	42,824
9	94.40	35,902
10	93.60	29,423
11	92.70	23,751
12	91.80	18,516
13	90.60	13,730
14	89.30	9,899
15	88.20	6,710
16	86.80	3,980
17	85.10	1,684

The KM analysis is to17 years rather than 18 as too few registered hips were revised in 2016.



Cemented

Years	% Revision-free	No in each year
1	99.20	24,053
2	98.80	22,470
3	98.40	20,760
4	98.00	19,053
5	97.70	17,289
6	97.30	15,608
7	96.80	13,992
8	96.20	12,415
9	95.60	10,881
10	94.60	9,256
11	93.60	7,682
12	92.60	6,116
13	91.30	4,628
14	89.90	3,440
15	89.00	2,419
16	87.90	1,482
17	86.20	689

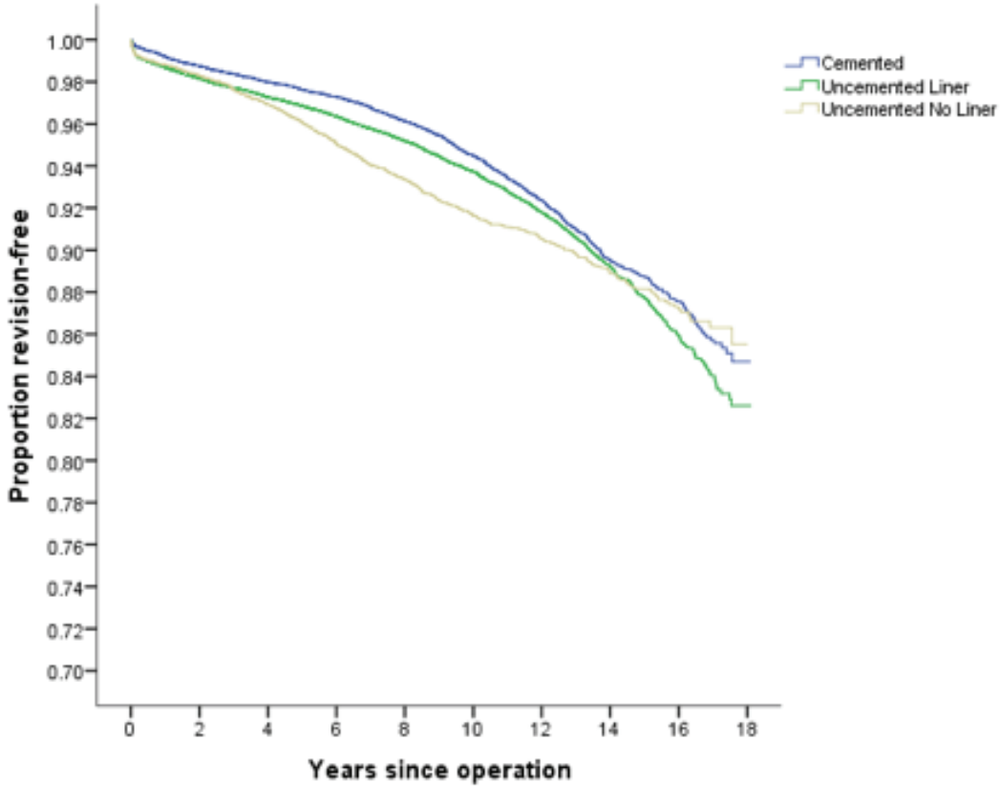
Uncemented

Years	% Revision-free	No in each year
1	98.60	41,041
2	98.00	36,796
3	97.40	32,708
4	96.80	28,845
5	96.10	25,219
6	95.40	21,678
7	94.60	17,912
8	93.90	14,380
9	93.00	11,458
10	92.30	8,996
11	91.60	6,968
12	90.80	5,310
13	89.70	3,892
14	88.80	2,722
15	87.60	1,809
16	86.20	1,062
17	84.40	444

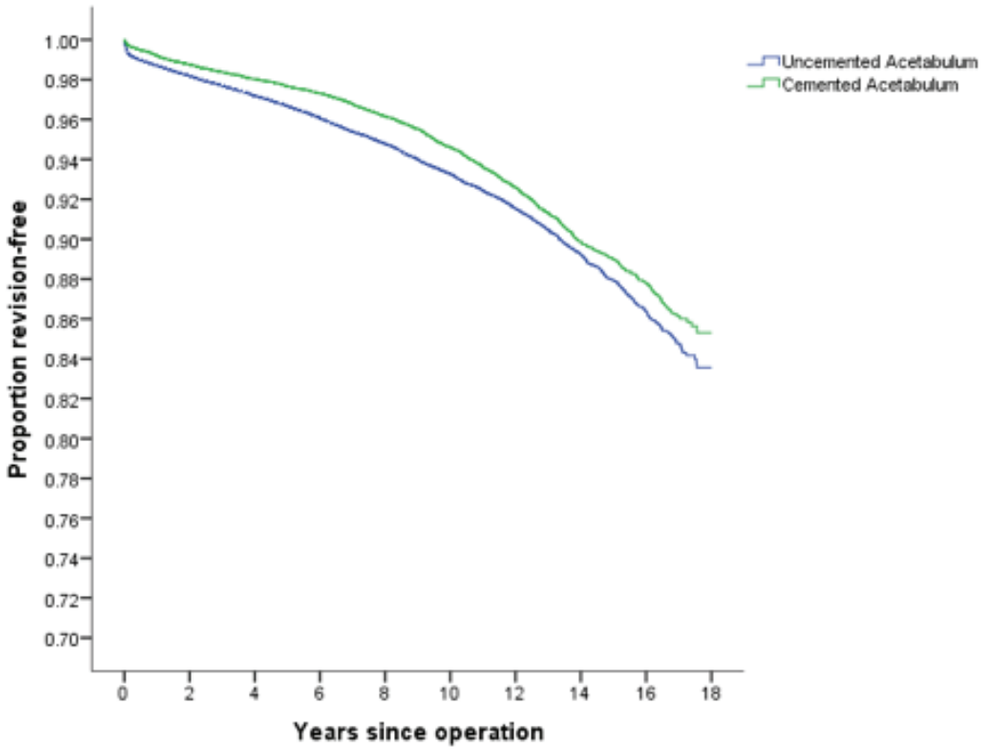
Hybrid

Years	% Revision-free	No in each year
1	98.80	40,430
2	98.40	36,104
3	98.00	31,933
4	97.60	28,216
5	97.20	24,658
6	96.80	21,504
7	96.20	18,668
8	95.70	16,029
9	95.00	13,563
10	94.20	11,171
11	93.30	9,101
12	92.40	7,090
13	91.20	5,210
14	89.80	3,737
15	88.30	2,482
16	86.70	1,436
17	85.20	551

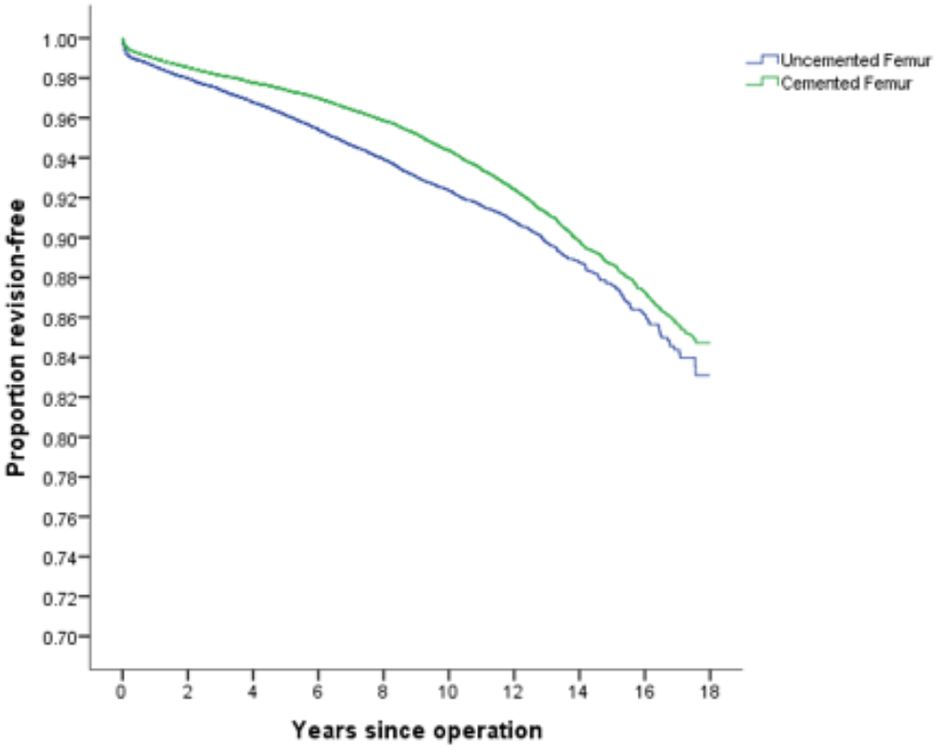
Survival of Cemented vs Uncemented no Liner vs Uncemented with Liner



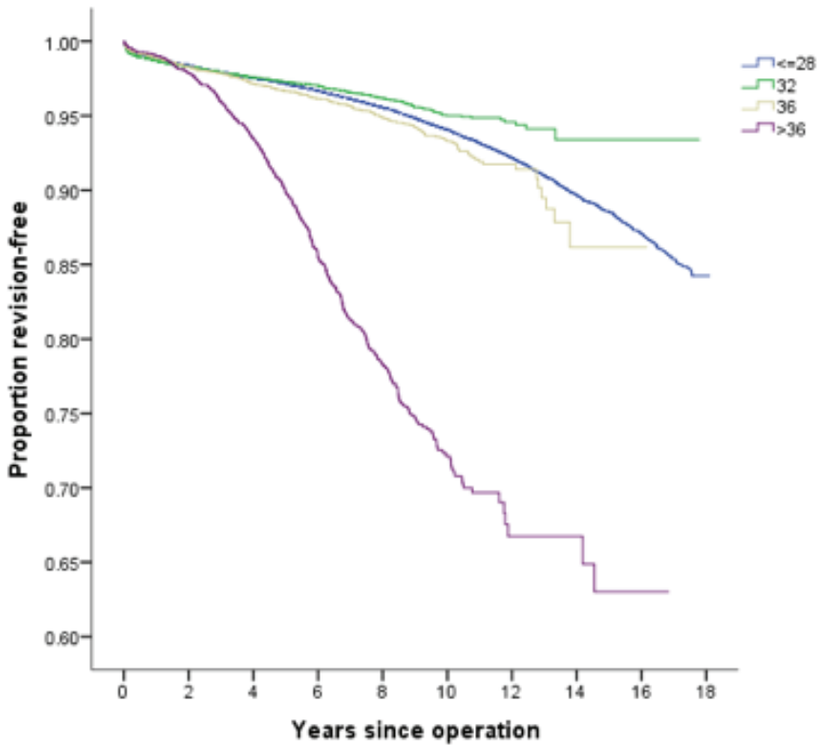
Survival of Cemented vs Uncemented Acetabulae



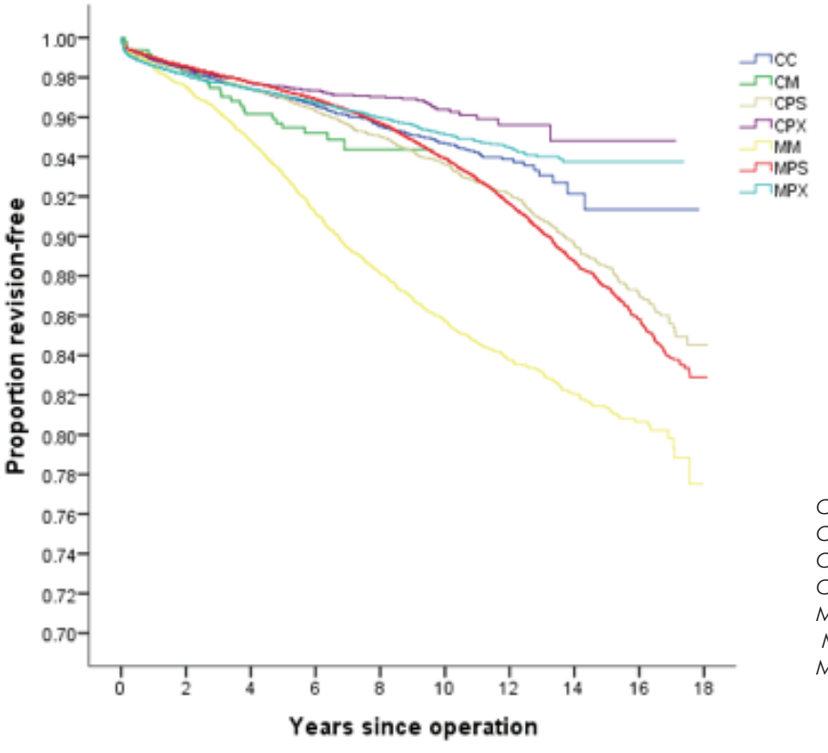
Survival of Cemented vs Uncemented Femoral components



Survival of Head Sizes

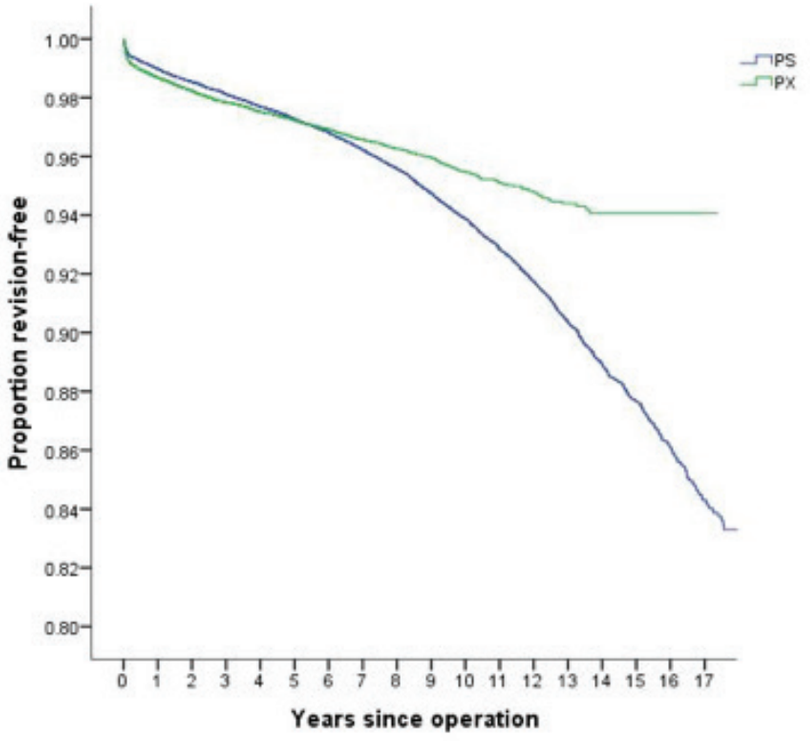


Survival of Bearing Surfaces



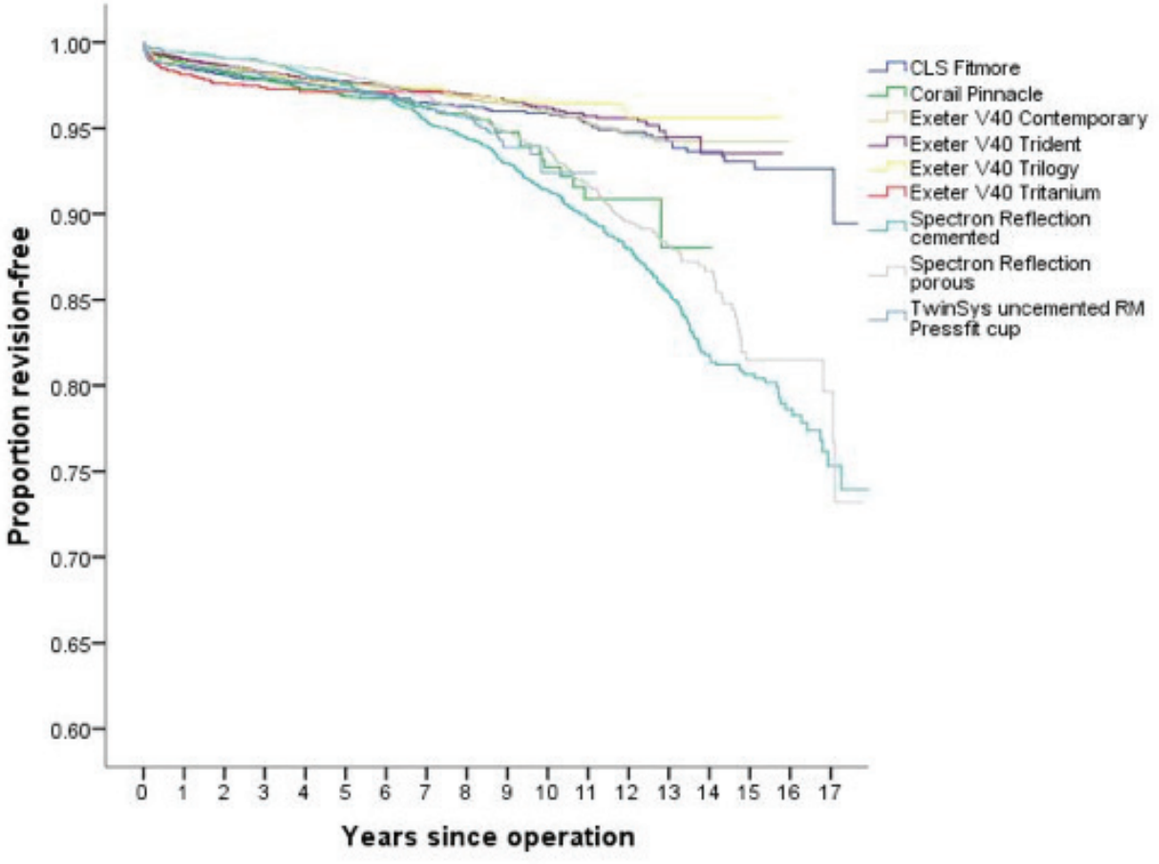
CC =ceramic/ceramic,
CM = ceramic/metal,
CPS = ceramic/std.plastic,
CPX ceramic/Xlinked plastic,
MM = metal/metal,
MPS = metal/std.plastic,
MPX = metal /Xlinked plastic

Survival of Crosslinked vs Standard polyethylene

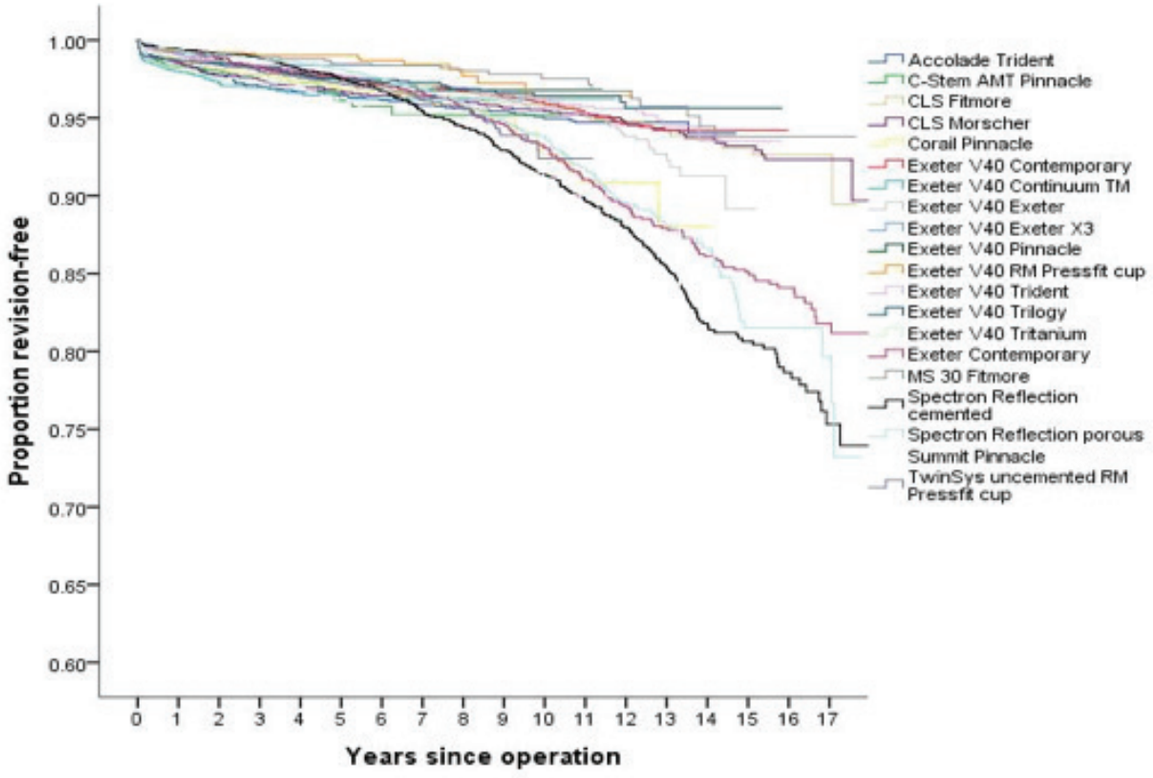


PX = cross linked
PS = standard polyethylene

Survival of combinations with > 2000 procedures

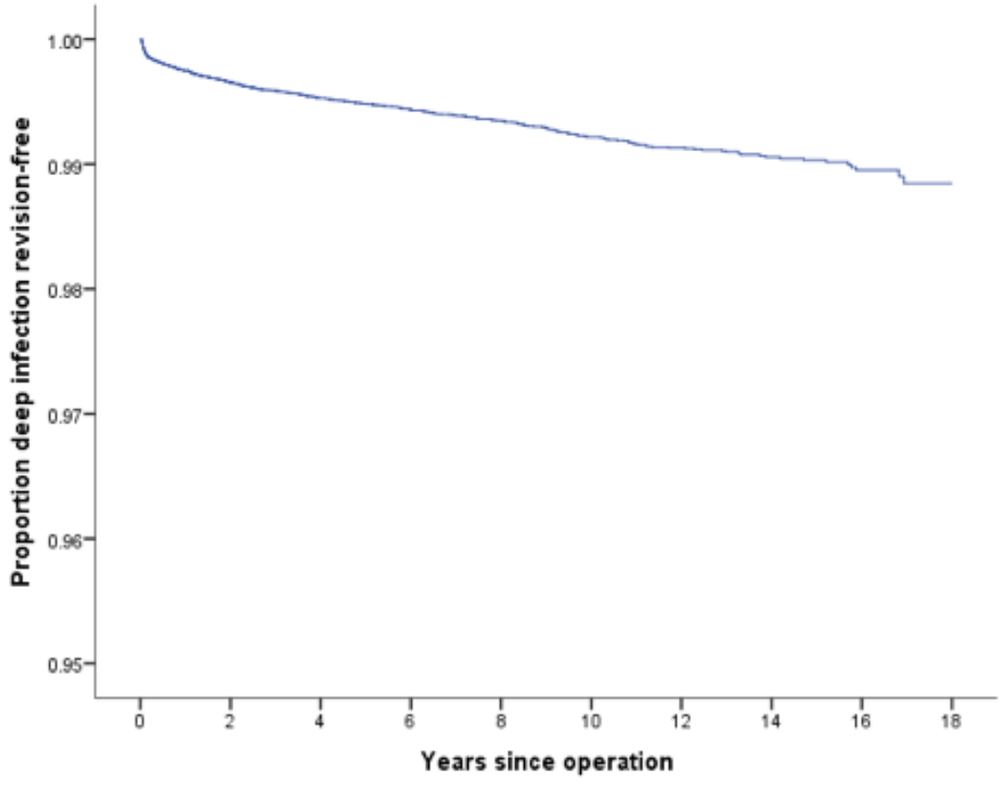


Survival of combinations with > 1500 procedures

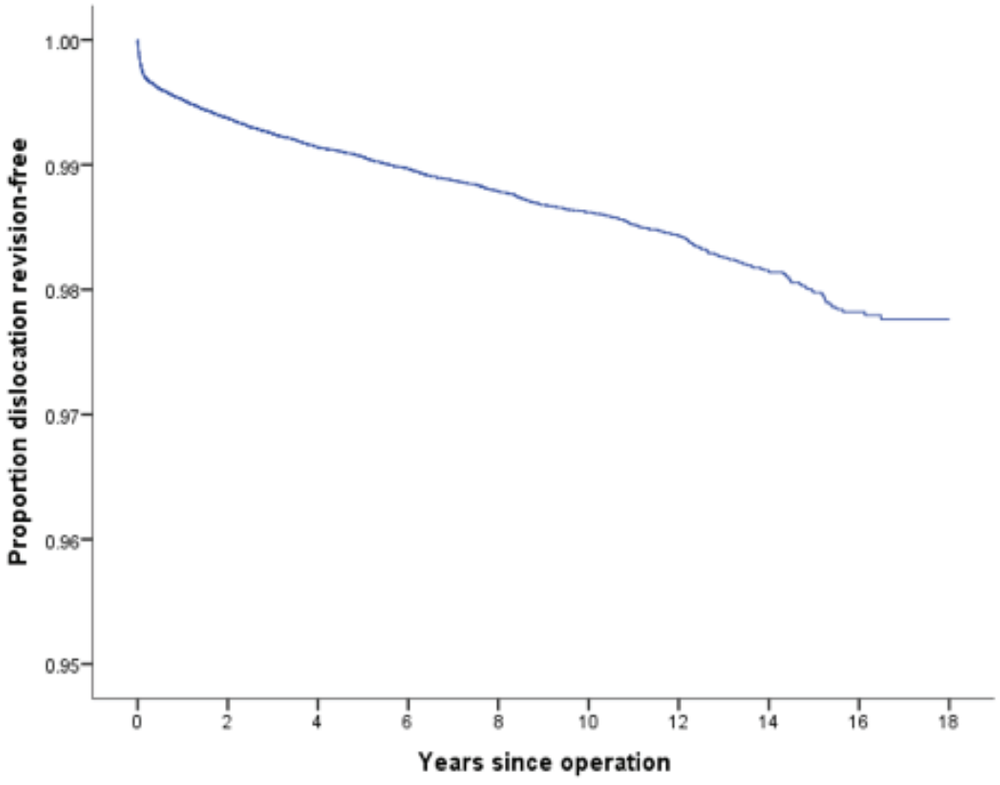


The following K M graphs are for the six main individual reasons for revision:

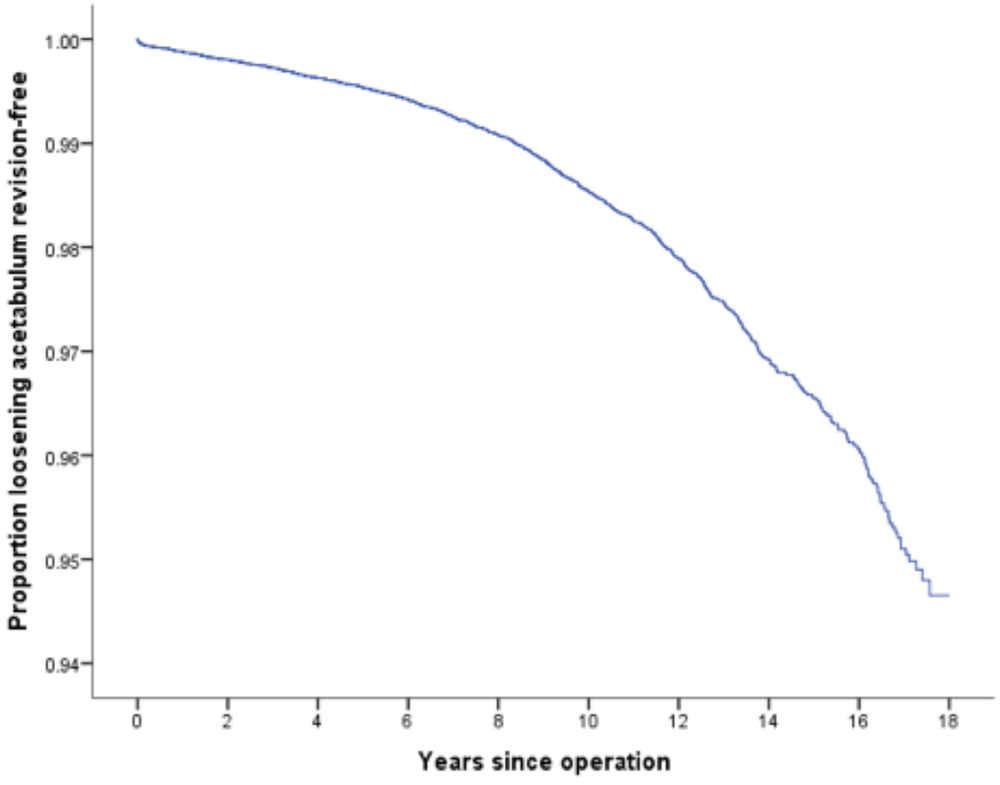
Deep infection



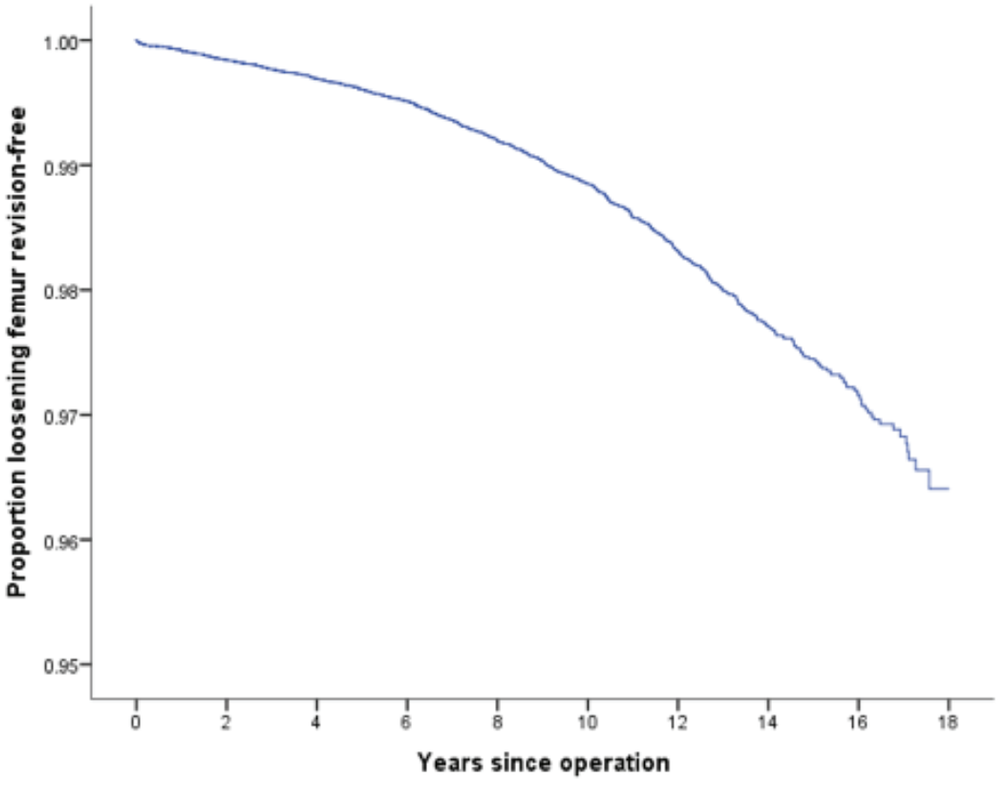
Dislocation



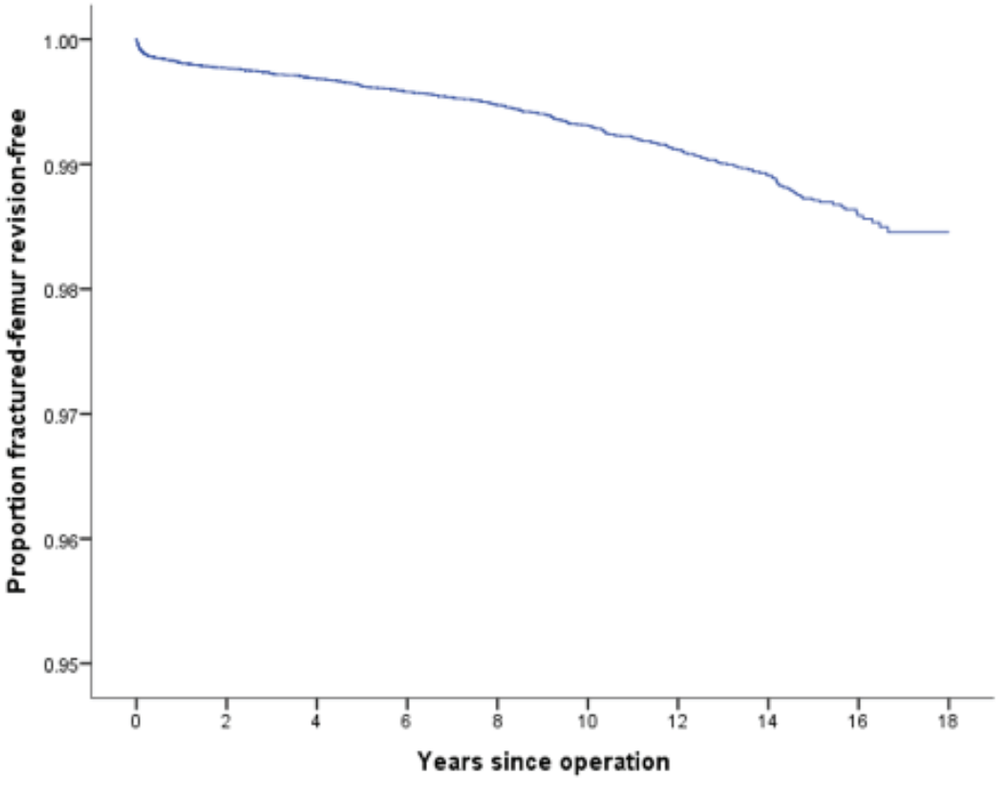
Loosening acetabular component



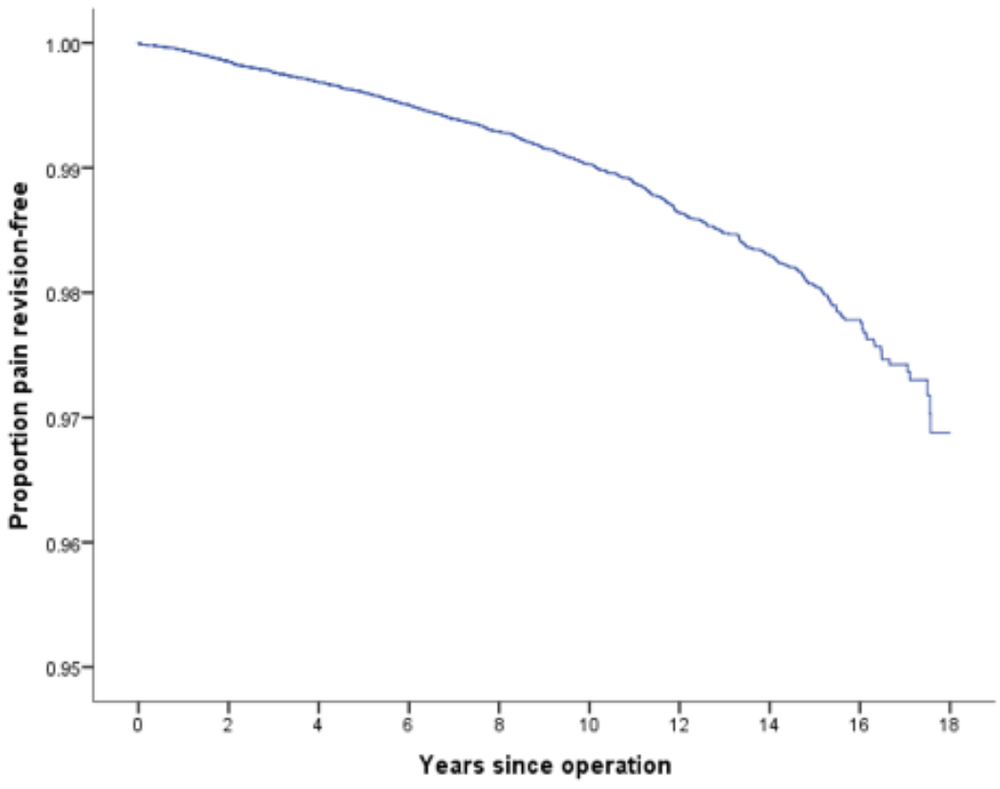
Loosening femoral component



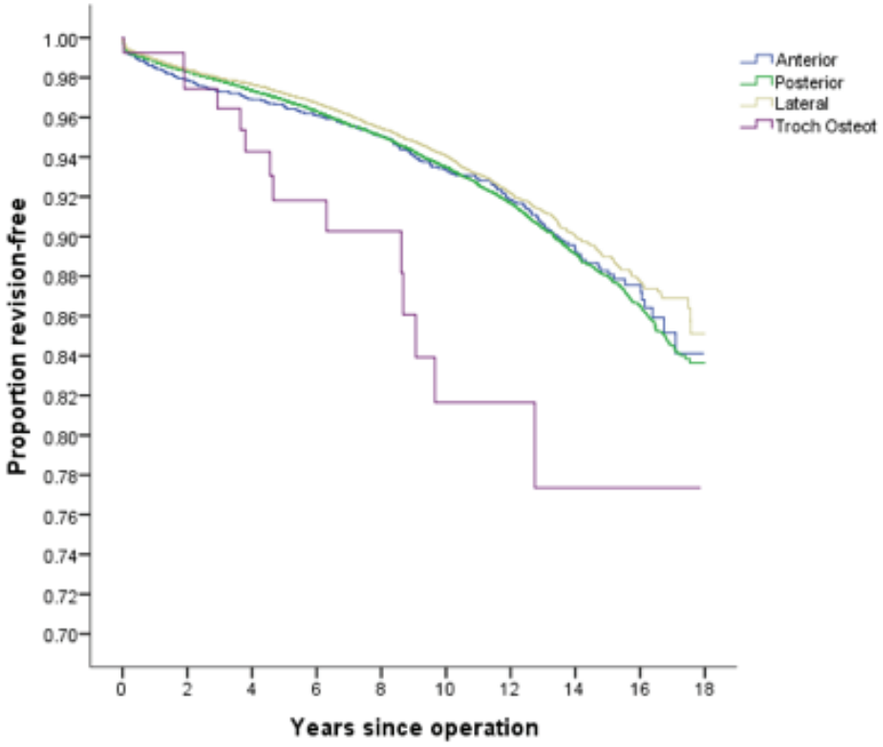
Fracture of femur



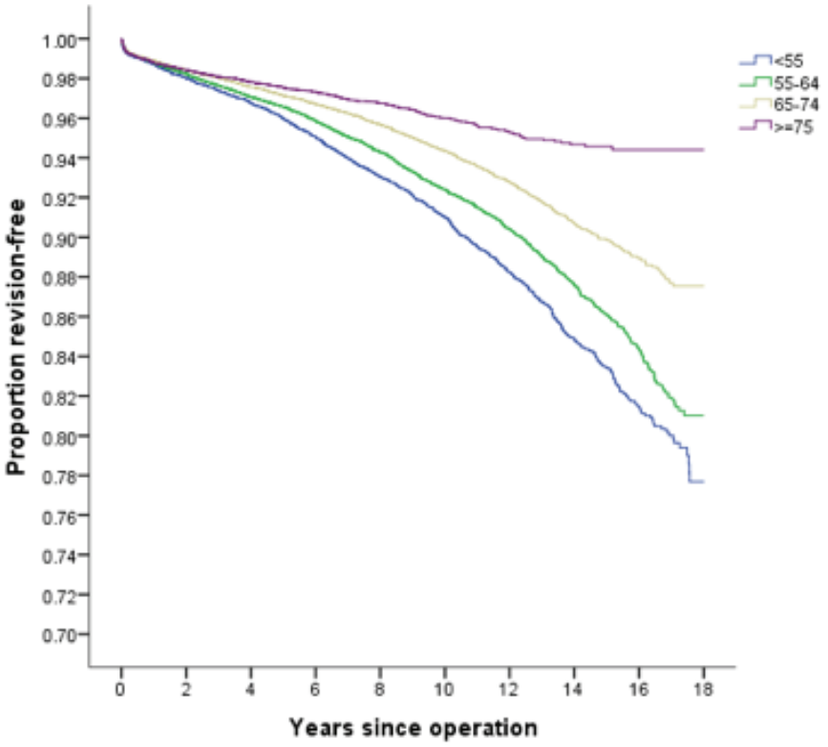
Pain



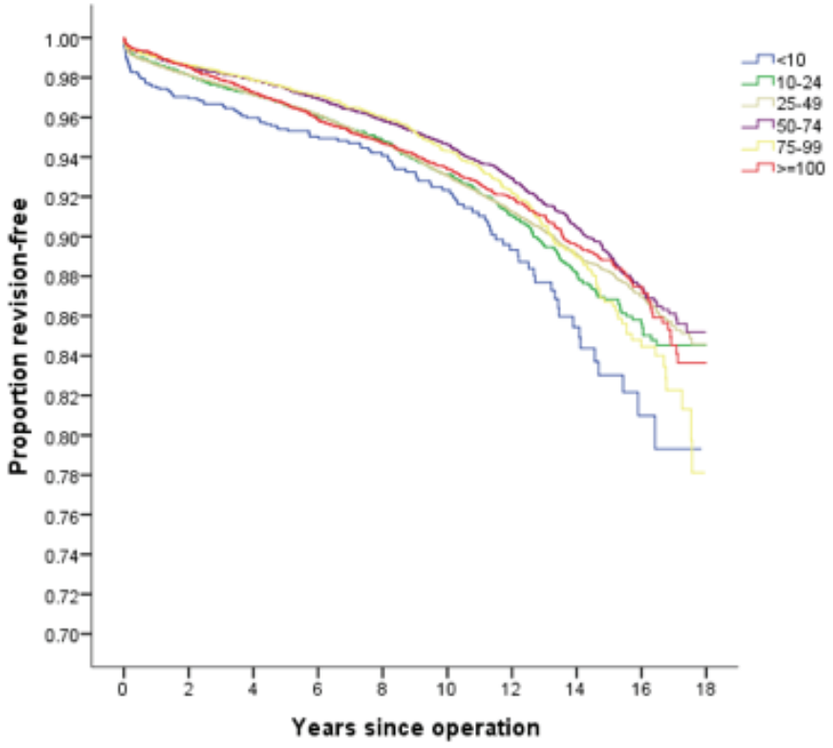
Survival for surgical approach



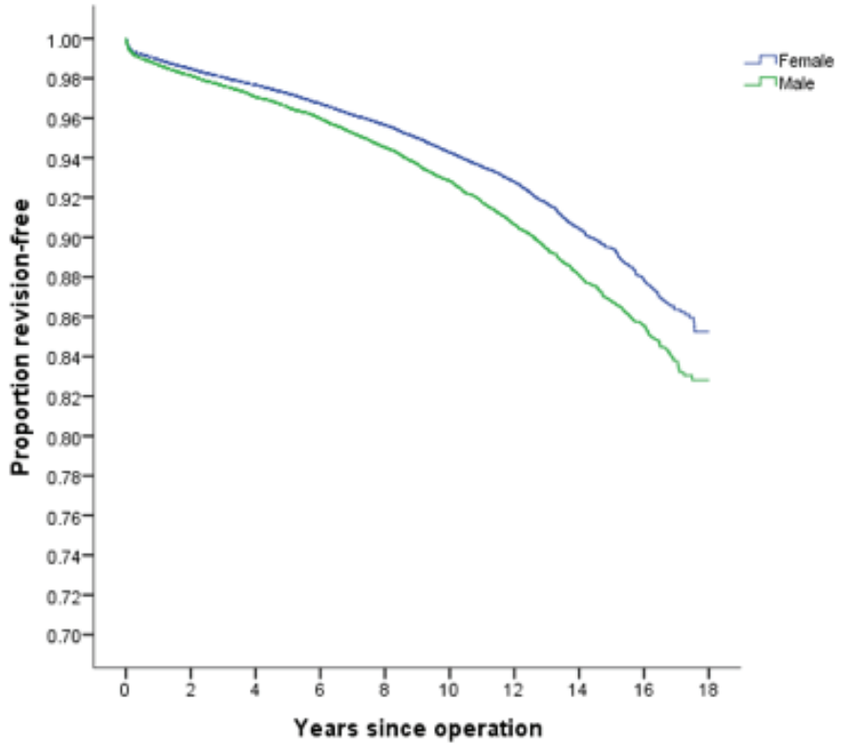
Survival for age bands



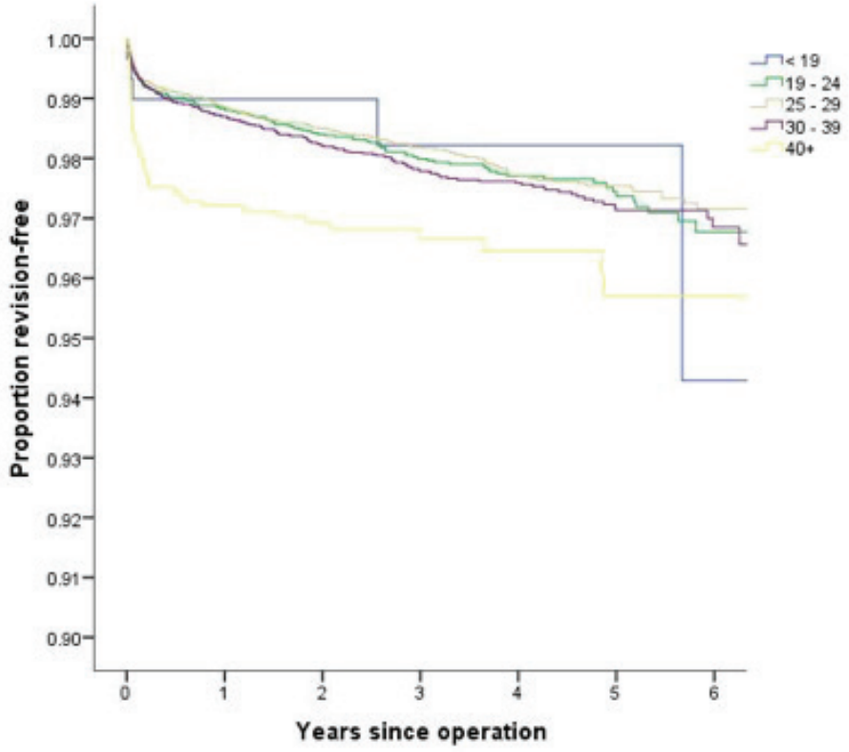
Survival for surgeon annual output



Survival male vs female



Survival vs BMI



Re-revisions of conventional hips

Analyses were undertaken of hip re-revisions.

There were 792 registered conventional hip replacements that had been revised twice, 180 that had been revised three times, 47 that had been revised four times, 11 that had been revised five times and 3 that had been revised six times. There was 1 patient who has now had 11 revisions.

Second revision

Time between the first and second revisions averaged 818 days, with a range of 1 – 6,257 and a standard deviation of 1,083. This compares to an average of 1,963 days between the primary and first revision.

Reason for revision

Dislocation	238
Deep infection	229
Loosening femoral component	105
Loosening acetabulum component	87
Pain	80
Fracture femur	54

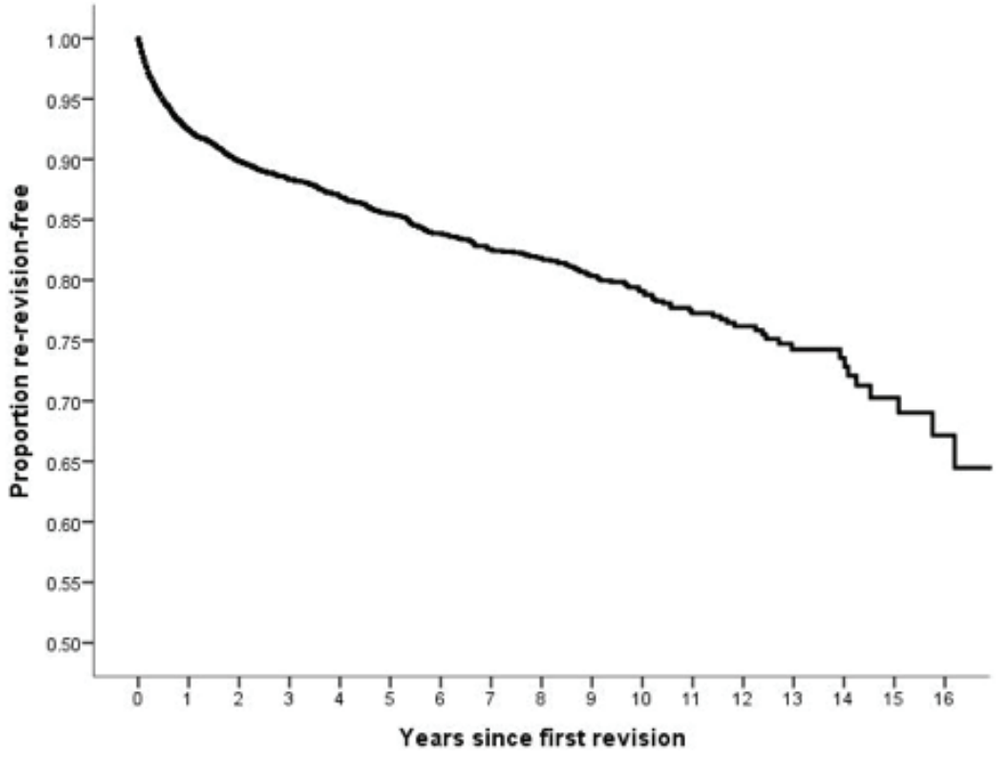
Revision

Change of head	533
Change of acetabulum	234
Change of liner	364
Change of femoral	228
Change of all	201

Re-revisions

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
5,714	24,903.0	792	3.18	2.96	3.41

The re- revision rate is highly significant when compared to the primary revision rate of 0.70 /100 component years.



Years	% re-revision free
1	92.40
2	89.80
3	88.30
4	86.90
5	85.50
6	83.90
7	82.60
8	81.80
9	80.30
10	79.10
11	77.30
12	76.20

Third revision

The average time between second and third revisions for the 180 arthroplasties was 606 days with a range of 1 – 4,451 and a standard deviation of 739.

Fourth revision

The average time between the third and fourth revisions for the 47 arthroplasties was 503 days, with a range of 7 – 3,925 and a standard deviation of 810 days.

Fifth revision

There were 11 registered, with an average time to revision of 456 days.

Sixth revision

There were three registered with an average time to revision of 246 days.

Eleventh revision

One patient has had 11 revisions.

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

Re- revisions of resurfacing hip replacements

There have been 28 re-revisions.

The average time between the first and second revisions was 701 days, with a range of 11 – 3,036 and a standard deviation of 866. This compares with an average of 1,886 days between the primary resurfacing and the first revision.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS, TEN YEARS AND 15 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 eighteen-year period, and as at July 2017, there were 30,463 primary hip questionnaire responses registered six months post-surgery. The mean hip score was 40.42 (standard deviation 7.61, range 48 – 2).

Scoring	> 41	17,229
Scoring	34 -41	8,359
Scoring	27 -33	2,894
Scoring	< 27	1,981

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 five years post-surgery.

This dataset represents sequential Oxford hip scores for 10,877 individual patients.

At five years post-surgery, 89% of these patients achieved an excellent or good score and had a mean of 42.42.

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 hip scores for 6,879 individual patients.

At ten years post-surgery, 87% of these patients achieved an excellent or good score and had a mean of 41.90.

Questionnaires at fifteen 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 15 years post-surgery.

This dataset represents sequential Oxford hip scores for 2,452 individual patients.

At fifteen years post-surgery, 86% of these patients achieved an excellent or good score and had a mean of 41.48

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 problems were pain (Q1) and limping (Q10). However, for the five, ten and fifteen year analyses the most common persisting problem was pain (Q1).

Percentage scoring 0 or 1 (worst categories) for each question at six months, five, ten and fifteen years post-surgery

		6m %	5y %	10y %	15y %
1	Moderate or severe pain from the operated hip	13	13	16	16
2	Only able to walk around the house or unable to walk before pain becomes severe	4	3	4	4
3	Extreme difficulty or impossible to get in and out of a car or public transport	2	2	3	3
4	Extreme difficulty or impossible to put on a pair of socks	9	5	6	8
5	Extreme difficulty or impossible to do the household shopping on your own	4	2	3	4
6	Extreme difficulty or impossible to wash and dry yourself	2	1	1	1
7	Pain interfering greatly or totally with your work	4	3	3	4
8	Very painful or unbearable to stand up from a chair after a meal	2	1	1	2
9	Sudden severe pain most or all of the time	2	2	2	2
10	Limping most or every day	12	8	8	9
11	Extreme difficulty or impossible to climb a flight of stairs	4	3	4	6
12	Pain from your hip in bed most (or every) nights	5	3	4	4

As noted in previous years there is little significant change between the six month, five, ten and now fifteen year scores which means the six month score is indicative of the longer term outcome.

Oxford Scores vs BMI Status

BMI	Mean	Std. Error of Mean	No
< 19	38.75	1.191	48
19 - 24	40.93	0.188	1,418
25 - 29	40.78	0.146	2,356
30 - 39	39.27	0.179	1,893
40+	36.61	0.618	216
Total	**40.17**	**0.097**	**5,931**

Revision hip questionnaire responses

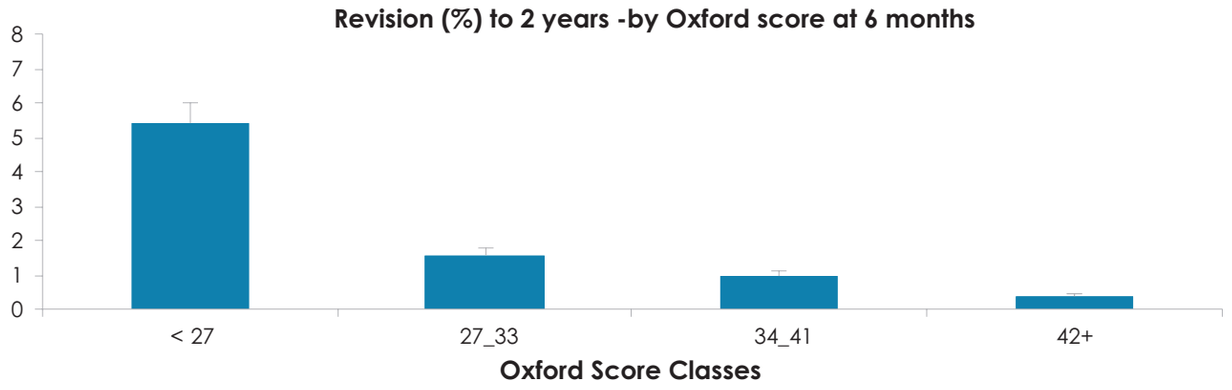
There were 9,397 revision hip responses with 63% achieving an excellent or good score. This group includes all revision hip procedures including revisions of primary arthroplasties performed prior to 1999. The mean revision hip score was 35.12 (standard deviation 9.81, range 48 – 2).

OXFORD 12 SCORE AS A PREDICTOR OF HIP ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at six months, five and ten 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 two years related to the Oxford score. A patient with a score below 27 has 12.5 times the risk of a revision within two years compared to a person with a score >41.

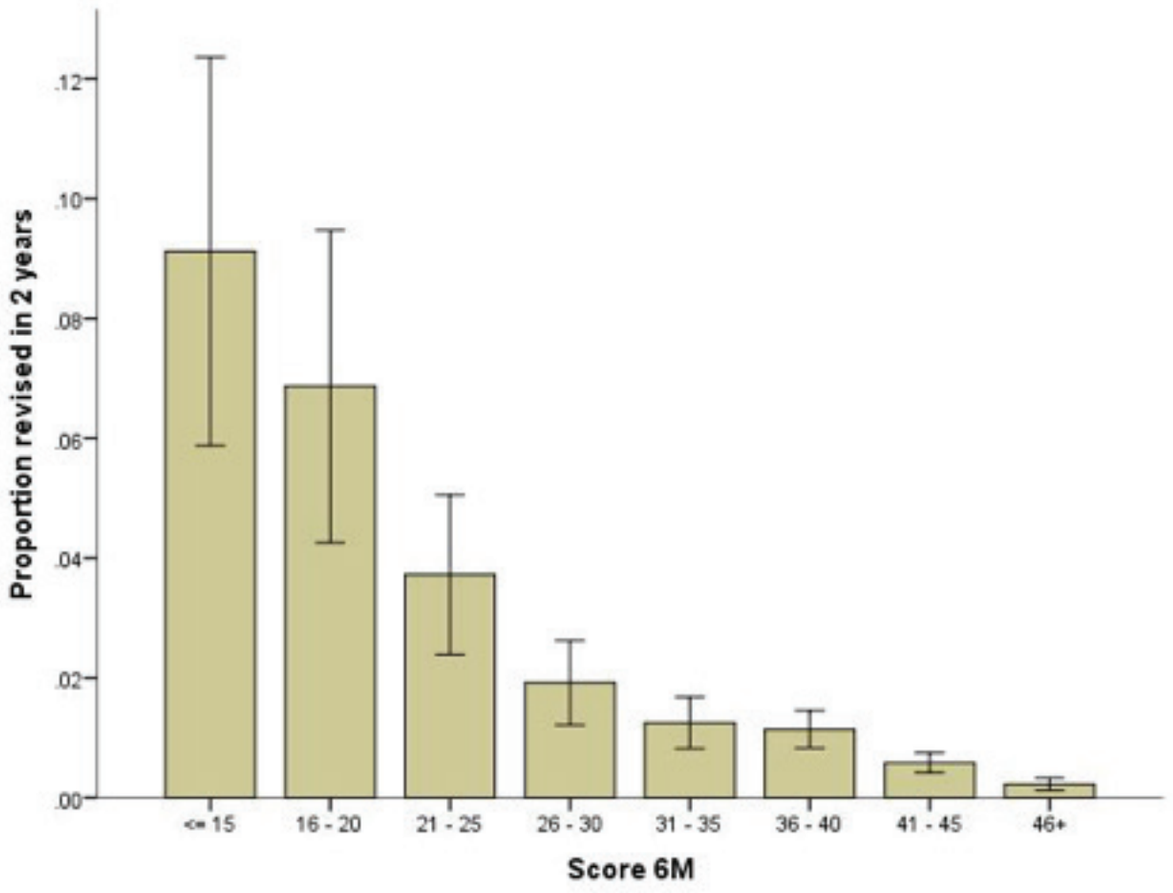


Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	1,671	88	5.27	0.55
27_33	2,512	41	1.63	0.25
34_41	7,145	71	0.99	0.12
42+	14,911	63	0.42	0.05

A person with a six month Oxford score >41 has a 0.42% risk of revision within two years compared to a 5.27% risk with a score of < 27.

In view of the large number of six month Oxford scores it is possible with statistical significance to further break down the score groupings to demonstrate an even more convincing relationship between score and risk of revision within two years.



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

			Revision in 2 yrs		Total
			No	Yes	
Score 6 months	<= 15	Count	279	28	**307**
		%	90.90	9.10	
	16 - 20	Count	339	25	**364**
		%	93.10	6.90	
	21 - 25	Count	750	29	**779**
		%	96.30	3.70	
	26 - 30	Count	1,429	28	**1,457**
		%	98.10	1.90	
	31 - 35	Count	2,531	32	**2,563**
		%	98.80	1.20	
	36 - 40	Count	4,421	51	**4,472**
		%	98.90	1.10	
	41 - 45	Count	8,309	49	**8,358**
		%	99.40	0.60	
	46+	Count	7,921	18	**7,939**
		%	99.80	0.20	
Total		**Count**	**25,979**	**260**	**26,239**
		%	**99.00**	**1.00**	

A person with a six month Oxford score >45 has a 0.20 % risk of revision within two years compared to a 9.1% (45.5x) risk with a score of <16.

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 hips 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 10 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 five year score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	349	18	5.16	1.18
27_33	508	15	2.95	0.75
34_41	1,518	13	0.86	0.24
42+	5,673	29	0.51	0.09

A person with a five year Oxford score >41 has a 0.51% risk of revision within two years compared to a 5.16% risk with a score <27.

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 hips 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 7.7 x 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 ten year score date

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	286	29	10.14	1.78
27_33	373	17	4.56	1.08
34_41	1,023	26	2.54	0.49
42+	3,483	46	1.32	0.19

A person with a 10 year Oxford score >41 has a 1.32% risk of revision within two years compared to a 10.42% risk with a score < 27.

Prediction of second revision from six month score following first revision

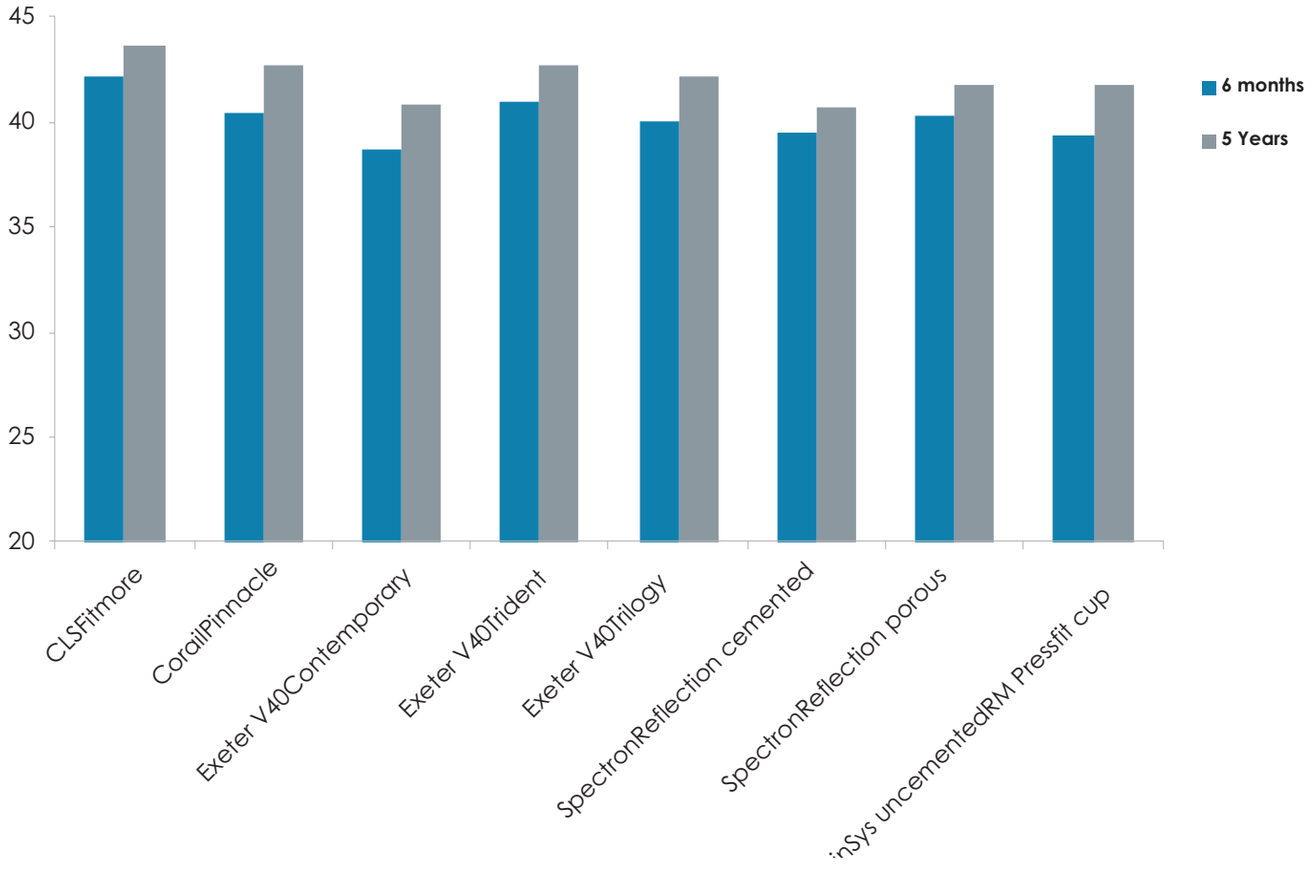
Plotting the patients' six month scores, following their first revision in the Kalairajah groupings, against the proportion of hips revised for that same group, again demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has six times the risk of a revision within two 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 Group	Revision to 2 yrs.	No. revised	%	Std error
< 27	1,298	130	10.02	0.83
27_33	1,257	65	5.17	0.62
34_41	2,297	59	2.57	0.33
42+	2,464	41	1.66	0.26

A person with a six month Oxford score >42 has a 1.66% risk of revision within two years compared to a 10.02% risk with a score < 27.

Mean Oxford scores at 6 months and 5 years for 8 hip combinations with > 2000 registrations.



		CLS Fitmore	Corail Pinnacle	Ex-V40 Contem-porary	Ex-V40 Trident	ExV40 Trilogy	Spectron Reflect cement	Spectron Reflect porous	TwinSys unce-mented RM Pressfit cup
6 mnths	Ox Mean	42.2	40.4	38.6	40.9	40.1	39.5	40.3	39.4
	Std. Error	0.3	0.2	0.2	0.2	0.4	0.2	0.3	0.3
	No.	617	1,413	1,084	1,475	394	1,289	811	1,036
5 years	Ox Mean	43.6	42.7	40.8	42.7	42.2	40.7	41.7	41.7
	Std. Error	0.4	0.3	0.4	0.3	0.5	0.4	0.4	0.3
	No.	283	538	517	615	175	378	390	446

KNEE ARTHROPLASTY

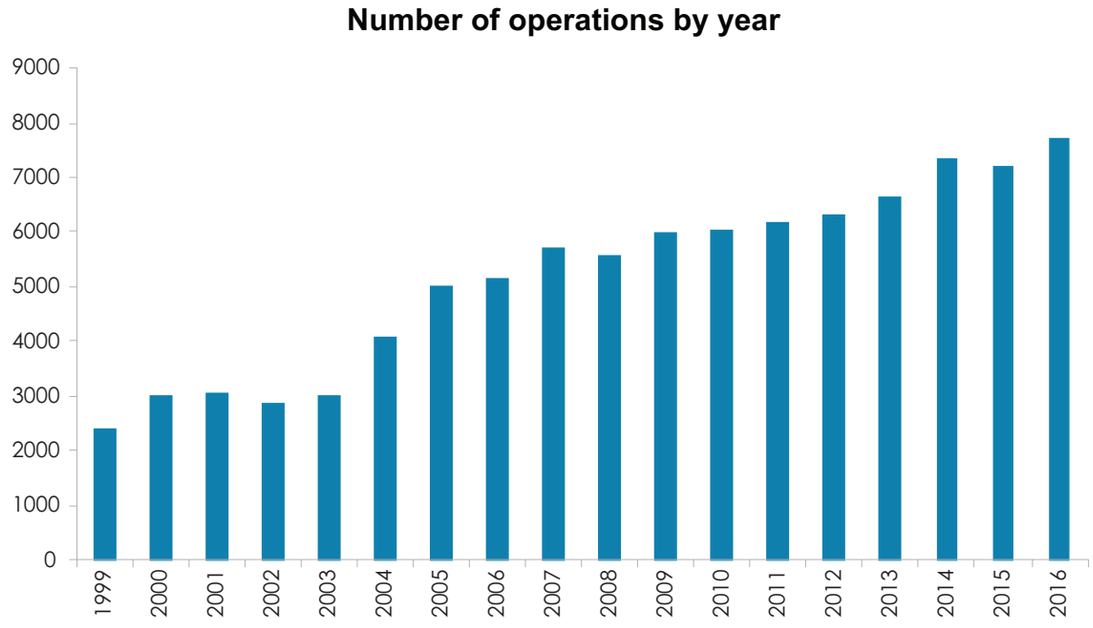
PRIMARY KNEE ARTHROPLASTY

The **eighteen-year** report analyses data for the period January 1999 – December 2016. There were 93,963 primary knee procedures registered, an additional 7,765 compared to last year's report and this represents a 6.8% increase over registrations in 2015 and reverses the 2.1% decrease in 2015.

The 93,963 includes 466 patello-femoral prostheses with 49 registered in 2016.

Primary Knee Registrations by Year

1999	2,429
2000	3,014
2001	3,059
2002	2,896
2003	3,046
2004	4,102
2005	5,024
2006	5,154
2007	5,762
2008	5,604
2009	6,015
2010	6,089
2011	6,255
2012	6,364
2013	6,694
2014	7,420
2015	7,268
2016	7,765



Data Analysis

Age and sex distribution

The average age for a knee replacement was 68.23 years, with a range of 8.19 – 100.49 years.

All knee arthroplasty

	Female	Male
Number	48,511	45,452
Percentage	51.63	48.37
Mean age	68.57	67.88
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.77	9.31

Conventional knee arthroplasty

	Female	Male
Number	44,159	45,338
Percentage	51.51	48.49
Mean age	68.63	67.90
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.72	9.30

Patello-femoral arthroplasty

	Female	Male
Number	352	114
Percentage	75.54	24.46
Mean age	60.29	59.56
Maximum age	89.39	88.56
Minimum age	31.15	31.25
Standard dev.	11.50	11.47

Body Mass Index

For the seven-year period 2010 - 2016, there were 30,456 BMI registrations for primary knee replacements. The average was 31.19 (obese) with a range of 15 – 68.7 and a standard deviation of 6.00.

Previous operation

None	78,679
Menisectomy	9,666
Osteotomy	1,442
Ligament reconstruction	1,227
Internal fixation forcjuxtarticular fracture	729
Synovectomy	157

Diagnosis

Osteoarthritis	88,982
Rheumatoid arthritis	2,146
Post fracture	967
Other inflammatory	756
Post ligament disruption /reconstruction	708
Avascular necrosis	330
Tumour	90

Approach

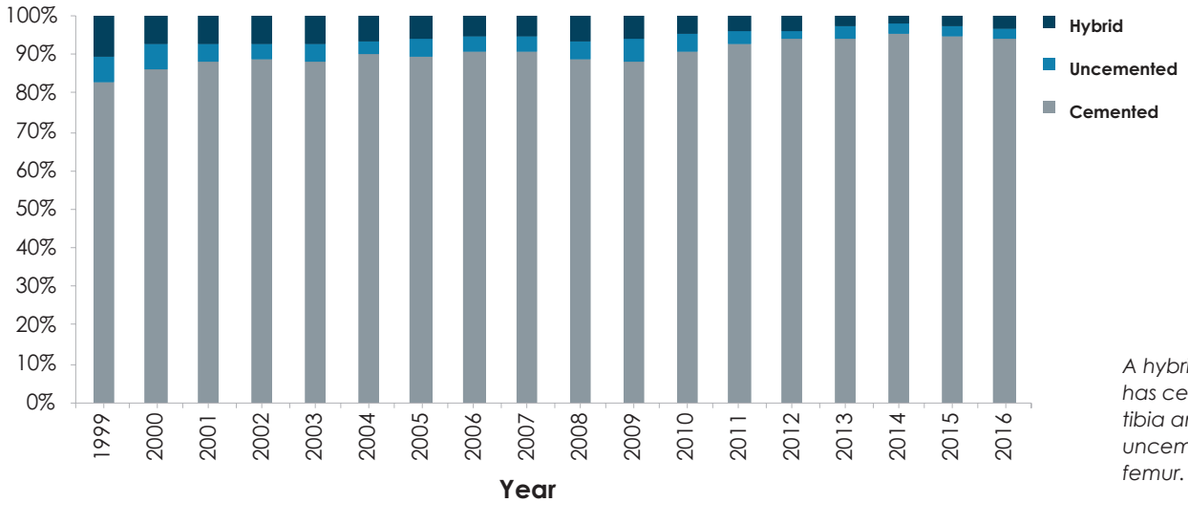
Medial parapatella	84,776
Other	2,331
Lateral parapatellar	1,268
Image guided surgery	10,661
Minimally invasive surgery	204

Image guided surgery was added to the updated forms at the beginning of 2005.

Bone graft

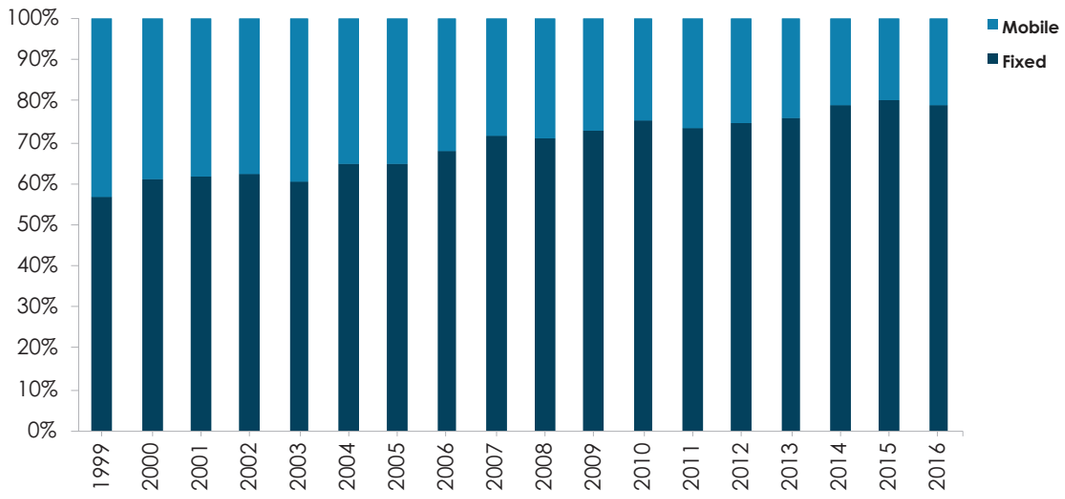
Femoral autograft	231
Femoral allograft	13
Femoral synthetic	9
Tibial autograft	94
Tibial allograft	21
Tibial synthetic	4

Comparison of proportions of cemented vs uncemented vs hybrid by year

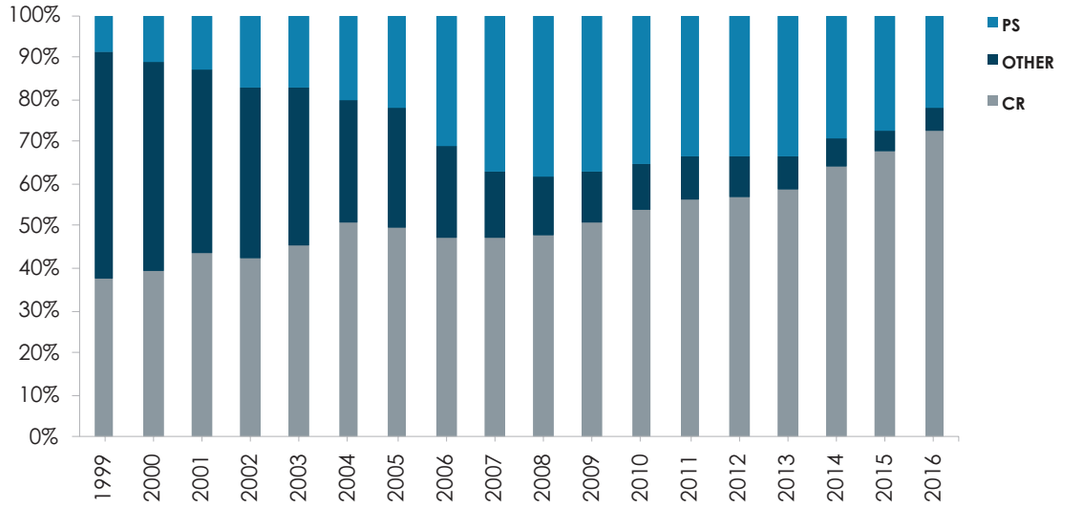


A hybrid knee has cemented tibia and uncemented femur.

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	86,333	92%
Antibiotic in cement	57,960	67%
Tibia cemented	89,476	95%
Antibiotic in cement	59,562	67%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	81,626	95%

A cephalosporin was used in 91% of arthroplasties.

Operating theatre

Conventional	52,459
Laminar flow	40,815
Space suits	31,438

In 2016, 34% of knee arthroplasties were performed in laminar flow theatres, down 13% from 2015 and space suits were used in 37%, down 2% from 2015.

ASA Class

This was introduced with the updated forms at the beginning of 2005. For the twelve-year period 2005 – 2016, there were 71,695 (95%) 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	8,181	11
2	45,755	64
3	17,451	24
4	308	1

Operative time (skin to skin in minutes)

Mean	83mins

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the twelve-year period 2005 – 2016.

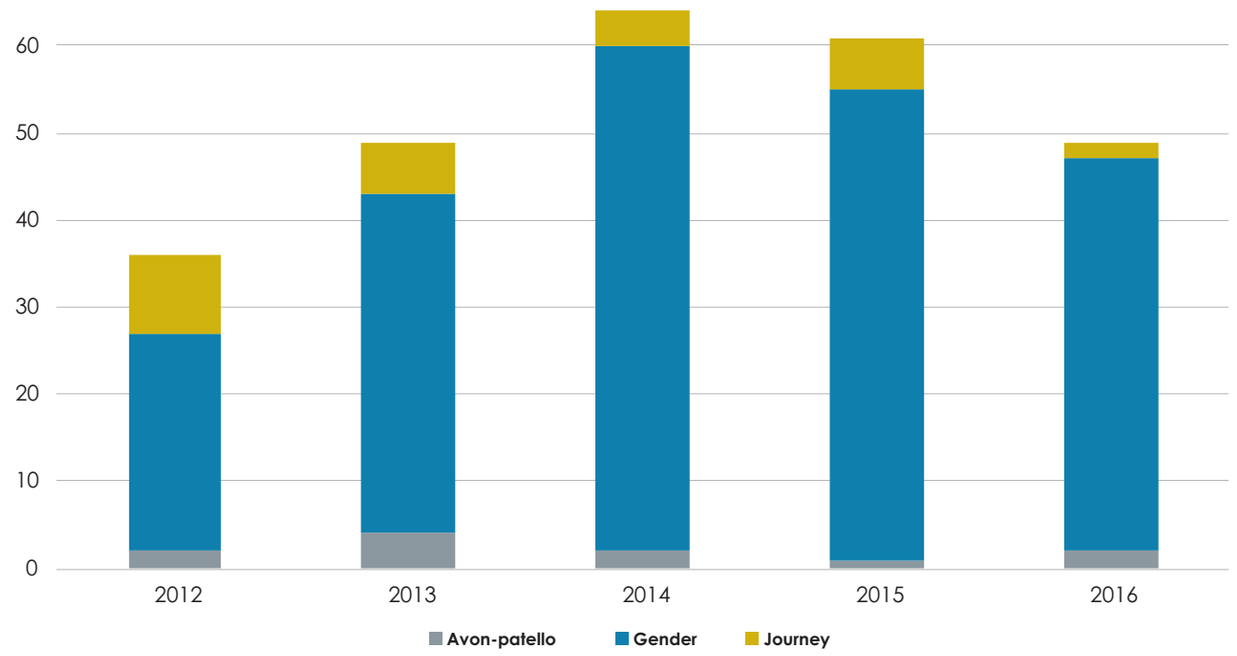
Consultant	66,615
Advanced trainee supervised	5,855
Basic trainee	1,495
Advanced trainee unsupervised	1,431

Prosthesis usage

Patello-femoral prostheses used in 2016

Gender	45
Journey	2
Avon patello	2

Patello- femoral prostheses used for five years, 2012-2016



In 2016 there were 49 patello-femoral procedures registered to 22 surgeons.

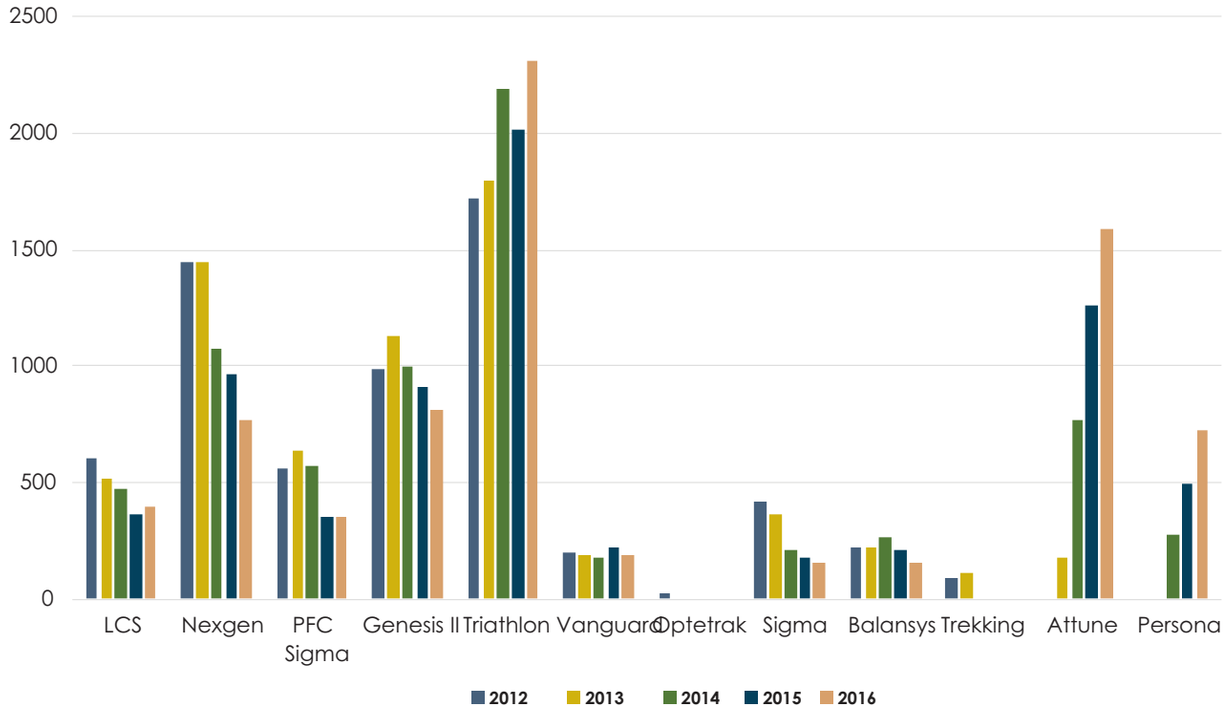
Conventional primary knees

Top ten knee prostheses used in 2016

Triathlon	2,309
Attune	1,586
Genesis II	812
Nexgen	770
Persona	727
LCS	399
PFC Sigma	349
Vanguard	192
Balansys	155
Sigma	152

There has been no change in the top ten from last year except for a switch between Genesis II and Nexgen.

Most Used Knee Prostheses per year for five years, 2012 – 2016



Surgeon and hospital workload

Surgeons

In 2016, 220 surgeons performed 7,777 total knee replacements, an average of 35 procedures per surgeon.

38 surgeons performed less than ten procedures and 73 performed more than 40.

Hospitals

In 2016 primary knee replacement was performed in 51 hospitals. 27 were public hospitals and 24 were private.

For 2016, the average number of total knee replacements per hospital was 152.

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 eighteen-year period January 1999 – December 2016, there were 7,390 revision knee procedures registered. This is an additional 651 compared to last year's report.

The average age for a revision knee replacement was 69.52 years, with a range of 10.57 – 98.39 years.

Revision knees

	Female	Male
Number	3,496	3,894
Percentage	47.31	52.69
Mean age	69.91	69.18
Maximum age	95.80	98.39
Minimum age	10.57	15.49
Standard dev.	10.34	10.10

The percentage of revision knees to primary knees is 8% and the ratio1:13

Body Mass Index

For the seven-year period 2010 - 2016, there were 1,319 BMI registrations for revision knee replacements. The average BMI was 31.38 (obese) with a range of 15 – 65 and a standard deviation of 6.11.

REVISION OF REGISTERED PRIMARY KNEE ARTHROPLASTIES

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

There were 2,941 revisions of the 93,497 primary conventional knee replacements (3.1%) and 44 revisions of the 466 patello-femoral prostheses (9.4%), a total of 2,985 revisions.

Conventional knee replacement analysis

Time to revision

Mean	1,387 days
Maximum	6,345 days
Minimum	1 day
Standard deviation	1,303 days

Reason for revision

Pain	873
Deep infection	784
Loosening tibial component	664
Patellar resurfacing	716
Loosening femoral component	323
Loosening patellar component	52
Fracture femur	52
Fracture tibia	36

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

NB each year column below does not add up to exactly 100% as often more than one cause for revision is listed and there are other reasons for revision other than the five above listed in the registry. There are too few numbers for analyses beyond 15 years.

Analysis of the five main reasons for revision by year after primary procedure

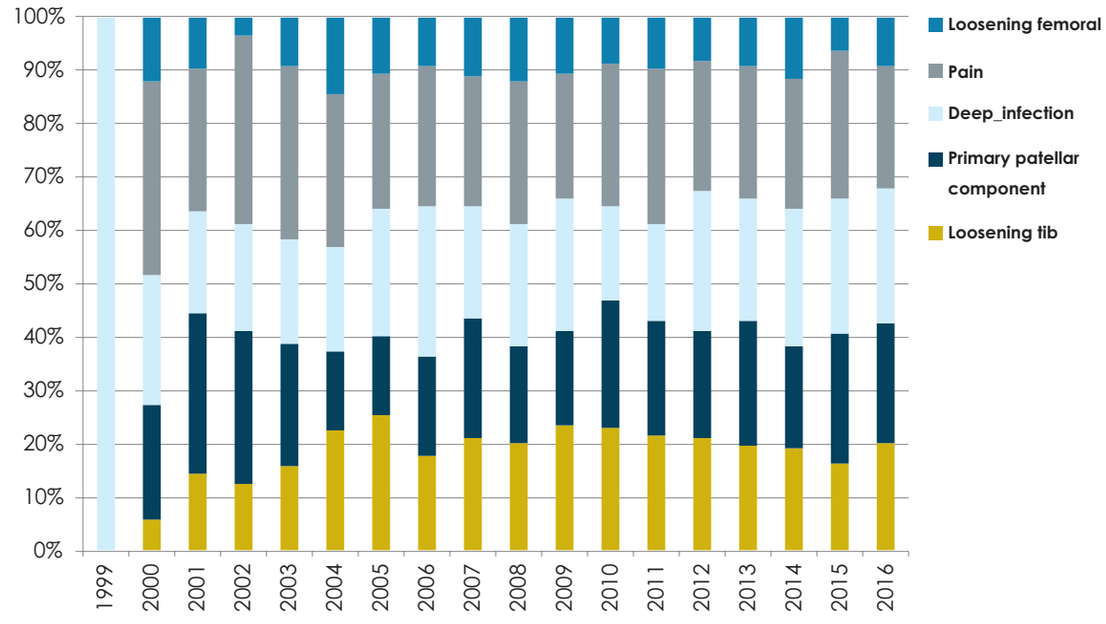
	Loosening tibial component		Primary patellar component		Deep infection		Pain		Loosening femoral component	
Years	Count	%	Count	%	Count	%	Count	%	Count	%
0	38	5.72	98	13.69	308	39.29	122	13.97	14	4.36
1	69	10.39	207	28.91	152	19.39	237	27.15	34	10.59
2	89	13.40	117	16.34	83	10.59	140	16.04	31	9.66
3	81	12.20	76	10.61	73	9.31	86	9.85	28	8.72
4	63	9.49	46	6.42	38	4.85	59	6.76	38	11.84
5	59	8.89	31	4.33	28	3.57	44	5.04	29	9.03
6	68	10.24	30	4.19	29	3.70	36	4.12	27	8.41
7	43	6.48	21	2.93	18	2.30	30	3.44	24	7.48
8	31	4.67	20	2.79	14	1.79	29	3.32	19	5.92
9	39	5.87	17	2.37	12	1.53	19	2.18	21	6.54
10	24	3.61	16	2.23	9	1.15	25	2.86	14	4.36
11	23	3.46	17	2.37	9	1.15	13	1.49	20	6.23
12	17	2.56	9	1.26	5	0.64	12	1.37	9	2.80
13	7	1.05	4	0.56	3	0.38	7	0.80	4	1.25
14	9	1.36	6	0.84	1	0.13	9	1.03	5	1.56
15	4	0.60	1	0.14	2	0.26	5	0.57	4	1.25
	664	**100**	**716**	**100**	**784**	**100**	**873**	**100**	**321**	**100**

Analyses by numbers of the five main reasons for revision by year

	Loosening tibial component	Primary patellar component	Deep infection	Pain	Loosening femoral component	Totals
Years	**%**	**%**	**%**	**%**	**%**	
1999	0	0	3	0	0	**3**
2000	2	7	8	12	4	**33**
2001	9	19	12	17	6	**63**
2002	10	23	16	28	3	**80**
2003	15	22	19	31	9	**96**
2004	22	14	19	28	14	**97**
2005	29	17	27	29	12	**114**
2006	21	22	33	31	11	**118**
2007	32	34	32	37	17	**152**
2008	42	37	47	55	25	**206**
2009	52	39	54	51	24	**220**
2010	53	54	40	61	20	**228**
2011	52	53	44	70	24	**243**
2012	54	52	68	63	21	**258**
2013	62	74	73	78	30	**317**
2014	63	64	85	81	39	**332**
2015	58	84	90	96	23	**351**
2016	90	101	114	105	41	**451**
Totals	**666**	**716**	**784**	**873**	**323**	**3,362**

The number of revisions of primary knees has increased year on year. The total number of 3,362 is inflated to some extent because, as noted above, there is often more than one listed reason for revision and all are entered.

Percentage of the 5 main reasons for revision by year



Patello-Femoral Arthroplasty

Revision of patello-femoral knees

Of the 417 registered, 36 have been revised.

Time to revision

Mean	1,612 days
Maximum	4,344 days
Minimum	108 days
Standard deviation	1,251 days

Reason for revision

Pain	13
Loosening patellar	3
Deep infection	2

Patellar resurfacing

65 % of the 93,497 registered conventional primary knees did not have the patella resurfaced and 35% did have the patella resurfaced. Of the group that was not resurfaced, 711 subsequently had the patella resurfaced (1.17%).

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 situ.

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 Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
93,497	593,588	2,941	0.50	0.48	0.51

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	18,707	126,293.5	670	0.53	0.49	0.57
Triathlon	18,007	79,337.3	348	0.43	0.39	0.49
LCS	14,136	120,994.7	596	0.49	0.45	0.53
Genesis II	12,775	79,262.9	401	0.50	0.46	0.56
PFC Sigma	10,198	75,624.7	303	0.40	0.35	0.45
Duracon	4,213	44,565.1	139	0.31	0.26	0.37
Attune	3,795	4,965.8	33	0.66	0.45	0.92
Vanguard	1,818	7,598.2	50	0.66	0.48	0.87
Persona	1,521	1,751.4	18	1.03	0.61	1.62
Sigma	1,290	4,393.8	22	0.50	0.30	0.74
Balansys	1,274	3,859.3	33	0.85	0.59	1.20
Sigma CR150	957	4,374.7	20	0.46	0.27	0.69
Scorpio	852	8,648.7	61	0.70	0.53	0.90
Maxim	822	8,879.6	50	0.56	0.41	0.73
Optetrak	661	4,881.7	46	0.94	0.68	1.24
Trekking	575	1,514.0	16	1.06	0.58	1.67
AGC	376	4,214.2	15	0.35	0.20	0.58

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MBK	256	3,137.7	18	0.57	0.34	0.91
Insall/Burstein	249	2,835.4	46	1.62	1.19	2.16
Journey	247	1,000.3	12	1.20	0.62	2.09
Legion	204	490.4	6	1.22	0.45	2.66
Advance	157	1,651.6	5	0.30	0.10	0.70
AMK	95	1,210.1	2	0.16	0.02	0.60
ROCC	66	550.5	5	0.91	0.29	2.12

There are 59 (same as last year) different types of knee prostheses in the Registry with 30 (50%) 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	2,835.4	46	1.62	1.19	2.16
Legion	204	490.4	6	1.22	0.45	2.66
*#Journey	247	1,000.3	12	1.20	0.62	2.09
*Trekking	575	1,514.0	16	1.05	0.58	1.67
*#Persona	1,521	1,751.4	18	1.03	0.61	1.62
*Optetrak	661	4,881.7	46	0.94	0.68	1.24
*ROCC	66	550.5	5	0.91	0.29	2.12
*#Balansys	1,274	3,859.3	33	0.85	0.59	1.20
*Scorpio	852	8,648.7	61	0.70	0.53	0.89
Attune	3,795	4,965.8	33	0.66	0.45	0.92
Vanguard	1,818	7,598.2	50	0.65	0.49	0.86
MBK	256	3,137.7	18	0.57	0.34	0.90
Maxim	822	8,879.6	50	0.56	0.41	0.73
Nexgen	18,707	126,293.5	670	0.53	0.49	0.57
Genesis II	12,775	79,262.9	401	0.50	0.45	0.55
Sigma	1,290	4,393.8	22	0.50	0.30	0.74
LCS	14,136	120,994.7	596	0.49	0.45	0.53
Sigma CR150	957	4,374.7	20	0.45	0.27	0.69
Triathlon	18,007	79,337.3	348	0.44	0.39	0.48
PFC Sigma	10,198	75,624.7	303	0.40	0.35	0.44
AGC	376	4,214.2	15	0.35	0.20	0.58
Duracon	4,213	44,565.1	139	0.31	0.26	0.36
Advance	157	1,651.6	5	0.30	0.10	0.70
AMK	95	1,210.1	2	0.16	0.00	0.59

*Those marked with an * in the above table have revision rates significantly higher than the overall rate of 0.50/100 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 2016. The Persona and Balansys were both on the top 10 list for 2016.*
It is to be noted that 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	
Insall/Burstein	249	2,835.4	46	1.62	1.18	2.16
Legion	204	490.4	6	1.22	0.44	2.66
Optetrak	281	2,143.9	26	1.21	0.77	1.74
Journey	247	1,000.3	12	1.20	0.62	2.09
Trekking	575	1,514.0	16	1.05	0.57	1.67
Persona	1,521	1,751.4	18	1.03	0.60	1.62
Balansys	1,274	3,859.3	33	0.85	0.58	1.20
Scorpio	852	8,648.7	61	0.70	0.53	0.89
Attune	3,767	4,952.5	33	0.66	0.45	0.92
Vanguard	1,802	7,524.0	49	0.65	0.48	0.86
MBK	247	3,037.2	18	0.59	0.35	0.93
Maxim	822	8,879.6	50	0.56	0.41	0.73
Nexgen	17,862	120,271.0	644	0.53	0.49	0.57
Genesis II	12,722	78,701.3	396	0.50	0.45	0.55
Sigma	1,161	3,923.5	18	0.46	0.26	0.70
Sigma CR150	957	4,374.7	20	0.45	0.27	0.69
Triathlon	17,776	78,153.1	341	0.43	0.39	0.48
LCS	9,336	84,319.6	337	0.40	0.35	0.44
PFC Sigma	9,474	71,420.0	276	0.38	0.34	0.43
AGC	376	4,214.2	15	0.35	0.19	0.58
Duracon	3,432	35,891.1	115	0.32	0.26	0.38
Advance	157	1,651.6	5	0.30	0.09	0.70
AMK	95	1,210.1	2	0.16	0.02	0.58

The, Insall/Burstein, Trekking, Journey, Scorpio, Personna, Optetrak and Balansys have significantly higher revision rates than the overall rate of 0.50 /100 ocys at the 95% confidence. Balansys, Trekking and Persona prostheses were implanted in 2016.

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	129	470.3	4	0.85	0.23	2.17
Optetrak	380	2,737.8	20	0.73	0.44	1.12
Genesis II	51	554.3	4	0.72	0.15	1.71
PFC Sigma	717	4,149.7	27	0.65	0.41	0.93
Triathlon	180	1,140.1	7	0.61	0.24	1.26
LCS	2,076	17,306.5	86	0.50	0.39	0.61
Nexgen	595	4,449.5	17	0.38	0.22	0.61
Duracon	321	3,953.8	14	0.35	0.18	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	2,724	19,368.7	173	0.90	0.76	1.03
Nexgen	250	1,572.9	9	0.57	0.26	1.08
Duracon	460	4,720.1	10	0.21	0.10	0.39

The uncemented LCS prosthesis (159 implanted in 2016) 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	4,214.2	15	0.35	0.20	0.58
AMK	Fixed	95	1,210.1	2	0.16	0.02	0.59
Balansys	Fixed	1,272	3,859.1	33	0.85	0.58	1.20
Duracon	Fixed	4,207	44,490.6	138	0.31	0.26	0.36
Genesis II	Fixed	12,742	79,247.7	401	0.51	0.45	0.55
Insall/Burstein	Fixed	249	2,835.4	46	1.62	1.18	2.16
Journey	Fixed	243	998.6	12	1.20	0.62	2.09
LCS	Mobile	14,135	120,993.6	596	0.49	0.45	0.53
Maxim	Fixed	822	8,879.6	50	0.56	0.41	0.73
MBK	Mobile	256	3,137.7	18	0.57	0.34	0.90
Trekking	Mobile	570	1,512.9	16	1.06	0.58	1.67
Persona	Fixed	1,521	1,751.4	18	1.03	0.60	1.62
Nexgen	Fixed	15,755	106,794.6	577	0.54	0.49	0.58
	Mobile	2,715	18,278.7	83	0.45	0.36	0.56
PFC Sigma	Fixed	5,781	46,046.8	187	0.40	0.34	0.46
	Mobile	3,433	27,282.1	104	0.38	0.31	0.46
Scorpio	Fixed	737	7,499.9	52	0.69	0.51	0.90
	Mobile	104	1,079.7	6	0.55	0.20	1.20
Sigma	Fixed	269	1,141.6	7	0.61	0.24	1.26
	Mobile	776	2,774.7	14	0.50	0.26	0.82
Sigma CR150	Fixed	172	873.4	8	0.91	0.39	1.80
	Mobile	769	3,466.0	12	0.34	0.17	0.60
Triathlon	Fixed	17,364	76,886.2	337	0.44	0.39	0.48
	Mobile	459	2,143.1	10	0.467	0.22	0.85
Attune	Fixed	1,852	2,414.7	20	0.83	0.50	1.27
	Mobile	1,932	2,542.4	13	0.51	0.25	0.85

The Balansys, Insall/Burstein, Journey, Trekking, Persona and the fixed version of the Scorpio have significantly higher revision rates 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	63,524	389,289.5	1,905	0.49	0.47	0.51
Mobile	25,166	183,283.1	872	0.48	0.44	0.51

There is no significant difference between the two groups. It was not possible to determine fixed or mobile categories for all registered knees, which accounts for the 4,807 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	348.4	3	0.86	0.17	2.51
Insall/Burstein	PS	249	2,835.4	46	1.62	1.18	2.16
LCS	PS	68	360.4	1	0.28	0.00	1.54
Legion	PS	169	401.5	4	0.99	0.27	2.55
Sigma CR150	CR	957	4,374.7	20	0.45	0.27	0.69
Attune	CR	2,566	3,462.1	25	0.72	0.46	1.06
	PS	1,229	1,503.7	8	0.53	0.23	1.04
Balansys	CR	1,159	3,630.8	27	0.74	0.47	1.06
	PS	112	224.5	6	2.67	0.85	5.50
Genesis II	CR	6,742	47,897.5	173	0.36	0.30	0.41
	PS	5,996	31,316.4	228	0.73	0.63	0.82
Maxim	CR	657	7,044.8	34	0.48	0.33	0.67
	PS	165	1,834.8	16	0.87	0.47	1.38
Nexgen	CR	8,676	59,188.6	255	0.43	0.37	0.48
	PS	9,745	66,004.6	401	0.61	0.54	0.66
Optetrak	CR	437	3,232.3	22	0.68	0.41	1.01
	PS	224	1,649.3	24	1.45	0.90	2.12
Persona	CR	1,054	1,015.5	11	1.08	0.54	1.93
	PS	467	736.0	7	0.95	0.38	1.96
PFC Sigma	CR	8,238	59,560.0	218	0.36	0.31	0.41
	PS	1,888	15,581.4	83	0.53	0.42	0.66
Scorpio	CR	739	7,643.0	52	0.68	0.50	0.89
	PS	111	991.7	9	0.91	0.41	1.72
Sigma	CR	204	574.4	0	0.00	0.00	0.64
	PS	1,084	3,815.3	22	0.57	0.36	0.87
Trekking	CR	225	595.6	6	1.01	0.32	2.077
	PS	345	917.3	10	1.09	0.52	2.00
Triathlon	CR	15,268	64,673.7	282	0.43	0.38	0.48
	PS	2,732	14,644.1	66	0.45	0.34	0.57
Vanguard	CR	1,279	5,525.8	27	0.49	0.32	0.71
	PS	527	2,045.5	23	1.12	0.71	1.68

The Insall/Burstein, AGC, Balansys PS, Nexgen PS, Genesis11 PS, Optetrak PS, Persona CR, Vangard PS and the Trekking PS have significantly higher revision rates than the overall rate of 0.50/100 ocys at the 95% confidence.

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	48,201	268,418.7	1,152	0.43	0.40	0.45
MS	14,390	124,349.7	618	0.50	0.46	0.54
PS	25,145	145,235.6	957	0.66	0.62	0.70

The LCS prostheses account for the majority of the minimally stabilised (MS).

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	85,432	532,091.6	2,559	0.48	0.46	0.50
Uncemented	3,549	26,137.8	199	0.76	0.66	0.87
Hybrid	4,516	35,029.3	183	0.52	0.45	0.60

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	
<55	6,686	43,437.3	397	0.91	0.83	1.01
55-64	23,274	148,206.2	916	0.62	0.58	0.66
65-74	33,074	208,695.8	918	0.44	0.41	0.47
>=75	22,398	131,752.3	328	0.25	0.22	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	48,159	311,568.7	1,402	0.45	0.43	0.47
Male	45,338	281,690.1	1,539	0.55	0.52	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	
<55	6,686	43,437.3	397	0.91	0.83	1.01
55-64	23,274	148,206.2	916	0.62	0.58	0.66
65-74	33,074	208,695.8	918	0.44	0.41	0.47
>=75	22,398	131,752.3	328	0.25	0.22	0.28

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

Revision by Age Bands vs Arthroplasty Fixation

Uncemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	594	5,196.3	69	1.33	1.02	1.67
55-64	1,246	9,598.0	81	0.84	0.67	1.05
65-74	1,117	7,858.3	39	0.50	0.35	0.68
>=75	592	3,485.2	10	0.29	0.14	0.53

The lowest age band has a significantly higher revision rate than the three highest bands and the 55-64 age band has a significantly higher revision rate than the highest two age bands.

Hybrid	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	551	4,316.5	40	0.93	0.66	1.26
55-64	1,427	11,550.7	70	0.61	0.47	0.77
65-74	1,575	12,362.2	46	0.37	0.27	0.50
>=75	963	6,800.0	27	0.40	0.26	0.57

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	84,133	532,484.4	2,595	0.49	0.47	0.51
Lateral	1,239	9,293.1	68	0.73	0.57	0.93
Other	2,103	14,928.1	67	0.45	0.35	0.57

The Lateral approach has a significantly higher revision rate than the other two approaches.

Revision vs Image Guidance

Image Guided	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
No	82,843	546,918.3	2,709	0.50	0.48	0.51
Yes	10,654	46,340.5	232	0.50	0.44	0.57

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	
<10	1,917	13,821.5	66	0.48	0.37	0.61
10-24	19,869	133,651.5	714	0.53	0.50	0.57
25-49	43,721	279,371.2	1,383	0.50	0.47	0.52
50-74	17,883	110,534.2	499	0.45	0.41	0.49
75-99	7,750	42,054.3	225	0.54	0.47	0.61
>=100	2,357	13,826.1	54	0.39	0.29	0.51

There is no significant difference among the groups except for the 50-74 age group which is significantly lower than the 10-24 group.

Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	8,062	41,274.3	222	0.54	0.47	0.61
2	45,499	225,345.9	1,143	0.51	0.48	0.54
3	17,402	81,037.7	472	0.58	0.53	0.64
4	308	1,234.6	8	0.65	0.28	1.28

There is no significant difference among the four classes.

Revision vs BMI

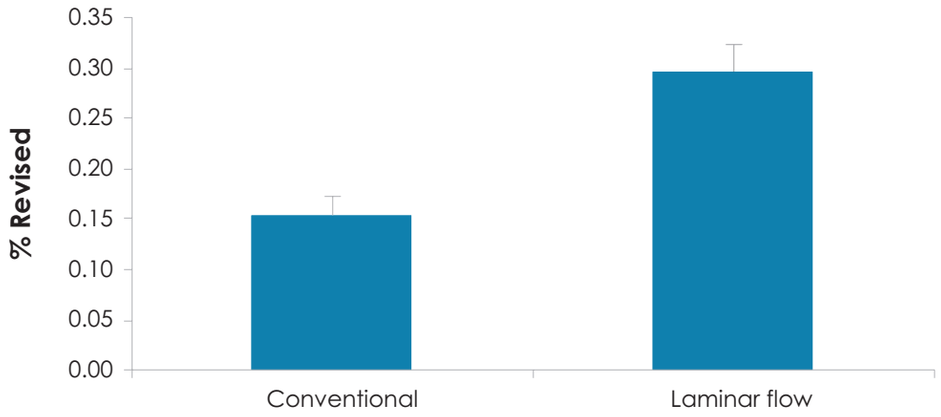
BMI	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
< 19	72	202.5	0	0.00	0.00	1.82
19 - 24	3,382	9,352.7	56	0.60	0.45	0.78
25 - 29	10,040	28,058.0	176	0.63	0.54	0.73
30 - 39	13,936	38,455.3	258	0.67	0.59	0.76
40+	2,777	7,783.6	76	0.98	0.77	1.22

40+ group has a significantly higher revision rate than the 2 groups above it.

Revision for Deep Infection within 6months versus Theatre Environment

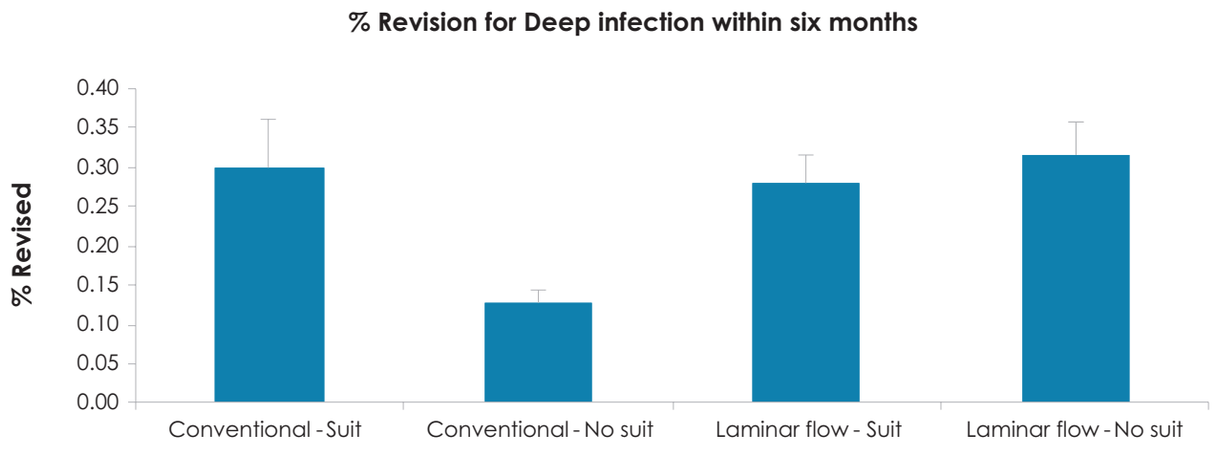
Theatre Environment	Total Number	Number Revised	%	Std Error
Conventional	49,639	77	0.16	0.018
Laminar flow	38,780	115	0.30	0.028

% Revision for Deep infection within six months



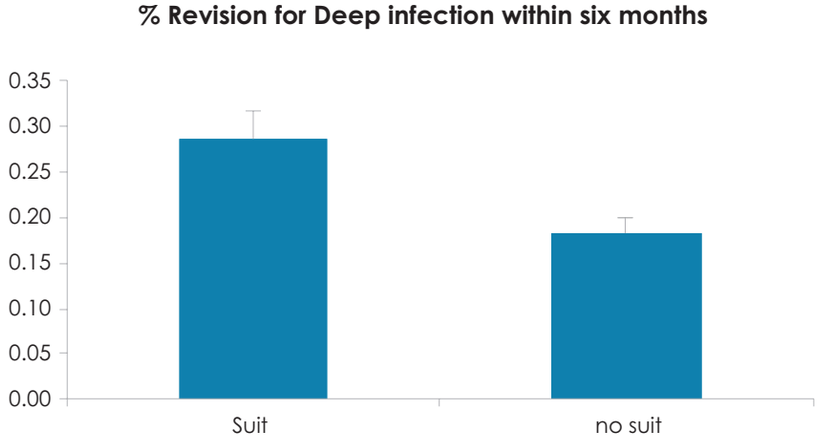
As with hip arthroplasty there is a significant difference in knee revision rates (2x) for deep infection within six months of surgery between conventional and laminar flow theatres.

Theatre Environment	Suit/No Suit	Total Number	Number	%	Std Error
Conventional	Suit	8,038	24	0.30	0.061
	no suit	41,601	53	0.13	0.017
Laminar flow	Suit	21,368	60	0.28	0.036
	no suit	17,412	55	0.31	0.042



There is a significant difference in the revision rates between conventional/no suit and the conventional/suit (2.3x) and laminar /suit (2.5x) environments.

	Total Number	Number Revised	%	Std Error
Suit	29,406	84	0.29	0.031
no suit	59,013	108	0.18	0.018

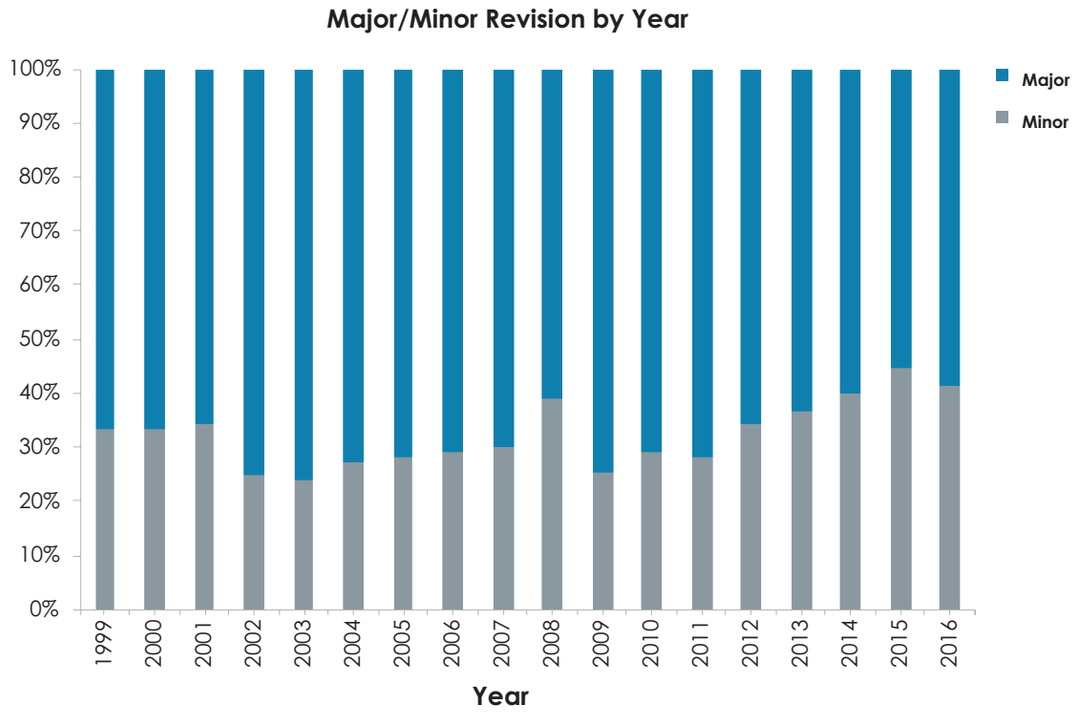


Furthermore, there is a significant increase in revision rates (1.6x) when suits are used in either conventional or laminar flow theatres.

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 six 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.



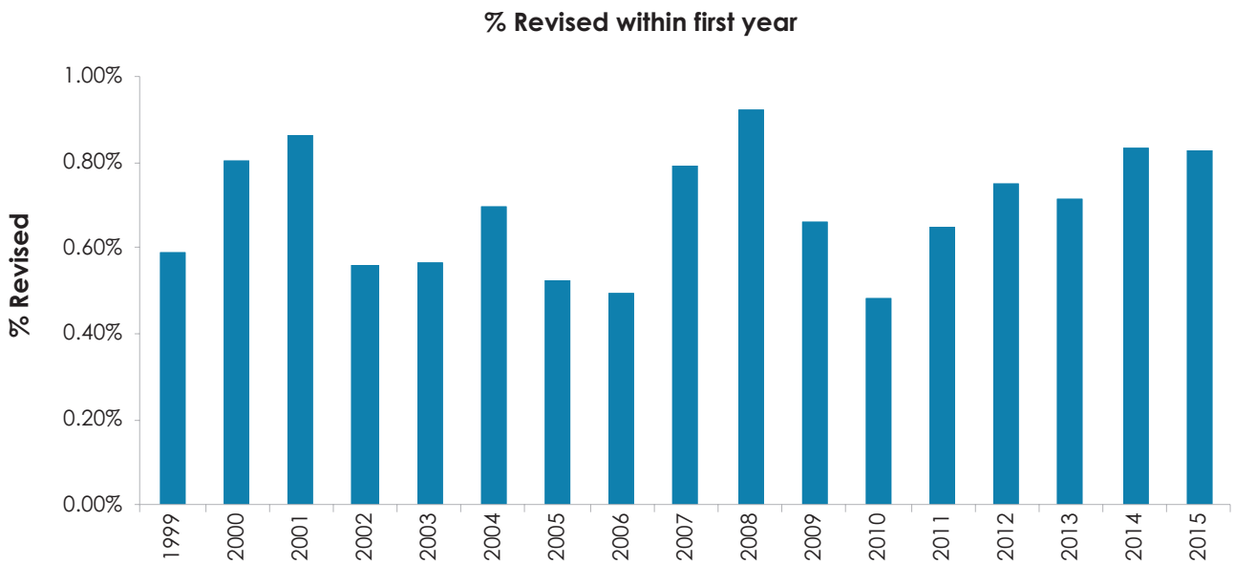
Re-revisions for major vs minor knee revisions

Major/Minor	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	844	3,247.1	138	4.25	3.57	5.02
Major	1,575	7,375.3	222	3.01	2.63	3.43

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

Percentage of knees revised in the first year

The following bar graph shows that the percentage of knees revised in the first year after arthroplasty fell very slightly in 2015 when compared to 2014.



Patello-Femoral Arthroplasty

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
466	2136.6	44	2.06	1.50	2.76

The revision rate is over four times that for total knee arthroplasty.

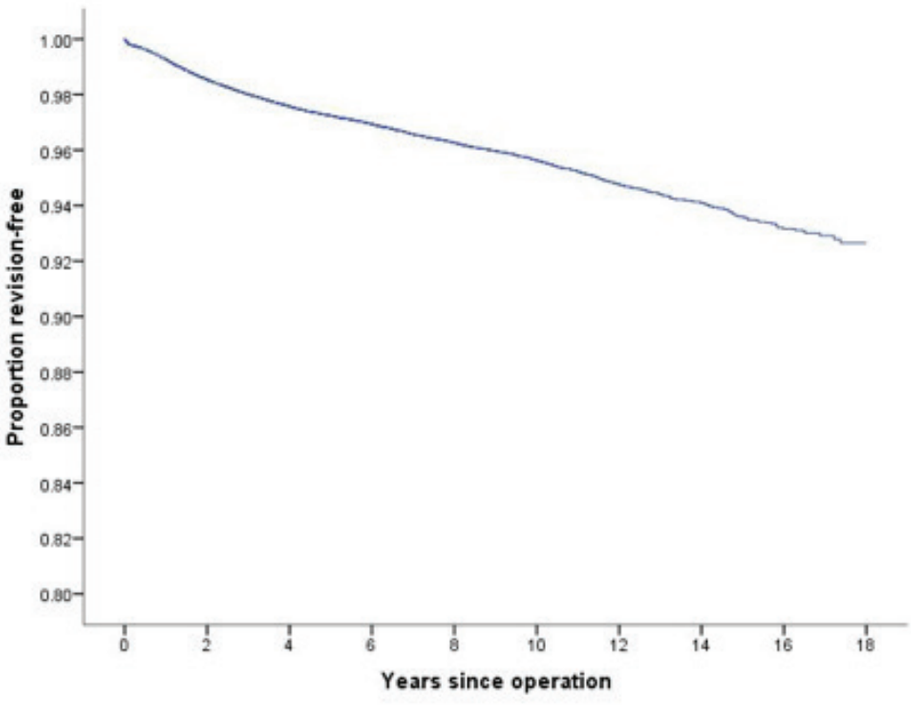
Revised to:

Total	39
Further Patello- Femoral	3
Uniknee	2

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for years 1999 – 2016 with deceased patients censored at time of death

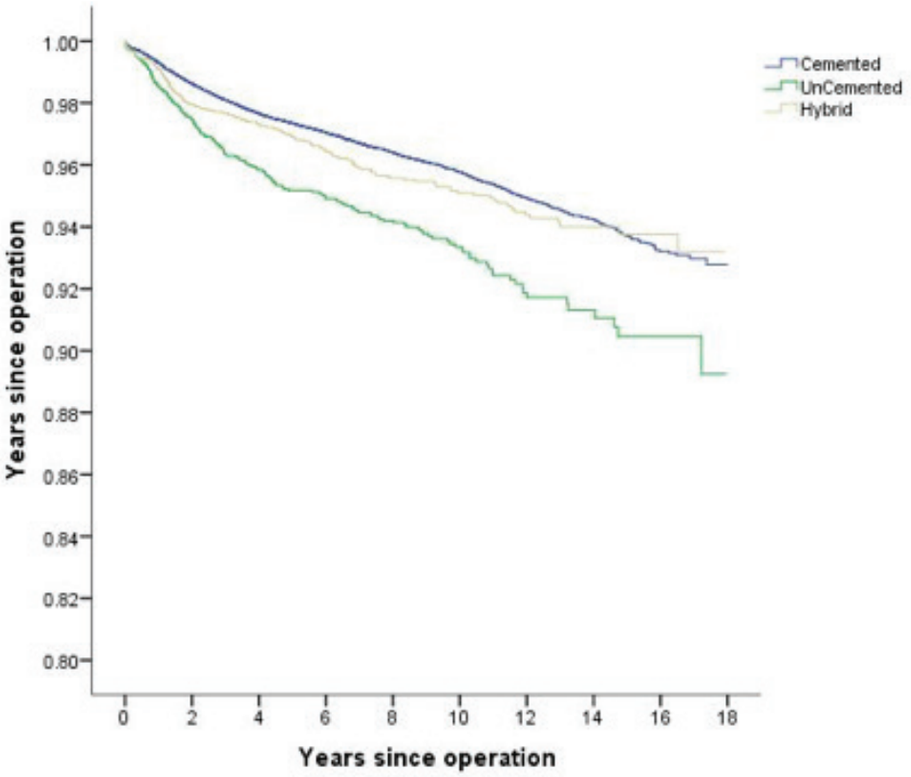
All Knees



Years	% Revision-free	No in each year
1	99.3	84,328
2	98.5	75,720
3	98.0	67,054
4	97.6	59,258
5	97.2	51,898
6	96.9	44,766
7	96.6	38,015
8	96.3	31,644
9	96.0	25,779
10	95.6	20,195
11	95.2	15,536
12	94.8	11,446
13	94.4	8,274
14	94.1	5,971
15	93.6	4,077
16	93.2	2,353
17	92.9	962

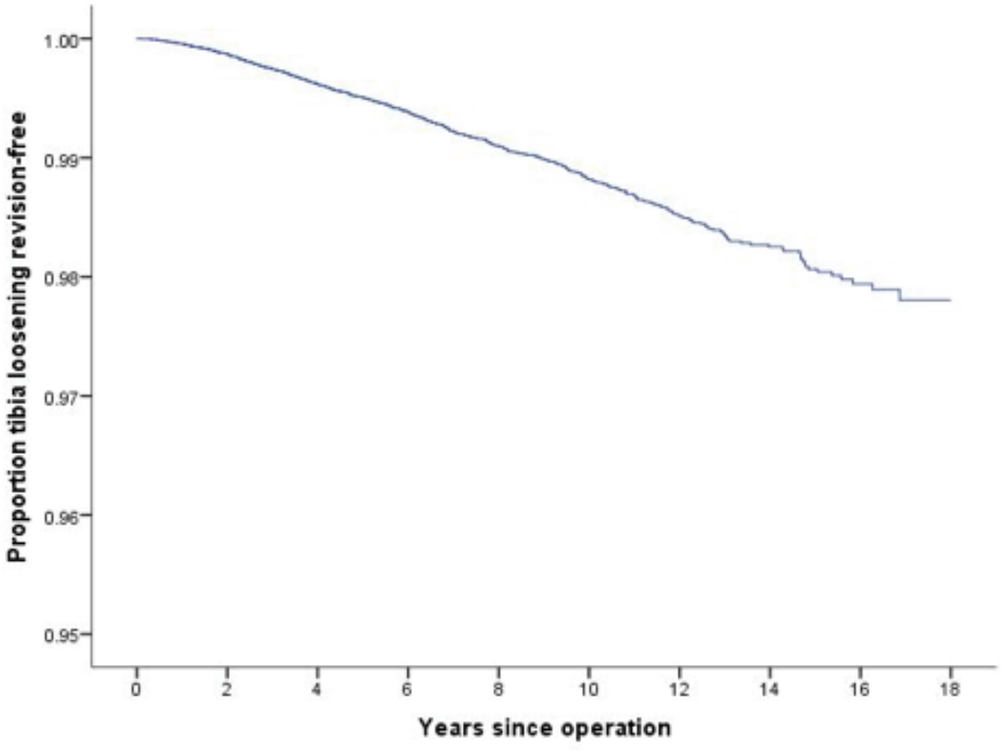
The KM analysis is to 17 years rather than 18 as too few registered knees were revised in 2016.

Cemented vs Uncemented vs Hybrid

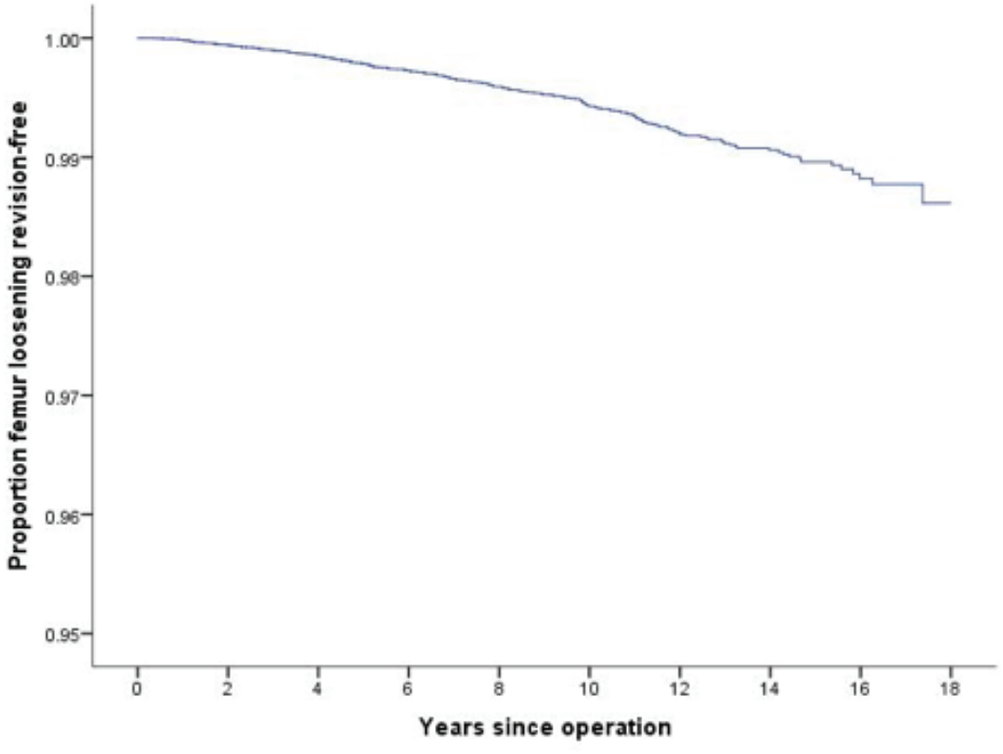


The following KM graphs are for the five main individual reasons for revision.

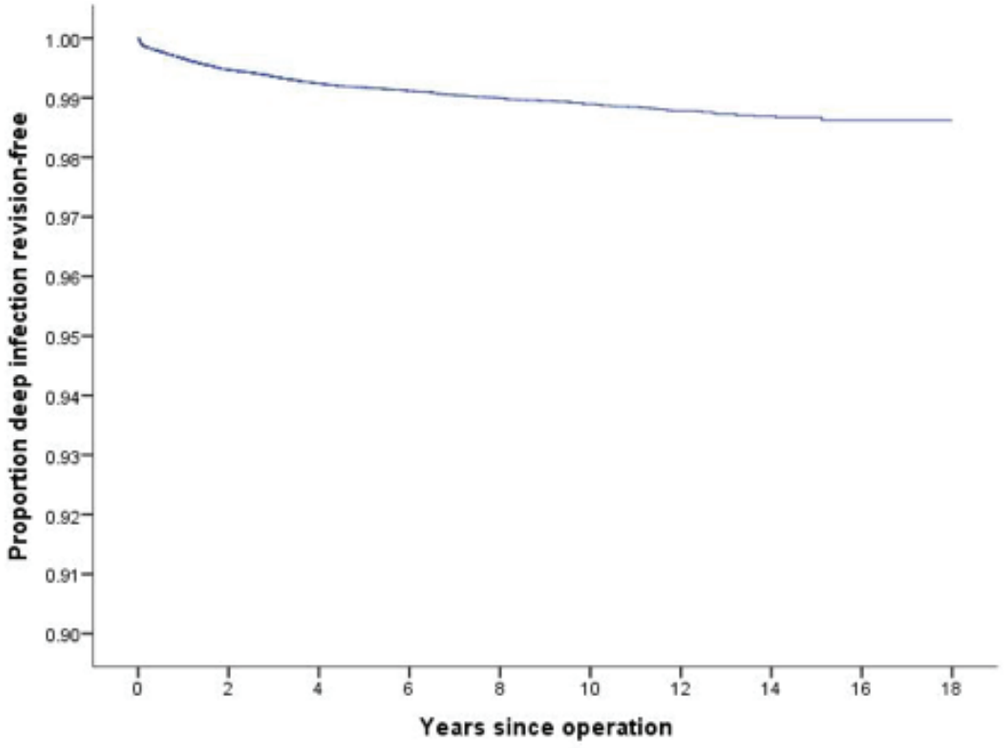
1. Tibial loosening



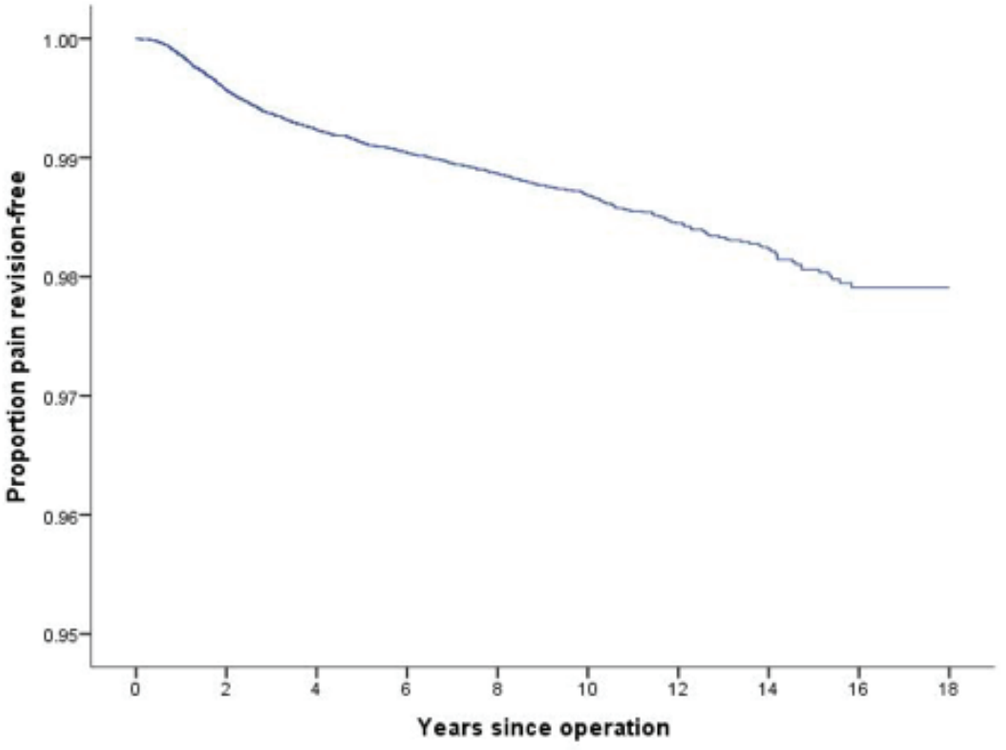
2. Femoral loosening



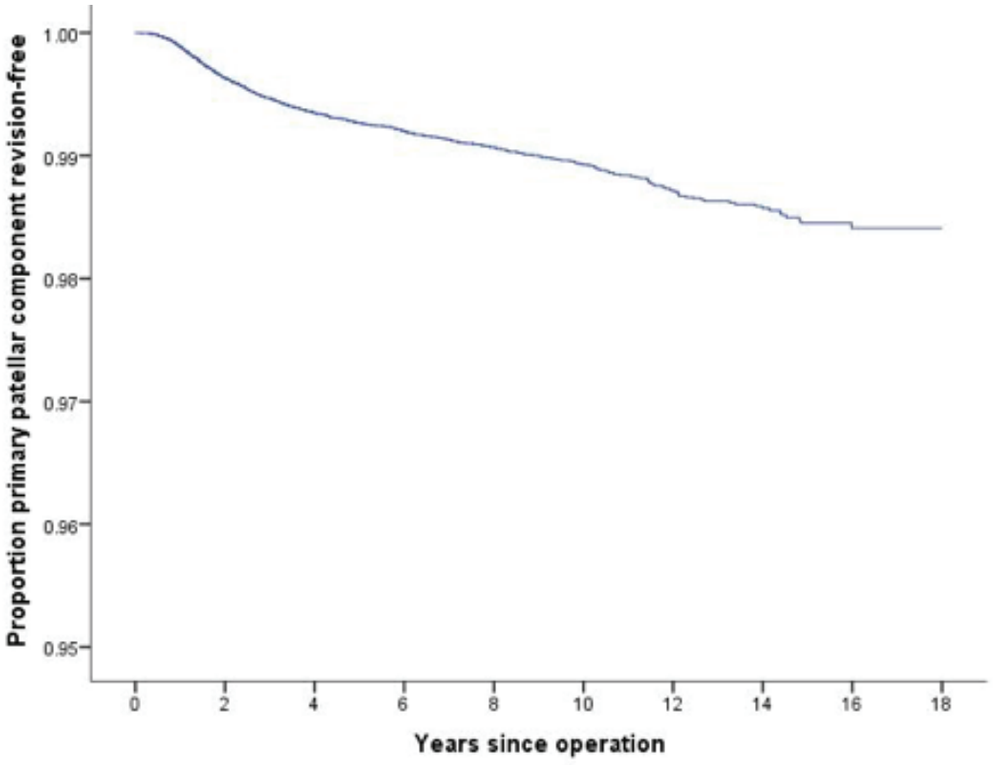
3. Deep infection



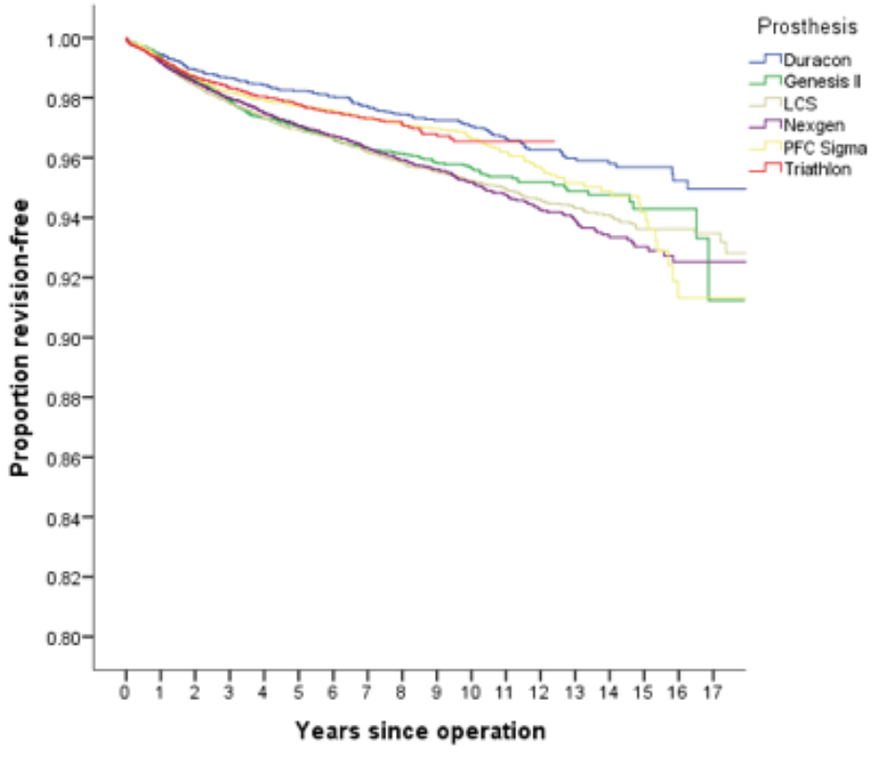
4. Pain



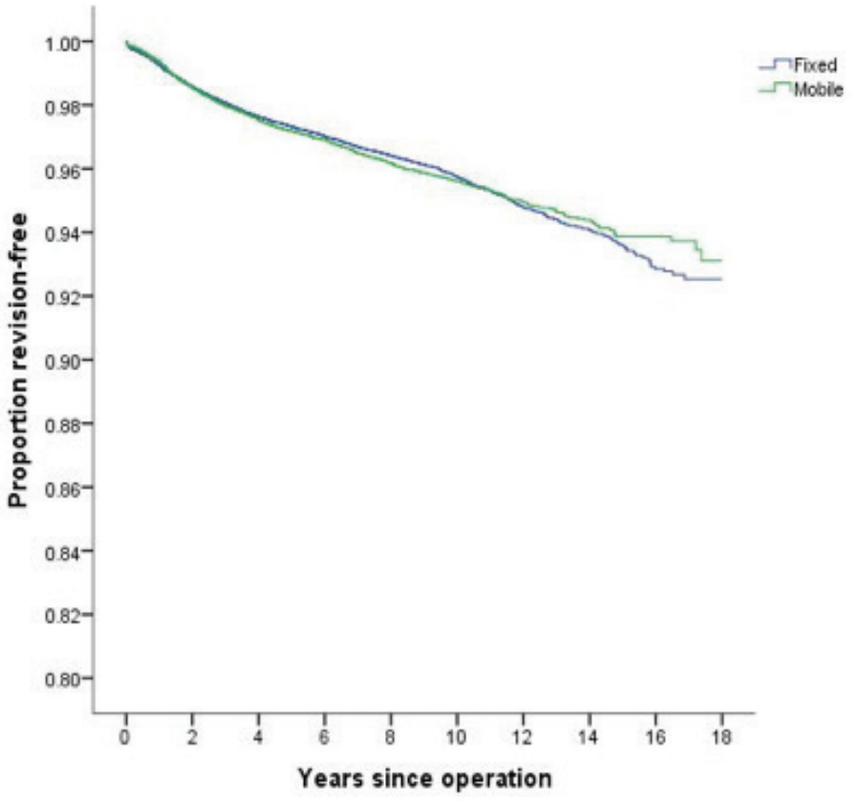
5. Patella



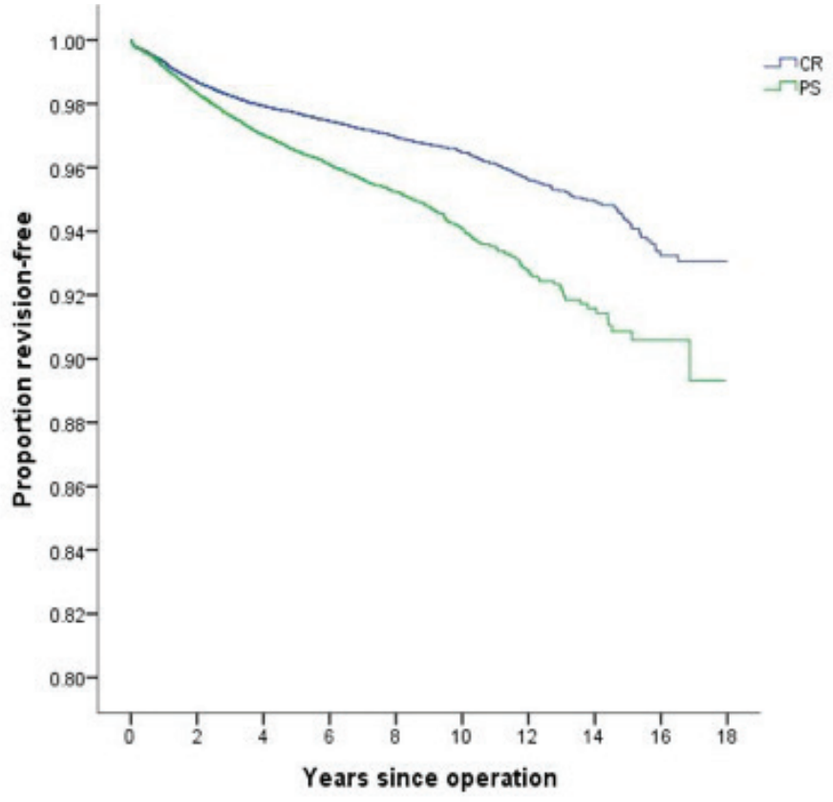
Survival Curve to 16 years for 6 knee prostheses



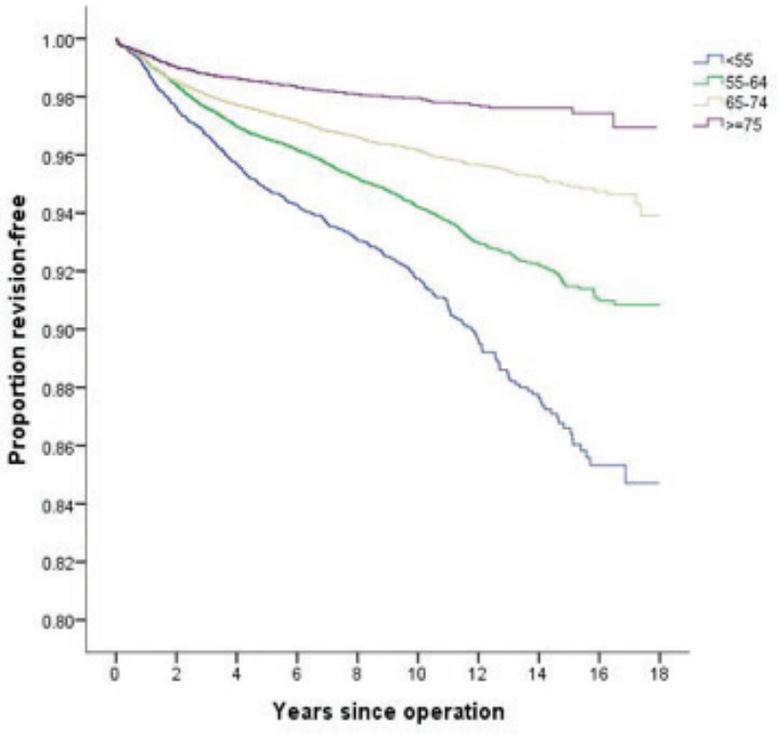
Fixed vs Mobile knees



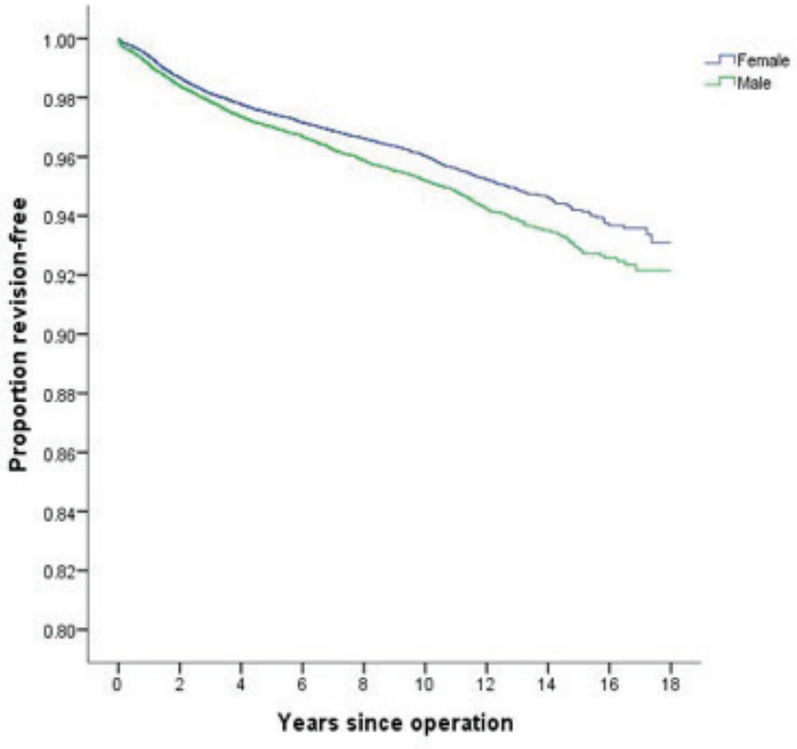
Posterior Stabilised vs Cruciate Retaining



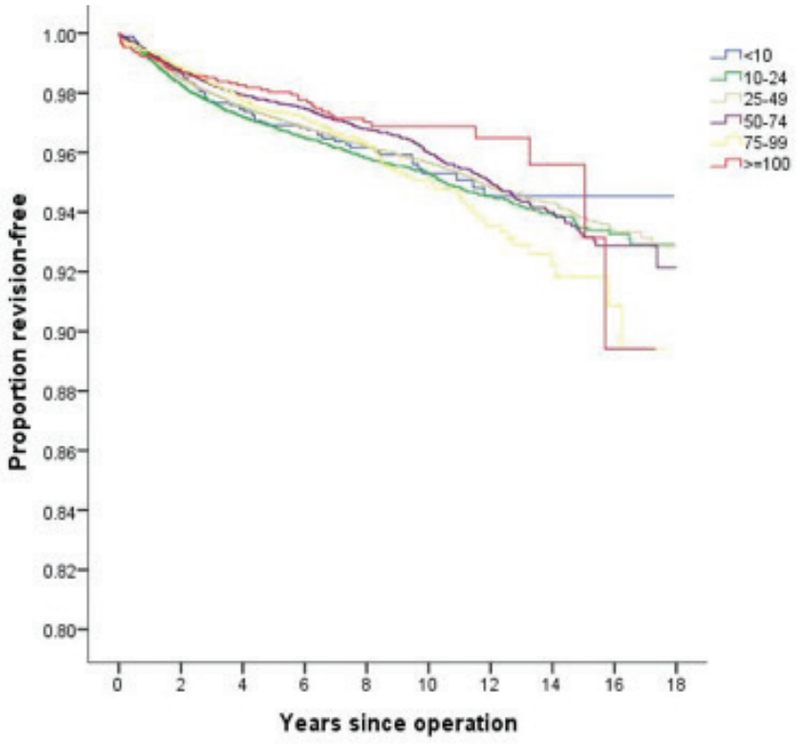
Survival for age bands



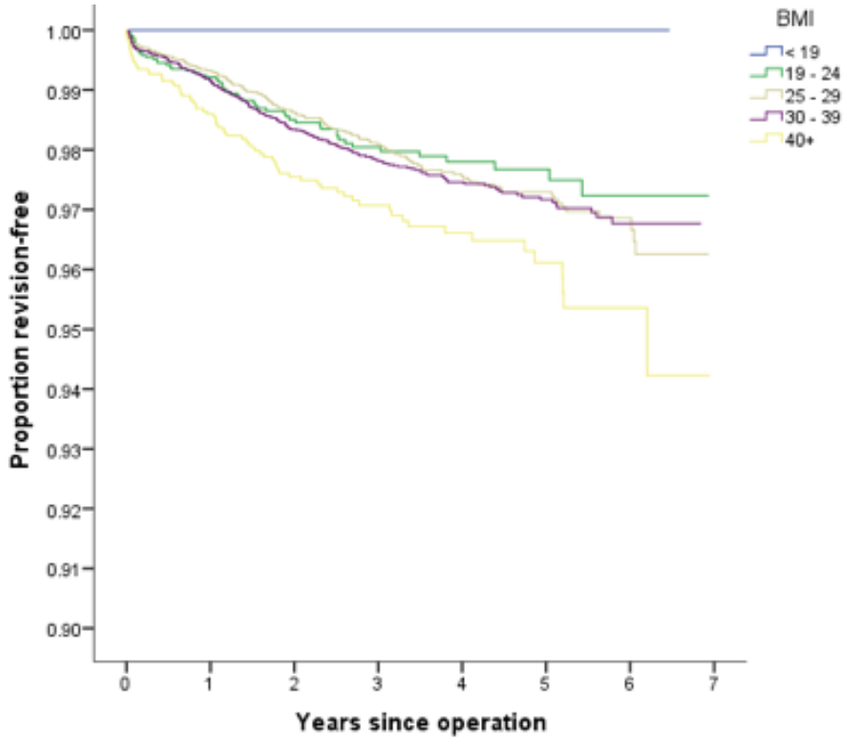
Survival for male vs female



Survival for for surgeon annual output



Survival for BMI groups



KNEE RE-REVISIONS

Analysis was undertaken of re-revisions. There were 428 registered primary knee revisions that had been revised twice, 89 that had been revised three times, 23 that had been revised four times, 4 that had been revised five times and 2 that had been revised six times.

Second revision

Time between the first and second revision for the 428 knee arthroplasties averaged 863 days, with a range of 1 – 5,398 and a standard deviation of 994 days. This compares to an average of 1,387 days between primary and first revision knee arthroplasty.

Reason for revision	
Deep infection	204
Pain	89
Loosening tibial component	63
Loosening femoral component	53
Loosening patellar component	7
Fracture femur	1

Second Revisions

Number of primary revisions	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
2,941	13,167.7	428	3.25	2.95	3.57

Third revision

The average time between second and third revisions for the 89 knee arthroplasties was 665 days, with a range of 5 – 5,185 and a standard deviation of 726 days.

Fourth revision

The average time between third and fourth revisions for the 23 knee arthroplasties was 572 days, with a range of 10 – 3,136 and a standard deviation of 729 days.

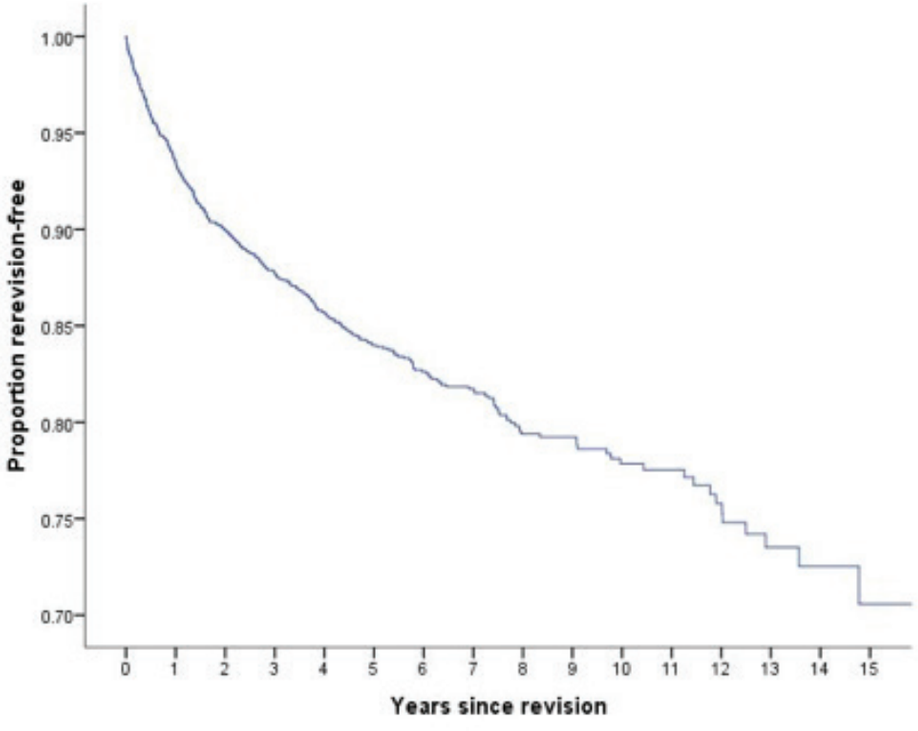
Fifth revision

The average time between fourth and fifth revisions for the 4 knee arthroplasties was 619 days.

Sixth revision

The average time between the fifth and sixth revisions for the 2 knee arthroplasties was 795 days.

Kaplan Meier survival curve for first revision knee arthroplasties



Years	Percentage re-revision free	No in year
1	93.40	2,355
2	90.00	1,954
3	87.70	1,624
4	85.70	1,332
5	84.00	1,093
6	82.60	893
7	81.60	707
8	79.40	542
9	79.20	399
10	77.80	286
11	77.50	216

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS, TEN YEARS AND FIFTEEN 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 eighteen-year period and as at July 2017, there were 27,745 primary knee questionnaire responses registered at six months post-surgery.

The mean knee score was 37.60 (standard deviation 8.05, range 48 – 0).

Scoring	> 41	10,785
Scoring	34 – 41	9,806
Scoring	27 – 33	4,187
Scoring	< 27	2,967

At six months post-surgery, 74% 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 10,646 individual patients.

At five years post-surgery, 75% of patients achieved an excellent or good score and had a mean of 40.43.

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 5,363 individual patients.

At ten years post-surgery, 81% of patients achieved an excellent or good score and had a mean of 39.87.

Questionnaires at fifteen 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 fifteen years post-surgery.

This dataset represents sequential Oxford knee scores for 1,749 individual patients.

At fifteen years post-surgery, 79% of patients achieved an excellent or good score and had a mean of 39.16.

Analysis of the individual questions at six months, five, ten and fifteen 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 primary knee responses at six months, five ten and fifteen years

		6m %	5y %	10y %	15y %
1	Moderate or severe pain from the operated knee	13	8	9	11
2	Only able to walk around the house or unable to walk before pain becomes severe	4	3	4	6
3	Extreme difficulty or impossible to get in and out of a car or public transport	4	3	4	5
4	Extreme difficulty or impossible to kneel down and get up afterwards	40	37	41	43
5	Extreme difficulty or impossible to do the household shopping on your own	4	4	5	6
6	Extreme difficulty or impossible to wash and dry yourself	1	1	2	2
7	Pain interfering greatly or totally with your work	5	4	3	5
8	Very painful or unbearable to stand up from a chair after a meal	3	2	2	3
9	Most of the time or always feeling that the knee might suddenly "give way"	2	2	2	4
10	Limping most or every day	10	7	7	8
11	Extreme difficulty or impossible to walk down a flight of stairs	7	7	8	10
12	Pain from your knee in bed most or every nights	10	4	4	7

As noted in previous years there is little significant change between the six month, five, ten and now fifteen year scores which means the six month score is indicative of the longer term outcome.

BMI vs Oxford score at six months

BMI	Mean	Std. Error of Mean	No
< 19	39.46	2.385	13
19 - 24	39.77	0.236	903
25 - 29	39.28	0.141	2,551
30 - 39	37.87	0.138	3,084
40+	36.38	0.348	513
Total	**38.52**	**0.089**	**7,064**

Revision knee questionnaire responses

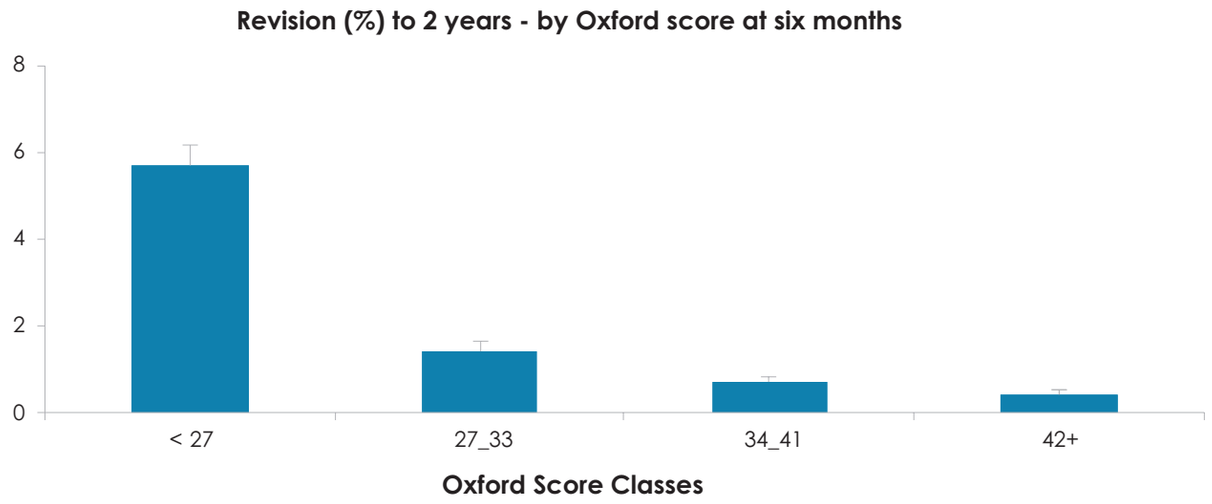
There were 4,171 revision hip responses with 53% achieving an excellent or good score. This group includes all revision knee procedures. The mean revision hip score was 32.85 (standard deviation 10.23, range 0 – 48).

OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at six months, five and ten years post-surgery 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 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 13 times the risk of a revision within two years compared to a person with a score >41.

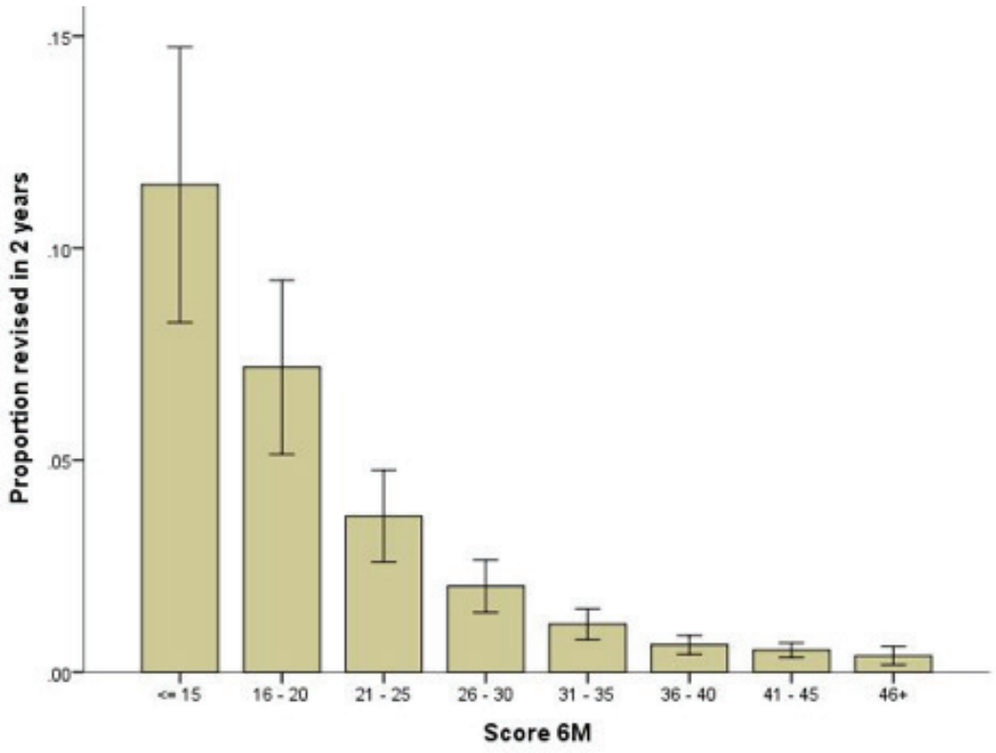


Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date

Kalairajah group	No in group	No. revised	%	Std error
< 27	2,487	141	5.67	0.46
27 - 33	3,416	49	1.43	0.20
34 - 41	7,902	58	0.73	0.10
42+	8,363	38	0.45	0.07

A person with an Oxford score >42 has a 0.45% risk of revision within two years compared to a 5.67% risk with a score of 27 or less.

In view of the large number of six month Oxford scores it is possible with statistical significance to further break down the score groupings to demonstrate an even more convincing relationship between score and risk of revision within two years.



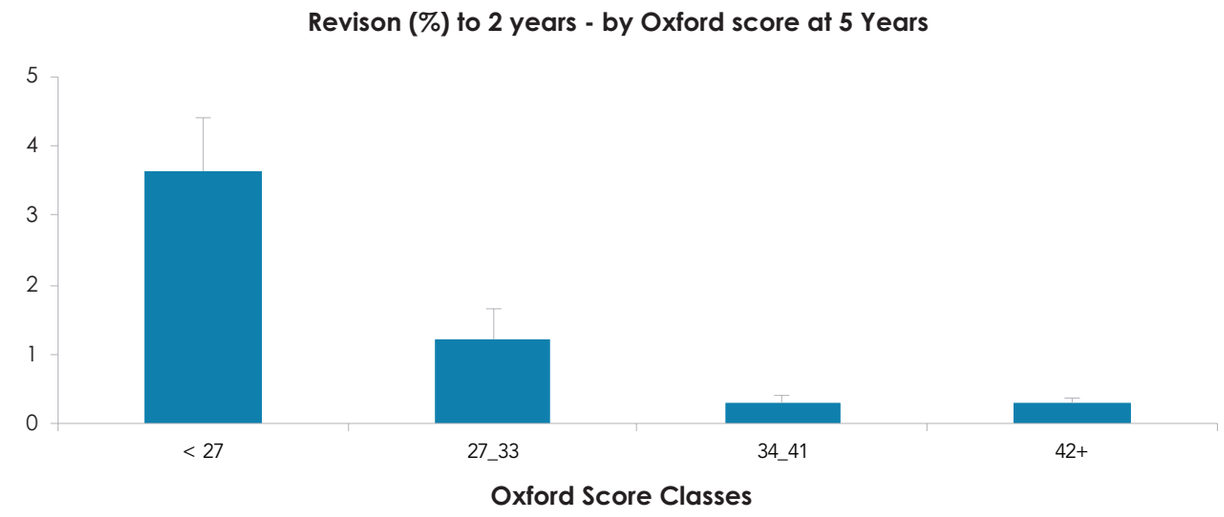
Revision risk versus groupings of Oxford scores within two years of the 6 month score date

			Revision in 2 yrs		Total
			No	Yes	
Score 6 months	<= 15	Count	331	43	374
		%	88.50	11.50	
	16 - 20	Count	568	44	612
		%	92.80	7.20	
	21 - 25	Count	1,126	43	1,169
		%	96.30	3.70	
	26 - 30	Count	1,933	40	1,973
		%	98.00	2.00	
	31 - 35	Count	3,227	37	3,264
		%	98.90	1.10	
	36 - 40	Count	5,089	33	5,122
		%	99.40	0.60	
	41 - 45	Count	6,512	34	6,546
		%	99.50	0.50	
	46+	Count	3,096	12	3,108
		%	99.60	0.40	
Total		**Count**	**21,882**	**286**	22,168
		%	**98.70**	**1.30**	

A person with a six month Oxford score >45 has a 0.40 % risk of revision within two years compared to an 11.5% (29x) risk with a score of <16.

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 12 times the risk of a revision within two years compared to a person with a score 34-41 or score > 41.



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	581	21	3.61	0.77
27 - 33	730	9	1.23	0.41
34 - 41	1,997	6	0.30	0.12
42+	4,580	14	0.31	0.08

A person with an Oxford score 34-41 has a 0.31% risk of revision within two years compared to a 3.61% risk with a score of 27 or less.

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 10 times the risk of a revision within two years compared to a person with a score >41.

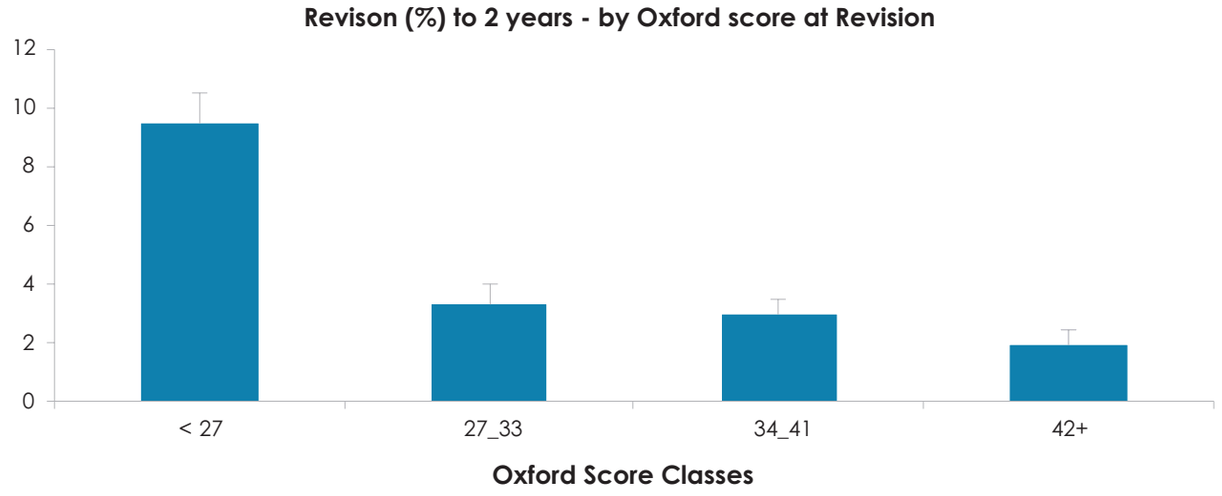
Revision risk versus Kalairajah groupings of Oxford scores within two years of the 10 year score date.

Kalairajah group	No in group	No. revised	%	Std error
< 27	292	14	4.79	1.25
27 - 33	374	8	2.14	0.75
34 - 41	959	5	0.52	0.23
42+	2,051	10	0.49	0.15

A person with an Oxford score >41 has a 0.49% risk of revision within two years compared to a 4.79% risk with a score of 27 or less.

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 knees revised for that same group again 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 5 times the risk of a revision within two years compared to a person with a score >41.

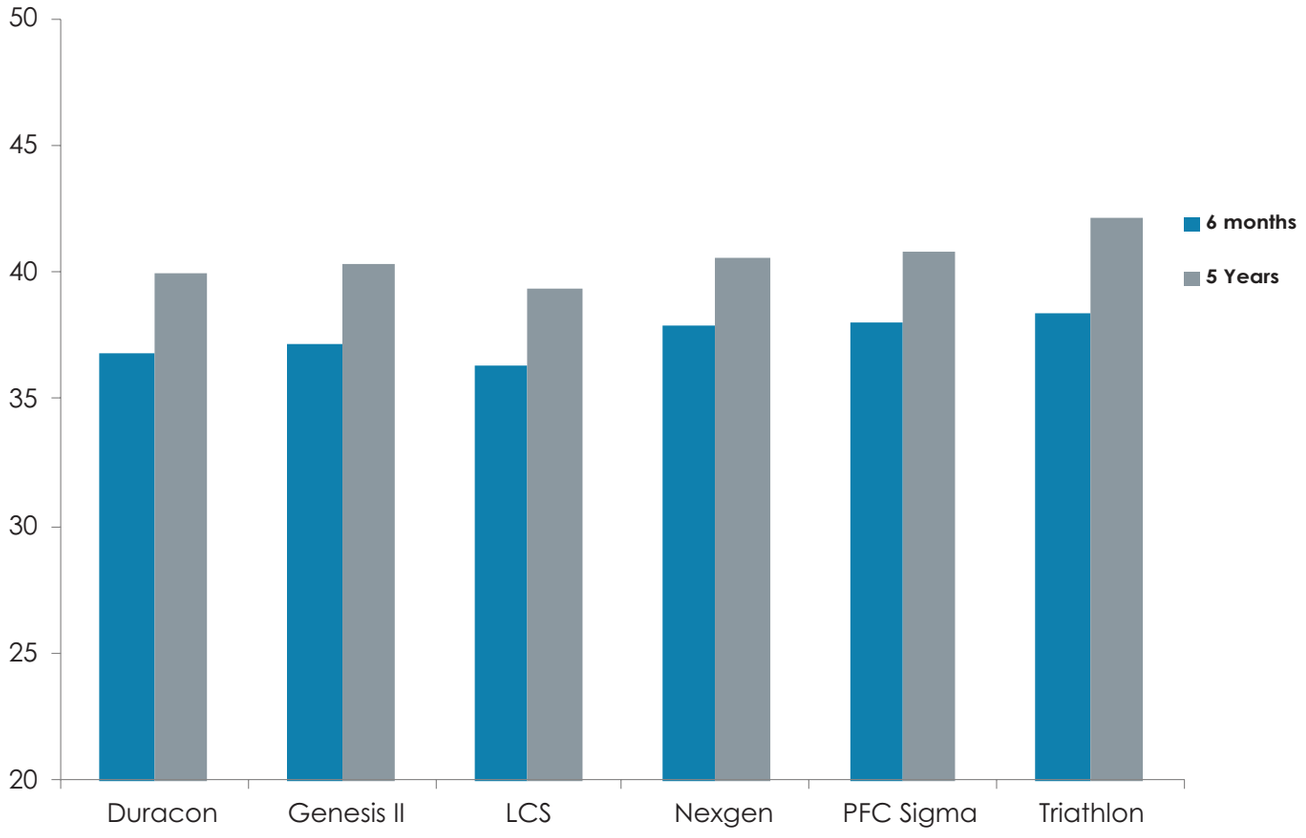


Second revision risk versus Kalairajah groupings of Oxford scores within two years of the six month post-first revision score date.

Kalairajah groups	No in group	No. revised	%	Std error
< 27	816	77	9.44	1.02
27 - 33	605	20	3.31	0.73
34 - 41	916	27	2.95	0.56
42+	763	15	1.97	0.50

A person with a six month Oxford score >42 has a 1.97% risk of revision within two years compared to a 9.44% risk with a score < 27.

Mean Oxford scores at six months and five years for six knee prostheses with minimum of 1,800 registrations



Oxford Score		Duracon	Genesis II	LCS	Nexgen	PFC Sigma	Triathlon
6 mnths	Mean	36.9	37.2	36.4	37.9	38.0	38.6
	Std. Error of Mean	0.2	0.1	0.1	0.1	0.1	0.1
	Number	1,800	3,287	5,587	4,893	2,877	3,689
5 year	Mean	40.0	40.5	39.5	40.6	40.9	41.9
	Std. Error of Mean	0.3	0.2	0.2	0.2	0.2	0.2
	Number	780	1,456	2,410	2,155	1,452	1,370

UNICOMPARTMENTAL KNEE ARTHROPLASTY

PRIMARY UNICOMPARTMENTAL KNEE ARTHROPLASTY

The **seventeen year** report analyses data for the period January 2000 – December 2016. There were 10,474 unicompartmental knee procedures registered with an additional 838 for 2016, which represents an increase of 3.6% over 2015.

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	726
2014	712
2015	810
2016	838

Data Analysis

Age and sex distribution

The average age for a unicompartmental knee replacement was 66.11 years, with a range of 18.28 – 94.71 years.

	Female	Male
Number	4,858	5,616
Percentage	46.38	53.62
Mean age	6.95	66.25
Maximum age	94.71	94.55
Minimum age	18.28	31.62
Standard dev.	10.15	9.16

Body Mass Index

For the seven- year period 2010 - 2016, there were 3,870 BMI registrations for unicompartmental knee replacements. The average was 29.78 with a range of 16.60 – 59.50 and a standard deviation of 5.00.

Previous operation

None	8,397
Menisectomy	1,601
Ligament reconstruction	59
Osteotomy	38
Internal fixation	30
Synovectomy	5

Diagnosis

Osteoarthritis	10,246
Avascular necrosis	85
Post ligament disruption	53
Other inflammatory	22
Rheumatoid arthritis	23
Post fracture	19
Tumour	2

Approach

Medial	7,772
Minimally invasive surgery	2,611
Other	211
Lateral	222
Image guided surgery	88

Image guided surgery was added to the updated forms at the beginning of 2005, but unlike the total knee arthroplasty, has never become popular.

Cement

Femur cemented	7,268	69%
Antibiotic in cement	4,706	65%
Tibia cemented	7,570	72%
Antibiotic in cement	4,935	65%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	10,100	96%

Operating theatre

Conventional	7,349
Laminar flow	3,019
Space suits	2,439

ASA Class

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

For the twelve- year period 2005 – 2015, there were 7,563 (95%) 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	1,468	19
2	4,889	65
3	1,191	15
4	15	1

Operative time (skin to skin)

Mean	74 minutes

Surgeon grade

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

The following figures are for the twelve- year period 2005 – 2016.

The following figures are for the eleven- year period 2005 – 2015.

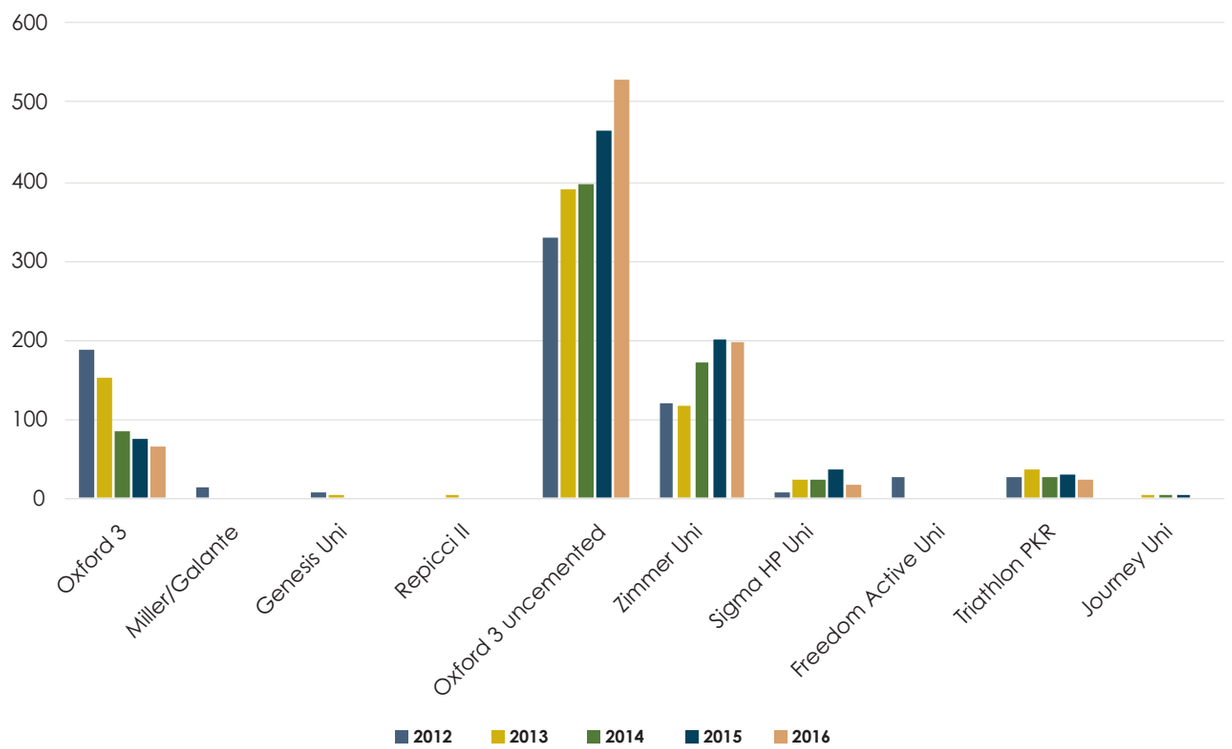
Consultant	7,529
Advanced trainee supervised	336
Advanced trainee unsupervised	18
Basic trainee	12

Prosthesis usage

Unicompartmental knee prostheses used in 2016

Oxford 3 uncemented	530
Zimmer Uni	199
Oxford 3	67
Triathlon PKR	25
Sigma HP Uni	17

Most used Unicompartmental Prostheses for 5 years, 2012 – 2016



Surgeon and hospital workload

Surgeons

In 2016, 76 surgeons performed 839 unicompartmental knee replacements, an average of 11 procedures per surgeon. 38 surgeons performed less than five procedures and 12 performed more than 15 procedures.

Hospitals

In 2016, unicompartmental knee replacements were performed in 39 hospitals; 19 were public and 20 were private.

For 2016, the average number of unicompartmental knee replacements per hospital was 22.

REVISION OF REGISTERED PRIMARY UNICOMPARTMENTAL ARTHROPLASTIES

This section analyses the data for revision of unicompartmental knee replacement over the seventeen-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 853 revisions of the 10,474 registered unicompartmental knee replacements (8%). A further 90 had a second revision, 14 a third revision and one had a fourth revision.

691 of the 853 (81%) were revised to total knee replacements and 162 (19%) were revised to further unicompartmental replacements.

Time to revision

Mean	1,828 days
Maximum	5,824 days
Minimum	4 days
Standard deviation	1,500 days

Reason for revision	
Pain	277
Loosening tibial component	151
Loosening femoral component	111
Deep infection	32
Fracture tibia	23
Fracture femur	3

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

Analysis of the three main reasons for revision by year after the primary procedure

	Loosening femoral component		Loosening tibial component		Pain	
Years	**Count**	**%**	**Count**	**%**	**Count**	**%**
0	12	10.81	29	19.21	40	14.44
1	22	19.82	34	22.52	62	22.38
2	9	8.11	11	7.28	35	12.64
3	15	13.51	12	7.95	17	6.14
4	5	4.50	9	5.96	30	10.83
5	8	7.21	5	3.31	14	5.05
6	3	2.70	12	7.95	15	5.42
7	9	8.11	9	5.96	14	5.05
8	7	6.31	4	2.65	10	3.61
9	4	3.60	9	5.96	10	3.61
10	7	6.31	5	3.31	12	4.33
11	3	2.70	4	2.65	5	1.81
12	7	6.31	4	2.65	6	2.17
13	0	0.00	3	1.99	3	1.08
14	0	0.00	1	0.66	1	0.36
15	0	0.00	0	0.00	3	1.08
Total	**111**		**151**		**277**	

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 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	
10,474	68,712.4	853	1.24	1.16	1.33

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	203.0	1	0.49	0.00	2.74
Freedom Active Uni	36	142.9	6	4.20	1.54	9.14
Genesis Uni	359	3,309.8	47	1.42	1.04	1.89
HLS Uni Evolution	1	0.5	1	193.25	4.89	1,076
Journey Uni	7	16.5	1	6.05	0.15	33.69
LCS Uni	6	59.7	2	3.35	0.41	12.11
Miller/Galante	710	7,160.9	70	0.98	0.76	1.24
Optetrak Unicondylar Cemented	101	676.8	8	1.18	0.51	2.33
Oxford 3	4,008	34,573.2	478	1.38	1.26	1.51
Oxford 3 uncemented	3,160	11,856.2	96	0.81	0.66	0.99
Oxford TiNbN coated	1	5.5	0	0.00	0.00	67.64
Oxinium Uni	33	243.2	12	4.94	2.55	8.62
Preservation	484	4,545.5	74	1.63	1.28	2.04
Repicci II	98	1,121.1	22	1.96	1.23	2.97
Sigma HP Uni	134	371.6	4	1.08	0.29	2.76
Triathlon PKR	196	621.0	8	1.29	0.50	2.54
Unix Uni	14	75.4	3	3.98	0.82	11.63
Zimmer Unicompartmental Knee	1,104	3,729.6	20	0.54	0.33	0.83

The Oxinium, and the Freedom Active 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 or Freedom Active unis have been registered for several years.

The uncemented Oxford and the Zimmer Unis have significantly lower revision rates than the overall mean of 1.25 /100ocys.

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	7,220	56,277.6	746	1.33	1.23	1.42
Uncemented	2,856	10,893.1	83	0.76	0.61	0.94
Hybrid	398	1,541.7	24	1.56	1.00	2.32

The uncemented Unis have a significantly lower revision rate than cemented and hybrid Unis.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	1,328	8,647.5	155	1.79	1.52	2.10
55-64	3,621	24,340.1	389	1.60	1.44	1.77
65-74	3,500	23,590.2	220	0.93	0.81	1.06
>=75	2,025	12,134.6	89	0.73	0.59	0.90

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	4,475	28,720.5	394	1.37	1.24	1.51
M	5,160	31,986.9	363	1.13	1.02	1.26

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	4,809	34,487.7	492	1.43	1.30	1.56
>=10	5,663	34,215.3	360	1.05	0.94	1.17

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

Revision vs Surgical Approach

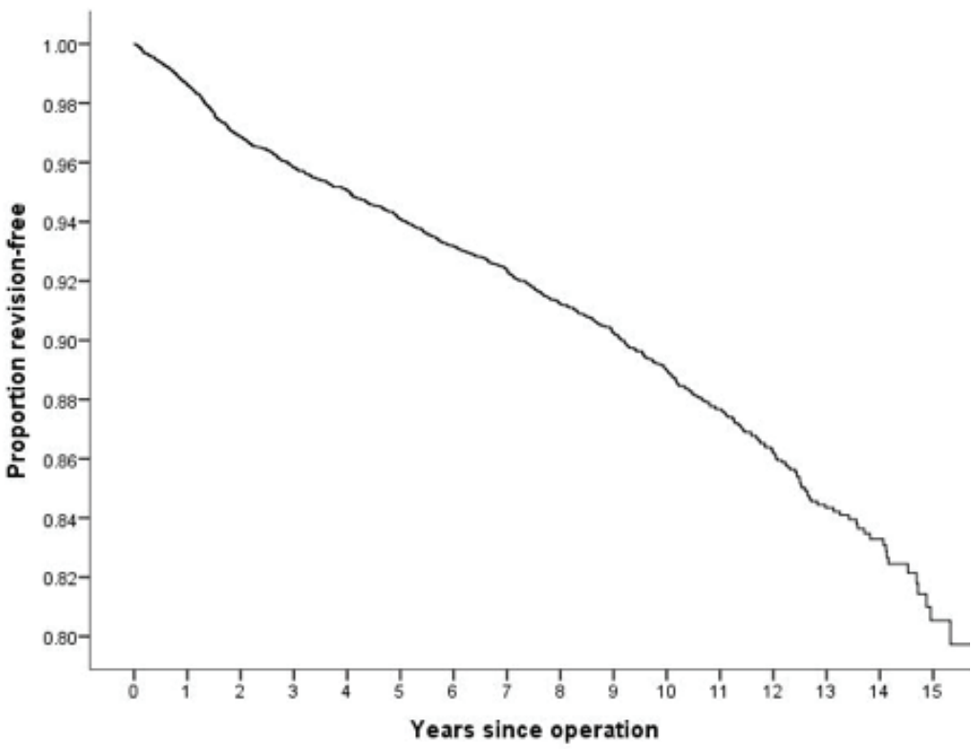
Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial parapatellar	7,766	52,800.2	696	1.32	1.22	1.42
Lateral parapatellar	221	1,538.8	25	1.62	1.05	2.40
Not Minimally Invasive	7,863	53,312.2	709	1.33	1.23	1.43
Minimally Invasive	2,611	15,400.2	144	0.94	0.79	1.10

The minimally invasive technique has a significantly lower revision rate.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 17 years from 2000 to 2016, with deceased patients censored at time of death.

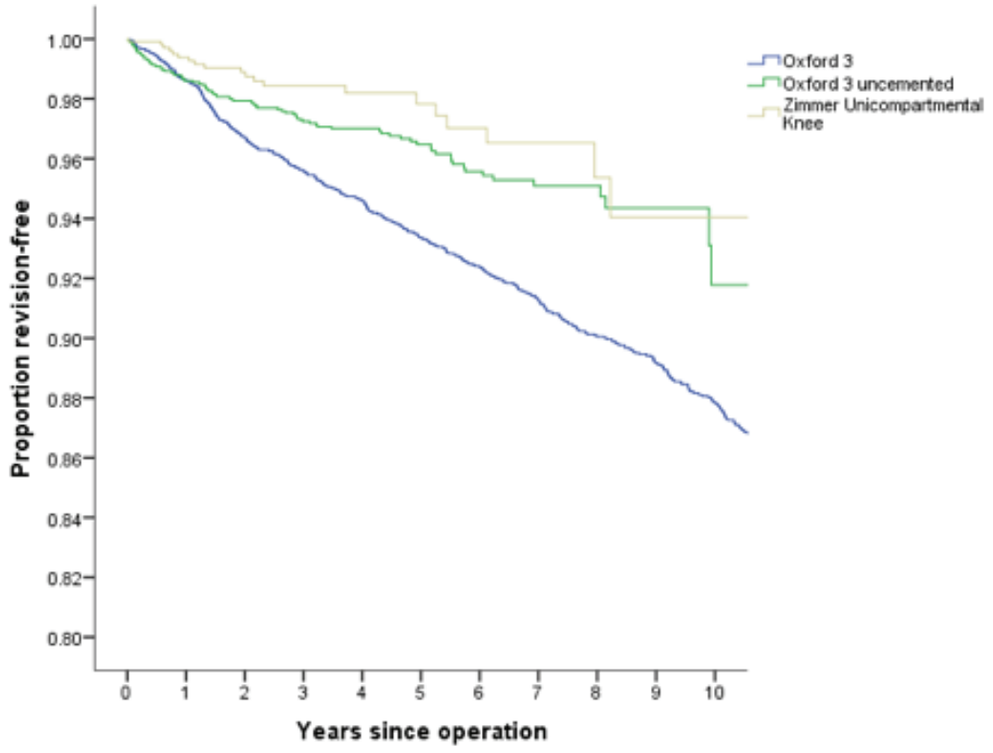
Unicompartmental Knees



Years	% Revision-free	Number
1	98.6	9,445
2	97.0	8,432
3	96.0	7,566
4	95.2	6,703
5	94.2	5,880
6	93.3	5,196
7	92.5	4,514
8	91.4	3,832
9	90.4	3,256
10	89.1	2,673
11	87.7	2,108
12	86.4	1,628
13	84.7	1,113
14	83.1	707
15	81.1	377

Note: Numbers too few for accurate percentage survival beyond 15 years.

Survival curves for the 3 unicompartmental knees with the biggest number of implantations



Revision Rate for Re-revisions

Re Revisions	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Revised to full	690	3,712.5	56	1.51	1.14	1.96
Revised to Uni	162	617.7	34	5.50	3.81	7.69
ALL	852	4,330.2	90	2.08	1.67	2.55

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 (3x) when a unicompartmental arthroplasty is converted to a total knee arthroplasty. This statistic is even more significant following revision of a unicompartmental to a further unicompartmental arthroplasty (11x). 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.

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 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 seventeen year period and as at July 2017, there were 6,935 unicompartmental knee questionnaire responses registered at six months post-surgery. The mean unicompartmental knee score was 39.67 (standard deviation 7.2, range 3 – 48).

Scoring	> 41	3,519
Scoring	34 -41	2,221
Scoring	27 -33	767
Scoring	< 27	428

At six months post-surgery, 83% 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 2,858 individual patients.

At five years post-surgery, 88% of patients had achieved an excellent or good score and had a mean of 41.56.

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 1,376 individual patients.

At ten years post-surgery, 82% of patients achieved an excellent or good score and had a mean of 40.45.

Questionnaires at fifteen 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 fifteen years post-surgery.

This dataset represents sequential Oxford knee scores for 229 individual patients.

At fifteen years post-surgery, 82% of patients achieved an excellent or good score and had a mean of 39.83.

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 at six months, five years and ten years post- surgery

		6m%	5y%	10y%
1	Moderate or severe pain from the operated knee	11	8	11
2	Only able to walk around the house or unable to walk before pain becomes severe	2	2	3
3	Extreme difficulty or impossible to get in and out of a car or public transport	1	1	3
4	Extreme difficulty or impossible to kneel down and get up afterwards	29	27	29
5	Extreme difficulty or impossible to do the household shopping on your own	1	1	1
6	Extreme difficulty or impossible to wash and dry yourself	0.4	0.4	0.7
7	Pain interfering greatly or totally with your work	3	3	4
8	Very painful or unbearable to stand up from a chair after a meal	3	2	3
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	6
11	Extreme difficulty or impossible to walk down a flight of stairs	3	3	5
12	Pain from your knee in bed most or every nights	7	4	6

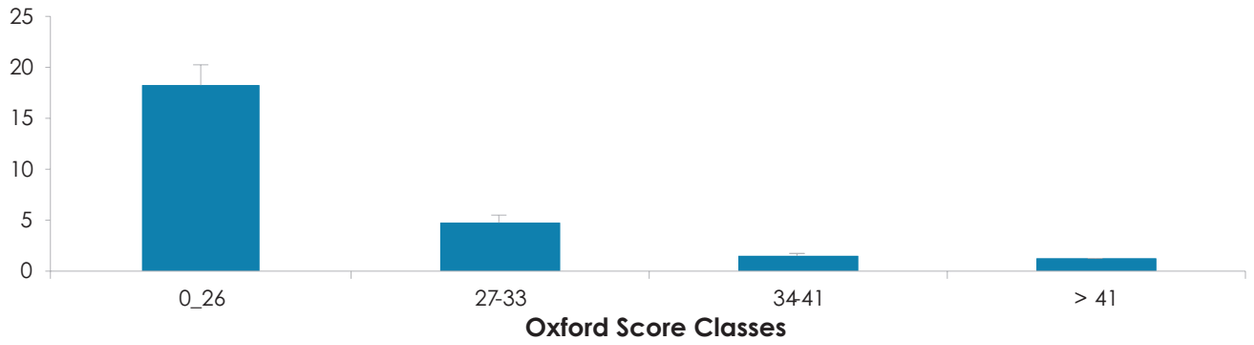
OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at six months, five years and ten years 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 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 16 times the risk of a revision within two years compared to a person with a score of >41.

Revision (%) to 2 years - by Oxford score at six months



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

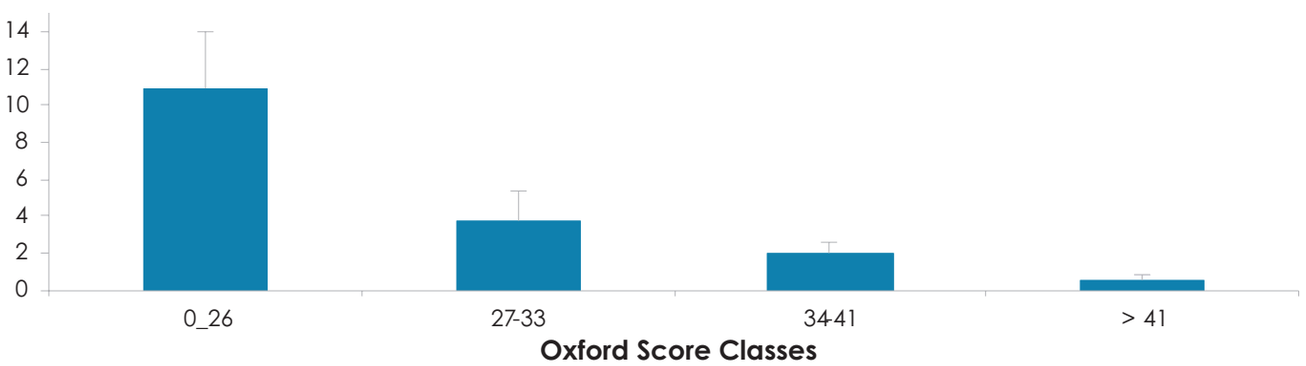
Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	359	66	18.38	2.04
27-33	636	30	4.72	0.84
34-41	1,855	28	1.51	0.28
> 41	2,812	33	1.17	0.20

A person with an Oxford score >41 has a 1.17% risk of revision within two years compared to an 18.38% risk with a score of < 27.

Five year score and revision arthroplasty

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 18 times the risk of a revision within two years compared to a person with a score of >41.

Revision (%) to 2 years - by Oxford score at 5 Years



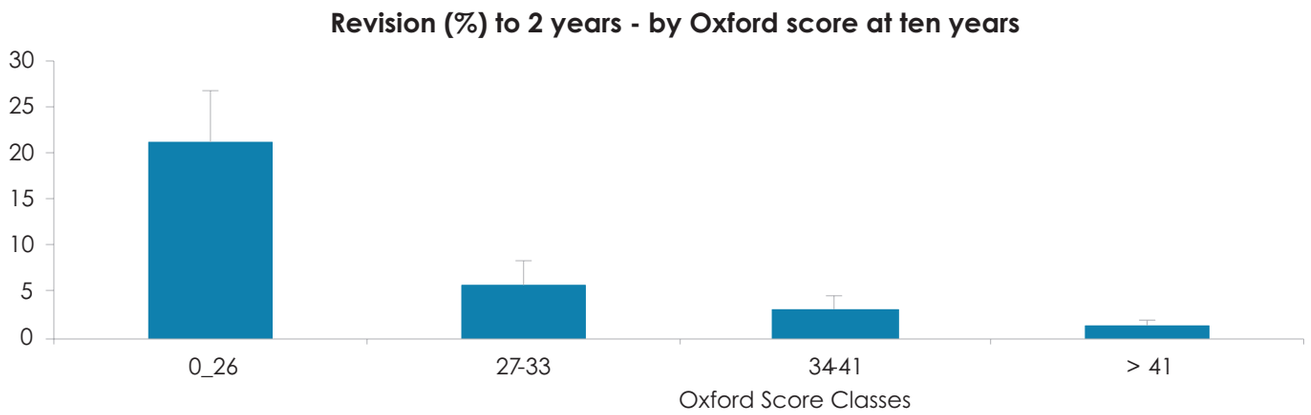
Revision risk versus Kalairajah groupings of Oxford scores within two years of the five year score date

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	101	11	10.89	3.10
27-33	159	6	3.77	1.51
34-41	504	10	1.98	0.62
> 41	1,337	8	0.60	0.21

A person with an Oxford score >41 has a 0.60% risk of revision within two years compared to a 10.89% risk with a score of < 27.

Ten year score and revision arthroplasty

Plotting the patients' ten 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 >41.



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

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0-26	52	11	21.15	5.66
27-33	87	5	5.75	2.50
34-41	187	6	3.21	1.29
> 41	488	7	1.43	0.54

A person with an Oxford score >41 has a 1.43 % risk of revision within two years compared to a 21.15 % risk with a score of < 27.

ANKLE ARTHROPLASTY

PRIMARY ANKLE ARTHROPLASTY

The **seventeen- year** report analyses data for the period January 2000 – December 2016. There were 1,380 primary ankle procedures registered, an additional 119 compared to last year's report, which represents an 18% increase over 2015 and equals the previous highest annual registrations recorded in 2009.

2000	17	2009	119
2001	28	2010	125
2002	28	2011	109
2003	26	2012	108
2004	48	2013	113
2005	70	2014	102
2006	81	2015	101
2007	79	2016	119
2008	107		

Data Analysis

Age and sex distribution

The average age for an ankle replacement was 65.91 years, with a range of 32.32 – 95.52 years.

	Female	Male
Number	538	842
Percentage	38.99	61.01
Mean age	63.58	67.39
Maximum age	95.52	90.26
Minimum age	32.32	33.42
Standard dev.	9.69	8.57

Body Mass Index

For the seven year period 2010 - 2016, there were 454 BMI registrations for primary ankle replacements. The average was 28.26 with a range of 17 – 54 and a standard deviation of 4.54.

Previous operation

None	1,092
Internal fixation for juxtaarticular fracture	133
Arthrodesis	41
Osteotomy	23

Diagnosis

Osteoarthritis	1,036
Post trauma	222
Rheumatoid arthritis	120
Other inflammatory	20
Avascular necrosis	5

Approach

Aterior	1,192
Anterolateral	40
Other	14

Bone graft

Tibia autograft	40
Tibia allograft	3
Tibia synthetic	1
Talus autograft	10
Talus allograft	3

Cement

Tibia cemented	20
Antibiotic in cement	13
Talus cemented	14
Antibiotic in cement	9

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	1,325 (96%)

Operating theatre

Conventional	686
Laminar flow	679
Space suits	253

ASA Class

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

For the twelve-year period 2005-2016, there were 1,110 (90%) 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	209
2	689
3	208
4	4

Operative time (skin to skin)

Mean	121 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the twelve-year period 2005 -2016.

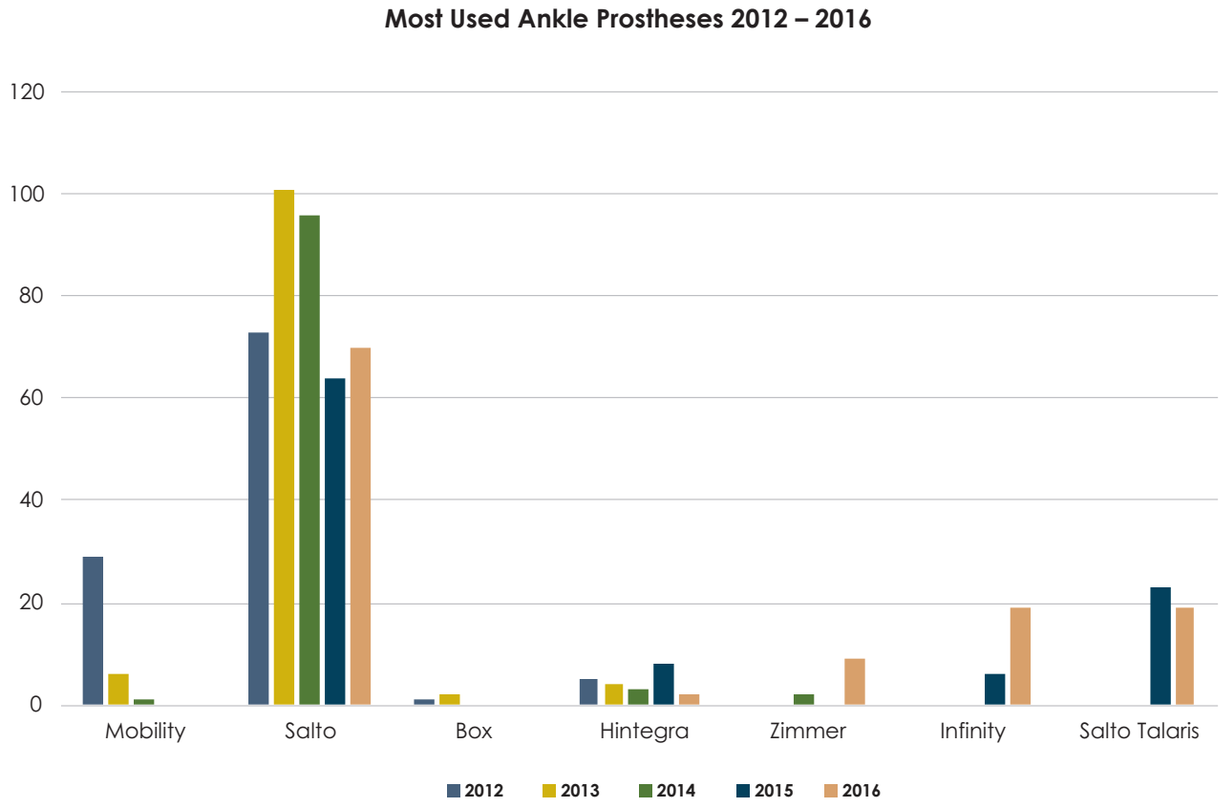
Consultant	1,227
Advanced trainee supervised	8

Prosthesis usage

Ankle prostheses used in 2016

Salto	70
Salton Talaris	19
Infinity	19
Zimmer Metal	9
Hintegra	2

The Salto reigned supreme but the Infinity continued to climb in 2016.



Surgeon and hospital workload

Surgeons

In 2016, 21 surgeons performed 119 primary ankle procedures, an average of 6 procedures per surgeon. One surgeon performed more than 15 procedures and 13 performed <5 procedures.

Hospitals

In 2016, primary ankle replacement was performed in 26 hospitals. 13 were public and 13 were private.

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 seventeen-year period January 2000–December 2016, there were 201 revision ankle procedures registered.

The average age for an ankle revision was 65.58 years, with a range of 34.55 – 85.43.

	Female	Male
Number	76	125
Percentage	37.81	62.19
Mean	64.51	66.24
Maximum age	81.68	85.43
Minimum age	42.13	34.55
Standard dev.	9.32	8.54

REVISION OF REGISTERED PRIMARY ANKLE ARTHROPLASTIES

This section analyses data for revisions of primary ankle procedures for the seventeen-year period 2000 – 2016.

There were 152 revisions of the primary total ankle procedures of 1,380 (11%)

Time to revision

Mean	1,576 days
Maximum	5,173 days
Minimum	21 days
Standard deviation	1,202 days

Reason for revision

Pain	65
Loosening talar component	46
Loosening tibial component	32
Deep infection	17
Fracture talus	3

Ankle re-revisions

There were 16 registered primary ankle procedures that were revised twice and two procedures that were revised three times.

Analysis of the three main reasons for revision by year after primary procedure

	Loosening talar component		Loosening tibial component		Pain	
Years	Count	%	Count	%	Count	%
0	3	6.52	1	3.13	4	6.15
1	5	10.87	9	28.13	15	23.08
2	8	17.39	3	9.38	10	15.38
3	6	13.04	3	9.38	10	15.38
4	7	15.22	4	12.50	9	13.85
5	4	8.70	1	3.13	4	6.15
6	2	4.35	2	6.25	3	4.62
7	2	4.35	1	3.13	2	3.08
8	2	4.35	3	9.38	3	4.62
9	3	6.52	2	6.25	2	3.08
10	1	2.17	1	3.13	3	4.62
11	1	2.17	1	3.13	0	0.00
12	0	0.00	1	3.13	0	0.00
13	1	2.17	0	0.00	0	0.00
14	1	2.17	0	0.00	0	0.00
Total	**46**		**32**		**65**	

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 Ankle Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
1,380	7,655.0	152	1.98	1.68	2.32

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	1,188.1	35	2.95	2.05	4.10
Box	6	28.5	2	7.02	0.85	25.36
Hintegra	22	56.5	2	3.54	0.43	12.78
Infinity	25	15.3	0	0.00	0.00	24.06
Mobility	450	3,026.5	59	1.95	1.48	2.51
Ramses	11	87.7	5	5.70	1.85	13.30
Salto	641	2,756.1	37	1.34	0.95	1.85
Salto Talaris	48	56.2	0	0.00	0.00	6.56
STAR	47	432.2	12	2.78	1.35	4.70
Zimmer Trabecular Metal Ankle	11	8.1	0	0.00	0.00	45.67

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	538	3,012.1	61	2.03	1.53	2.58
Males	842	4,642.9	91	1.96	1.58	2.41

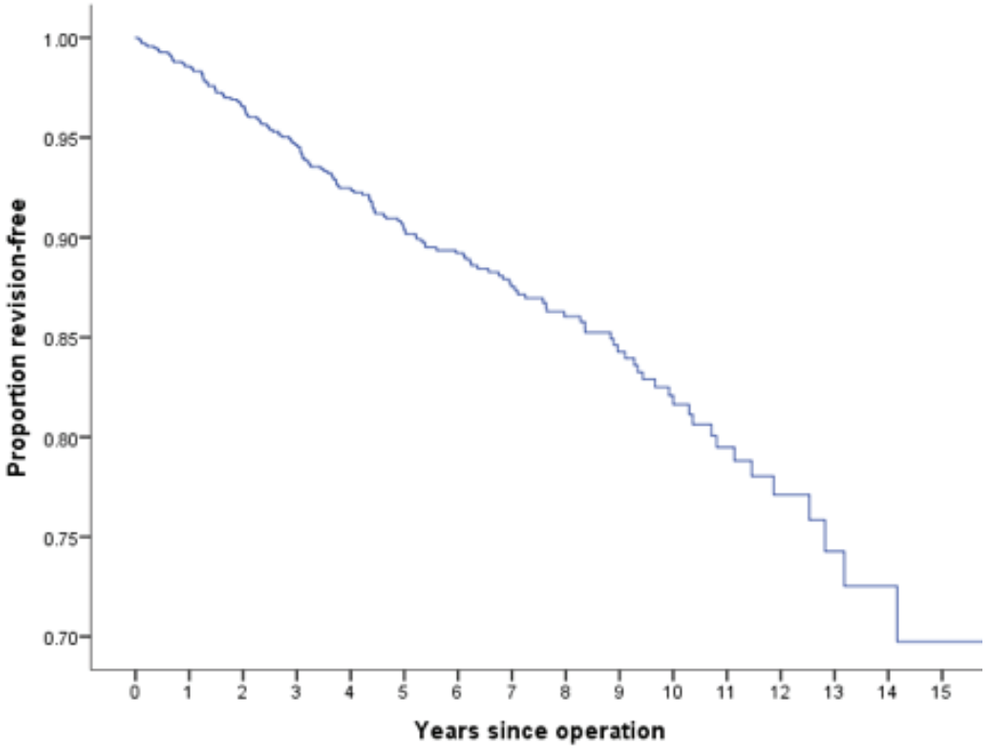
Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	156	884.4	29	3.28	2.15	4.64
55-64	451	2,764.0	68	2.46	1.91	3.12
65-74	544	2,956.7	47	1.59	1.15	2.09
>=75	229	1,049.9	8	0.76	0.33	1.50

The highest age band has a significantly lower revision rate than the lower two.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 17 years from 2000 to 2016, with deceased patients censored at time of death.



Years	% Revision-free	No in each year
1	98.5	1,231
2	96.5	1,097
3	94.5	965
4	92.4	825
5	90.3	702
6	89.2	594
7	87.5	469
8	86.0	350
9	84.3	255
10	81.6	185
11	79.5	126

There are insufficient numbers to give an accurate revision-free percentage beyond 11 years.

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

At six months post-surgery patients are sent an outcome questionnaire.

The non -validated ankle questionnaire used previously by the Registry was replaced by the validated Manchester-Oxford Foot Questionnaire towards the end of 2015.

This has 16 questions answered on a 5 point Likert scale, with each item scoring from 0 – 4, with 4 denoting "most severe". Total score range from 0-64

For the 2016 year there were n = 66 responses.

Mean = 14.82, Maximum = 59, Minimum = 0 and Standard deviation = 12.76.

SHOULDER ARTHROPLASTY

PRIMARY SHOULDER ARTHROPLASTY

The **seventeen-year** report analyses data for the period January 2000 – December 2016. There were 8,250 primary shoulder procedures registered with an additional 942 registered in 2016 which represents a 3.6% decrease in registrations compared to 2015. It is the first decrease since 2010.

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	748
2014	801
2015	976
2016	942

Of the 8,250 shoulder registrations, 1,689 are hemi shoulder replacements, 2,941 are conventional total shoulder replacements, 3,328 are reverse shoulder replacements, 219 are partial resurfacing shoulder replacements, 162 are total resurfacing replacements and one is a humeral sphere.

Data Analysis

Age and sex distribution

The average age for all patients with a shoulder arthroplasty was 71.11 years, with a range of 15.63 – 99.36 years.

All shoulder arthroplasty

	Female	Male
Number	5,231	3,019
Percentage	63.41	36.59
Mean age	72.67	68.40
Maximum age	97.71	99.36
Minimum age	15.63	21.83
Standard dev.	9.41	10.22

Hemiarthroplasty

	Female	Male
Number	1,111	578
Percentage	65.78	34.22
Mean age	71.53	65.40
Maximum age	97.71	99.36
Minimum age	15.63	21.15
Standard dev.	11.07	12.38

Conventional total shoulder arthroplasty

	Female	Male
Number	1,853	1,088
Percentage	63.00	37.00
Mean age	70.70	66.70
Maximum age	94.62	89.11
Minimum age	26.64	29.38
Standard dev.	8.73	8.72

Reverse shoulder arthroplasty

	Female	Male
Number	2,086	1,152
Percentage	64.42	35.58
Mean age	75.62	73.13
Maximum age	96.82	92.65
Minimum age	35.61	44.28
Standard dev.	7.62	7.50

Partial resurfacing arthroplasty

	Female	Male
Number	78	141
Percentage	35.62	64.38
Mean age	58.92	56.02
Maximum age	87.06	86.12
Minimum age	20.70	21.83
Standard dev.	14.25	11.07

Total resurfacing arthroplasty

	Female	Male
Number	102	60
Percentage	62.96	37.04
Mean age	71.07	66.58
Maximum age	86.79	81.51
Minimum age	47.24	23.67
Standard dev.	8.12	10.28

Humeral sphere

One female patient aged 50.11 years.

Previous operation

None	6,918
Rotator cuff repair	475
Internal fixation for juxtarticular fracture	200
Previous stabilisation	169
Arthroscopic debridement	21
Osteotomy	4
Arthrodesis	1

Diagnosis

Osteoarthritis	4,395
Cuff tear arthropathy	1,793
Acute fracture prox. humerus	803
Rheumatoid arthritis	586
Post old trauma	468
Avascular necrosis	243
Post recurrent dislocation	118
Other inflammatory	71

Approach

Deltopectoral	7,260
Other including deltoid split	262

Bone graft

Humeral autograft	111
Humeral allograft	22
Humeral synthetic	3
Glenoid autograft	111
Glenoid allograft	12

Cement

Humerus cemented	1,650
Antibiotic in cement	1,015
Glenoid cemented	2,084
Antibiotic in cement	1,463

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	7,730 (94%)

Operating theatre

Conventional	5,008
Laminar flow	3,123
Space suits	1,412

ASA Class

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

For the twelve-year period 2005 – 2016 there were 6,982 (96%) 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	601	9
2	3,918	56
3	2,382	34
4	81	1

Operative time (skin to skin in minutes)

	Mean
Hemi Arthroplasty	110
Conventional Total	127
Partial Resurfacing	94
Total Resurfacing	124
Reverse Arthroplasty	114

Surgeon grade

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

The following figures are for the twelve-year period 2005 – 2016.

Consultant	6,938
Advanced trainee supervised	342
Advanced trainee unsupervised	17
Basic trainee	2

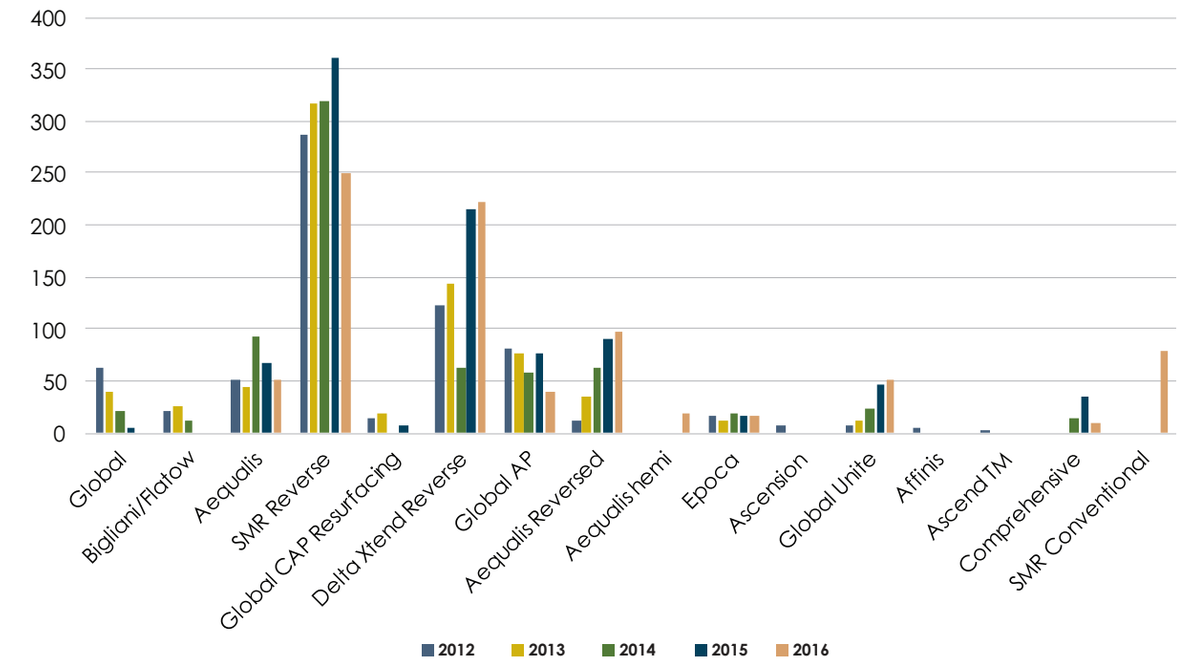
Top 10 shoulder prostheses 2016

SMR Reverse	250
Delta Xtend Reverse	223
Aequalis reversed	97
SMR Conventional / L1 glenoid	78
Global Unite Conventional	52
Aequalis Conventional	51
Global AP Conventional	39
Aequalis Hemiarthroplasty	18
Epoca Head	16
Comprehensive	10

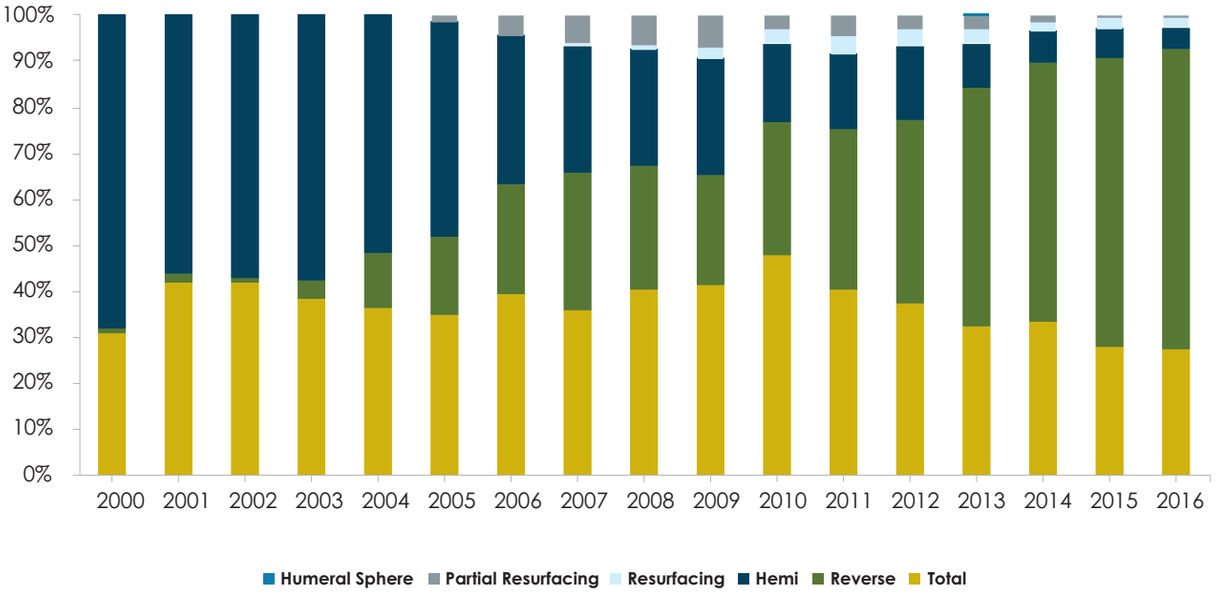
No change in the top 10 from 2015 apart from some mild reshuffle in the order.

Most used shoulder prostheses for five years 2012 - 2016

(NB For the 2016 year, the SMR conventional and Reverse options have been graphed separately)



Percentages of the different types of shoulder prostheses used by year



Surgeon and hospital workload

Surgeons

In 2016, 77 surgeons performed 942 shoulder procedures; an average of 12 procedures per surgeon. 18 surgeons performed more than 20 procedures and 10 surgeons each performed one procedure.

Hospitals

In 2016, shoulder replacement was performed in 51 hospitals. 27 were public and 24 were private.

For 2016, the average number of shoulder replacements per hospital was 18.

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 seventeen- year period January 2000 – December 2016, there were 637 revision shoulder procedures registered.

The average age for a shoulder revision was 68.56 years with a range of 24.05 – 89.95 years.

	Female	Male
Number	371	266
Percentage	58.24	41.76
Mean	70.25	66.20
Maximum age	89.95	88.46
Minimum age	33.20	24.05
Standard dev.	10.29	10.57

REVISION OF REGISTERED PRIMARY SHOULDER ARTHROPLASTIES

This section analyses data for revisions of primary shoulder procedures for the seventeen-year period January 2000 – December 2016.

There were 401 revisions of the primary group of 8,250 (4.9%). There were 42 procedures that had been revised twice, 9 that had been revised three times and 2 revised 4 times.

Time to revision

Mean	1,035 days
Maximum	5,517 days
Minimum	0 days
Standard deviation	1,060 days

Reason for revision

Pain	87
Dislocation/instability anterior	68
Sub acromial cuff impingement	66
Loosening glenoid	56
Deep infection	27
Loosening humeral	18
Instability posterior	12
Sub acromial tuberosity impingement.	7
Fracture humerus	7
Loosening both	3

Analysis of the six main reasons for revision by year after primary procedure

	Loosening glenoid		Dislocation		Deep infection		Pain		Sub acromial Cuff		Loosening Humeral Component	
Years	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	15	26.79	41	60.29	10	37.04	21	24.14	14	21.21	4	22.22
1	11	19.64	12	17.65	9	33.33	22	25.29	17	25.76	1	5.56
2	6	10.71	3	4.41	4	14.81	12	13.79	13	19.70	1	5.56
3	2	3.57	2	2.94	2	7.41	8	9.20	3	4.55	3	16.67
4	1	1.79	4	5.88	1	3.70	6	6.90	4	6.06	2	11.11
5	4	7.14	4	5.88	0	0.00	2	2.30	6	9.09	3	16.67
6	3	5.36	0	0.00	0	0.00	4	4.60	2	3.03	0	0.00
7	1	1.79	0	0.00	1	3.70	3	3.45	3	4.55	0	0.00
8	2	3.57	1	1.47	0	0.00	2	2.30	0	0.00	1	5.56
9	6	10.71	0	0.00	0	0.00	3	3.45	2	3.03	1	5.56
10	2	3.57	0	0.00	0	0.00	1	1.15	2	3.03	1	5.56
11	2	3.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
12	0	0.00	1	1.47	0	0.00	1	1.15	0	0.00	1	5.56
13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
14	1	1.79	0	0.00	0	0.00	2	2.30	0	0.00	0	0.00
Total	**56**		**68**		**27**		**87**		**66**		**18**	

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 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	
8,250	40,524.8	401	0.99	0.90	1.09

Revision rate of Shoulder Prostheses vs Arthroplasty Type

Operation Type	No. Ops.	Observed	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total	2,941	16,104.3	154	0.96	0.81	1.12
Reverse	3,238	10,570.5	83	0.79	0.63	0.97
Hemi	1,689	11,960.1	133	1.11	0.93	1.31
Resurfacing	162	605.2	3	0.50	0.10	1.45
Partial resurfacing	219	1,281.6	28	2.18	1.45	3.16
Humeral Sphere	1	3.1	0	0.00	0.00	120

There is a significantly higher revision rate for Partial Resurfacing compared to all the other types.

Revision Rate of Individual Shoulder Prostheses Sorted on Alphabetical Order

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total	Aequalis	469	2,259.9	15	0.66	0.37	1.09
	Affinis	26	27.7	0	0.00	0.00	13.33
	Anatomical	35	406.6	1	0.25	0.01	1.37
	Arthrex Eclipse	1	3.1	0	0.00	0.00	117.47
	Ascend TM	2	7.6	0	0.00	0.00	48.26
	Bi-Angular	8	52.7	0	0.00	0.00	7.00
	Bigliani/Flatow	281	2,288.2	7	0.31	0.12	0.63
	Cofield 2	21	226.7	0	0.00	0.00	1.63
	Comprehensive	22	28.3	0	0.00	0.00	13.04
	Delta Xtend Reverse	1	2.7	0	0.00	0.00	137.21
	Epoca Humeral stem	4	25.6	0	0.00	0.00	14.39
	Global	517	3,895.1	19	0.49	0.29	0.76
	Global AP	436	1,684.9	4	0.24	0.06	0.61
	Global Unite	99	104.8	0	0.00	0.00	3.52
	Humeral stem	1	4.3	0	0.00	0.00	84.90
	Neer 3	2	26.4	0	0.00	0.00	13.97
	Neer II	12	150.1	1	0.67	0.02	3.71
	Osteonics humeral component	49	470.5	6	1.28	0.41	2.63

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total, *continued*	Sidus	1	2.3	0	0.00	0.00	158.51
	Simpliciti TM	16	32.4	0	0.00	0.00	11.38
	SMR	932	4378.9	101	2.31	1.87	2.79
Reverse	Aequalis Reversed Fracture	30	66.3	0	0.00	0.00	5.56
	Affinis	10	17.5	0	0.00	0.00	21.07
	Comprehensive	73	78.6	0	0.00	0.00	4.69
	Delta	55	472.4	2	0.42	0.05	1.53
	Delta Xtend Reverse	1,168	3,600.6	33	0.92	0.63	1.29
	Global Unite	1	0.2	0	0.00	0.00	1,663.41
	RSP	2	1.7	0	0.00	0.00	215.58
	SMR	1,573	5,654.2	41	0.73	0.51	0.97
	Trabecular Metal Reverse	29	86.2	1	1.16	0.03	6.46
	Vaios	1	5.7	0	0.00	0.00	64.71
Hemi	Aequalis	190	1,084.5	12	1.11	0.57	1.93
	Aequalis Reversed	1	2.4	0	0.00	0.00	153.46
	Affinis	5	12.8	1	7.84	0.20	43.66
	Anatomical	19	227.7	0	0.00	0.00	1.62
	Arthrex Eclipse	2	16.2	0	0.00	0.00	22.77
	Ascend TM	1	4.6	0	0.00	0.00	80.68
	Bi-Angular	19	206.7	2	0.97	0.12	3.49
	Bigliani/Flatow	137	1,204.8	14	1.16	0.64	1.95
	Bio-modular	1	7.1	1	14.00	0.35	78.03
	Cofield 2	50	542.9	1	0.18	0.00	1.03
	Comprehensive	2	0.9	0	0.00	0.00	426.38
	Delta	1	8.8	0	0.00	0.00	42.08
	Delta Xtend Reverse	22	76.3	4	5.24	1.11	13.42
	Global	723	5,745.6	53	0.92	0.69	1.21
	Global AP	83	331.7	3	0.90	0.19	2.64
	Global Unite	46	102.4	6	5.86	2.15	12.75
	MRS Humeral	4	16.9	0	0.00	0.00	21.77
	Neer II	24	212.1	0	0.00	0.00	1.74
	Osteonics humeral component	43	383.2	2	0.52	0.06	1.89
	Randelli	1	8.2	0			
	Simpliciti TM	1	1.4	0	0.00	0.00	255.67
	SMR	312	1,751.9	34	1.94	1.34	2.71
	Trabecular Metal Reverse	1	7.2	0	0.00	0.00	51.00
	Univers 3D	1	3.8	0	0.00	0.00	96.59

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total Resurfacing	Aequalis Resurfacing Head	10	53.8	0	0.00	0.00	6.86
	Affiniti	1	1.8	0	0.00	0.00	201.58
	Epoca Head	94	300.1	2	0.67	0.08	2.41
	Global CAP Resurfacing	53	236.3	1	0.42	0.01	2.36
	Global Unite	1	1.1	0	0.00	0.00	329.36
	Hemicap Resurfacing	1	0.7	0	0.00	0.00	505.33
	SMR Resurfacing	2	11.3	0	0.00	0.00	32.59
Partial resurfacing	Aequalis Resurfacing Head	1	3.1	0	0.00	0.00	120.95
	Arthrex Eclipse	3	9.9	2	20.14	2.44	72.76
	Ascension	20	84.7	2	2.36	0.29	8.53
	Copeland Resurfacing	19	138.0	3	2.17	0.45	6.36
	Custom Global Cap	1	5.4	0	0.00	0.00	68.19
	Epoca Head	20	72.7	1	1.38	0.03	7.67
	Global CAP Resurfacing	96	654.3	11	1.68	0.84	3.01
	Global Humeral Head	1	4.2	0	0.00	0.00	87.00
	Hemicap Resurfacing	6	45.8	1	2.18	0.06	12.17
	SMR Resurfacing	45	229.2	6	2.62	0.96	5.70
	SMR Resurfacing CTA	7	34.4	2	5.81	0.70	20.98

There are widely varying revision rates, most of which do not reach statistical significance. The stand out is SMR Conventional which paired with the L1 glenoid continues to be the most popular conventional prosthesis (78 implanted in 2016) and which continues to have a significantly higher revision rate than the other main Conventional prostheses (six times that for the Global AP and 2x that for the Aequalis). The SMR hemi replacement also has a significantly higher revision rate (2x) when compared to the long serving Global.

Revision vs Glenoid Fixation

(Conventional Total arthroplasties only)

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Uncemented	958	4,744.2	98	2.07	1.67	2.51
Cemented	1,983	11,360.1	56	0.49	0.37	0.64

The uncemented glenoids have a significantly higher revision rate.

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	500	2,926.1	60	2.05	1.55	2.62
55-64	1,467	7,956.4	125	1.57	1.31	1.87
65-74	3,141	15,552.4	140	0.90	0.76	1.06
>=75	3,142	14,090.0	76	0.54	0.42	0.68

The lower two age bands have a significantly higher revision rate than the higher two and the >75 has a significantly lower revision rate than the 65-74 age group.

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	<55	172	842.4	20	2.37	1.45	3.67
	55-64	691	3,767.7	51	1.35	1.00	1.76
	65-74	1,293	7,209.4	62	0.86	0.66	1.10
	>=75	785	4,284.9	21	0.49	0.29	0.74
Reverse	<55	30	64.7	3	4.64	0.96	13.56
	55-64	330	1,081.8	19	1.76	1.06	2.74
	65-74	1,213	3,896.8	32	0.82	0.55	1.14
	>=75	1,665	5,527.2	29	0.52	0.34	0.74
Hemi	<55	201	1,459.8	24	1.64	1.03	2.41
	55-64	338	2,506.5	47	1.88	1.38	2.49
	65-74	515	3,929.3	37	0.94	0.66	1.30
	>=75	635	4,064.4	25	0.62	0.39	0.89
Resurfacing	<55	7	23.7	1	4.22	0.11	23.50
	55-64	38	167.1	0	0.00	0.00	2.21
	65-74	73	268.3	2	0.75	0.09	2.69
	>=75	44	146.1	0	0.00	0.00	2.52
Partial resurfacing	<55	89	532.4	12	2.25	1.16	3.94
	55-64	70	433.3	8	1.85	0.80	3.64
	65-74	47	248.6	7	2.82	1.13	5.80
	>=75	13	67.4	1	1.48	0.04	8.27

There is a definite trend for lower revision rates for each ascending age group although often not statistically significant due to small numbers and wide CIs.

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
F	5,231	26,013.2	238	0.91	0.80	1.04
M	3,019	14,511.6	163	1.12	0.95	1.31

There is no significant difference between the two genders.

Revision vs Surgeon Annual Workload

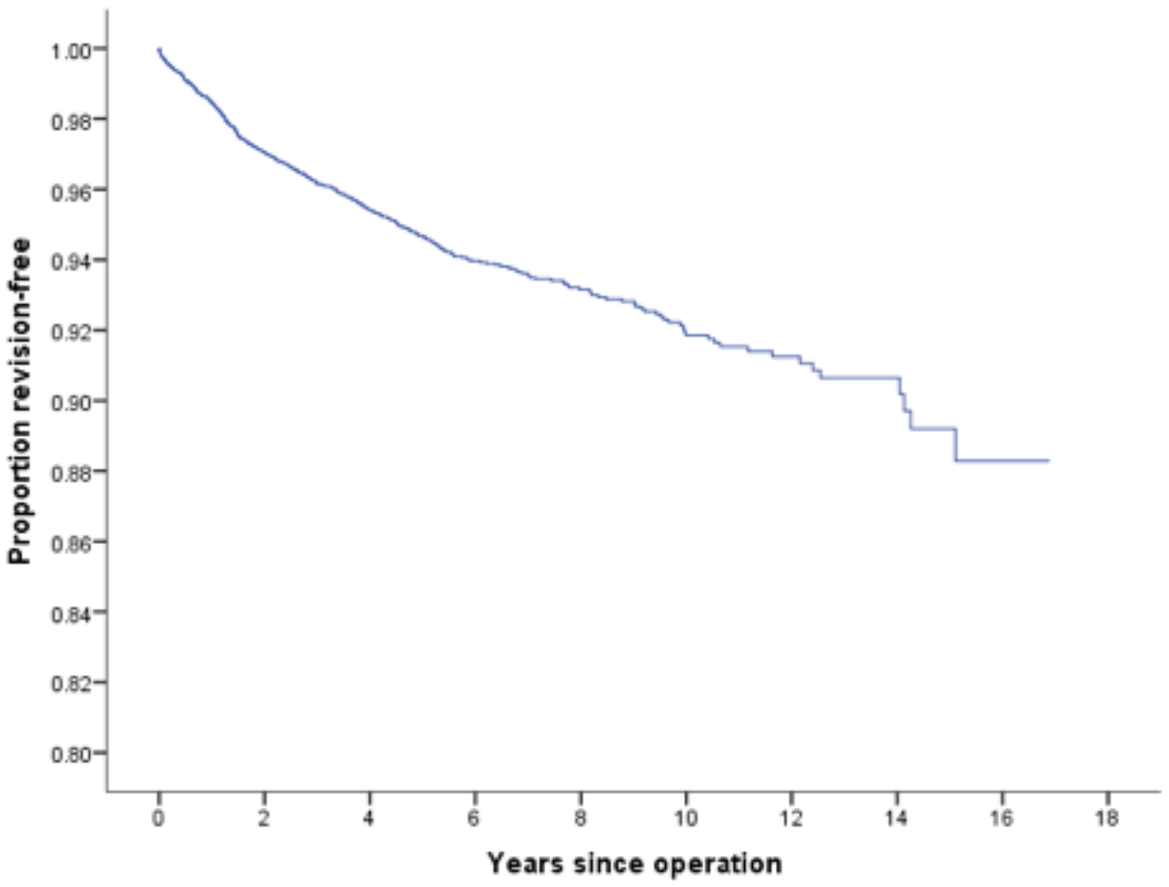
Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	3,266	16,690.7	171	1.02	0.87	1.19
>=10	4,984	23,834.1	230	0.97	0.84	1.10

There is no significant difference between the two groups.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 17 years from 2000 to 2016, with deceased patients censored at time of death.

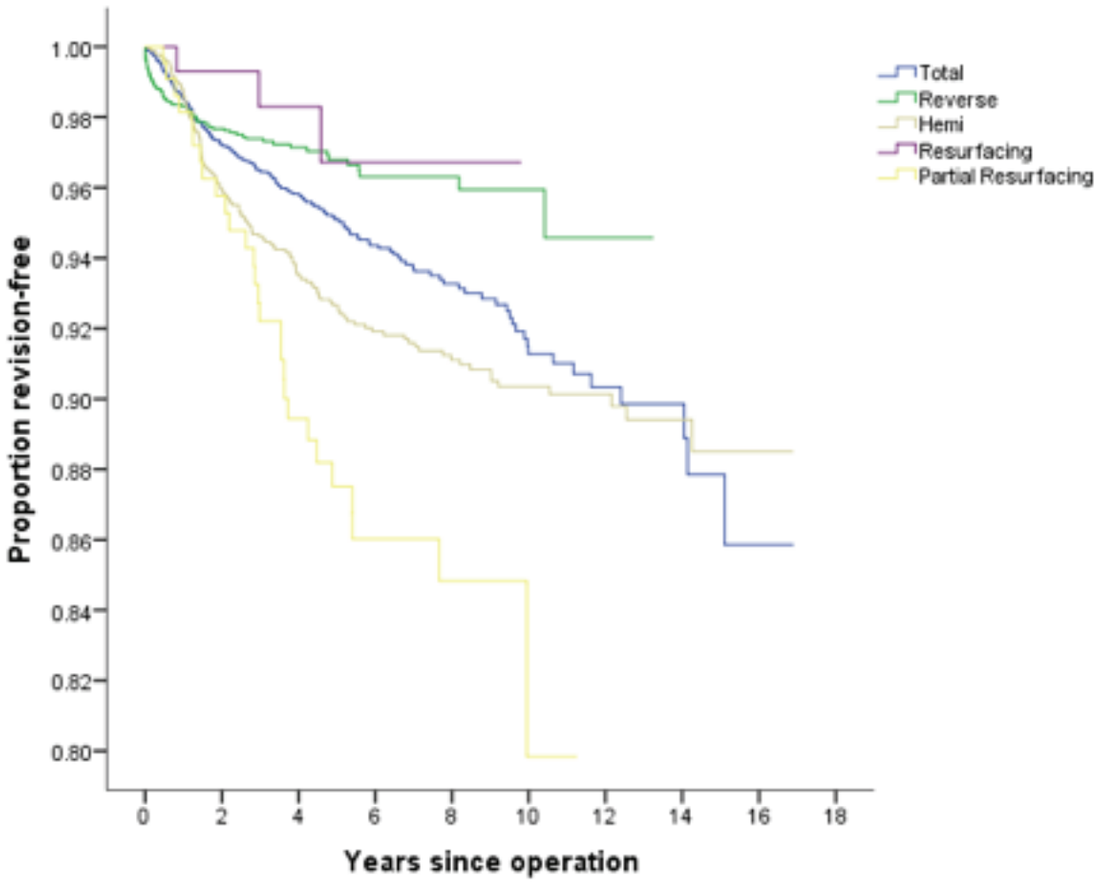
All Shoulders



Years	% Revision-free	Number
1	98.5	7,085
2	97.0	5,917
3	96.2	4,975
4	95.4	4,114
5	94.7	3,348
6	94.0	2,743
7	93.6	2,254
8	93.2	1,778
9	92.8	1,358
10	91.9	1,014
11	91.5	726
12	91.2	520
13	90.6	337

There are insufficient numbers to give an accurate revision free percentage beyond thirteen 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 seventeen-year period and as at July 2017, there were 5,411 shoulder questionnaire responses registered at six months post-surgery.

The mean shoulder score was 36.46 (standard deviation 9.46, range 2 – 48)

Scoring	> 41	2,036
Scoring	34 - 41	1,695
Scoring	27 - 33	822
Scoring	<27	853

At six months post-surgery, 69% 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 1,702 individual patients.

At five years post-surgery, 78% of these patients achieved an excellent or good score and had a mean of 39.64

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 463 individual patients.

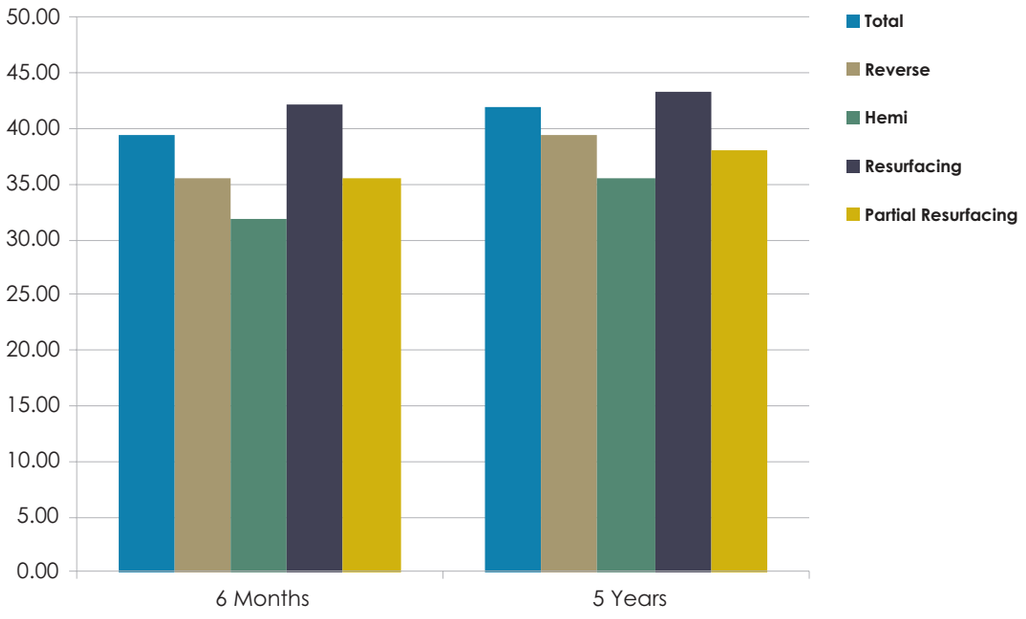
At ten years post-surgery, 73% of these patients achieved an excellent or good score and had a mean of 38.71.

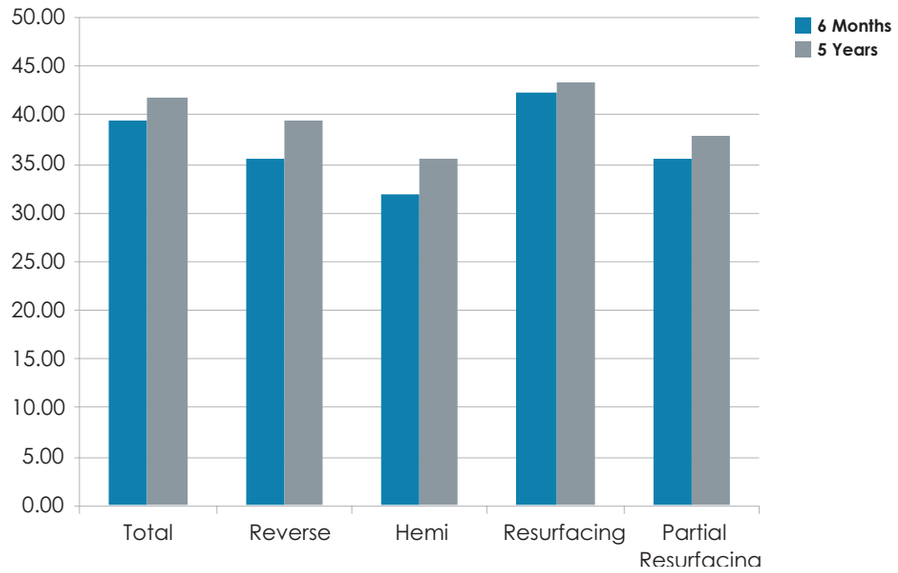
Six Month and Five Year Oxford Scores for the different arthroplasty types

Prosthesis type	Time Post-Surgery	Mean Score	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Conventional Total	6 Months	39.48	0.21	39.09	39.87
	5 Years	41.89	0.30	41.29	42.48
Reverse	6 Months	35.49	0.22	35.10	35.87
	5 Years	39.52	0.42	38.71	40.34
Hemi	6 Months	31.87	0.28	31.32	32.41
	5 Years	35.52	0.41	34.72	36.33
Resurfacing	6 Months	42.23	0.80	40.62	43.83
	5 Years	43.39	1.53	40.39	46.38
Partial Resurfacing	6 Months	35.56	0.80	33.90	37.22
	5 Years	37.98	1.33	35.37	40.58

Conventional Total and Resurfacing Head types have significantly higher (better) six month and five year scores.

Comparison of six month and five 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 and working above shoulder height.

Percentage scoring 0 or 1 for each question out of the group at six-months and five-years

		6mth %	5yr %
1	The worst pain from the shoulder is severe or unbearable	15	10
2	Usually have moderate or severe pain from the operated shoulder	20	11
3	Extreme difficulty or impossible to get in and out of a car or public transport	2	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	6	5
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	16	10
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	15	11
10	Extreme difficulty or impossible to wash and dry under both arms	8	5
11	Pain from operated shoulder greatly or totally interfering with usual work	12	9
12	Pain from shoulder in bed most or every night(s)	15	9

Revision shoulder questionnaire responses

There were 364 revision shoulder responses with 46% achieving an excellent or good score. This group includes all revision shoulder responses. The mean revision shoulder score was 31.08 (standard deviation 10.43 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 six months and five years 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. A patient with a score below 27 has 5 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	No in group	No. revised	%	Std error
0_26	609	39	6.40	0.99
27-33	587	24	4.09	0.82
34-41	1,217	15	1.23	0.32
> 41	1,427	17	1.19	0.29

A person with an Oxford score >41 has a 1.19% risk of revision within two years compared to a 6.40% risk with a score <27.

Five year score and revision arthroplasty

Plotting the patients' five year 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 33 has 12 times the risk of a revision within two years compared to a person with a score of >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
0_26	96	2	2.08	1.46
27-33	134	3	2.24	1.28
34-41	236	2	0.85	0.60
> 41	589	1	0.17	0.17

A person with an Oxford score >41 has a 0.17% risk of revision within two years compared to a 2.24% risk with a score 27-33.

ELBOW ARTHROPLASTY

PRIMARY ELBOW ARTHROPLASTY

The **seventeen-year** report analyses data for the period January 2000 – December 2016. There were 515 primary elbow procedures registered with an additional 39 registered in 2016 which represents a small decrease from 2015.

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
2014	26
2015	41
2016	39

Data Analysis

Age and sex distribution

The average age for an elbow replacement was 66.88 years, with a range of 15.16 – 92.41 years.

	Female	Male
Number	392	123
Percentage	76.12	23.88
Mean age	67.32	65.51
Maximum age	92.41	91.73
Minimum age	36.38	15.16
Standard dev.	11.66	14.58

Previous operation

None	431
Internal fixation for juxtarticular fracture	26
Synovectomy+-removal radial head	19
Debridement	12
Osteotomy	3
Ligament reconstruction	3
Interposition arthroplasty	1

Diagnosis

Rheumatoid arthritis	268
Post fracture	148
Osteoarthritis	76
Other inflammatory	11
Post dislocation	8
Post ligament disruption	6

Approach

Posterior	320
Medial	98
Lateral	35

Bone graft

Humeral autograft	33
Humeral allograft	3
Humeral synthetic	1
Ulnar autograft	2

Cement

Humerus cemented	468
Antibiotic in cement	355 (75%)
Ulna cemented	442
Antibiotic in cement	330 (75%)
Radius cemented	24
Antibiotic in cement	23 (96%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	480 (93%)

Operating theatre

Conventional	344
Laminar flow	166
Space suits	76

ASA Class

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

For the twelve year period 2005 – 2016, there were 362 (94%) 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	16
2	157
3	182
4	7

Operative time (skin to skin)

Mean	142 minutes

Surgeon grade

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

The following figures are for the twelve- year period 2005 – 2016.

Consultant	380
Advanced trainee supervised	7
Advanced trainee unsupervised	3

Surgeon and hospital workload

In 2016, 23 surgeons performed 39 primary elbow procedures. These ranged from one to 4 per surgeon, with 13 performing 1 elbow procedure.

Hospitals

In 2016, primary elbow replacement was performed in 20 hospitals, of which 12 were public and 8 were private.

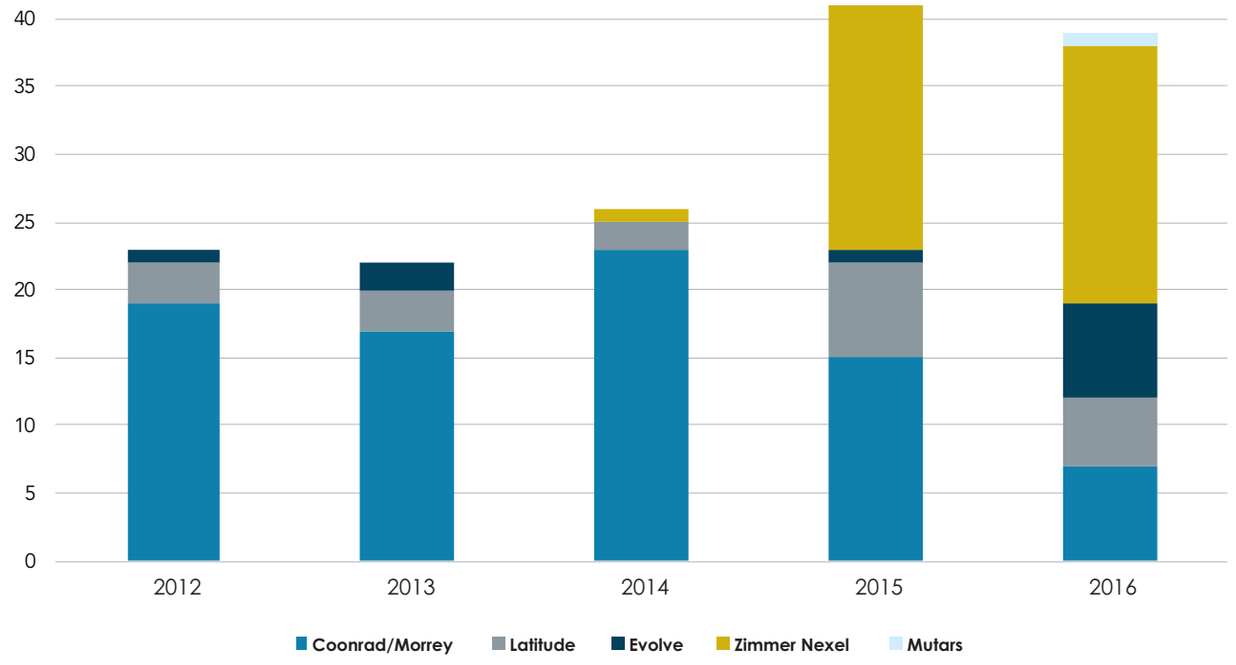
Prosthesis usage

Elbow prostheses used in 2016

Zimmer Nexel	19
Coonrad/Morrey	7
Evolve	7
Latitude	5
Mutars	1

The Zimmer Nexel, the successor to the Coonrad/Morrey, continued to dominate and the Evolve resurged after 2 years in the doldrums.

Most used Elbow Prostheses per year for five years (2012- 2016)



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 seventeen-year period January 2000 – December 2016, there were 90 revision elbow procedures registered.

The average age for a revision elbow replacement was 65.69 years, with a range of 30.34 – 90.50 years.

	Female	Male
Number	62	28
Percentage	68.88	31.12
Mean	66.27	64.43
Maximum age	88.95	90.50
Minimum age	42.23	30.34
Standard dev.	9.40	15.17

REVISION OF REGISTERED PRIMARY ELBOW ARTHROPLASTIES

This section analyses data for revisions of primary elbow procedures for the seventeen-year period January 2000 – December 2016.

There were 35 revisions of the primary group of 515 (6.8%).

There were 5 that had been revised twice and 1 that had been revised 3 times.

Time to revision

Mean	1,476 days
Maximum	5,174 days
Minimum	62 days
Standard deviation	1,394 days

Reason for revision

Loosening humeral component	11
Deep infection	9
Loosening ulnar component	8
Pain	4
Fracture humerus	3
Loosening radial head component	3
Dislocation	2
Fracture ulna	1

Analysis of the three main reasons for revision by year after primary procedure

	Loosening humeral component		Loosening Ulnar component		Deep infection	
Years	Count	%	Count	%	Count	%
0	1	9.09	1	12.50	2	22.22
1	2	18.18	0	0.00	4	44.44
2	3	27.27	3	37.50	1	11.11
3	2	18.18	2	25.00	0	0.00
4	1	9.09	0	0.00	0	0.00
5	0	0.00	0	0.00	0	0.00
6	0	0.00	0	0.00	1	11.11
7	0	0.00	0	0.00	0	0.00
8	0	0.00	0	0.00	1	11.11
9	0	0.00	0	0.00	0	0.00
10	1	9.09	1	12.50	0	0.00
11	1	9.09	1	12.50	0	0.00
12	0	0.00	0	0.00	0	0.00
Total	**11**		**8**		**9**	

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	
515	3,128.2	35	1.12	0.78	1.56

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	140.2	6	4.28	1.57	9.32
Coonrad/Morrey	339	2,265.1	15	0.66	0.37	1.09
Evolve Stem	18	68.8	2	2.91	0.00	10.50
Kudo	18	154.7	4	2.59	0.70	6.62
Latitude	83	452.3	7	1.55	0.55	3.04
MUTARS	1	0.9	0	0.00	0.00	431.85
Sorbie Questor	1	6.8	0	0.00	0.00	54.09
Stanmore custom implant	1	6.4	0	0.00	0.00	57.33
Zimmer Nexel	38	33.05	1	3.03	0.08	16.86

Although not statistically significant, except for the Acclaim, 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	392	2,539.7	22	0.87	0.54	1.31
Males	123	588.5	13	2.21	1.18	3.78

Even although males appear to have over twice the revision rate of females it is not statistically significant.

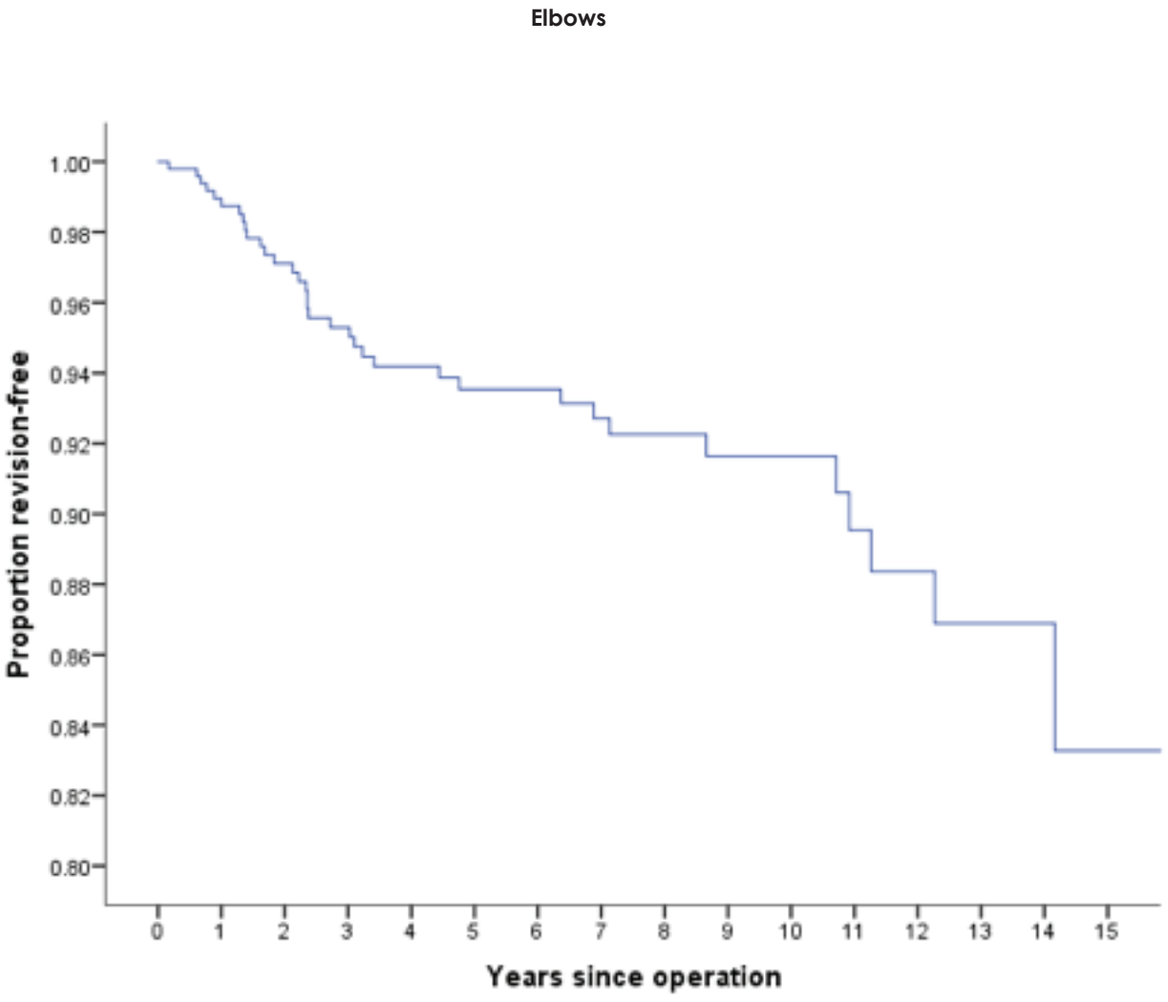
Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	92	663.6	8	1.21	0.47	2.27
55-64	126	899.9	11	1.22	0.61	2.19
65-74	148	831.6	10	1.20	0.54	2.13
>=75	149	733.2	6	0.82	0.30	1.78

There is no significant difference among the groups.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 17 years from 2000 to 2016, with deceased patients censored at time of death.



Years	% Revision-free	Number
1	98.7	450
2	97.1	391
3	95.0	348
4	94.2	314
5	93.5	275
6	93.5	241
7	92.7	211
8	92.3	170
9	91.6	137
10	91.6	106

There are insufficient numbers to give an accurate revision-free percentage beyond ten 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 was replaced by the validated Oxford Elbow score at the end of 2015.

There are 12 questions and each response is scores from 4-0 with 0 representing the greatest severity.

Total score range 0-48

For 2016 there were n = 15 responses.

Mean	30.2
Maximum	46
Minimum	6

LUMBAR DISC REPLACEMENT

PRIMARY LUMBAR DISC REPLACEMENT

This report analyses data for the fifteen-year period January 2002 – December 2016.There were 156 lumbar disc replacements registered, an additional 3 compared to last year.

Data Analysis

The average age for a lumbar disc replacement was 40.26 years, with a range of 24.07 – 62.19 years.

	Female	Male
Number	72	84
Percentage	46.15	53.85
Mean age	40.45	40.11
Maximum age	62.19	60.71
Minimum age	24.07	27.19
Standard dev.	8.60	7.17

Disc replacement levels

L3/4	20
L4/5	105
L5/S1	33

Fusion levels

L3/4	2
L4/5	12
L5/S1	58

Previous operation

Discectomy	29
L3/4	0
L4/5	11
L5/S1	17

Diagnosis

Degenerative disc disease

L3/4	11
L4/5	61
L5/S1	84

Annular tear MRI scan

L3/4	13
L4/5	68
L5/S1	26

Discogenic pain on discography

L3/4	20
L4/5	85
L5/S1	63

Approach

Retroperitoneal midline	140
Retroperitoneal lateral	3
Transperitoneal	2
Other- mini open horizontal	3

Intraoperative complications

Damage to major veins	13
Subsidence	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	128

Operating theatre

Conventional	86
Laminar flow	69
Spacesuits	2

Operative time (skin to skin)

Mean	137 minutes

Surgeon grade

Consultant	156

REVISION OF REGISTERED PRIMARY LUMBAR DISC REPLACEMENTS

This section analyses data for revisions of primary lumbar disc replacements for the 15-year period.

There were three revisions of the primary group of 156 lumbar disc replacements and one re-revision.

Time to revision

Mean	1,841 days
Maximum	4,528 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

Oswestry Disability Index	n =21
Average	25

CERVICAL DISC REPLACEMENT

This report analyses data for the thirteen-year period January 2004 – December 2016. There were 347 primary cervical disc replacements, an additional 33 from the previous year.

Data Analysis

The average age for a cervical disc replacement was 44.69 years, with a range of 23.26 – 65.79 years.

	Female	Male
Number	143	204
Percentage	41.21	58.79
Mean age	45.42	44.17
Maximum age	65.79	63.00
Minimum age	23.26	24.92
Standard dev.	7.90	8.35

Disc replacement levels

C3/4	11
C4/5	35
C5/6	185
C6/7	165
C7T1	5

Previous operation

Foraminotomy	10
Adjacent level fusion	20
Adjacent level disc arthroplasty	2

Diagnosis

Acute disc prolapse	246
Chronic spondylosis	29
Neck pain	19

Approach

Anterior right	203
Anterior left	67

Intra operative complications

Equipment failure	1
Removal of implant	1
Tear jugular vein	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	292

Operating theatre

Conventional	198
Laminar flow	146
Spacesuits	1

Operative time (skin to skin)

Mean	116 minutes

Surgeon grade

Consultant	345
Advanced trainee supervised	2

Revision Cervical disc replacement

There were 2 revisions registered.

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.

Post-operative score

Neck Disability Index	155
Mean	20.41

RE-OPERATION WITHOUT REPLACEMENT OR REMOVAL OF ANY PROSTHETIC COMPONENTS

The re-operation form was introduced in December 2015.

For the period 2015 – 2016 there were 106 re-operations registered.

Reason for Re-operation

Deep infection	42
Dislocation of joint	8
Dislocation of bearing	2
Fracture	11
Instability	2
Malalignment	0
Impingement	3
Stiffness	1
Haematoma evacuation	7
Arthrofibrosis	2

Procedure

Open lavage	45
Arthroscopic lavage	3
Closed reduction of dislocation	5
Open reduction of dislocation	5
Fracture fixation	8
Soft tissue procedure	8
Ligament reconstruction	2
Osteotomy	1
Bone debridement	7
Arthrolysis	2
MUA	10

ASA	Number
1	9
2	51
3	34
4	5

Surgeon grade

Consultant	82
Advanced trainee supervised	7
Advanced trainee unsupervised	12
Basic trainee	1

APPENDIX 1 - OXFORD 12 QUESTIONNAIRE REFERENCES

Murray, D.W et al, *The use of the Oxford hip and knee scores*. J Bone Joint Surg (Br) 2007; 89-B: 1010-14

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

Kalairajah, Y et al, *Health outcome measures in the evaluation of total hip arthroplasties: a comparison between the Harris hip score and the Oxford hip score.* J Arthroplasty 2005; 20: 1037-41

APPENDIX 2

Publications in Peer Reviewed Journals

Development of the New Zealand Joint Register. Rothwell A G. Bull Hosp Jt Dis. 1999;58(3):148-60

The early failure of the Oxford Phase 3 unicompartmental arthroplasty - an audit of revisions. The New Zealand experience. Hartnett NI, Tregonning RJA, Rothwell A, Hobbs T. J Bone Joint. Surg Br, Orthopaedic Proceedings 2006;88 B Supp II:318

A New Zealand national joint registry review of 202 total ankle replacements followed for up to 6 years. Hosman AH, Mason RB, Hobbs T, Rothwell AG. Acta Orthop. 2007 Oct; 78(5):584-91

Functional outcomes of femoral peri prosthetic fracture and revision hip arthroplasty: a matched pair study from the N ew Zealand Registry. Young SW, Walker CG, Pitto RP. Acta Orthop. 2008 Aug: 79(4); 483-8

Bilateral total joint arthroplasty : the early results from the New Zealand National Joint Registry. Hooper GJ, Hopper NM, Rothwell AG, Hobbs T. J Arthroplasty. 2008 Dec

Revision following cemented and uncemented primary total hip replacement: a seven year analysis from the New Zealand Joint Registry. Hooper GJ, Rothwell AG, Stringer M, Frampton C. J Bone Joint Surg Br. 2009 Apr; 91(4):451-8

An analysis of the Oxford hip and knee scores and their relationship to early joint revision; data from the New Zealand Joint Registry. Rothwell AG, Hooper GJ, Hobbs A, Frampton C. J Bone Joint Surg Br.2010 Mar; 92(3)413-418

A critique of revision rate as an outcome measure re-interpretation of knee joint registry data. J. W. Goodfellow, J. J. O'Connor, D. W. Murray J Bone Joint Surg [Br] 2010; 92-B:1628-31.

The survivorship and functional outcomes of unicompartmental knee replacements converted to total knee replacements: The New Zealand National Joint Registry. Andrew J Pearse, Gary J Hooper, Alastair G Rothwell, Chris Frampton.J Bone Joint Surg Br. 2010 Apr; 92(4):508-12

Does the use of Laminar Flow and Space Suits Reduce Early Deep Infection in Total Hip and Knee Replacement? The ten year results of the New Zealand Joint Registry. G J Hooper, AG Rothwell, M Wyatt, C Frampton J bone Joint Surg Br.2011 Jan; 93(1): 85-90

Use of Patient-Reported Outcomes in the context of Different Levels of Data .O Rolfson, A Rothwell, K Chenok, E Bohm, K Bozic, G Garellick J Bone Joint Surg Am 2011;93 Suppl 3(E):66-71

A Multinational Assessment of Metal in Metal bearings in Hip Replacement. S Graves, A Rothwell, K Tucker, J Jacobs, A Sedrakyan J Bone Joint Surg Am 2011;93 Suppl 3(E):43-7

Osteotomy and Unicompartmental Knee Arthroplasty Converted to Total Knee Arthroplasty: Data From the New Zealand Joint Registry. Pearse AJ, Hooper GJ, Rothwell AG, Frampton C. J Arthroplasty. 2012 Oct 11

Does the ASA physical rating score predict early complications or poorer outcomes following hip or knee arthroplasty. Analyses from the New Zealand Joint Registry. Hooper G J, Rothwell A G, Hooper N, Frampton C J Bone Joint Surg Am. 2012 Jun 20;94(12):1065-70.

Joint Arthroplasty: the climate has made it ripe for quality assessment, but how do we compare apples to apples?: Commentary on an article by Gary J. Hooper, FRACS, et al.: "The relationship between the American Society of Anesthesiologists physical rating and outcome following total hip and knee arthroplasty. an analysis of the New Zealand Joint Registry". Cheng EY J Bone Joint Surg Am. 2012 Jun 20;94(12

A Review of National Shoulder and Elbow Joint Replacement Registries. J V.Rasmussen, B S.Olsen, B S. Fevang, O Furnes, E Skytta, H Rahme, B Salomonsson, KD Mohammed, R S. Page, A J Carr, J Shoulder Elbow Surg. 2012 Oct;21(10):1328-35

Do joint registries report true rates of hip dislocation? Devane PA, Wraighte PJ, Ong DC, Horne JG.Clin Orthop Relat Res. 2012 Nov;470(11):3003-6

*The New Zealand Joint Registry: report of 11-year data for ankle arthroplasty.*Tomlinson M, Harrison M. Foot Ankle Clin. 2012 Dec;17(4):719-23

Does orthopedic training compromise the outcome in total hip arthroplasty? Inglis T, Dalzell K, Hooper G, Rothwell A, Frampton C. J Surg Educ. 2013 Jan-Feb;70(1):76-80

APPENDIX 2

The ageing population and the increasing demand for joint replacement. Hooper G. N Z Med J. 2013 Jun 28; 126(1377):5-6

Mobile versus fixed-bearing modern total knee replacements- which is the more patella-friendly design?: The 11-year New Zealand Joint Registry study. Wyatt MC, Frampton C, Horne JG, Devane P. Bone Joint Res. 2013 Jul 1; 2(7):129-31

Oxford hip scores at 6 months and 5 years are associated with total hip revision within the subsequent 2 years. Devane P, Horne G, Gehling DJ. Clin Orthop Relat Res. 2013 Dec; 471(12):3870-4

Effect of glenoid cementation on total shoulder arthroplasty for degenerative arthritis of the shoulder; a review of the New Zealand National Joint Registry. Harry D.S. Clitherow, Christopher M.A. Frampton, Timothy M. Ashley J Shoulder Elbow Surg. 2014 Jun;23(6):775-81.

Current trends and projections in the utilisation rates of hip and knee replacement in New Zealand from 2001 to 2026. Gary Hooper, Alex J-J Lee, Alastair Rothwell, Chris Frampton NZMJ 29 August 2014, Vol 127 No 1401

The effect of body mass index on outcome in total hip arthroplasty: early analysis from the New Zealand Joint Registry. Murgatroyd SE, Frampton CM, Wright MS. J Arthroplasty. 2014 Oct; 29(10):1884-8

The use of a lipped acetabular liner decreases the rate of revision for instability after total hip replacement: a study using data from the New Zealand Joint Registry. Insull PJ, Cobbett H, Frampton CM, Munro JT.Bone Joint J. 2014 Jul; 96-B(7):884-8

The impact of patient and surgical factors on the rate of infection after primary total knee arthroplasty. An analysis of 64 566 joints from the New Zealand Joint Registry E.R. Tayton, C. Frampton, G. J. Hooper, S W Young

The impact of patient and surgical factors on the rate of infection after primary total knee arthroplasty: an analysis of 64,566 joints from the New Zealand Joint Registry. Tayton ER, Frampton C, Hooper GJ, Young SW. *Bone Joint J 2016; 98-B:* 334–40.

Perioperative mortality in New Zealand related to hip and knee replacement surgery: comparing administrative and registry data. Hider P, Frampton C, Theis JC, Wilson L, Rothwell A. N Z Med J. 2016 Apr 1;129(1432):33-40. *Bone Joint J. 2016 Mar; 98-B(3):334-40.*

New Zealand Joint Registry data underestimates the rate of prosthetic joint infection. Zhu M, Ravi S, Frampton C, Luey C, Young S. Acta Orthop. 2016 Aug; 87(4):346-50.

Periprosthetic Joint Infection in Hip Arthroplasty: Is There an Association Between Infection and Bearing Surface Type? Pitto RP, Sedel L. Clin Orthop Relat Res. 2016 Oct; 474(10):2213-8

APPENDIX 3 - PROSTHESIS 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	
	Persona	
Orthotec	Optetrak	
	Themis	
	Trekking	
Mathys	Balansys	
Unicompartmental Knees		
Stryker	Eius	
	Unix	
	Triathlon PKR	
	Mako Restoris	
Biomet	Oxford cemented	
	Oxford cementless	

	Repecci II
Zimmer	Miller Galanti
	Zimmer Uni - Zuc
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
Stryker	Star
Elbows	
Zimmer	Coonrad/Morrey
	Nexel
DePuy	Acclaim
Biomet	Kudo
	Discovery Elbow
REM Systems	Latitude

Data Forms

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 ❑** **Resurfacing Arthroplasty ❑**
31.05.2010

Date: .....

BMI:.....

Side:..... **

Patient Name:
Address:

d.o.b. NHI:
Attach Patient Label

Consultant: .....

[If different from patient label]

pital: .....

Town/City

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fractures
- ❑ Osteotomy
- ❑ Arthrodesis
- ❑ Other: .....

DIAGNOSIS

- ❑ Osteoarthritis
- ❑ Rheumatoid arthritis
- ❑ Other inflammatory
- ❑ Acute fracture NOF
- ❑ Developmental dysplasia/dislocation
- ❑ Old fracture NOF
- ❑ Post-acute dislocation
- ❑ Avascular necrosis
- ❑ Tumour
- ❑ Other: Name: .....

APPROACH ❑ **Image guided surgery** ❑ **Minimally invasive surgery**
❑ **Anterior** ❑ **Posterior** ❑ **Lateral** ❑ **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
❑ **Allograft**
❑ **Autograft** ❑ **Synthetic**

BONE GRAFT - ACETABULUM
❑ **Allograft**
❑ **Autograft** ❑ **Synthetic**

FEMORAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT
❑ **Femur** ❑ **Acetabulum** ❑ **Antibiotic brand:** .....

❑**SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Name: .....**ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE
❑ **Conventional** ❑ **Laminar flow or similar** ❑ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON
❑ **Consultant** ❑ **Adv Trainee Unsupervised** ❑ **Adv Trainee Supervised** **Year**..... ❑ **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:..... **
Tick Appropriate Boxes

Patient Name:
Address:
d.o.b. NHI:
Attach Patient Label

Consultant: .....
m patient label]
Hospital: .....
Town/City: .....

REASON FOR REVISION
- ❑ Loosening acetabular component
- ❑ Loosening femoral component
- ❑ Dislocation
- ❑ Pain
- ❑ Previous hemiarthroplasty
- ❑ Deep infection
- ❑ Fracture femur
- ❑ Removal of components
- ❑ Other: Name: .....

Date Index Operation: .....
If re-revision - Date previous revision: .....

REVISION
- ❑ Change of femoral component
- ❑ Change of acetabular component
- ❑ Change of head
- ❑ Change of liner
- ❑ Change of all components

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery
❑ Anterior ❑ Posterior ❑ Lateral ❑ 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
❑Allograft ❑ Synthetic
❑Autograft

BONE GRAFT - ACETABULUM
❑Allograft ❑ Synthetic
❑Autograft

FEMORAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT
❑ Femur ❑ Acetabulum ❑ Antibiotic brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE
❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

PRIMARY OPERATING SURGEON
❑ Adv Trainee Supervised
❑ Consultant ❑ Adv Trainee Supervised Year..... ❑ 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 ❑ Total Knee Arthroplasty ❑ Unicompartmental ❑ Patellofemoral
31.05.2010

Date: .....
BMI:.....
Side:..... **

Tick Appropriate Boxes

Patient Name:
Address:

d.o.b. NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fracture
- ❑ Ligament reconstruction
- ❑ Menisectomy
- ❑ Synovectomy
- ❑ Osteotomy
- ❑ Other: Name: .....

DIAGNOSIS

- ❑ Osteoarthritis
- ❑ Rheumatoid arthritis
- ❑ Other inflammatory
- ❑ Tumour
- ❑ Post fracture
- ❑ Post ligament disruption/reconstruction
- ❑ Avascular necrosis
- ❑ Other: Name: .....

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery ❑ Medial parapatellar ❑ Lateral parapatellar ❑ Other

FEMUR

Please do not fold bar-coded label

TIBIA

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

BONE GRAFT - TIBIA

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

PATELLA

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

❑ Femur ❑ Tibia ❑ Patella ❑ Antibiotic brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE
❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin.....** **Finish skin.....**

PRIMARY OPERATING SURGEON
❑ Consultant ❑ Adv Trainee Unsupervised ❑ Adv Trainee Supervised **Year.....** ❑ 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:..... **

Tick Appropriate Boxes

Patient Name:
Address:

d.o.b. **NHI:**

Attach Patient Label

Consultant: .....
[If different from patient label]

Hospital: .....

Town/City:.....

REASON FOR REVISION

- ❑ Loosening femoral component
- ❑ Loosening tibial component
- ❑ Loosening patellar component
- ❑ Pain
- ❑ Previous Unicompartmental
- ❑ Deep infection
- ❑ Fracture femur
- ❑ Fracture tibia
- ❑ Other details: .....

Date Index Operation: .....

If re-revision - Date previous revision: .....

REVISION

- ❑ Change of femoral component
- ❑ Change of tibial component
- ❑ Change of patellar component
- ❑ Addition of patellar component
- ❑ Change of tibial polyethylene only
- ❑ Change of all components
- ❑ Removal of components
- ❑ Other

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery
❑ Medial parapatellar ❑ Lateral parapatellar ❑ Other

FEMUR

Please do not fold bar-coded label

TIBIA

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT – FEMUR

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

BONE GRAFT – TIBIA

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

PATELLA

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT
❑ Femur ❑ Tibia ❑ Patella ❑ Antibiotic brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE
❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

PRIMARY OPERATING SURGEON
❑ Consultant ❑ Adv Trainee Unsupervised ❑ Adv Trainee Supervised Year..... ❑ Basic Trainee

*****NB If bilateral procedure two completed forms are required***

NEW ZEALAND JOINT REGISTRY
Primary Replacement Shoulder

❑ Total shoulder Arthroplasty ❑ Hemiarthroplasty ❑ Reverse Shoulder

24.03.2016

Date:..... **Consultant:** ..... [If different from patient label]

BMI:.....

Hospital:.....

Side:..... **

Patient Name:
Address:

d.o.b. NHI:

Attach Patient Label

Town/City:

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fracture
- ❑ Previous stabilisation
- ❑ Rotator Cuff Repair
- ❑ Osteotomy
- ❑ Arthrodesis
- ❑ Arthroscopic debridement/compression
- ❑ Other: Name: .....

DIAGNOSIS

- ❑ Rheumatoid arthritis
- ❑ Osteoarthritis
- ❑ Other inflammatory
- ❑ Acute fracture proximal humerus
- ❑ Post recurrent dislocation
- ❑ Avascular necrosis
- ❑ Cuff tear arthropathy
- ❑ Post old trauma
- ❑ Other: Name:

.....

APPROACH

❑ Deltopectoral ❑ Other : specify

HUMERUS

Please do not fold bar-coded label

GLENOID

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - GLENOID

❑ Allograft
❑ Autograft ❑ Synthetic

HUMERAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK ALL LABELS ON REVERSE SIDE

CEMENT

❑ Humerus ❑ Glenoid ❑ Antibiotic brand: .....

❑**SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name: ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

***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:

d.o.b. NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City:.....

REASON FOR REVISION

- ❑ Loosening glenoid component
- ❑ Loosening humeral component
- ❑ Loosening both components
- ❑ Dislocation/instability anterior
- ❑ Instability posterior
- ❑ Subacromial tuberosity impingement
- ❑ Subacromial cuff impingement/tear
- ❑ Fracture humerus
- ❑ Deep infection
- ❑ Pain
- ❑ Other: Name: .....

Date Index Operation: .....

If re-revision - Date previous revision: .....

REVISION

- ❑ Change of head only
- ❑ Change of humeral component
- ❑ Change of glenoid component
- ❑ Change of liner (glenoid non cemented)
- ❑ Change of all components
- ❑ Remove glenoid
- ❑ Remove humerus
- ❑ Removal of components
- ❑ Other Specify: .....

APPROACH

- ❑ Deltopectoral
- ❑ Other: specify

HUMERUS

Please do not fold bar-coded labels

GLENOID

Please do not fold bar-coded labels

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

- ❑Allograft
- ❑Autograft
- ❑ Synthetic

BONE GRAFT - GLENOID

- ❑Allograft
- ❑Autograft
- ❑ Synthetic

HUMERAL HEAD

Please do not fold bar-coded labels

AUGMENTS

Please do not fold bar-coded labels

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

- ❑ Humerus
- ❑ Glenoid
- ❑ Antibiotic brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

- ❑ Conventional
- ❑ Laminar flow or similar
- ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

- ❑ Adv Trainee Unsupervised
- ❑ Consultant
- ❑ Adv Trainee Supervised

Year..... ❑ 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:
d.o.b. NHI:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City.....

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fractures
- ❑ Osteotomy
- ❑ Arthrodesis
- ❑ Other: Name: .....

DIAGNOSIS

- ❑ Osteoarthritis
- ❑ Rheumatoid arthritis
- ❑ Other inflammatory
- ❑ Post trauma
- ❑ Avascular necrosis talus
- ❑ Other: Name: .....

APPROACH

❑ Anterior ❑ Anterio-lateral ❑ Other

TIBIA

Please do not fold bar-coded label

TALUS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

BONE GRAFT - TALUS

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

AUGMENTS

Please do not fold bar-coded label

FUSION DISTAL TFJ

STICK ALL LABELS ON REVERSE SIDE

CEMENT

❑Tibia ❑ Talus ❑ Antibiotic Brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name: ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

❑ Consultant ❑ Adv Trainee Unsupervised ❑ Adv Trainee Supervised **Year**..... ❑ 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 Ankle Joint

Free Phone 0800-274-989 **07.04.2005**

Date: .....

Side:..... **

Tick Appropriate Boxes

Patient Name:
Address:

d.o.b. NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital:.....

Town/City: .....

REASON FOR REVISION

- ❑ Loosening talar component
- ❑ Loosening tibial component
- ❑ Dislocation
- ❑ Pain
- ❑ Deep infection
- ❑ Fracture talus
- ❑ Fracture tibia
- ❑ Dislocations
- ❑ Other details: .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- ❑ Change of talar component
- ❑ Change of tibial component
- ❑ Change of polyethylene only
- ❑ Change of all components
- ❑ Removal of components
- ❑ Other Name: .....

APPROACH

❑ Anterior ❑ Anterio-lateral ❑ Posterior

TIBIA

Please do not fold bar-coded label

TALUS

Please do not fold bar-coded label

STICK ALL LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - TALUS

❑ Allograft
❑ Autograft ❑ Synthetic

AUGUMENTS

Please do not fold bar-coded label

FUSION DISTAL TFJ

Yes ❑ No ❑

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

❑ Talus ❑ Tibia ❑ Antibiotic brand: .....

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

❑ Consultant ❑ Adv Trainee Supervised Year..... ❑ Adv Trainee Unsupervised ❑ 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: .....

Side:..... **

Patient Name:
Address:

d.o.b. NHI:

Consultant: .....
[If different from patient label]
Hospital: .....
Town/City:.....

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fracture
- ❑ Ligament reconstruction
- ❑ Interposition arthroplasty
- ❑ Debridement
- ❑ Synovectomy + removal radial head
- ❑ Osteotomy
- ❑ Other: Name: .....

DIAGNOSIS

- ❑ Rheumatoid arthritis
- ❑ Osteoarthritis
- ❑ Other inflammatory
- ❑ Post dislocation
- ❑ Post fracture
- ❑ Post ligament disruption
- ❑ Other: Name: .....

APPROACH

❑ Medial ❑ Lateral ❑ Posterior

HUMERUS

Please do not fold bar-coded label

ULNA

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

BONE GRAFT - ULNA

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

RADIAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

❑ Humerus ❑ Ulna ❑ Radius ❑ Antibiotic brand: .....

❑SYSTEMIC ANTIBIOTIC PROPHYLAXIS

Name ..... ASA Class: 1 2 3 4 (please circle one)

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* Start skin..... Finish skin.....

PRIMARY OPERATING SURGEON

❑ Consultant ❑ Adv Trainee Unsupervised ❑ Adv Trainee Supervised Year..... ❑ 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: .....

Side:..... **

Tick Appropriate Boxes

Patient Name:
Address:

d.o.b. NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City: .....

REASON FOR REVISION

- ❑ Loosening humeral component
- ❑ Loosening ulnar component
- ❑ Loosening radial head component
- ❑ Pain
- ❑ Deep infection
- ❑ Fracture humerus
- ❑ Fracture ulna
- ❑ Dislocations
- ❑ Other Name: .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- ❑ Change of humeral component
- ❑ Change of ulnar component
- ❑ Change of radial head component
- ❑ Change of all components
- ❑ Removal of components
- ❑ Other Name: .....

APPROACH

❑ Medial ❑ Lateral ❑ Posterior

HU

Please do not fold bar-coded label

UL

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

❑ Allograft ❑ Autograft ❑ Synthetic

BONE GRAFT - ULNA

❑ Allograft ❑ Autograft ❑ Synthetic

RADIAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

❑ Humerus ❑ Ulna ❑ Radius ❑ Antibiotic brand: .....

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Name ..... **ASA Class: 1 2 3 4 (please circle one)**

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

❑ Adv Trainee Unsupervised

❑ Consultant ❑ Adv Trainee Supervised **Year**..... ❑ 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: .....

Tick Appropriate Boxes

.....

Patient Name:
Address:

DOB: NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City:.....

ACC ☐ **ACC Claim No:**

LEVELS OF DISC REPLACEMENT

- ☐ C3/4
- ☐ C4/5
- ☐ C5/6
- ☐ C6/7
- ☐ C7/T1
- Other .....

PRE OP PATIENT SCORE
(NECK DISABILITY INDEX) .....

PREVIOUS OPERATION

- ☐ Foreminotomy
- ☐ Adjacent Level Fusion
- ☐ Adjacent Level Disc Arthroplasty
- ☐ Other.....

DIAGNOSIS

- ☐ Acute Disc Prolapse
- ☐ Chronic Spondylosis
- ☐ Neck Pain
- ☐ Other .....

APPROACH

- ☐ Anterior Right
- ☐ Anterior Left
- ☐ 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

- ☐ Yes
- ☐ No

OPERATIVE THEATRE

- ☐ Conventional
- ☐ Laminar flow or similar
- ☐ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

- ☐ Consultant
- ☐ Adv Trainee Unsupervised
- ☐ Adv Trainee Supervised
- **Year** .....
- ☐ 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:

DOB: **NHI:**
Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City: .....

LEVEL OF REVISION

- ❑ C3/4 ❑ C6/7
- ❑ C4/5 ❑ C7/T1
- ❑ C5/6 ❑ Other:

Tick Appropriate Boxes

ACC **ACC Claim No:** .....

REASON FOR REVISION

- ❑ Dislocation of component
- ❑ Failure of component
- ❑ Infection
- ❑ Pain (Neck)
- ❑ Adjacent level surgery
- ❑ Additional decompression required
- ❑ Heterotopic calcification
- ❑ Other: Name: .....

Date Index Operation: .....

If re-revision - Date previous revision: ...

REVISION

- ❑ Replace disc prosthesis (same)
- ❑ Replace disc prosthesis (different)
- ❑ Fuse
- ❑ Removal only
- ❑ Other: .....

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery

- ❑ Anterior ❑ Posterior ❑ Lateral ❑ Trochanteric Osteotomy

IMPLANTS

Please do not fold bar-coded label

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

Please do not fold bar-coded label

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Name .....

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

SKIN TO SKIN TIME *mins* **Start skin**..... **Finish skin**.....

PRIMARY OPERATING SURGEON

❑ Consultant ❑ Adv Trainee Unsupervised ❑ Adv Trainee Supervised **Year**..... ❑ 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

Patient Name:
Address:

d.o.b. **NHI:**

Attach Patient Label

Date: .....

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City.....

Tick Appropriate Boxes **ACC** ✔**ACC Claim No.** .....

DISC REPLACEMENT Levels
- ❑ L3/4
- ❑ L4/5
- L5/S1

FUSION Levels
- ❑ L3/4
- ❑ L4/5
- L5/S1

PRE OP PATIENT SCORE
Modified Roland and Morris
Total number of "Yes" responses.....
Oswestry Score ❑
Percentage score

Other .....

PREVIOUS OPERATION
- ❑ **Discectomy** ❑ L3/4 ❑ L4/5 ❑ L5/S1 ❑ **Other** .....
- ❑ **Other** ..... ❑ L3/4 ❑ L4/5 ❑ L5/S1

DIAGNOSIS
1. **Degenerative Disc disease (plain x-ray changes present)** ❑ L3/4 ❑ L4/5 ❑ L5/S1 ❑ **Other** .....
2. **Annular tear MRI scan (normal plain x-ray)** ❑ L3/4 ❑ L4/5 ❑ L5/S1 ❑ **Other** .....
3. **Discogenic pain on discography** ❑ L3/4 ❑ L4/5 ❑ L5/S1 ❑ **Other** .....

APPROACH
- ❑ **Retroperitoneal midline abdominal wall incision** ❑ **Transperitoneal**
- ❑ **Retroperitoneal lateral abdominal wall incision** ❑ **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**
Yes ❑ **No** ❑

OPERATIVE THEATRE
❑**Conventional** ❑ **Laminar flow or similar** ❑ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin** ..... **Finish skin** .....

PRIMARY OPERATING SURGEON

❑ **Consultant** ❑ **Adv Trainee** **Year**..... ❑ **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:

d.o.b. NHI:

Attach Patient Label

Consultant: .....
[If different from patient label]
Hospital: .....

Town/City: .....

Tick Appropriate Boxes

ACC ☐ **ACC Claim No:** .....

REASON FOR REVISION

- ☐ **Loosening of components**
- ☐ **Dislocation of articulating core**
- ☐ **Loss of spinal alignment**
- ☐ **Pain**
- ☐ **Deep infection**
- ☐ **Fracture of vertebra**
- ☐ **Removal of components**
- ☐ **Other: Name:** .....

Date Index Operation: ..... **If re-revision - Date previous revision:** .....

REVISION

- ☐ **Change of TDR components**
- ☐ **Change to Anterior Fusion**
- ☐ **Change of articulating core**
- ☐ **In-situ posterior instrumented fusion**

APPROACH

- ☐ **Retroperitoneal midline abdominal wall incision**
- ☐ **Retroperitoneal lateral abdominal wall incision**
- ☐ **Transperitoneal**
- ☐ **Other** .....
- ☐ **Posterior Approach for in-situ fusion**

NEW DISC REPLACEMENT Levels	**NEW FUSION Levels**	**PRE OP PATIENT SCORE**
		Modified Roland and Morris
☐ **L3/4**	☐ **L3/4**	**Total number of "Yes" responses.....**
☐ **L4/5**	☐ **L4/5**	***Oswestry Score***
☐ **L5/S1**	☐ **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

.....

.....

☐**SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

Yes ☐ **No** ☐

OPERATIVE THEATRE

☐**Conventional** ☐ **Laminar flow or similar** ☐ **Space suits**

SKIN TO SKIN TIME *mins* **Start skin** ..... **Finish skin** .....

PRIMARY OPERATING SURGEON

☐ **Consultant** ☐ **Adv Trainee** **Year**..... ☐ **Basic Trainee**

TOTAL HIP REPLACEMENT - QUESTIONNAIRE

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.

REVISION HIP REPLACEMENT - QUESTIONNAIRE

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.

TOTAL KNEE REPLACEMENT - QUESTIONNAIRE

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.

REVISION KNEE REPLACEMENT - QUESTIONNAIRE

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.

Manchester-Oxford Foot Questionnaire (MOxFQ)

Circle as appropriate Right / Left **Full Name**_____

Please tick (✓) one for each statement

1. I have pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

2. During the past 4 weeks this has applied to me:
I avoid walking long distances because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

3. During the past 4 weeks this has applied to me:
I change the way I walk due to pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

4. During the past 4 weeks this has applied to me:
I walk slowly because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

5. During the past 4 weeks this has applied to me:
I have to stop and rest my foot/ankle because of pain

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

6. During the past 4 weeks this has applied to me:
I avoid some hard or rough surfaces because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

7. During the past 4 weeks this has applied to me:
I avoid standing for a long time because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

8. During the past 4 weeks this has applied to me:
I catch the bus or use the car instead of walking, because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

9. During the past 4 weeks this has applied to me:
I feel self-conscious about my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

10. During the past 4 weeks this has applied to me:
I feel self-conscious about the shoes I have to wear

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

11. During the past 4 weeks this has applied to me:
The pain in my foot/ankle is more painful in the evening

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

12. During the past 4 weeks this has applied to me:
I get shooting pains in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

13. During the past 4 weeks this has applied to me:
The pain in my foot/ankle prevents me from carrying out my work/everyday activities

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

14. During the past 4 weeks this has applied to me:
I am unable to do all my social or recreational activities because of pain in my foot/ankle

None of the Time	Rarely	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

15. During the past 4 weeks…..
How would you describe the pain you usually have in your foot/ankle?

None	Very mild	Mild	Moderate	Severe
☐	☐	☐	☐	☐

16. During the past 4 weeks….
Have you been troubled by pain from your foot/ankle in bed at night?

No nights	Only 1 or 2 nights	Some nights	Most nights	Every night
☐	☐	☐	☐	☐

TOTAL SHOULDER REPLACEMENT - QUESTIONNAIRE

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

.....

□ 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.

REVISION SHOULDER REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....
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
- 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

.....

□ 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.

Oxford Elbow Score (OES)

Problems with your elbow **Full Name**_____

Circle as appropriate **Right / Left** **Please tick (√) one box for every question**

1. **During the past 4 weeks**:
Have you had difficulty lifting things in your home, such as putting out the rubbish, because of your elbow problem?

No difficulty	A little bit of difficulty	Moderate difficulty	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

2. During the past 4 weeks:
Have you had difficulty carrying bags of shopping, because of your elbow problem?

No difficulty	A little bit of difficulty	Moderate difficulty	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

3. During the past 4 weeks:
Have you had any difficulty washing yourself all over, because of your elbow problem?

No difficulty	A little bit of difficulty	Moderate difficulty	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

4. During the past 4 weeks:
Have you had any difficulty dressing yourself, because of your elbow problem?

No difficulty	A little bit of difficulty	Moderate difficulty	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

5. During the past 4 weeks:
Have you felt that your elbow problem is “controlling your life”?

No, not at all	Occasionally	Some days	Most days	Every day
☐	☐	☐	☐	☐

6. During the past 4 weeks:
How much has your elbow problem “been on your mind"?

Not at all	A little of the time	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

7. During the past 4 weeks:
Have you been troubled by pain from your elbow in bed at night?

Not at all	1 or 2 nights	Some nights	Most nights	Every night
☐	☐	☐	☐	☐

8 During the past 4 weeks:

How often has your elbow pain interfered with your sleeping?

Not at all	Occasionally	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

9 During the past 4 weeks:
How much has your elbow problem interfered with your usual work or everyday activities?

Not at all	A little bit	Moderately	Greatly	Totally
☐	☐	☐	☐	☐

10 During the past 4 weeks:

Has your elbow problem limited your ability to take part in leisure activities that you enjoy doing?

No, not at all	Occasionally	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

11 During the past 4 weeks:

How would you describe the worst pain you have from your elbow?

No pain	Mild pain	Moderate pain	Severe pain	Unbearable
☐	☐	☐	☐	☐

12 During the past 4 weeks:

How would you describe the pain you usually have from your elbow?

No pain	Mild pain	Moderate pain	Severe pain	Unbearable
☐	☐	☐	☐	☐

The New Zealand Joint Registry Seventeen Year Report (January 1999 - December 2016)

www.nzoa.org.nz