



# THE NEW ZEALAND JOINT REGISTRY

NINETEEN YEAR REPORT  
JANUARY 1999 TO DECEMBER 2017

A large, light blue stylized tree graphic occupies the lower half of the page. A blue circle with the text '19 YEARS' is positioned on the right side of the tree. A thick blue curved line starts from the top right and curves around the tree.

**19  
YEARS**





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## EDITORIAL COMMENT

The Registry Management Committee is pleased to present the nineteen year report of the New Zealand Orthopaedic Association's 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 2017 was 281,558, which had been performed on 191,441 individual patients, of which 41,527 (22%) have died during the 19 year period.

The number of observed component years (ocys) contained within the Registry is now well in excess of one million. The increase of 20,699 registered joints for 2017 compared to the 20,417 in 2016 represents an overall annual gain of 1.2%

The mean BMIs are 31.26 (knees) and 29.0 (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 126,396 conventional total hip arthroplasties with 874,069 ocys in the Registry with an overall revision rate of 0.72 per 100 ocys (95% confidence interval; 0.71 -0.74) with an 18 year prosthesis survival of 84.70% (cemented 86.1%; uncemented 84.5% and hybrid 84.10%).

More females than males received a hip replacement (52.89% vs 47.11%), with a slightly higher mean age (68.43 vs 65.44 years), but a very wide range for both (13 to 101 yrs.)

Most had no previous surgery (96%) and a diagnosis of osteoarthritis (87.7%). Most operations were performed through the posterior (65.5%) or lateral approach (25.3%).

Approximately 200 hips per year in New Zealand are performed through the anterior approach, and this number has remained steady since 2014, despite its popularity in the literature. Fully cemented hip replacement has continued to fall from 14% in 2012, and is now constituting only 7% of the hips performed in 2017.

The ceramic on polyethylene bearing surface continues to increase in popularity and rose to 42% of the total in 2017.

The proportion of the metal on metal articulation continues to decline and in 2017 was less than 1% of the total, all with head sizes < 32mm.

The most popular head size overall remains the 32mm and in 2017, this was used in 60% of primary arthroplasties.

However, the use of 36mm head sizes also increased in 2017 to 25%, owing to the increasing use of the ceramic 36mm head. This has so far been vindicated, as the revision rate remains low.

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.

The use of cross linked polyethylene continues its upward trend, making up 94% of the total polyethylene in 2017.

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.

There are 1,092 hip prosthesis combinations in the Registry but only 219 (20%) with 50 or more registrations.

This years' report does not include a Table of Revisions vs Hip Prostheses Combinations Sorted on Number of Implantations, since it does not reflect what is currently being used.

Instead we have replaced it with a new Table labelled Revisions versus Hip Prostheses Combinations used in 2017, Sorted on Revision Rate.

This Table reflects prostheses combinations currently being used.

There were 95 different combinations of acetabular and femoral components used in 2017 that had more than 50 operations in the Registry.

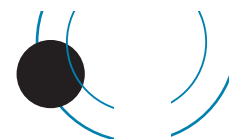
Note that the total of prostheses used in 2017 in this table is 8570, not 9056, meaning that only 486 (5.4%) "new" prostheses combinations (less than 50 operations in total) were used by surgeons in 2017.

We hope surgeons use this Table to monitor performance of their chosen implant combinations.

The Corail/Pinnacle combination is currently the most popular in 2017, with 1322 primary arthroplasties.

Second most popular in 2017 was the Exeter V40/ Trident combination, with 994 primary arthroplasties. Both have revision rates well below the NZ mean, 0.67 and 0.42 ocys respectively.

In 2017, use of three prostheses combinations (in very small numbers) raise concerns, one Anthology Porous/ R3, ten Twinsys cemented/Pinnacle and four Spectron / Reflection cemented.



"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."

Otherwise NZ surgeons are using (and being supplied with) prostheses combinations that have good track records for revision rate.

One combination used in quite large numbers in 2017, the Exeter V40/Continuum has a lower CI close to the NZ mean and results of this prosthesis combination in the future will be monitored closely.

Monitoring of this Table into the future will allow us to make recommendations if the lower CI's of prostheses in current use trend higher than the NZ mean (0.72 ocys)

The previous years' report highlighted three combinations; Twinsys cemented/Pinnacle, ML taper/TT Delta and Echo TM Bi-metric/Continuum TM, which were still currently being used, that had revision rates significantly higher ( $p < 0.05$ ) than the overall rate of 0.72/100 ocys.

In 2017 there were 10 Twinsys cemented/Pinnacle prostheses implanted, and they continue to have a significantly higher revision rate. Their continued use should be questioned.

The ML taper/TT Delta was not used in 2017.

The EchoTM Bi-Metric/Continuum TM was used in 24 cases, but its revision rate is now within normal limits.

Tables listing combinations by fixation method 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.

Revision rates for cross linked polyethylene 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 metal and ceramic heads.

KM survival curves for some of the hip combinations with a minimum of 2,000 arthroplasties and 17 years of analysable data have once again been included.

Other analyses include yearly stacked graphs to demonstrate changes over the last 17 years of head size, bearing surfaces, polyethylene and reasons for revision, have again been included.

Also, 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 have increased for the first time in 5 years to 94 Birmingham hip replacements in 2017, compared to just 70 registered in 2016.

The revision rate has again fallen slightly to 1.15/100 ocys.

## Knee Arthroplasty

101,758 conventional knee arthroplasties have been registered totalling 670,325 ocys with the overall revision rate 0.49/100 ocys, (95% confidence interval; 0.48-0.51) and the excellent 19year survival of 92.30%.

The number of TKA's implanted continues to increase, with the 8,298 implanted in 2017 a 6.9% increase over 2016.

As was done for recent annual reports, several variants of basically the same knee prosthesis type e.g.Nexgen and 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 24 different knee prostheses in the Registry that have a minimum of 50 registrations.

The Triathlon remains the most popular prosthesis in 2017, 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 0.324/100ocys.

The Nexgen has the biggest number of registrations at 19,365 with 140,964 ocys and a revision rate of 0.53/100ocys.

Four of the currently used cemented prostheses, Balansys, Persona, Trekking and the Journey and the two fully uncemented prostheses, Attune and LCS have higher revision rates than the overall rate of 0.49/100 ocys @ the 95% confidence interval.



It is important to note that the use of revisions per 100 component years as an outcome measure will tend to disadvantage newer prostheses such as the Persona and the Attune, as revision for infection occurs more commonly in the first year post implantation.

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 years 14 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.

Similar to other registry findings, this suggests that the tibial component remains the limiting factor in uncemented TKA replacement.

The analyses comparing revision rates and 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 KM survival graphs.

There are 531 registered patello-femoral prostheses, with 65 added in 2017, compared to 49 in 2016.

52 have been revised and the revision rate at 2.03/100 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 11,530 registered primary unicompartmental prostheses with a total of 77,388 ocys, a mean revision rate of 1.20/100 ocys and a 16 year survival of 79.5%. Pain remains the main listed reason for revision in 52 % of cases where a reason is given.

There were 1054 registrations in 2017, a 25 % increase over 2016.

Once again the Oxford uncemented prosthesis was very dominant, accounting for 67% of unicompartmental prostheses implanted in 2017.

The revision rate is 0.76/100 ocys and this drops to 0.71/100 ocys when the medial Oxford UKR's are analysed separately- lateral Oxford UKR's have a revision rate of 1.48/100 ocys (0.84 – 2.40)

The lowest revision rate is currently the Zimmer unicompartmental prosthesis at 0.52/100 ocys.

## Ankle arthroplasty

There are 1,502 primary registered ankle prostheses with a total of 8,796 ocys.

There were 122 primary ankle arthroplasties registered in 2017.

## Shoulder arthroplasty

There are 9,250 registered primary shoulder prostheses, with a total of 47,277 ocys.

The results of shoulder arthroplasty in the 19 year report differ little from the previous year. An additional 1,000 primary shoulder replacements have been performed in 2017, representing a 6% increase in the number performed in 2016.

There continues to be a gradual increase in the utilization of reverse shoulder arthroplasty, now representing 69% of all shoulder arthroplasty performed in New Zealand in 2017.

The decline in anatomic shoulder replacement has stabilised and currently represents 26% of all shoulder arthroplasties performed.

The 10 year survival of all shoulder prostheses is 91.8%, whilst the 15 year revision free survival is 89.2%.

The revision rate of 0.97 per 100 component years for primary shoulder arthroplasty remains steady as do the rates of total (0.93) and reverse arthroplasty (0.77).

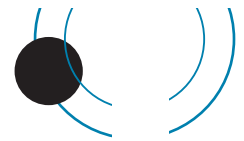
Although reverse shoulder arthroplasty has increased revision rates compared to total shoulder replacement during the first two years, reverse arthroplasty outperforms total shoulder replacement with a ten year survival of 96% compared to a rate of 91% for total shoulder replacement.

Partial Resurfacing continues to have a significantly higher revision rate than all other groups, with a trend to increasing revision rate from previous years.

Arthroplasties utilizing uncemented glenoids continue to show a 4 times revision rate compared to those having cemented glenoids.

Average Oxford shoulder scores remain unchanged from 2017. There is an improvement in scores from 6 months to 5 years, but then the scores stabilise at 10 years. The initial four point difference in scores for total shoulder and reverse shoulder decreases at five years, but the total shoulder scores remain 2.5 points higher at five years.

An Oxford score of less than 27 results in a five fold increase in risk of revision compared to those with a score of 34 or greater.



## Elbow arthroplasty

There are 560 registered primary elbow prostheses with a total of 3,460 ocys.

There were 45 primary elbow prostheses registered in 2017.

Worldwide, Rheumatoid arthritis has decreased and Trauma has increased as an indication for elbow replacement.

## 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.

The registry data continues to show an increased rate of infection when exhaust suits and laminar flow ventilation is used. This data needs to continue to be interpreted with caution. The data regarding suit use is likely to be accurate and experimental evidence has supported the observation that exhaust suits are counterproductive.

Data on use of laminar flow is likely to be inaccurate with many surgeons unsure of the status of ventilation in the theatres used.

The registry intends to record the status of all theatres used and have the theatre listed on the data capture form to improve the accuracy of this over time

## 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

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 scoring 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).

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**John McKie** – Supervisor  
**Toni Hobbs** – Coordinator  
**Chris Frampton** – Statistician

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For accommodation and other facilities

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**Deborah McPherson:**

For formatting assistance

**DH Designz:**

Final design

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- CANTERBURY DISTRICT HEALTH BOARD
- MINISTRY OF HEALTH
- ORTHOPAEDIC SURGEONS
- SOUTHERN CROSS HOSPITALS

## 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.



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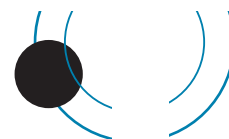
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# DEVELOPMENT AND IMPLEMENTATION OF THE NEW ZEALAND JOINT REGISTRY

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. These additions have now been discontinued. 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.

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, and they now pay \$25 for each joint registered from a private hospital.

The latest MOH contract has been extended for a further 2 years with 4 six monthly payments of \$37,500.

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

Since 2008 each surgeon receives an annual report giving their revision rate for primary registered primary arthroplasties, and this include their questionnaire responses.

## Introduction of the Registry

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

### Stage I: November 1997 to March 1998

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

### Stage II: April 1998 to June 1998

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

### Stage III: July 1998 to March 1999

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

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

### Stage IV: April 1st 1999

The National Joint Registry became fully operational throughout New Zealand.

## 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.

In 2016 the Oxford Elbow Score (OES) and the Manchester-Oxford Foot Questionnaire (MOxFAQ) were introduced replacing the former questionnaires that were not validated.

All patients receiving total arthroplasty of the above joints, as well as unicompartmental knee arthroplasties, are sent questionnaires with a response rate of 70%. As for hips and knees, the questionnaires are sent out 6M post-surgery then at 5Y, 10Y and 15Y.

## 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. 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 February 2018 again demonstrated a New Zealand-wide public hospital compliance of > 95% when compared to NZHIS data.

Following the introduction of the South Island PICS system at the beginning of October 2018, the Registry lost the ability to search for nationwide NHI entries and was not able to access nationwide date of death registrations.

This has now been overcome, and the data entry staff now use the MOH NHI lookup system to check NHI entries and addresses.

Also, the Registry can now access the nationwide death files through the MOH FTP server with twice monthly updates. Accurate date of death registrations are essential for our statistical analyses.

## NZJR Staff

The current staff are data entry (1.75 FTE), Registry coordinator (0.8 FTE), Registry supervisor (0.2 FTE) and statistician (0.04 FTE).



## DEVELOPMENT AND IMPLEMENTATION OF THE NEW ZEALAND JOINT REGISTRY

The number of registered joint replacements for the 19 year period to December 2017 was 281,558.

During this period 191,441 individual patients were registered, of which 41,527 (22%) have died.

Bilateral joint replacements carried out under the same anaesthetic ;

### Bilateral hips

2,393

patients (4,786 hips)  
4% of primary hips

### Bilateral knees

4,030

patients (8,060 knees) 8% of  
primary knees

### Bilateral Unicompartmental knees

893

patients (1,766 knees) 15%  
of unicompartmental knees

### Bilateral ankles

2

patients (4 ankles)

### Bilateral shoulders

4

patients (8 shoulders)

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

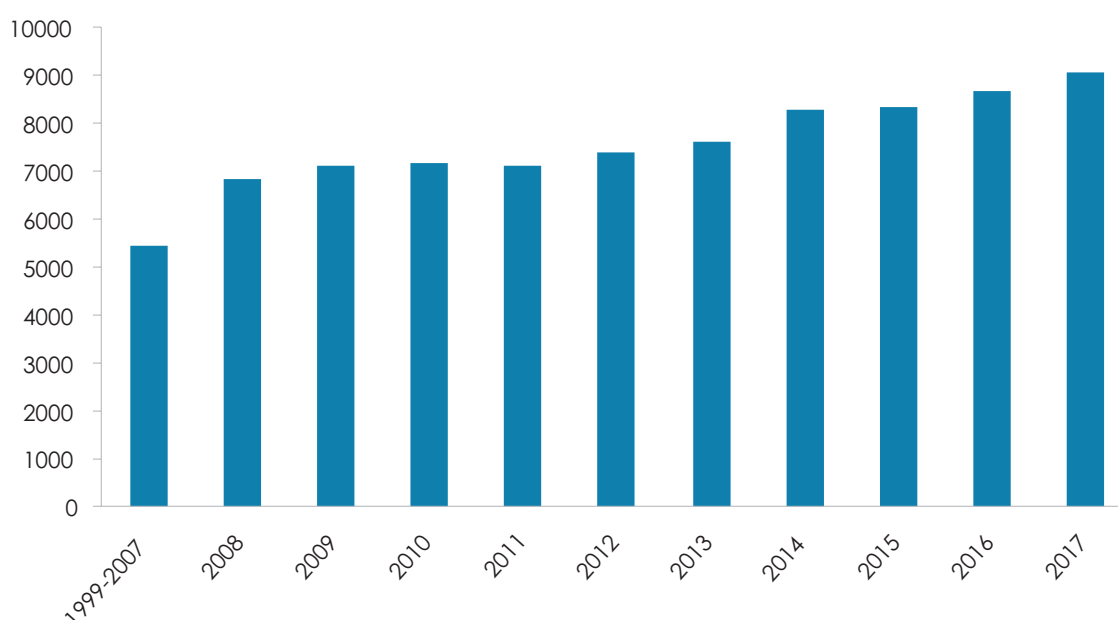


# HIP ARTHROPLASTY

## PRIMARY HIP ARTHROPLASTY

The **nineteen year** report analyses data for the period January 1999 – December 2017. There were 128,155 primary hip procedures registered including 1,759 resurfacing arthroplasties. This is an additional 9,150 compared to last year's report.

Number of operations by year



## Data Analysis

### Age and sex distribution

The average age for all patients with primary hip arthroplasty was 67 years, with a range of 13 – 101 years.

#### All hip arthroplasty

	Female	Male
Number	67,785	60,370
Percentage	52.89	47.11
Mean age	68.43	65.44
Maximum age	100.95	99.62
Minimum age	13.43	14.65
Standard dev.	11.48	11.50

#### Conventional hip arthroplasty

	Female	Male
Number	67,526	58,870
Percentage	53.42	46.58
Mean age	68.50	65.77
Maximum age	100.95	99.62
Minimum age	13.43	14.64
Standard dev.	11.44	11.37

### Resurfacing hip arthroplasty

	Female	Male
Number	259	1,500
Percentage	14.72	85.28
Mean age	50.00	52.18
Maximum age	65.88	81.44
Minimum age	25.72	17.74
Standard dev.	7.22	8.54

### Body Mass Index

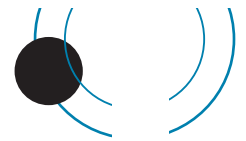
For the eight year period 2010 – 2017 there were 41,025 BMI registrations for primary hip replacements. The average was 29.00 with a range of 15 – 65 and a standard deviation of 5.66.

### Previous operation

None	123,029
Internal fixation	2,347
Osteotomy	653
Arthrodesis	89

### Diagnosis

Osteoarthritis	112,375
Acute fracture NOF	4,878
Avascular necrosis	3,847

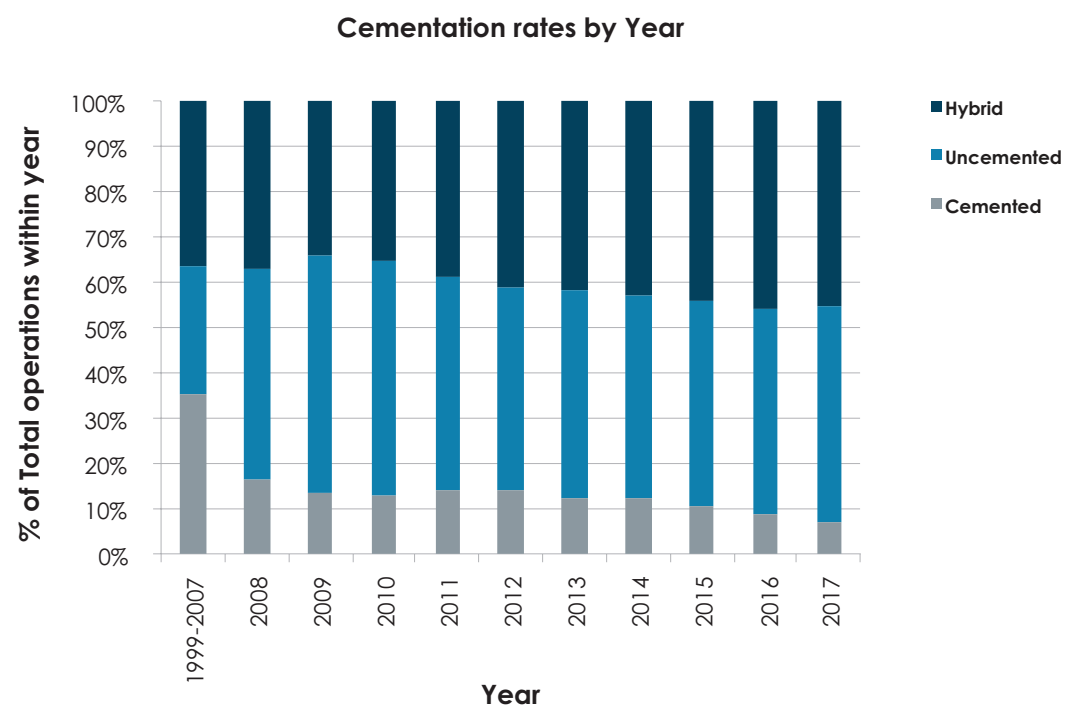


Developmental dysplasia	2,741
Rheumatoid arthritis	1,606
Old fracture NOF	1,516
Other inflammatory	894
Tumour	588
Post-acute dislocation	345

#### Approach

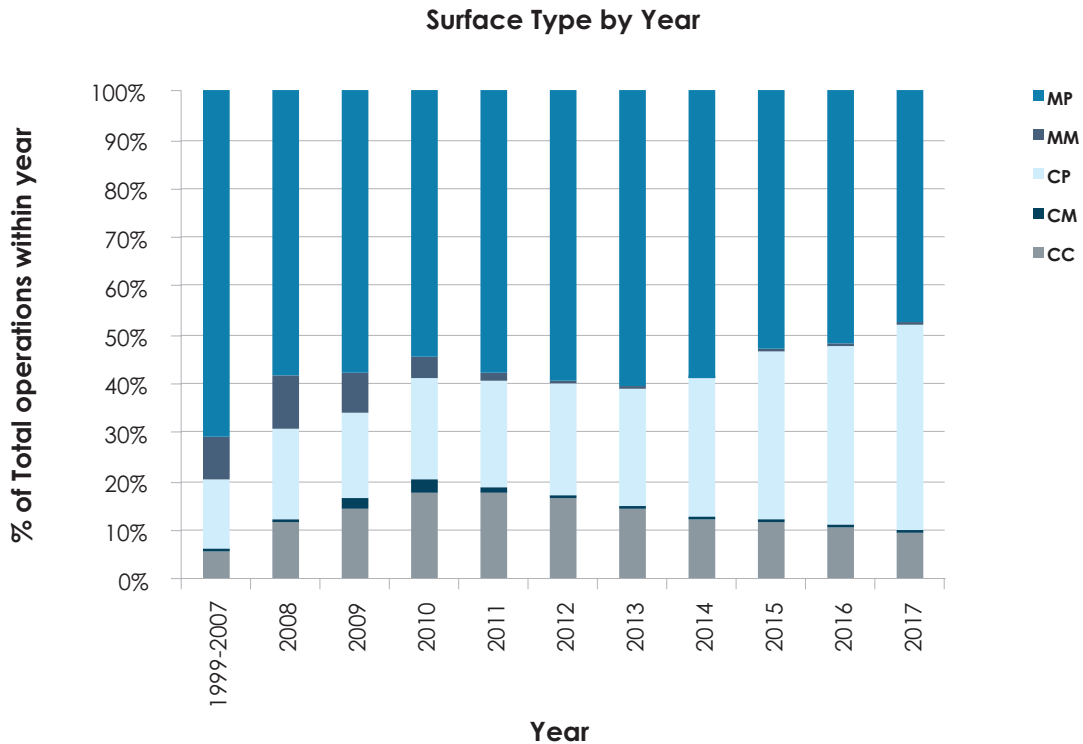
Posterior	83,983
Lateral	31,628
Anterior	4,405
Minimally invasive	1,880
Trochanteric osteotomy	219
Image guided surgery	544

### Comparison of proportions of cemented vs uncemented vs hybrid by year



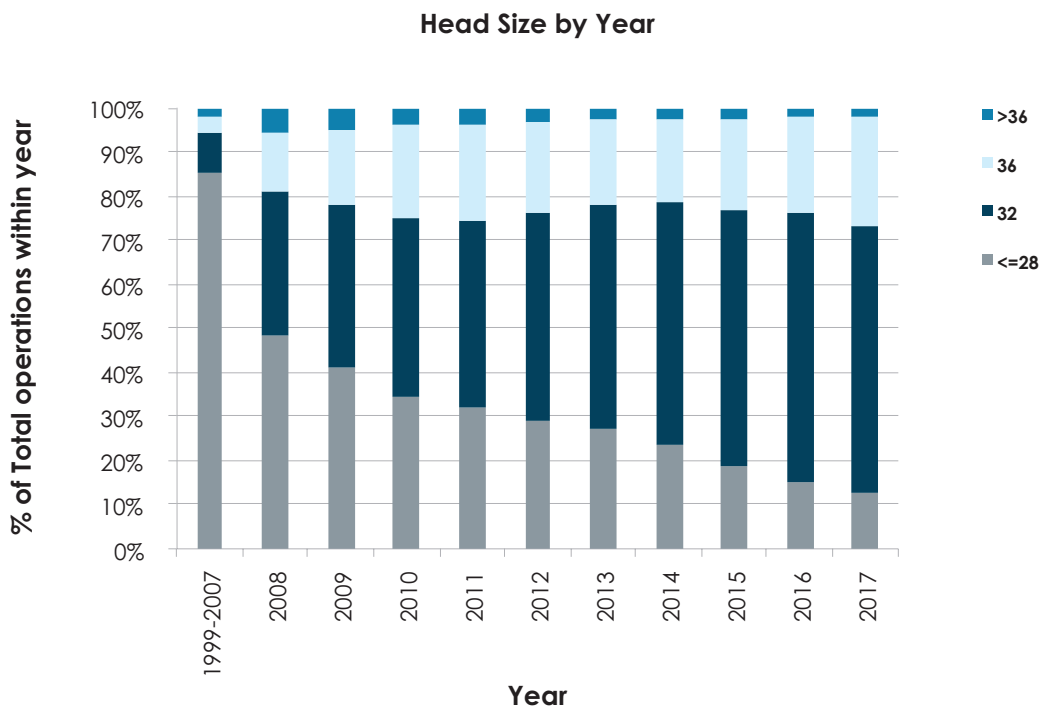


Comparison of different bearing surface usage over time

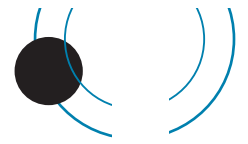


MP = metal/polyethylene; MM = metal/metal; CP = ceramic/polyethylene; CM = ceramic/metal & CC = ceramic/ceramic.

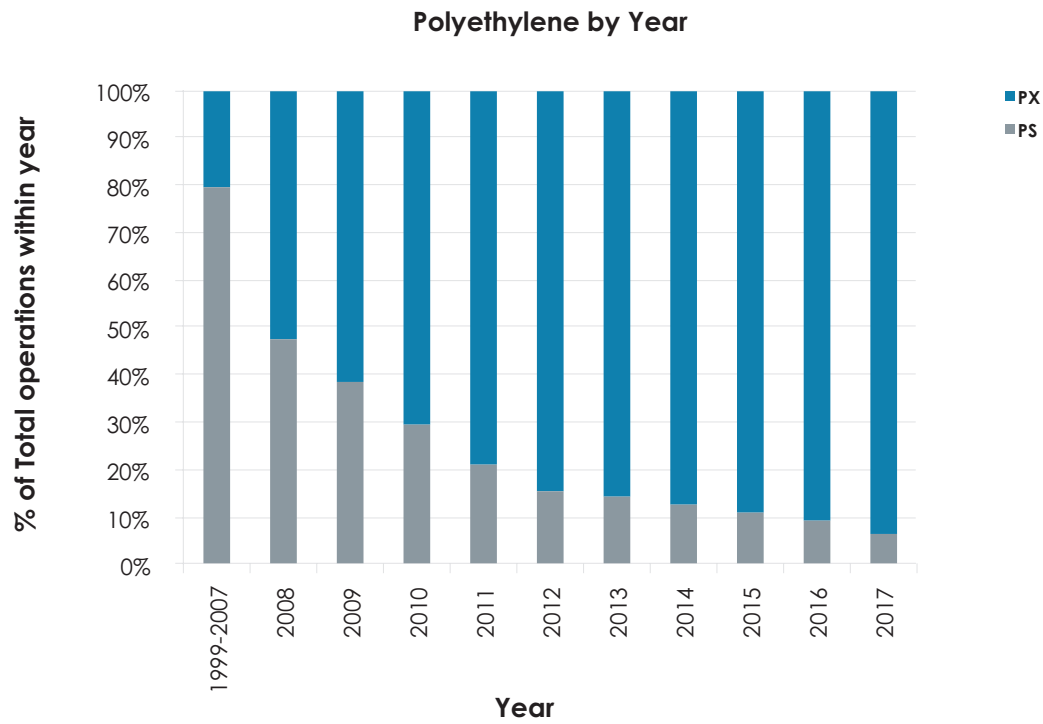
Comparison of head size usage over time



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	236
Femoral allograft	46
Femoral synthetic	9
Acetabular autograft	991
Acetabular allograft	125
Acetabular synthetic	6

### Cement

Femur cemented	77,041 (60%)
Antibiotic in cement	51,742 (67%)
Acetabulum cemented	27,312 (21%)
Antibiotic in cement	17,148 (63%)

### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic:	122,945 (96%)
------------------------------------------------------------	---------------

A cephalosporin was used in 89% of patients.

### Operating theatre

Conventional	78,253
Laminar flow	47,989
Space suits	37,733

### 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	15,535	17
2	55,983	59
3	22,009	23
4	796	1

For the thirteen year period 2005 – 2017, there were 94,323 (96%) primary hip procedures with the ASA class recorded.

### Operative time (skin to skin in minutes)

Mean	78 minutes
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### Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the thirteen year period 2005 – 2017.

Consultant	85,741
Advanced trainee supervised	8,111
Advanced trainee unsupervised	2,630
Basic trainee	1,907

### Prosthesis usage

#### Conventional primary hips

##### Top 10 femoral components used in 2017

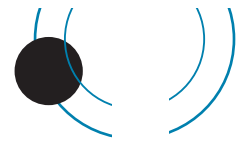
Exeter V40	3,371
Corail	1,494
Accolade II	466
C-Stem AMT	387
Stemsys	327
Twinsys cemented	280
Twinsys uncemented	265
Polarstem uncemented	249
CLS	248
MS 30	242

##### Top 10 acetabular components used in 2017

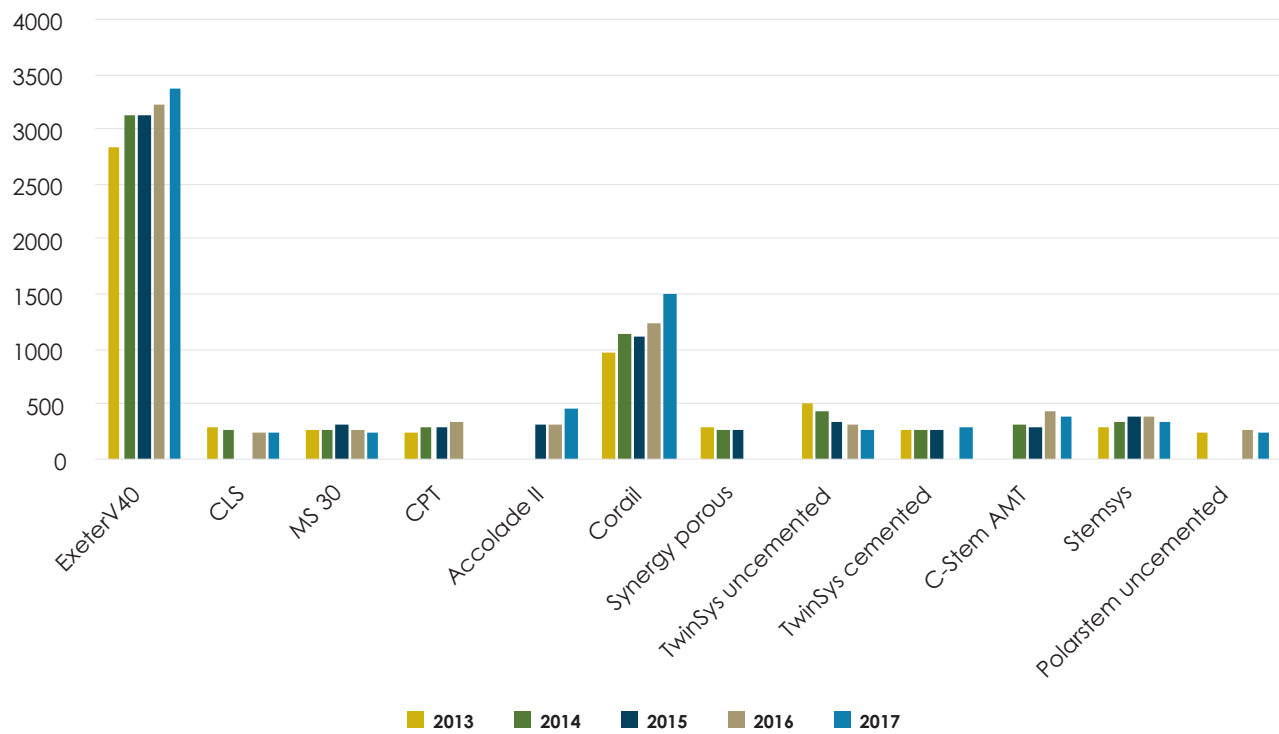
Pinnacle	2,225
Trident	1,247
RM Pressfit cup	1,071
Continuum TM	966
Tritanium	729
R3 porous	578
Fitmore	426
Trilogy	255
Delta-TT cup	233
Exeter X3	231

##### Top ten combinations used in 2017

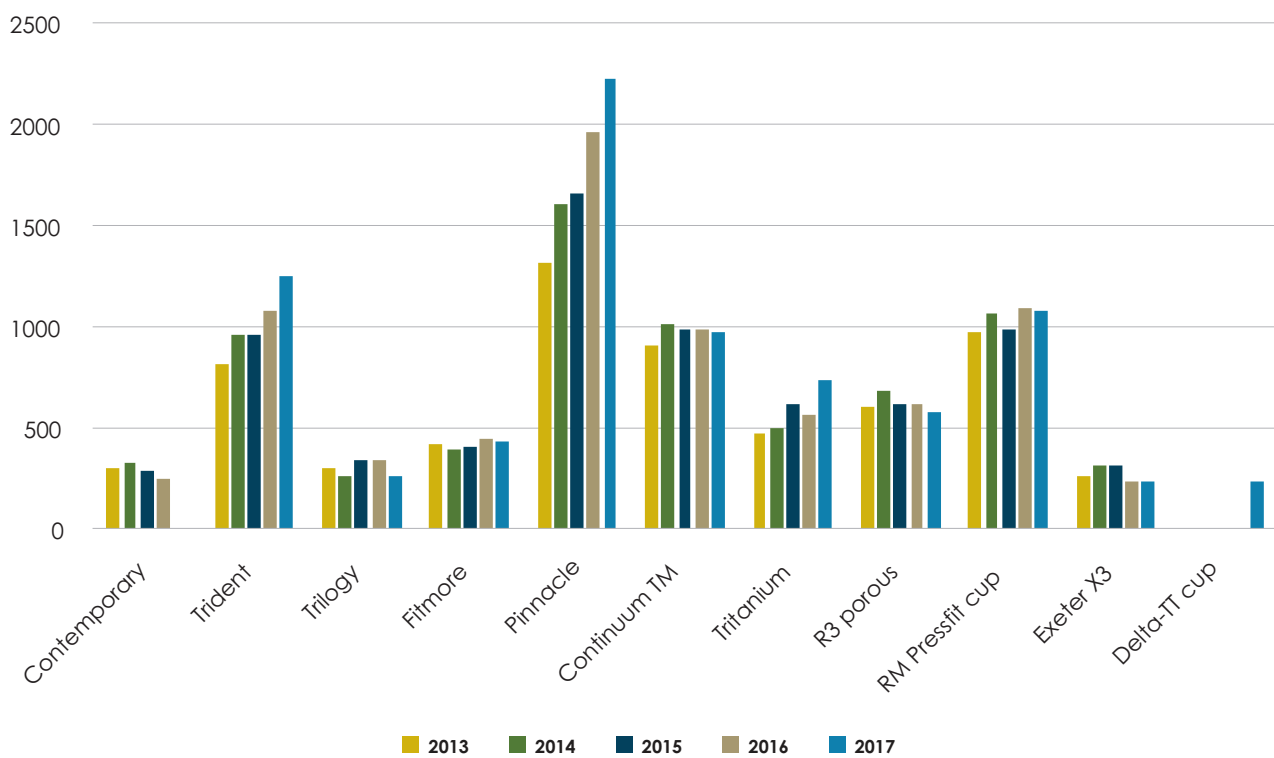
Femur	Acetabulum	All Years	2017
Corail	Pinnacle	8,876	1,322
Exeter V40	Trident	9,342	994
Exeter V40	Tritanium	2,702	505
C-Stem AMT	Pinnacle	1,983	348
Exeter V40	Continuum TM	2,302	333
Exeter V40	RM Pressfit cup	2,084	306
Twinsys uncemented	RM Pressfit cup	1,667	220
Exeter V40	Pinnacle	2,159	279
Polarstem uncemented	R3 porous	1,245	247
Exeter V40	Exeter X3	1,764	227



### Most used femoral components per year for five years 2013 – 2017



### Most used acetabular components per year for five years 2013 – 2017

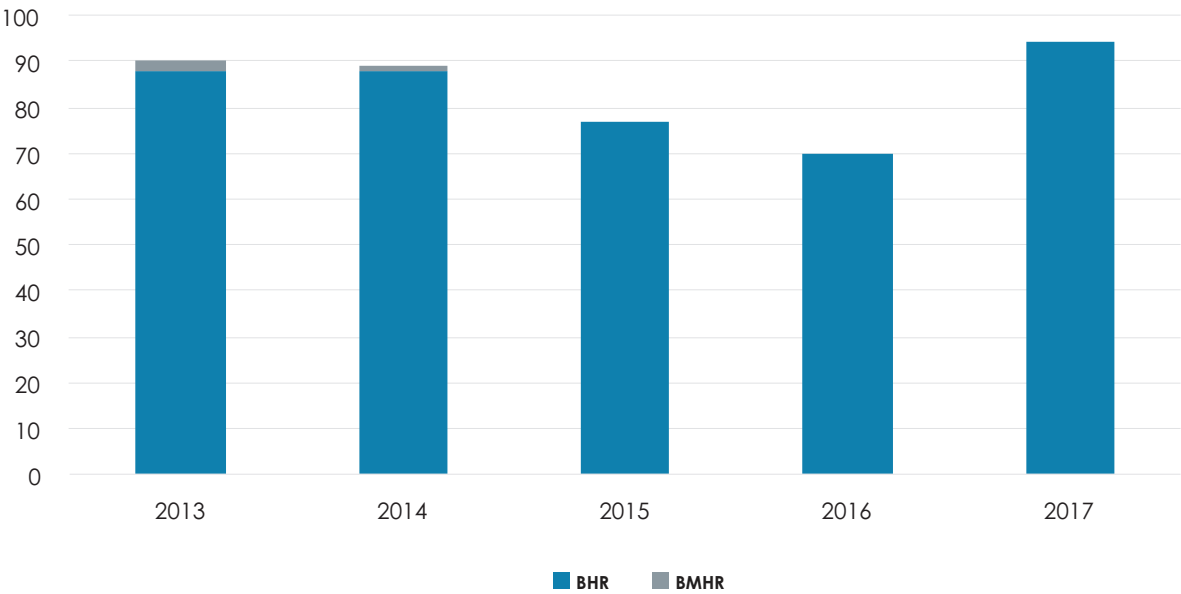




**Resurfacing hips components used in 2017**

BHR	94
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**Resurfacing Components for five years 2013-2017**



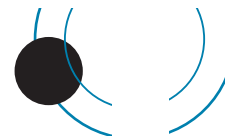
**Surgeon and Hospital Workload**

**Surgeons**

In 2017, 225 surgeons performed 9,150 total hip replacements, an average of 41 procedures per surgeon.

**Hospitals**

In 2017, primary hip replacement was performed in 51 hospitals, 27 public and 24 private.



## 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 nineteen year period January 1999 – December 2017, there were 18,456 revision hip procedures registered.

The average age for a revision hip replacement was 70 years, with a range of 18–100 years.

#### Revision hips

	Female	Male
Number	8,905	9,551
Percentage	48.25	51.75
Mean age	70.35	69.93
Maximum age	100.28	99.83
Minimum age	17.52	25.68
Standard dev.	12.04	10.89

The percentage of revision hips to primary hips is 14%.

### Body Mass Index

For the 8 year period 2010 – 2017, there were 3,104 BMI registrations for revision hip replacements. The average BMI was 29.04 with a range of 15– 55 with a standard deviation of 5.64.

### Revision of Registered Primary Hip Arthroplasties

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

There were 6,330 revisions of the 126,396 primary conventional hip replacements (5%) and 144 revisions of the 1,759 resurfacing hip replacements (8%) a total of 6,474 revisions.

#### Conventional hip arthroplasty analyses

##### Time to revision for conventional hips

Average	2,044 days
Maximum	6,791 days
Minimum	0 days
Standard deviation	1,743 days

##### Reason for revision

Dislocation	1,387
Loosening acetabular component	1,360
Loosening femoral component	1,070
Pain	921
Deep infection	765
Fracture femur	713

### 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	591	42.6	149	11.0	100	9.3	323	42.2	73	7.9	247	34.6
1	161	11.6	75	5.5	81	7.6	96	12.5	97	10.5	45	6.3
2	118	8.5	73	5.4	74	6.9	70	9.2	85	9.2	42	5.9
3	91	6.6	83	6.1	65	6.1	50	6.5	67	7.3	35	4.9
4	60	4.3	68	5.0	65	6.1	38	5.0	64	6.9	47	6.6
5	62	4.5	74	5.4	63	5.9	33	4.3	70	7.6	31	4.3
6	58	4.2	94	6.9	89	8.3	28	3.7	66	7.2	28	3.9
7	42	3.0	83	6.1	80	7.5	21	2.7	54	5.9	35	4.9
8	47	3.4	98	7.2	67	6.3	26	3.4	57	6.2	37	5.2
9	29	2.1	109	8.0	65	6.1	27	3.5	50	5.4	38	5.3
10	28	2.0	79	5.8	81	7.6	17	2.2	46	5.0	33	4.6
>10	100	7.2	375	27.6	240	22.4	36	4.7	192	20.8	95	13.3
Total	1,387	100	1,360	100	1,070	100	765	100	921	100	713	100

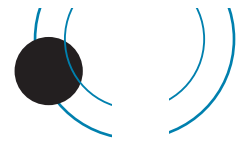


### Analyses of numbers of the six main reasons for revision by year

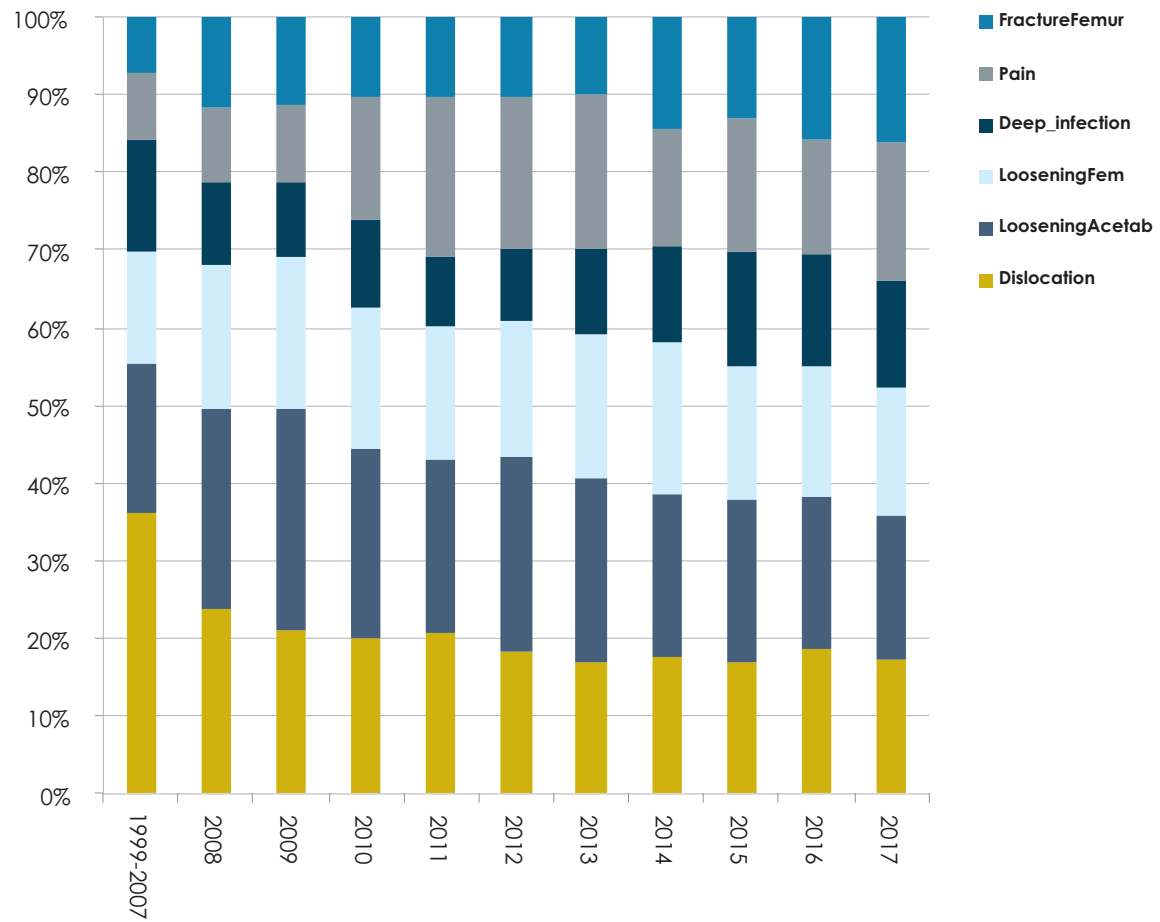
	Dislocation	Loosening Acetabulum	Loosening Femur	Deep infection	Pain	Fracture Femur
	%	%	%	%	%	%
<b>1999-2007</b>	450	239	182	177	106	91
<b>2008</b>	82	88	64	37	33	40
<b>2009</b>	81	108	75	37	38	43
<b>2010</b>	87	104	79	49	67	45
<b>2011</b>	106	116	88	45	106	53
<b>2012</b>	91	126	88	46	97	52
<b>2013</b>	94	130	102	61	110	54
<b>2014</b>	87	104	96	62	74	72
<b>2015</b>	102	125	102	89	101	79
<b>2016</b>	105	110	95	81	83	89
<b>2017</b>	102	110	99	81	106	95

### Analyses of the percentages of the six main reasons for revision by year

	Dislocation	Loosening Acetabulum	Loosening Femur	Deep infection	Pain	Fracture Femur
	No.	No.	No.	No.	No.	No.
<b>1999-2007</b>	37.9%	20.1%	15.3%	14.9%	8.9%	7.7%
<b>2008</b>	24.9%	26.7%	19.5%	11.2%	10.0%	12.2%
<b>2009</b>	22.2%	29.6%	20.5%	10.1%	10.4%	11.8%
<b>2010</b>	21.5%	25.7%	19.6%	12.1%	16.6%	11.1%
<b>2011</b>	20.7%	22.6%	17.2%	8.8%	20.7%	10.3%
<b>2012</b>	17.3%	23.9%	16.7%	8.7%	18.4%	9.9%
<b>2013</b>	15.9%	21.9%	17.2%	10.3%	18.5%	9.1%
<b>2014</b>	15.6%	18.6%	17.2%	11.1%	13.2%	12.9%
<b>2015</b>	16.4%	20.1%	16.4%	14.3%	16.3%	12.7%
<b>2016</b>	17.0%	17.8%	15.4%	13.1%	13.4%	14.4%
<b>2017</b>	16.6%	17.9%	16.2%	13.2%	17.3%	15.5%



### Comparison of the 6 main reasons for revision over time





## RESURFACED HIP ANALYSES

There were 1,759 resurfacing hips registered for the period 2000 – 2017, and 144 (8%) have been revised.

### Time to revision for resurfaced hips

Average	2,002 days
Maximum	4,430 days
Minimum	10 days
Standard deviation	1,133 days

### Reason for revision

Pain	46
Loosening acetabulum	17
Deep infection	16
Loosening femoral component	15
Fracture femur	14
Dislocation	2

### Statistical note

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

#### i) Observed component years

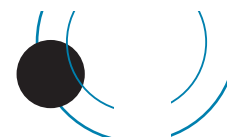
This is the number of registered primary procedures multiplied by the number of years each component has been in place.

#### ii) Rate/100 component years

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

### Statistical Significance

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



## Conventional Primary Hip Arthroplasties

### All Primary Total Hip Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
126,396	874,069	6,330	0.72	0.71	0.74

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

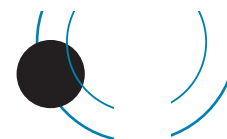
The tables below contain the analyses of the 207 (20%) that have a minimum of 50 primary registered procedures. As stated above it is important to note the confidence intervals and observed component years in conjunction with the revision rates.

### Revision versus Hip Prostheses Combinations used in 2017, sorted on Revision Rate

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval		Procedures 2017
Anthology Porous	R3 porous	67	454.2	30	6.61	4.46	9.43	1
ABGII	RM Pressfit cup	69	152.7	5	3.28	0.88	7.18	16
TwinSys cemented	Pinnacle	68	224.1	7	3.12	1.26	6.44	10
Accolade II	RM Pressfit cup	52	65.6	2	3.05	0.37	11.02	20
CPT	Delta-TT Cup	60	120.2	3	2.50	0.35	6.66	19
Taperloc Complete	RM Pressfit cup	124	125.3	3	2.39	0.49	6.99	57
Exeter V40	G7 acetabular shell	73	129.8	3	2.31	0.48	6.76	18
Taperloc Complete	G7 acetabular shell	163	178.5	4	2.24	0.47	5.74	81
Echo Bi-Metric	Continuum TM	80	93.4	2	2.14	0.26	7.73	24
C-Stem	Pinnacle	65	199.4	3	1.50	0.31	4.40	20
H-Max S	Delta-PF Cup	184	409.9	6	1.46	0.54	3.19	33
Stemsys	Polymax	99	150.5	2	1.33	0.16	4.80	31
Stemsys	Agilis Ti-por	393	1102.2	14	1.27	0.66	2.07	57
Avenir Muller uncemented	Continuum TM	178	931.1	11	1.18	0.59	2.11	4
Exeter V40	Trabecular Metal Shell	198	938.8	11	1.17	0.58	2.10	13
Spectron	Reflection cemented	2954	28768.5	326	1.13	1.01	1.26	4
Friendly	Delta-TT Cup	66	354.3	4	1.13	0.31	2.89	1
C-Stem AMT	RM Pressfit cup	106	369.8	4	1.08	0.23	2.57	14
Corail	RM Pressfit cup	137	374.5	4	1.07	0.29	2.73	18
CLS	Tritanium	76	287.9	3	1.04	0.21	3.05	4
S-Rom	Pinnacle	367	3298.9	34	1.03	0.70	1.42	14
H-Max S	Delta-TT Cup	689	2278.1	23	1.01	0.64	1.51	94
CPT	Continuum TM	1195	3730.2	37	0.99	0.69	1.35	168
CPT	Fitmore	181	908.6	9	0.99	0.42	1.81	15
Trabecular Metal Stem	Continuum TM	437	1744.8	17	0.97	0.57	1.56	21



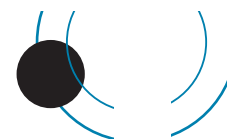
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval		Procedures 2017
Corail	Fitmore	268	629.1	6	0.95	0.35	2.08	54
Exeter V40	Continuum TM	2302	7904.2	75	0.95	0.74	1.18	333
M/L Taper	Trident	197	535.6	5	0.93	0.30	2.18	38
CBC Stem	RM Pressfit cup	432	2314.3	21	0.91	0.56	1.39	38
Synergy Porous	R3 porous	1653	6326.1	54	0.85	0.64	1.11	171
Corail	Continuum TM	269	834.9	7	0.84	0.30	1.65	40
Tri-Lock BPS	Pinnacle	63	367.5	3	0.82	0.11	2.18	1
C-Stem AMT	Pinnacle	1983	6263.9	51	0.81	0.60	1.06	348
M/L Taper	Continuum TM	881	3218.3	26	0.81	0.52	1.17	136
CPCS	R3 porous	263	638.3	5	0.78	0.25	1.83	52
Summit	Pinnacle	2063	11438.9	89	0.78	0.62	0.96	212
Corail	Trident	80	402.0	3	0.75	0.15	2.18	6
CLS	Continuum TM	644	2278.7	17	0.75	0.43	1.19	99
CLS	Reflection porous	358	2688.1	20	0.74	0.45	1.15	16
Exeter V40	Tritanium	2702	8505.5	63	0.74	0.57	0.95	505
Exeter V40	R3 porous	534	1681.1	12	0.71	0.35	1.21	87
CLS	RM Pressfit cup	540	3363.4	24	0.71	0.45	1.04	30
Exeter V40	Delta-TT Cup	189	577.8	4	0.69	0.19	1.77	21
Corail	Pinnacle	8876	39586.8	266	0.67	0.59	0.76	1322
TwinSys uncemented	RM Pressfit cup	4614	25657.2	171	0.67	0.57	0.77	253
Echo Bi-Metric	G7 acetabular shell	225	471.0	3	0.64	0.09	1.70	64
TwinSys cemented	CCB	427	2075.9	13	0.63	0.33	1.07	23
Polarstem uncemented	R3 porous	1245	3226.7	20	0.62	0.38	0.96	247
Corail	Tritanium	153	665.7	4	0.60	0.16	1.54	18
Stemsys	Fixa Ti Por	630	2064.7	12	0.58	0.28	0.98	84
Accolade II	Tritanium	735	1573.2	9	0.57	0.26	1.09	198
TwinSys uncemented	Continuum TM	133	700.4	4	0.57	0.16	1.46	3
CLS	Trilogy	572	3726.5	21	0.56	0.35	0.86	37
MS 30	Continuum TM	371	1246.1	7	0.56	0.20	1.10	57
Accolade II	Trident	639	1432.4	8	0.56	0.24	1.10	176
Exeter V40	Bio-clad poly	140	898.5	5	0.56	0.18	1.30	1
MS 30	RM Pressfit cup	90	719.5	4	0.56	0.15	1.42	1
Stemsys	RM Pressfit cup	287	918.5	5	0.54	0.18	1.27	30
M/L Taper	Trilogy	212	1663.5	9	0.54	0.23	0.99	2
CLS	Trabecular Metal Shell	51	379.8	2	0.53	0.06	1.90	1
Exeter V40	Exeter	1641	14644.4	77	0.53	0.41	0.66	4
Summit	Trilogy	157	1149.2	6	0.52	0.19	1.14	7
C-Stem AMT	Marathon cemented	316	1534.1	8	0.52	0.23	1.03	17



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval		Procedures 2017
TwinSys cemented	RM Pressfit cup	1667	7113.0	36	0.51	0.35	0.69	220
CLS	Fitmore	2266	21599.1	107	0.50	0.40	0.60	51
Exeter V40	Contemporary	6390	45809.8	211	0.46	0.40	0.53	200
Exeter V40	Pinnacle	2159	9719.9	44	0.45	0.33	0.61	279
CCA	CCB	765	5771.6	26	0.45	0.29	0.66	9
Exeter V40	Trident	9342	55192.0	233	0.42	0.37	0.48	994
Exeter V40	Trilogy	2652	17553.8	72	0.41	0.32	0.52	149
Wagner cone stem	Fitmore	72	739.4	3	0.41	0.08	1.19	1
Exeter V40	Reflection cemented	891	4979.2	20	0.40	0.25	0.62	39
Exeter V40	Exeter X3	1764	5633.4	22	0.39	0.24	0.59	227
Synergy Porous	Reflection porous	1224	10782.9	42	0.39	0.28	0.53	14
Corail	Trilogy	190	774.1	3	0.39	0.08	1.13	24
Exeter V40	CCB	534	2609.9	10	0.38	0.18	0.70	33
CCA	RM Pressfit cup	135	1183.3	4	0.34	0.09	0.87	1
Spectron	R3 porous	421	2083.8	7	0.34	0.12	0.66	12
Exeter V40	RM Pressfit cup	2084	9023.8	30	0.33	0.22	0.47	306
Friendly	Delta-PF Cup	168	1543.4	5	0.32	0.11	0.76	2
TwinSys cemented	Continuum TM	101	310.6	1	0.32	0.01	1.79	10
MS 30	Fitmore	1982	12441.5	35	0.28	0.20	0.39	149
Stemsys	DeltaMotion Cup	441	1954.1	5	0.26	0.08	0.60	57
CPT	ZCA all-poly cup	96	396.8	1	0.25	0.01	1.40	4
Corail	Delta-PF Cup	80	825.3	2	0.24	0.03	0.88	1
MS 30	Trilogy	311	1696.2	4	0.24	0.06	0.60	26
Exeter V40	ZCA	85	527.7	1	0.19	0.00	1.06	1
CLS	Pinnacle	80	535.0	1	0.19	0.00	1.04	6
Exeter V40	Fitmore	872	3876.7	7	0.18	0.07	0.37	118
Stemsys	Delta-PF Cup	322	724.1	1	0.14	0.00	0.65	61
Accolade II	Delta-TT Cup	54	63.0	0	0.00	0.00	5.85	29
C-Stem	Marathon cemented	75	237.3	0	0.00	0.00	1.55	11
Corail	DeltaMotion Cup	78	440.8	0	0.00	0.00	0.84	1
Exeter V40	ZCA all-poly cup	100	351.6	0	0.00	0.00	1.05	5
Optimys	RM Pressfit cup	60	63.0	0	0.00	0.00	5.85	30
TwinSys cemented	Reflection porous	50	122.4	0	0.00	0.00	3.01	11

**Revision versus hip prostheses combinations sorted on revision rate**  
(Minimum of 50 primary registered arthroplasties)

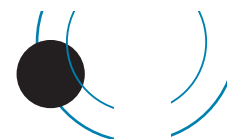
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
S-Rom	ASR	130	767.1	94	12.25	9.84	14.92
Corail	ASR	156	1,125.1	81	7.20	5.72	8.95
Anthology Porous	R3 porous	67	454.2	30	6.61	4.46	9.43
Anthology Porous	BHR Acetabular Cup	93	682.9	42	6.15	4.37	8.23
Summit	ASR	88	694.6	35	5.04	3.51	7.01
Synergy Porous	BHR Acetabular Cup	114	968.8	38	3.92	2.78	5.38
CLS	Artek	59	685.6	24	3.50	2.24	5.21
ABGII	RM Pressfit cup	69	152.7	5	3.28	0.88	7.18
TwinSys cemented	Pinnacle	68	224.1	7	3.12	1.26	6.44
CLS	Durom	198	1,823.0	56	3.07	2.32	3.99
Accolade II	RM Pressfit cup	52	65.6	2	3.05	0.37	11.02
CPT	Delta-TT Cup	60	120.2	3	2.50	0.35	6.66
Taperloc Complete	RM Pressfit cup	124	125.3	3	2.39	0.49	6.99
Exeter V40	G7 acetabular shell	73	129.8	3	2.31	0.48	6.76
Taperloc Complete	G7 acetabular shell	163	178.5	4	2.24	0.47	5.74
Echo Bi-Metric	Continuum TM	80	93.4	2	2.14	0.26	7.73
ABG	Duraloc	116	1,805.8	37	2.05	1.44	2.82
Lateral straight stem	Trilogy	69	515.4	10	1.94	0.93	3.57
M/L Taper	Delta-TT Cup	64	268.4	5	1.86	0.60	4.35
ABGII	Duraloc	139	1,846.5	34	1.84	1.25	2.54
Elite plus	Duraloc	608	6,736.4	109	1.62	1.32	1.94
C-Stem	Pinnacle	65	199.4	3	1.50	0.31	4.40
ABG	ABGII	72	1,074.2	16	1.49	0.85	2.42
Prodigy	Duraloc	113	1,433.2	21	1.47	0.91	2.24
H-Max S	Delta-PF Cup	184	409.9	6	1.46	0.54	3.19
H-Max M	Delta-PF Cup	71	480.3	7	1.46	0.59	3.00
CBC Stem	Expansys shell	183	1,675.4	24	1.43	0.89	2.10
Exeter	Duraloc	553	7,552.5	105	1.39	1.14	1.68
CLS	RM cup	113	1,097.7	15	1.37	0.76	2.25
TwinSys uncemented	Selexys TPS	1,231	9,374.0	125	1.33	1.11	1.59
Stemsys	Polymax	99	150.5	2	1.33	0.16	4.80
CCA	Contemporary	74	754.4	10	1.33	0.64	2.44
Mallory-Head	M2A	105	1,157.8	15	1.30	0.73	2.14
Stemsys	Agilis Ti-por	393	1,102.2	14	1.27	0.66	2.07
Contemporary	Contemporary	71	884.3	11	1.24	0.62	2.23
Spectron	Duraloc	1,153	13,325.6	165	1.24	1.06	1.44
TwinSys cemented	Selexys TPS	65	409.4	5	1.22	0.40	2.85
Avenir Muller uncemented	Continuum TM	178	931.1	11	1.18	0.59	2.11



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trabecular Metal Shell	198	938.8	11	1.17	0.58	2.10
Spectron	Reflection cemented	2,954	28,768.5	326	1.13	1.01	1.26
Friendly	Delta-TT Cup	66	354.3	4	1.13	0.31	2.89
CPT	Tritanium	85	534.2	6	1.12	0.41	2.44
Spectron	Morscher	210	2,672.0	30	1.12	0.76	1.60
S-Rom	Ultima	78	1,172.0	13	1.11	0.59	1.90
Spectron	Muller PE cup	66	644.7	7	1.09	0.39	2.13
C-Stem AMT	RM Pressfit cup	106	369.8	4	1.08	0.23	2.57
CLS	Allofit	192	1,776.2	19	1.07	0.64	1.67
Corail	RM Pressfit cup	137	374.5	4	1.07	0.29	2.73
CLS	Tritanium	76	287.9	3	1.04	0.21	3.05
S-Rom	Pinnacle	367	3,298.9	34	1.03	0.70	1.42
H-Max S	Delta-TT Cup	689	2,278.1	23	1.01	0.64	1.51
CPT	Continuum TM	1,195	3,730.2	37	0.99	0.69	1.35
CPT	Fitmore	181	908.6	9	0.99	0.42	1.81
Exeter	Contemporary	1,551	17,855.8	176	0.99	0.84	1.14
C-Stem	Duraloc	53	609.6	6	0.98	0.31	2.03
Trabecular Metal Stem	Continuum TM	437	1,744.8	17	0.97	0.57	1.56
Corail	Duraloc	464	4,824.3	47	0.97	0.72	1.30
CLS	Duraloc	699	8,696.2	83	0.95	0.76	1.18
Corail	Fitmore	268	629.1	6	0.95	0.35	2.08
Exeter V40	Continuum TM	2,302	7,904.2	75	0.95	0.74	1.18
M/L Taper	Trident	197	535.6	5	0.93	0.30	2.18
ABGII	Delta-PF Cup	107	1,188.7	11	0.93	0.46	1.66
CBC Stem	Fitmore	59	543.9	5	0.92	0.30	2.15
CPT	Trilogy	842	5,901.0	54	0.92	0.69	1.19
AML MMA	Duraloc	74	986.4	9	0.91	0.42	1.73
CPT	Monoblock Acetabular Cup	84	878.8	8	0.91	0.36	1.72
CBC Stem	RM Pressfit cup	432	2,314.3	21	0.91	0.56	1.39
Exeter V40	Duraloc	987	10,194.9	91	0.89	0.72	1.10
TwinSys uncemented	RM cup	122	912.9	8	0.88	0.38	1.73
SL modular stem	RM cup	322	4,409.6	38	0.86	0.61	1.18
Synergy Porous	R3 porous	1,653	6,326.1	54	0.85	0.64	1.11
MS 30	Duraloc	55	714.7	6	0.84	0.31	1.83
Corail	Continuum TM	269	834.9	7	0.84	0.30	1.65
Lateral straight stem	RM cup	533	4,920.8	41	0.83	0.60	1.13
Tri-Lock BPS	Pinnacle	63	367.5	3	0.82	0.11	2.18
Spectron	Reflection porous	2,755	26,021.3	212	0.81	0.71	0.93

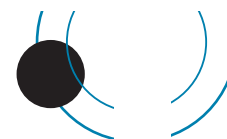


Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Furlong	Furlong	66	736.6	6	0.81	0.30	1.77
C-Stem AMT	Pinnacle	1,983	6,263.9	51	0.81	0.60	1.06
M/L Taper	Continuum TM	881	3,218.3	26	0.81	0.52	1.17
AML	Duraloc	53	748.7	6	0.80	0.29	1.74
CPCS	R3 porous	263	638.3	5	0.78	0.25	1.83
Polarstem uncemented	Reflection porous	335	1,790.5	14	0.78	0.43	1.31
Summit	Pinnacle	2,063	11,438.9	89	0.78	0.62	0.96
ABGII	Trident	342	3,754.1	29	0.77	0.52	1.11
CLS	CLS Expansion	1,263	14,788.2	113	0.76	0.63	0.92
Omnifit	Trident	149	1,702.8	13	0.76	0.41	1.31
MS 30	Contemporary	128	1,195.8	9	0.75	0.34	1.43
Corail	Trident	80	402.0	3	0.75	0.15	2.18
CLS	Continuum TM	644	2,278.7	17	0.75	0.43	1.19
CLS	Reflection porous	358	2,688.1	20	0.74	0.45	1.15
Exeter V40	Tritanium	2,702	8,505.5	63	0.74	0.57	0.95
CPT	Trident	145	1,496.0	11	0.74	0.37	1.32
Exeter	Exeter	1,326	14,785.9	108	0.73	0.60	0.88
Exeter V40	R3 porous	534	1,681.1	12	0.71	0.35	1.21
CLS	RM Pressfit cup	540	3,363.4	24	0.71	0.45	1.04
CLS	Trident	165	1,718.9	12	0.70	0.36	1.22
Exeter V40	Delta-TT Cup	189	577.8	4	0.69	0.19	1.77
Standard straight stem	RM cup	138	1,463.2	10	0.68	0.30	1.21
Exeter	Osteolock	836	10,699.8	72	0.67	0.53	0.85
Corail	Pinnacle	8,876	39,586.8	266	0.67	0.59	0.76
TwinSys uncemented	RM Pressfit cup	4,614	25,657.2	171	0.67	0.57	0.77
CLS	Weill ring	106	1,524.3	10	0.66	0.29	1.16
Exeter	CLS Expansion	129	1,539.2	10	0.65	0.31	1.19
Charnley	Charnley Cup Ogee	303	3,706.9	24	0.65	0.40	0.95
Echo Bi-Metric	G7 acetabular shell	225	471.0	3	0.64	0.09	1.70
MS 30	Morscher	787	9,287.5	59	0.64	0.48	0.81
CPT	Duraloc	212	2,381.5	15	0.63	0.35	1.04
TwinSys cemented	CCB	427	2,075.9	13	0.63	0.33	1.07
CPT	ZCA	543	5,277.8	33	0.63	0.43	0.88
Versys cemented	ZCA	391	4,002.8	25	0.62	0.39	0.91
Polarstem uncemented	R3 porous	1,245	3,226.7	20	0.62	0.38	0.96
Elite plus	Charnley	298	3,572.0	22	0.62	0.37	0.92
Corail	Tritanium	153	665.7	4	0.60	0.16	1.54
Corail	Monoblock Acetabular Cup	95	860.2	5	0.58	0.19	1.36



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Stemsys	Fixa Ti Por	630	2,064.7	12	0.58	0.28	0.98
Elite plus	Elite Plus Ogee	110	1,042.6	6	0.58	0.21	1.25
Accolade II	Tritanium	735	1,573.2	9	0.57	0.26	1.09
TwinSys uncemented	Continuum TM	133	700.4	4	0.57	0.16	1.46
CLS	Trilogy	572	3,726.5	21	0.56	0.35	0.86
MS 30	Continuum TM	371	1,246.1	7	0.56	0.20	1.10
Accolade II	Trident	639	1,432.4	8	0.56	0.24	1.10
Exeter V40	Bio-clad poly	140	898.5	5	0.56	0.18	1.30
MS 30	RM Pressfit cup	90	719.5	4	0.56	0.15	1.42
TwinSys uncemented	Trilogy	209	1,636.1	9	0.55	0.23	1.00
Lateral straight stem	Muller PE cup	749	6,971.0	38	0.55	0.38	0.74
Stemsys	RM Pressfit cup	287	918.5	5	0.54	0.18	1.27
M/L Taper	Trilogy	212	1,663.5	9	0.54	0.23	0.99
CLS	Trabecular Metal Shell	51	379.8	2	0.53	0.06	1.90
Exeter V40	Exeter	1,641	14,644.4	77	0.53	0.41	0.66
Summit	Trilogy	157	1,149.2	6	0.52	0.19	1.14
C-Stem AMT	Marathon cemented	316	1,534.1	8	0.52	0.23	1.03
Spectron	Biomex acet shell porous	68	978.4	5	0.51	0.17	1.19
CLS	Monoblock Acetabular Cup	80	784.5	4	0.51	0.14	1.31
TwinSys cemented	RM Pressfit cup	1,667	7,113.0	36	0.51	0.35	0.69
ABGII	Pinnacle	67	597.3	3	0.50	0.10	1.47
Exeter V40	Morscher	630	6,795.5	34	0.50	0.35	0.70
Exeter	Trilogy	213	2,807.6	14	0.50	0.27	0.84
CLS	Fitmore	2,266	21,599.1	107	0.50	0.40	0.60
Exeter V40	Osteolock	270	3,056.2	15	0.49	0.27	0.81
Lateral straight stem	Continuum TM	78	409.5	2	0.49	0.06	1.76
CLS	Morscher	1,682	21,477.4	104	0.48	0.40	0.59
Exeter	Bio-clad poly	113	1,241.1	6	0.48	0.15	1.00
Accolade	Trident	1,867	18,980.0	91	0.48	0.38	0.59
Exeter V40	Contemporary	6,390	45,809.8	211	0.46	0.40	0.53
Versys	Trilogy	272	3,696.2	17	0.46	0.27	0.74
Exeter V40	Pinnacle	2,159	9,719.9	44	0.45	0.33	0.61
CCA	CCB	765	5,771.6	26	0.45	0.29	0.66
Summit	Duraloc	101	1,132.1	5	0.44	0.14	1.03
Elite plus	Elite Plus LPW	282	2,956.6	13	0.44	0.23	0.75
SL monoblock	Muller PE cup	488	5,305.0	23	0.43	0.27	0.65
Exeter	Morscher	551	7,876.4	34	0.43	0.30	0.60
Spectron	Fitmore	78	927.4	4	0.43	0.12	1.10

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Avenir Muller uncemented	Pinnacle	99	708.4	3	0.42	0.06	1.13
Exeter V40	Trident	9,342	55,192.0	233	0.42	0.37	0.48
Exeter	Muller PE cup	119	1,425.4	6	0.42	0.15	0.92
CPT	Pinnacle	64	481.1	2	0.42	0.05	1.50
Spectron	Mallory-Head	152	1,695.8	7	0.41	0.15	0.81
Exeter V40	Trilogy	2,652	17,553.8	72	0.41	0.32	0.52
Charnley	Charnley	456	5,153.5	21	0.41	0.25	0.62
Wagner cone stem							
	Fitmore	72	739.4	3	0.41	0.08	1.19
Exeter V40	Reflection cemented	891	4,979.2	20	0.40	0.25	0.62
Trabecular Metal Stem	Monoblock Acetabular Cup	74	753.5	3	0.40	0.06	1.06
Standard straight stem	ZCA all-poly cup stem	50	251.6	1	0.40	0.00	2.21
Exeter V40	Exeter X3	1,764	5,633.4	22	0.39	0.24	0.59
Synergy Porous	Reflection porous	1,224	10,782.9	42	0.39	0.28	0.53
Corail	Trilogy	190	774.1	3	0.39	0.08	1.13
Exeter V40	CCB	534	2,609.9	10	0.38	0.18	0.70
C-Stem	Elite Plus Ogee	55	523.7	2	0.38	0.05	1.38
Echo Bi-Metric	Exceed ABT Ringloc-X	57	263.6	1	0.38	0.01	2.11
TwinSys cemented	RM cup	148	1,356.5	5	0.37	0.10	0.81
Lateral straight stem	Weber	287	2,758.1	10	0.36	0.17	0.67
Spectron	Trident	78	843.4	3	0.36	0.07	1.04
H-Max M	Delta-TT Cup	86	575.7	2	0.35	0.04	1.25
MS 30	Muller PE cup	462	4,319.0	15	0.35	0.19	0.57
Exeter V40	Muller PE cup	94	864.8	3	0.35	0.07	1.01
CCA	RM Pressfit cup	135	1,183.3	4	0.34	0.09	0.87
Exeter V40	Monoblock Acetabular Cup	123	1,486.1	5	0.34	0.11	0.79
Spectron	R3 porous	421	2,083.8	7	0.34	0.12	0.66
Exeter V40	RM Pressfit cup	2,084	9,023.8	30	0.33	0.22	0.47
Standard straight stem	Muller PE cup	628	5,529.1	18	0.33	0.19	0.50
Accolade	Tritanium	152	925.9	3	0.32	0.07	0.95
Friendly	Delta-PF Cup	168	1,543.4	5	0.32	0.11	0.76
TwinSys cemented	Continuum TM	101	310.6	1	0.32	0.01	1.79
Standard straight stem	Weber	134	1,250.9	4	0.32	0.09	0.82
Exeter V40	Reflection porous	475	3,711.2	11	0.30	0.14	0.51
MS 30	Fitmore	1,982	12,441.5	35	0.28	0.20	0.39



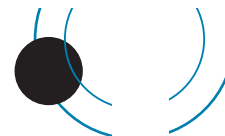
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Versys cemented	Trilogy	237	2,536.5	7	0.28	0.11	0.57
Lateral straight stem	RM Pressfit cup	173	1,133.6	3	0.26	0.05	0.77
Accolade	Muller PE cup	114	1,152.3	3	0.26	0.05	0.76
Basis	Reflection porous	108	768.4	2	0.26	0.03	0.94
Corail	Ultima	135	1,152.6	3	0.26	0.05	0.76
Stemsys	DeltaMotion Cup	441	1,954.1	5	0.26	0.08	0.60
CPT	ZCA all-poly cup	96	396.8	1	0.25	0.01	1.40
Corail	Delta-PF Cup	80	825.3	2	0.24	0.03	0.88
MS 30	Trilogy	311	1,696.2	4	0.24	0.06	0.60
Exeter V40	CLS Expansion	88	968.2	2	0.21	0.03	0.75
Exeter V40	ZCA	85	527.7	1	0.19	0.00	1.06
SL modular stem	Muller PE cup	83	1,061.3	2	0.19	0.02	0.68
CLS	Pinnacle	80	535.0	1	0.19	0.00	1.04
Exeter V40	Weber	53	535.9	1	0.19	0.00	1.04
Exeter V40	Fitmore	872	3,876.7	7	0.18	0.07	0.37
Avenir Muller uncemented	Tritanium	91	569.3	1	0.18	0.00	0.98
Lateral straight stem	ZCA	98	689.2	1	0.15	0.00	0.81
Synergy Porous	Delta-PF Cup	88	695.7	1	0.14	0.00	0.80
Stemsys	Delta-PF Cup	322	724.1	1	0.14	0.00	0.65
Accolade	Pinnacle	180	1,458.3	2	0.14	0.02	0.50
Avenir Muller uncemented	RM cup	105	734.8	1	0.14	0.00	0.76
Standard straight stem	RM Pressfit cup	137	1,006.6	1	0.10	0.00	0.55
Corail	Reflection porous	140	1,237.1	1	0.08	0.00	0.45
TwinSys uncemented	Delta-PF Cup	370	2,646.5	1	0.04	0.00	0.18
Accolade II	Delta-TT Cup	54	63.0	0	0.00	0.00	5.85
C-Stem	Marathon cemented	75	237.3	0	0.00	0.00	1.55
Corail	DeltaMotion Cup	78	440.8	0	0.00	0.00	0.84
	Trident	84	1,207.9	0	0.00	0.00	0.31
Exeter V40	ZCA all-poly cup	100	351.6	0	0.00	0.00	1.05
Lateral straight stem	ZCA all-poly cup	70	363.4	0	0.00	0.00	1.02
MS 30	ZCA all-poly cup	94	433.6	0	0.00	0.00	0.85
Optimys	RM Pressfit cup	60	63.0	0	0.00	0.00	5.85
TwinSys cemented	Reflection porous	50	122.4	0	0.00	Exeter	3.01

## 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	6,390	45,809.8	211	0.46	0.40	0.53
Spectron	Reflection cemented	2,954	28,768.5	326	1.13	1.01	1.26
Exeter V40	Exeter X3	1,764	5,633.4	22	0.39	0.24	0.59
Exeter V40	Exeter	1,641	14,644.4	77	0.53	0.41	0.66
Exeter	Contemporary	1,551	17,855.8	176	0.99	0.84	1.14
Exeter	Exeter	1,326	14,785.9	108	0.73	0.60	0.88
Exeter V40	Reflection cemented	891	4,979.2	20	0.40	0.25	0.62
CCA	CCB	765	5,771.6	26	0.45	0.29	0.66
Lateral straight stem	Muller PE cup	749	6,971.0	38	0.55	0.38	0.74
Standard straight stem	Muller PE cup	628	5,529.1	18	0.33	0.19	0.50
CPT	ZCA	543	5,277.8	33	0.63	0.43	0.88
Exeter V40	CCB	534	2,609.9	10	0.38	0.18	0.70
SL monoblock	Muller PE cup	488	5,305.0	23	0.43	0.27	0.65
MS 30	Muller PE cup	462	4,319.0	15	0.35	0.19	0.57
Charnley	Charnley	456	5,153.5	21	0.41	0.25	0.62
TwinSys cemented	CCB	427	2,075.9	13	0.63	0.33	1.07
Versys cemented	ZCA	391	4,002.8	25	0.62	0.39	0.91
C-Stem AMT	Marathon cemented	316	1,534.1	8	0.52	0.23	1.03
Charnley	Charnley Cup Ogee	303	3,706.9	24	0.65	0.40	0.95
Elite plus	Charnley	298	3,572.0	22	0.62	0.37	0.92
Lateral straight stem	Weber	287	2,758.1	10	0.36	0.17	0.67
Elite plus	Elite Plus LPW	282	2,956.6	13	0.44	0.23	0.75
Exeter V40	Bio-clad poly	140	898.5	5	0.56	0.18	1.30
Standard straight stem	Weber	134	1,250.9	4	0.32	0.09	0.82
MS 30	Contemporary	128	1,195.8	9	0.75	0.34	1.43
Exeter	Muller PE cup	119	1,425.4	6	0.42	0.15	0.92
Exeter	Bio-clad poly	113	1,241.1	6	0.48	0.15	1.00
Elite plus	Elite Plus Ogee	110	1,042.6	6	0.58	0.21	1.25
Exeter V40	ZCA all-poly cup	100	351.6	0	0.00	0.00	1.05
Lateral straight stem	ZCA	98	689.2	1	0.15	0.00	0.81
CPT	ZCA all-poly cup	96	396.8	1	0.25	0.01	1.40
Exeter V40	Muller PE cup	94	864.8	3	0.35	0.07	1.01
MS 30	ZCA all-poly cup	94	433.6	0	0.00	0.00	0.85
Exeter V40	ZCA	85	527.7	1	0.19	0.00	1.06

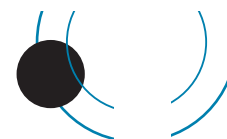


Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
SL modular stem	Muller PE cup	83	1,061.3	2	0.19	0.02	0.68
C-Stem	Marathon cemented	75	237.3	0	0.00	0.00	1.55
CCA	Contemporary	74	754.4	10	1.33	0.64	2.44
Contemporary	Contemporary	71	884.3	11	1.24	0.62	2.23
Lateral straight stem	ZCA all-poly cup	70	363.4	0	0.00	0.00	1.02
Spectron	Muller PE cup	66	644.7	7	1.09	0.39	2.13
C-Stem	Elite Plus Ogee	55	523.7	2	0.38	0.05	1.38
Exeter V40	Weber	53	535.9	1	0.19	0.00	1.04
Standard straight stem	ZCA all-poly cup	50	251.6	1	0.40	0.00	2.21



## Uncemented

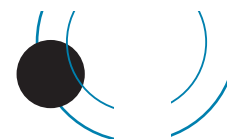
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 Component-years	Exact 95% confidence interval	
Corail	Pinnacle	8,876	39,586.8	266	0.67	0.59	0.76
TwinSys uncemented	RM Pressfit cup	4,614	25,657.2	171	0.67	0.57	0.77
CLS	Fitmore	2,266	21,599.1	107	0.50	0.40	0.60
Summit	Pinnacle	2,063	11,438.9	89	0.78	0.62	0.96
Accolade	Trident	1,867	18,980.0	91	0.48	0.38	0.59
CLS	Morscher	1,682	21,477.4	104	0.48	0.40	0.59
Synergy Porous	R3 porous	1,653	6,326.1	54	0.85	0.64	1.11
CLS	CLS Expansion	1,263	14,788.2	113	0.76	0.63	0.92
Polarstem uncemented	R3 porous	1,245	3,226.7	20	0.62	0.38	0.96
TwinSys uncemented	Selexys TPS	1,231	9,374.0	125	1.33	1.11	1.59
Synergy Porous	Reflection porous	1,224	10,782.9	42	0.39	0.28	0.53
M/L Taper	Continuum TM	878	3,212.8	26	0.81	0.52	1.17
Accolade II	Tritanium	735	1,573.2	9	0.57	0.26	1.09
CLS	Duraloc	699	8,696.2	83	0.95	0.76	1.18
H-Max S	Delta-TT Cup	688	2,277.7	23	1.01	0.64	1.52
CLS	Continuum TM	644	2,278.7	17	0.75	0.43	1.19
Accolade II	Trident	639	1,432.4	8	0.56	0.24	1.10
Stemsys	Fixa Ti Por	630	2,064.7	12	0.58	0.28	0.98
CLS	Trilogy	572	3,726.5	21	0.56	0.35	0.86
CLS	RM Pressfit cup	540	3,363.4	24	0.71	0.45	1.04
Corail	Duraloc	464	4,824.3	47	0.97	0.72	1.30
Stemsys	DeltaMotion Cup	441	1,954.1	5	0.26	0.08	0.60
Trabecular Metal Stem	Continuum TM	437	1,744.8	17	0.97	0.57	1.56
CBC Stem	RM Pressfit cup	432	2,314.3	21	0.91	0.56	1.39
Stemsys	Agilis Ti-por	392	1,101.9	14	1.27	0.66	2.07
TwinSys uncemented	Delta-PF Cup	370	2,646.5	1	0.04	0.00	0.18
S-Rom	Pinnacle	367	3,298.9	34	1.03	0.70	1.42
CLS	Reflection porous	358	2,688.1	20	0.74	0.45	1.15
ABGII	Trident	342	3,754.1	29	0.77	0.52	1.11
Polarstem uncemented	Reflection porous	335	1,790.5	14	0.78	0.43	1.31
Stemsys	Delta-PF Cup	322	724.1	1	0.14	0.00	0.65
Stemsys	RM Pressfit cup	287	918.5	5	0.54	0.18	1.27
Versys	Trilogy	272	3,696.2	17	0.46	0.27	0.74
Corail	Continuum TM	269	834.9	7	0.84	0.30	1.65
Corail	Fitmore	268	629.1	6	0.95	0.35	2.08
Echo Bi-Metric	G7 acetabular shell	225	471.0	3	0.64	0.09	1.70
M/L Taper	Trilogy	212	1,663.5	9	0.54	0.23	0.99



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 Component-years	Exact 95% confidence interval	
TwinSys uncemented	Trilogy	209	1,636.1	9	0.55	0.23	1.00
CLS	Durom	198	1,823.0	56	3.07	2.32	3.99
M/L Taper	Trident	196	534.3	5	0.94	0.30	2.18
CLS	Allofit	192	1,776.2	19	1.07	0.64	1.67
Corail	Trilogy	190	774.1	3	0.39	0.08	1.13
CBC Stem	Expansys shell	183	1,675.4	24	1.43	0.89	2.10
H-Max S	Delta-PF Cup	183	409.1	6	1.47	0.54	3.19
Accolade	Pinnacle						
	180	1,458.3	2	0.14	0.02	0.50	
Avenir Muller uncemented	Continuum TM	178	931.1	11	1.18	0.59	2.11
CLS	Trident	165	1,718.9	12	0.70	0.36	1.22
Taperloc Complete	G7 acetabular shell	163	178.5	4	2.24	0.47	5.74
Summit	Trilogy	157	1,149.2	6	0.52	0.19	1.14
Corail	ASR	156	1,125.1	81	7.20	5.72	8.95
Corail	Tritanium	153	665.7	4	0.60	0.16	1.54
Accolade	Tritanium	152	925.9	3	0.32	0.07	0.95
Corail	Reflection porous	140	1,237.1	1	0.08	0.00	0.45
ABGII	Duraloc	139	1,846.5	34	1.84	1.25	2.54
Corail	RM Pressfit cup	137	374.5	4	1.07	0.29	2.73
TwinSys uncemented	Continuum TM	133	700.4	4	0.57	0.16	1.46
S-Rom	ASR	130	767.1	94	12.25	9.84	14.92
Omnifit	Trident	126	1,460.7	12	0.82	0.40	1.39
Taperloc Complete	RM Pressfit cup	124	125.3	3	2.39	0.49	6.99
TwinSys uncemented	RM cup	122	912.9	8	0.88	0.38	1.73
ABG	Duraloc	116	1,805.8	37	2.05	1.44	2.82
Synergy Porous	BHR Acetabular Cup	114	968.8	38	3.92	2.78	5.38
CLS	RM cup	113	1,097.7	15	1.37	0.76	2.25
Prodigy	Duraloc	113	1,433.2	21	1.47	0.91	2.24
ABGII	Delta-PF Cup	107	1,188.7	11	0.93	0.46	1.66
CLS	Weill ring	106	1,524.3	10	0.66	0.29	1.16
Avenir Muller uncemented	RM cup	105	734.8	1	0.14	0.00	0.76
Mallory-Head	M2A	105	1,157.8	15	1.30	0.73	2.14
Summit	Duraloc	101	1,132.1	5	0.44	0.14	1.03
Avenir Muller uncemented	Pinnacle	99	708.4	3	0.42	0.06	1.13
Stemsys	Polymax	99	150.5	2	1.33	0.16	4.80
Corail	Monoblock Acetabular Cup	95	860.2	5	0.58	0.19	1.36
Anthology Porous	BHR Acetabular Cup	91	671.5	41	6.11	4.32	8.20



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 Component-years	Exact 95% confidence interval	
Avenir Muller uncemented	Tritanium	91	569.3	1	0.18	0.00	0.98
Summit	ASR	88	694.6	35	5.04	3.51	7.01
Synergy Porous	Delta-PF Cup	88	695.7	1	0.14	0.00	0.80
H-Max M	Delta-TT Cup	86	575.7	2	0.35	0.04	1.25
CLS	Monoblock Acetabular Cup	80	784.5	4	0.51	0.14	1.31
CLS	Pinnacle	80	535.0	1	0.19	0.00	1.04
Corail	Delta-PF Cup	80	825.3	2	0.24	0.03	0.88
Corail	Trident	80	402.0	3	0.75	0.15	2.18
Echo Bi-Metric	Continuum TM	80	93.4	2	2.14	0.26	7.73
Corail	DeltaMotion Cup	78	440.8	0	0.00	0.00	0.84
S-Rom	Ultima	78	1,172.0	13	1.11	0.59	1.90
CLS	Tritanium	76	287.9	3	1.04	0.21	3.05
AML MMA	Duraloc	74	986.4	9	0.91	0.42	1.73
Trabecular Metal Stem	Monoblock Acetabular Cup	74	753.5	3	0.40	0.06	1.06
ABG	ABGII						
	72	1,074.2	16	1.49	0.85	2.42	
Wagner cone stem	Fitmore	72	739.4	3	0.41	0.08	1.19
H-Max M	Delta-PF Cup	71	480.3	7	1.46	0.59	3.00
ABGII	RM Pressfit cup	69	152.7	5	3.28	0.88	7.18
ABGII	Pinnacle	67	597.3	3	0.50	0.10	1.47
Anthology Porous	R3 porous	67	454.2	30	6.61	4.46	9.43
Furlong	Furlong	66	736.6	6	0.81	0.30	1.77
M/L Taper	Delta-TT Cup	64	268.4	5	1.86	0.60	4.35
Tri-Lock BPS	Pinnacle	63	367.5	3	0.82	0.11	2.18
Optimys	RM Pressfit cup	60	63.0	0	0.00	0.00	5.85
CBC Stem	Fitmore	59	543.9	5	0.92	0.30	2.15
CLS	Artek	59	685.6	24	3.50	2.24	5.21
Echo Bi-Metric	Exceed ABT Ringloc-X	57	263.6	1	0.38	0.01	2.11
Accolade II	Delta-TT Cup	54	63.0	0	0.00	0.00	5.85
AML	Duraloc	53	748.7	6	0.80	0.29	1.74
Accolade II	RM Pressfit cup	52	65.6	2	3.05	0.37	11.02
CLS	Trabecular Metal Shell	51	379.8	2	0.53	0.06	1.90

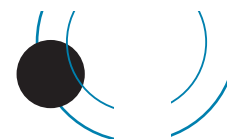


### Hybrid

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	9,342	55,192.0	233	0.42	0.37	0.48
Spectron	Reflection porous	2,755	26,021.3	212	0.81	0.71	0.93
Exeter V40	Tritanium	2,702	8,505.5	63	0.74	0.57	0.95
Exeter V40	Trilogy	2,652	17,553.8	72	0.41	0.32	0.52
Exeter V40	Continuum TM	2,302	7,904.2	75	0.95	0.74	1.18
Exeter V40	Pinnacle	2,159	9,719.9	44	0.45	0.33	0.61
Exeter V40	RM Pressfit cup	2,084	9,023.8	30	0.33	0.22	0.47
C-Stem AMT	Pinnacle	1,983	6,263.9	51	0.81	0.60	1.06
MS 30	Fitmore	1,982	12,441.5	35	0.28	0.20	0.39
TwinSys cemented	RM Pressfit cup	1,667	7,113.0	36	0.51	0.35	0.69
CPT	Continuum TM	1,195	3,730.2	37	0.99	0.69	1.35
Spectron	Duraloc	1,153	13,325.6	165	1.24	1.06	1.44
Exeter V40	Duraloc	987	10,194.9	91	0.89	0.72	1.10
Exeter V40	Fitmore	872	3,876.7	7	0.18	0.07	0.37
CPT	Trilogy	842	5,901.0	54	0.92	0.69	1.19
Exeter	Osteolock	836	10,699.8	72	0.67	0.53	0.85
MS 30	Morscher	787	9,287.5	59	0.64	0.48	0.81
Exeter V40	Morscher	630	6,795.5	34	0.50	0.35	0.70
Elite plus	Duraloc	608	6,736.4	109	1.62	1.32	1.94
Exeter	Duraloc	553	7,552.5	105	1.39	1.14	1.68
Exeter	Morscher	551	7,876.4	34	0.43	0.30	0.60
Exeter V40	R3 porous	534	1,681.1	12	0.71	0.35	1.21
Lateral straight stem	RM cup	533	4,920.8	41	0.83	0.60	1.13
Exeter V40	Reflection porous	475	3,711.2	11	0.30	0.14	0.51
Spectron	R3 porous	421	2,083.8	7	0.34	0.12	0.66
MS 30	Continuum TM	371	1,246.1	7	0.56	0.20	1.10
SL modular stem	RM cup	322	4,409.6	38	0.86	0.61	1.18
MS 30	Trilogy	311	1,696.2	4	0.24	0.06	0.60
Exeter V40	Osteolock	270	3,056.2	15	0.49	0.27	0.81
CPCS	R3 porous	263	638.3	5	0.78	0.25	1.83
Versys cemented	Trilogy	237	2,536.5	7	0.28	0.11	0.57
Exeter	Trilogy	213	2,807.6	14	0.50	0.27	0.84
CPT	Duraloc	212	2,381.5	15	0.63	0.35	1.04
Spectron	Morscher	210	2,672.0	30	1.12	0.76	1.60
Exeter V40	Trabecular Metal Shell	198	938.8	11	1.17	0.58	2.10
Exeter V40	Delta-TT Cup	189	577.8	4	0.69	0.19	1.77
CPT	Fitmore	181	908.6	9	0.99	0.42	1.81
Lateral straight stem	RM Pressfit cup	173	1,133.6	3	0.26	0.05	0.77
Friendly	Delta-PF Cup	168	1,543.4	5	0.32	0.11	0.76



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Spectron	Mallory-Head	152	1,695.8	7	0.41	0.15	0.81
TwinSys cemented	RM cup	148	1,356.5	5	0.37	0.10	0.81
CPT	Trident	145	1,496.0	11	0.74	0.37	1.32
Standard straight stem	RM cup	138	1,463.2	10	0.68	0.30	1.21
Standard straight stem	RM Pressfit cup	137	1,006.6	1	0.10	0.00	0.55
CCA	RM Pressfit cup	135	1,183.3	4	0.34	0.09	0.87
Corail	Ultima	134	1,143.4	3	0.26	0.05	0.77
Exeter	CLS Expansion	129	1,539.2	10	0.65	0.31	1.19
Exeter V40	Monoblock Acetabular Cup	123	1,486.1	5	0.34	0.11	0.79
Accolade	Muller PE cup	114	1,152.3	3	0.26	0.05	0.76
Basis	Reflection porous	108	768.4	2	0.26	0.03	0.94
C-Stem AMT	RM Pressfit cup	106	369.8	4	1.08	0.23	2.57
TwinSys cemented	Continuum TM	101	310.6	1	0.32	0.01	1.79
MS 30	RM Pressfit cup	90	719.5	4	0.56	0.15	1.42
Exeter V40	CLS Expansion	88	968.2	2	0.21	0.03	0.75
CPT	Tritanium	85	534.2	6	1.12	0.41	2.44
CPT	Monoblock Acetabular Cup	84	878.8	8	0.91	0.36	1.72
Exeter	Trident	84	1,207.9	0	0.00	0.00	0.31
Lateral straight stem	Continuum TM	78	409.5	2	0.49	0.06	1.76
Spectron	Fitmore	78	927.4	4	0.43	0.12	1.10
Spectron	Trident	78	843.4	3	0.36	0.07	1.04
Exeter V40	G7 acetabular shell	73	129.8	3	2.31	0.48	6.76
Lateral straight stem	Trilogy	69	515.4	10	1.94	0.93	3.57
Spectron	Biomex acet shell porous	68	978.4	5	0.51	0.17	1.19
TwinSys cemented	Pinnacle	68	224.1	7	3.12	1.26	6.44
Friendly	Delta-TT Cup	66	354.3	4	1.13	0.31	2.89
C-Stem	Pinnacle	65	199.4	3	1.50	0.31	4.40
TwinSys cemented	Selexys TPS	65	409.4	5	1.22	0.40	2.85
CPT	Pinnacle	64	481.1	2	0.42	0.05	1.50
CPT	Delta-TT Cup	60	120.2	3	2.50	0.35	6.66
MS 30	Duraloc	55	714.7	6	0.84	0.31	1.83
C-Stem	Duraloc	53	609.6	6	0.98	0.31	2.03
TwinSys cemented	Reflection porous	50	122.4	0	0.00	0.00	3.01

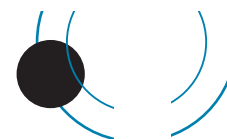


## Prosthesis combinations based on femur in alphabetical order

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
ABG	ABGII	72	1,074.2	16	1.49	0.85	2.42
ABG	Duraloc	116	1,805.8	37	2.05	1.44	2.82
ABGII	Delta-PF Cup	107	1,188.7	11	0.93	0.46	1.66
ABGII	Duraloc	139	1,846.5	34	1.84	1.25	2.54
ABGII	Pinnacle	67	597.3	3	0.50	0.10	1.47
ABGII	RM Pressfit cup	69	152.7	5	3.28	0.88	7.18
ABGII	Trident	342	3,754.1	29	0.77	0.52	1.11
Accolade	Muller PE cup	114	1,152.3	3	0.26	0.05	0.76
Accolade	Pinnacle	180	1,458.3	2	0.14	0.02	0.50
Accolade	Trident	1,867	18,980.0	91	0.48	0.38	0.59
Accolade	Tritanium	152	925.9	3	0.32	0.07	0.95
Accolade II	Delta-TT Cup	54	63.0	0	0.00	0.00	5.85
Accolade II	RM Pressfit cup	52	65.6	2	3.05	0.37	11.02
Accolade II	Trident	639	1,432.4	8	0.56	0.24	1.10
Accolade II	Tritanium	735	1,573.2	9	0.57	0.26	1.09
AML	Duraloc	53	748.7	6	0.80	0.29	1.74
AML MMA	Duraloc	74	986.4	9	0.91	0.42	1.73
Anthology Porous	BHR Acetabular Cup	93	682.9	42	6.15	4.37	8.23
Anthology Porous	R3 porous	67	454.2	30	6.61	4.46	9.43
Avenir Muller uncemented	Continuum TM	178	931.1	11	1.18	0.59	2.11
Avenir Muller uncemented	Pinnacle	99	708.4	3	0.42	0.06	1.13
Avenir Muller uncemented	RM cup	105	734.8	1	0.14	0.00	0.76
Avenir Muller uncemented	Tritanium	91	569.3	1	0.18	0.00	0.98
Basis	Reflection porous	108	768.4	2	0.26	0.03	0.94
CBC Stem	Expansys shell	183	1,675.4	24	1.43	0.89	2.10
CBC Stem	Fitmore	59	543.9	5	0.92	0.30	2.15
CBC Stem	RM Pressfit cup	432	2,314.3	21	0.91	0.56	1.39
CCA	CCB	765	5,771.6	26	0.45	0.29	0.66
CCA	Contemporary	74	754.4	10	1.33	0.64	2.44
CCA	RM Pressfit cup	135	1,183.3	4	0.34	0.09	0.87
Charnley	Charnley	456	5,153.5	21	0.41	0.25	0.62
Charnley	Charnley Cup Ogee	303	3,706.9	24	0.65	0.40	0.95
CLS	Allofit	192	1,776.2	19	1.07	0.64	1.67
CLS	Artek	59	685.6	24	3.50	2.24	5.21
CLS	CLS Expansion	1,263	14,788.2	113	0.76	0.63	0.92
CLS	Continuum TM	644	2,278.7	17	0.75	0.43	1.19
CLS	Duraloc	699	8,696.2	83	0.95	0.76	1.18



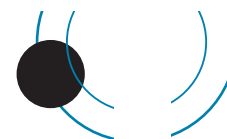
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Durom	198	1,823.0	56	3.07	2.32	3.99
CLS	Fitmore	2,266	21,599.1	107	0.50	0.40	0.60
CLS	Monoblock Acetabular Cup	80	784.5	4	0.51	0.14	1.31
CLS	Morscher	1,682	21,477.4	104	0.48	0.40	0.59
CLS	Pinnacle	80	535.0	1	0.19	0.00	1.04
CLS	Reflection porous	358	2,688.1	20	0.74	0.45	1.15
CLS	RM cup	113	1,097.7	15	1.37	0.76	2.25
CLS	RM Pressfit cup	540	3,363.4	24	0.71	0.45	1.04
CLS	Trabecular Metal Shell	51	379.8	2	0.53	0.06	1.90
CLS	Trident	165	1,718.9	12	0.70	0.36	1.22
CLS	Trilogy	572	3,726.5	21	0.56	0.35	0.86
CLS	Tritanium	76	287.9	3	1.04	0.21	3.05
CLS	Weill ring	106	1,524.3	10	0.66	0.29	1.16
Contemporary	Contemporary	71	884.3	11	1.24	0.62	2.23
Corail	ASR	156	1,125.1	81	7.20	5.72	8.95
Corail	Continuum TM	269	834.9	7	0.84	0.30	1.65
Corail	DeltaMotion Cup	78	440.8	0	0.00	0.00	0.84
Corail	Delta-PF Cup	80	825.3	2	0.24	0.03	0.88
Corail	Duraloc	464	4,824.3	47	0.97	0.72	1.30
Corail	Fitmore	268	629.1	6	0.95	0.35	2.08
Corail	Monoblock Acetabular Cup	95	860.2	5	0.58	0.19	1.36
Corail	Pinnacle	8,876	39,586.8	266	0.67	0.59	0.76
Corail	Reflection porous	140	1,237.1	1	0.08	0.00	0.45
Corail	RM Pressfit cup	137	374.5	4	1.07	0.29	2.73
Corail	Trident	80	402.0	3	0.75	0.15	2.18
Corail	Trilogy	190	774.1	3	0.39	0.08	1.13
Corail	Tritanium	153	665.7	4	0.60	0.16	1.54
Corail	Ultima	135	1,152.6	3	0.26	0.05	0.76
CPCS	R3 porous	263	638.3	5	0.78	0.25	1.83
CPT	Continuum TM	1,195	3,730.2	37	0.99	0.69	1.35
CPT	Delta-TT Cup	60	120.2	3	2.50	0.35	6.66
CPT	Duraloc	212	2,381.5	15	0.63	0.35	1.04
CPT	Fitmore	181	908.6	9	0.99	0.42	1.81
CPT	Monoblock Acetabular Cup	84	878.8	8	0.91	0.36	1.72
CPT	Pinnacle	64	481.1	2	0.42	0.05	1.50
CPT	Trident	145	1,496.0	11	0.74	0.37	1.32
CPT	Trilogy	842	5,901.0	54	0.92	0.69	1.19
CPT	Tritanium	85	534.2	6	1.12	0.41	2.44



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CPT	ZCA	543	5,277.8	33	0.63	0.43	0.88
CPT	ZCA all-poly cup	96	396.8	1	0.25	0.01	1.40
C-Stem	Duraloc	53	609.6	6	0.98	0.31	2.03
C-Stem	Elite Plus Ogee	55	523.7	2	0.38	0.05	1.38
C-Stem	Marathon cemented	75	237.3	0	0.00	0.00	1.55
C-Stem	Pinnacle	65	199.4	3	1.50	0.31	4.40
C-Stem AMT	Marathon cemented	316	1,534.1	8	0.52	0.23	1.03
C-Stem AMT	Pinnacle	1,983	6,263.9	51	0.81	0.60	1.06
C-Stem AMT	RM Pressfit cup	106	369.8	4	1.08	0.23	2.57
Echo Bi-Metric	Continuum TM	80	93.4	2	2.14	0.26	7.73
Echo Bi-Metric	Exceed ABT Ringloc-X	57	263.6	1	0.38	0.01	2.11
Echo Bi-Metric	G7 acetabular shell	225	471.0	3	0.64	0.09	1.70
Elite plus	Charnley	298	3,572.0	22	0.62	0.37	0.92
Elite plus	Duraloc	608	6,736.4	109	1.62	1.32	1.94
Elite plus	Elite Plus LPW	282	2,956.6	13	0.44	0.23	0.75
Elite plus	Elite Plus Ogee	110	1,042.6	6	0.58	0.21	1.25
Exeter	Bio-clad poly	113	1,241.1	6	0.48	0.15	1.00
Exeter	CLS Expansion	129	1,539.2	10	0.65	0.31	1.19
Exeter	Contemporary	1,551	17,855.8	176	0.99	0.84	1.14
Exeter	Duraloc	553	7,552.5	105	1.39	1.14	1.68
Exeter	Exeter	1,326	14,785.9	108	0.73	0.60	0.88
Exeter	Morscher	551	7,876.4	34	0.43	0.30	0.60
Exeter	Muller PE cup	119	1,425.4	6	0.42	0.15	0.92
Exeter	Osteolock	836	10,699.8	72	0.67	0.53	0.85
Exeter	Trident	84	1,207.9	0	0.00	0.00	0.31
Exeter	Trilogy	213	2,807.6	14	0.50	0.27	0.84
Exeter V40	Bio-clad poly	140	898.5	5	0.56	0.18	1.30
Exeter V40	CCB	534	2,609.9	10	0.38	0.18	0.70
Exeter V40	CLS Expansion	88	968.2	2	0.21	0.03	0.75
Exeter V40	Contemporary	6,390	45,809.8	211	0.46	0.40	0.53
Exeter V40	Continuum TM	2,302	7,904.2	75	0.95	0.74	1.18
Exeter V40	Delta-TT Cup	189	577.8	4	0.69	0.19	1.77
Exeter V40	Duraloc	987	10,194.9	91	0.89	0.72	1.10
Exeter V40	Exeter	1,641	14,644.4	77	0.53	0.41	0.66
Exeter V40	Exeter X3	1,764	5,633.4	22	0.39	0.24	0.59
Exeter V40	Fitmore	872	3,876.7	7	0.18	0.07	0.37
Exeter V40	G7 acetabular shell	73	129.8	3	2.31	0.48	6.76
Exeter V40	Monoblock Acetabular Cup	123	1,486.1	5	0.34	0.11	0.79



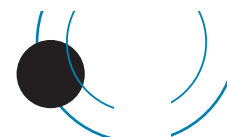
Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Morscher	630	6,795.5	34	0.50	0.35	0.70
Exeter V40	Muller PE cup	94	864.8	3	0.35	0.07	1.01
Exeter V40	Osteolock	270	3,056.2	15	0.49	0.27	0.81
Exeter V40	Pinnacle	2,159	9,719.9	44	0.45	0.33	0.61
Exeter V40	R3 porous	534	1,681.1	12	0.71	0.35	1.21
Exeter V40	Reflection cemented	891	4,979.2	20	0.40	0.25	0.62
Exeter V40	Reflection porous	475	3,711.2	11	0.30	0.14	0.51
Exeter V40	RM Pressfit cup	2,084	9,023.8	30	0.33	0.22	0.47
Exeter V40	Trabecular Metal Shell	198	938.8	11	1.17	0.58	2.10
Exeter V40	Trident	9,342	5,5192.0	233	0.42	0.37	0.48
Exeter V40	Trilogy	2,652	17,553.8	72	0.41	0.32	0.52
Exeter V40	Tritanium	2,702	8,505.5	63	0.74	0.57	0.95
Exeter V40	Weber	53	535.9	1	0.19	0.00	1.04
Exeter V40	ZCA	85	527.7	1	0.19	0.00	1.06
Exeter V40	ZCA all-poly cup	100	351.6	0	0.00	0.00	1.05
Friendly	Delta-PF Cup	168	1,543.4	5	0.32	0.11	0.76
Friendly	Delta-TT Cup	66	354.3	4	1.13	0.31	2.89
Furlong	Furlong	66	736.6	6	0.81	0.30	1.77
H-Max M	Delta-PF Cup	71	480.3	7	1.46	0.59	3.00
H-Max M	Delta-TT Cup	86	575.7	2	0.35	0.04	1.25
H-Max S	Delta-PF Cup	184	409.9	6	1.46	0.54	3.19
H-Max S	Delta-TT Cup	689	2,278.1	23	1.01	0.64	1.51
Lateral straight stem	Continuum TM	78	409.5	2	0.49	0.06	1.76
Lateral straight stem	Muller PE cup	749	6,971.0	38	0.55	0.38	0.74
Lateral straight stem	RM cup	533	4,920.8	41	0.83	0.60	1.13
Lateral straight stem	RM Pressfit cup	173	1,133.6	3	0.26	0.05	0.77
Lateral straight stem	Trilogy	69	515.4	10	1.94	0.93	3.57
Lateral straight stem	Weber	287	2,758.1	10	0.36	0.17	0.67
Lateral straight stem							
	ZCA	98	689.2	1	0.15	0.00	0.81
Lateral straight stem	ZCA all-poly cup	70	363.4	0	0.00	0.00	1.02
M/L Taper	Continuum TM	881	3,218.3	26	0.81	0.52	1.17
M/L Taper	Delta-TT Cup	64	268.4	5	1.86	0.60	4.35
M/L Taper	Trident	197	535.6	5	0.93	0.30	2.18
M/L Taper	Trilogy	212	1,663.5	9	0.54	0.23	0.99
Mallory-Head	M2A	105	1,157.8	15	1.30	0.73	2.14
MS 30	Contemporary	128	1,195.8	9	0.75	0.34	1.43
MS 30	Continuum TM	371	1,246.1	7	0.56	0.20	1.10
MS 30	Duraloc	55	714.7	6	0.84	0.31	1.83
MS 30	Fitmore	1,982	12,441.5	35	0.28	0.20	0.39



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Morscher	787	9,287.5	59	0.64	0.48	0.81
MS 30	Muller PE cup	462	4,319.0	15	0.35	0.19	0.57
MS 30	RM Pressfit cup	90	719.5	4	0.56	0.15	1.42
MS 30	Trilogy	311	1,696.2	4	0.24	0.06	0.60
MS 30	ZCA all-poly cup	94	433.6	0	0.00	0.00	0.85
Omnifit	Trident	149	1,702.8	13	0.76	0.41	1.31
Optimys	RM Pressfit cup	60	63.0	0	0.00	0.00	5.85
Polarstem uncemented	R3 porous	1,245	3,226.7	20	0.62	0.38	0.96
Polarstem uncemented	Reflection porous	335	1,790.5	14	0.78	0.43	1.31
Prodigy	Duraloc	113	1,433.2	21	1.47	0.91	2.24
SL modular stem	Muller PE cup	83	1,061.3	2	0.19	0.02	0.68
SL modular stem	RM cup	322	4,409.6	38	0.86	0.61	1.18
SL monoblock	Muller PE cup	488	5,305.0	23	0.43	0.27	0.65
Spectron	Biomex acet shell porous	68	978.4	5	0.51	0.17	1.19
Spectron	Duraloc	1,153	13,325.6	165	1.24	1.06	1.44
Spectron	Fitmore	78	927.4	4	0.43	0.12	1.10
Spectron	Mallory-Head	152	1,695.8	7	0.41	0.15	0.81
Spectron	Morscher	210	2,672.0	30	1.12	0.76	1.60
Spectron	Muller PE cup	66	644.7	7	1.09	0.39	2.13
Spectron	R3 porous	421	2,083.8	7	0.34	0.12	0.66
Spectron	Reflection cemented	2,954	28,768.5	326	1.13	1.01	1.26
Spectron	Reflection porous	2,755	26,021.3	212	0.81	0.71	0.93
Spectron	Trident	78	843.4	3	0.36	0.07	1.04
S-Rom	ASR	130	767.1	94	12.25	9.84	14.92
S-Rom	Pinnacle	367	3,298.9	34	1.03	0.70	1.42
S-Rom	Ultima	78	1,172.0	13	1.11	0.59	1.90
Standard straight stem	Muller PE cup	628	5,529.1	18	0.33	0.19	0.50
Standard straight stem	RM cup	138	1,463.2	10	0.68	0.30	1.21
Standard straight stem	RM Pressfit cup	137	1,006.6	1	0.10	0.00	0.55
Standard straight stem	Weber	134	1,250.9	4	0.32	0.09	0.82
Standard straight stem	ZCA all-poly cup	50	251.6	1	0.40	0.00	2.21
Stemsys	Agilis Ti-por	393	1,102.2	14	1.27	0.66	2.07
Stemsys	DeltaMotion Cup	441	1,954.1	5	0.26	0.08	0.60
Stemsys	Delta-PF Cup	322	724.1	1	0.14	0.00	0.65
Stemsys	Fixa Ti Por	630	2,064.7	12	0.58	0.28	0.98
Stemsys	Polymax	99	150.5	2	1.33	0.16	4.80



Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Stemsys	RM Pressfit cup	287	918.5	5	0.54	0.18	1.27
Summit	ASR	88	694.6	35	5.04	3.51	7.01
Summit	Duraloc	101	1,132.1	5	0.44	0.14	1.03
Summit	Pinnacle	2,063	11,438.9	89	0.78	0.62	0.96
Summit	Trilogy	157	1,149.2	6	0.52	0.19	1.14
Synergy Porous	BHR Acetabular Cup	114	968.8	38	3.92	2.78	5.38
Synergy Porous	Delta-PF Cup	88	695.7	1	0.14	0.00	0.80
Synergy Porous	R3 porous	1,653	6,326.1	54	0.85	0.64	1.11
Synergy Porous	Reflection porous	1,224	10,782.9	42	0.39	0.28	0.53
Taperloc Complete	G7 acetabular shell	163	178.5	4	2.24	0.47	5.74
Taperloc Complete	RM Pressfit cup	124	125.3	3	2.39	0.49	6.99
Trabecular Metal Stem	Continuum TM	437	1,744.8	17	0.97	0.57	1.56
Trabecular Metal Stem	Monoblock Acetabular Cup	74	753.5	3	0.40	0.06	1.06
Tri-Lock BPS	Pinnacle	63	367.5	3	0.82	0.11	2.18
TwinSys cemented	CCB	427	2,075.9	13	0.63	0.33	1.07
TwinSys cemented	Continuum TM	101	310.6	1	0.32	0.01	1.79
TwinSys cemented	Pinnacle	68	224.1	7	3.12	1.26	6.44
TwinSys cemented	Reflection porous	50	122.4	0	0.00	0.00	3.01
TwinSys cemented	RM cup	148	1,356.5	5	0.37	0.10	0.81
TwinSys cemented	RM Pressfit cup	1,667	7,113.0	36	0.51	0.35	0.69
TwinSys cemented	Selexys TPS	65	409.4	5	1.22	0.40	2.85
TwinSys uncemented	Continuum TM	133	700.4	4	0.57	0.16	1.46
TwinSys uncemented	Delta-PF Cup	370	2,646.5	1	0.04	0.00	0.18
TwinSys uncemented	RM cup	122	912.9	8	0.88	0.38	1.73
TwinSys uncemented	RM Pressfit cup	4,614	25,657.2	171	0.67	0.57	0.77
TwinSys uncemented	Selexys TPS	1,231	9,374.0	125	1.33	1.11	1.59
TwinSys uncemented	Trilogy	209	1,636.1	9	0.55	0.23	1.00
Versys	Trilogy	272	3,696.2	17	0.46	0.27	0.74
Versys cemented	Trilogy	237	2,536.5	7	0.28	0.11	0.57
Versys cemented	ZCA	391	4,002.8	25	0.62	0.39	0.91
Wagner cone stem	Fitmore	72	739.4	3	0.41	0.08	1.19



## 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	752	7,356.5	57	0.77	0.59	1.00
<=28	CM	35	156.1	2	1.28	0.16	4.63
<=28	CP	11,379	101,585.6	696	0.69	0.64	0.74
<=28	MM	2,938	37,164.1	279	0.75	0.67	0.84
<=28	MP	45,808	411,069.0	2,900	0.71	0.68	0.73
32	CC	3,649	27,138.2	152	0.56	0.47	0.65
32	CP	11,608	41,950.2	232	0.55	0.48	0.63
32	MM	480	4,418.9	40	0.91	0.65	1.23
32	MP	26,544	113,600.1	679	0.60	0.55	0.64
36	CC	6,889	39,719.4	231	0.58	0.51	0.66
36	CM	443	3,263.7	24	0.74	0.46	1.08
36	CP	5,225	17,504.0	111	0.63	0.52	0.76
36	MM	1,002	9,589.6	119	1.24	1.03	1.48
36	MP	3,449	12,231.6	95	0.78	0.62	0.94
>36	CC	1,689	7,035.6	35	0.50	0.35	0.69
>36	CM	7	55.6	0	0.00	0.00	6.64
>36	CP	4	15.9	0	0.00	0.00	23.19
>36	MM	1,648	13,789.5	521	3.78	3.46	4.11
>36	MP	34	168.8	1	0.59	0.00	3.30

## Summary Revision Rates vs Head Size

Size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	60,912	557,331.3	3,934	0.71	0.68	0.73
32	42,281	187,107.4	1,103	0.59	0.56	0.63
36	17,008	82,308.3	580	0.70	0.65	0.76
>36	3,382	21,065.4	557	2.64	2.43	2.87



### Revision Comparison Standard vs Cross linked Polyethylene

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	12,990	81,257.3	475	0.58	0.53	0.64
CM	486	3,477.4	26	0.75	0.48	1.08
CP	28,239	161,076.8	1,040	0.65	0.61	0.69
PS	6,991	75,803.6	578	0.76	0.70	0.83
PX	21,248	85,273.1	462	0.54	0.49	0.59
MM	6,074	64,982.0	960	1.48	1.38	1.57
MP	75,844	537,083.6	3,675	0.68	0.66	0.71
PS	36,698	334,516.6	2,511	0.75	0.72	0.78
PX	39,146	202,567.0	1,164	0.57	0.54	0.61

### Revision vs Bearing Surfaces of Uncemented Prostheses

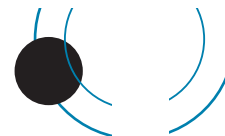
Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	10,186	64,668.5	400	0.62	0.56	0.68
CM	475	3,450.7	25	0.72	0.47	1.07
CP	18,674	100,910.6	659	0.65	0.60	0.70
MM	5,383	57,955.6	879	1.52	1.42	1.62
MP	14,932	93,785.1	721	0.77	0.71	0.83

### 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	722	5,543.7	43	0.78	0.56	1.04
MM	7	56.7	2	3.53	0.43	12.75
MP	24,238	196,432.7	1,249	0.64	0.60	0.67

### Revision vs Bearing Surfaces of Hybrid Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	2,804	16,588.7	75	0.45	0.35	0.56
CM	11	26.7	1	3.74	0.09	20.84
CP	8,843	54,622.4	338	0.62	0.55	0.69
MM	684	6,969.8	79	1.13	0.90	1.41
MP	36,674	246,865.8	1,705	0.69	0.66	0.72



### Summary for Revision vs Bearing Surfaces

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	12,990	81,257.3	475	0.58	0.53	0.64
CM	486	3,477.4	26	0.75	0.48	1.08
CP	28,239	161,076.8	1,040	0.65	0.61	0.69
MM	6,074	64,982.0	960	1.48	1.38	1.57
MP	75,844	537,083.6	3,675	0.68	0.66	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	2,977.7	23	0.77	0.49	1.16
	P	10,607	51,728.5	297	0.57	0.51	0.64
	PS	6,005	37,355.7	214	0.57	0.50	0.65
	PX	4,602	14,372.8	83	0.58	0.46	0.71
Pinnacle	C	3,069	16,406.8	90	0.55	0.44	0.67
	M	1,525	13,889.9	162	1.17	0.99	1.36
	PS	23	134.2	0	0.00	0.00	2.75
	PX	11,612	45,227.6	265	0.59	0.52	0.66
	P	11,635	45,361.8	265	0.58	0.51	0.66
R3 porous	C	940	4,146.3	14	0.34	0.18	0.57
	M	110	761.3	47	6.17	4.54	8.21
	P	3,212	9,949.8	69	0.69	0.54	0.87
Trident	C	2,455	22,436.8	102	0.45	0.37	0.55
	M	65	118.3	1	0.84	0.02	4.71
	PS	1	11.9	0	0.00	0.00	30.96
	PX	10,809	66,039.4	331	0.50	0.45	0.56
	P	10,810	66,051.3	331	0.50	0.45	0.56
Tritanium	C	103	439.5	1	0.23	0.01	1.27
	M	100	226.7	3	1.32	0.27	3.87
	P	3,965	13,100.9	93	0.71	0.57	0.87
Trilogy	C	69	825.4	5	0.61	0.20	1.41
	M	5	54.8	0	0.00	0.00	6.73
	PS	158	2,190.0	14	0.64	0.35	1.07
	PX	5,844	41,653.8	225	0.54	0.47	0.61
	P	6,002	43,843.9	239	0.55	0.48	0.62



### Revision vs Monoblock Femoral Stems

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,297	14,668	72	0.49	0.38	0.62

### Revision vs Acetabulum types

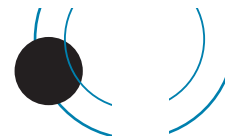
Acetabulum type	No. Ops.	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	25,477	205,765.0	1,327	0.64	0.61	0.68
Uncemented liner	78,540	498,996.5	3,607	0.72	0.70	0.75
Uncemented no liner	19,616	143,115.6	1,242	0.87	0.82	0.92

### Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	18,452	145,070.4	1,531	1.06	1.00	1.11
55-64	31,685	236,112.4	2,011	0.85	0.81	0.89
65-74	42,424	296,749.7	1,862	0.63	0.60	0.66
>=75	33,835	196,136.8	926	0.47	0.44	0.50

### 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	5,028	31,680.7	206	0.65	0.56	0.74
	55-64	5,269	33,861.3	175	0.52	0.44	0.60
	65-74	2,453	14,517.3	88	0.61	0.49	0.75
	>=75	240	1,197.9	6	0.50	0.16	1.03
CM	<55	185	1,336.6	9	0.67	0.28	1.23
	55-64	211	1,538.4	13	0.85	0.45	1.45
	65-74	74	531.3	4	0.75	0.21	1.93
	>=75	16	71.1	0	0.00	0.00	5.19
CP	<55	5,386	34,644.0	295	0.85	0.76	0.95
	55-64	9,960	58,917.4	377	0.64	0.58	0.71
	65-74	9,326	51,148.0	268	0.52	0.46	0.59
	>=75	3,567	16,367.4	100	0.61	0.49	0.74
MM	<55	2,882	33,258.1	468	1.41	1.28	1.54
	55-64	2,389	25,031.7	404	1.61	1.46	1.78
	65-74	688	6,221.0	80	1.29	1.01	1.59
	>=75	115	471.3	8	1.70	0.66	3.20
MP	<55	4,683	40,984.7	521	1.27	1.16	1.39
	55-64	13,333	111,252.2	1,003	0.90	0.85	0.96
	65-74	28,867	214,040.8	1,367	0.64	0.61	0.67
	>=75	28,961	170,805.9	784	0.46	0.43	0.49



### Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	67,526	465,821.4	3,015	0.65	0.62	0.67
Male	58,870	408,248.0	3,315	0.81	0.78	0.84

### Revision vs Surgeon Annual Workload

Operations per Year	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	1,568	12,628.4	126	1.00	0.83	1.19
10-24	13,272	92,667.9	700	0.76	0.70	0.81
25-49	51,868	366,251.8	2,863	0.78	0.75	0.81
50-74	31,156	202,831.6	1,272	0.63	0.59	0.66
75-99	16,581	99,087.8	628	0.63	0.59	0.69
>=100	11,951	100,601.9	741	0.74	0.68	0.79

### Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	4,248	36,177.7	276	0.76	0.68	0.86
Posterior	82,387	553,102.2	4,048	0.73	0.71	0.75
Lateral	31,435	232,920.1	1,568	0.67	0.64	0.71
Troch	209	1,557.6	22	1.41	0.89	2.14

### Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	26,522	218,218.3	1,381	0.63	0.60	0.67
Uncemented	50,263	324,909.7	2,715	0.84	0.80	0.87
Hybrid	49,611	330,941.3	2,234	0.68	0.65	0.70



### Revision by Arthroplasty Fixation vs Age Bands

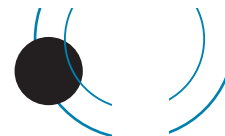
Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	732	7,268.4	136	1.87	1.57	2.21
55-64	2,559	26,615.5	302	1.13	1.01	1.27
65-74	9,160	87,187.0	587	0.67	0.62	0.73
>=75	14,071	97,147.4	356	0.37	0.33	0.41
<b>Uncemented</b>						
<55	13,691	102,678.7	979	0.95	0.89	1.01
55-64	18,287	122,244.8	1,052	0.86	0.81	0.91
65-74	13,297	76,371.1	504	0.66	0.60	0.72
>=75	4,988	23,615.2	180	0.76	0.65	0.88
<b>Hybrid</b>						
<55	4,029	35,123.4	416	1.18	1.07	1.30
55-64	10,839	87,252.1	657	0.75	0.70	0.81
65-74	19,967	133,191.6	771	0.58	0.54	0.62
>=75	14,776	75,374.2	390	0.52	0.47	0.57

### Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	15,004	86,901.2	647	0.74	0.69	0.80
2	54,930	291,247.7	1,910	0.66	0.63	0.69
3	21,908	100,616.8	689	0.68	0.63	0.74
4	796	2,669.7	29	1.09	0.73	1.56

### Revision vs BMI Status

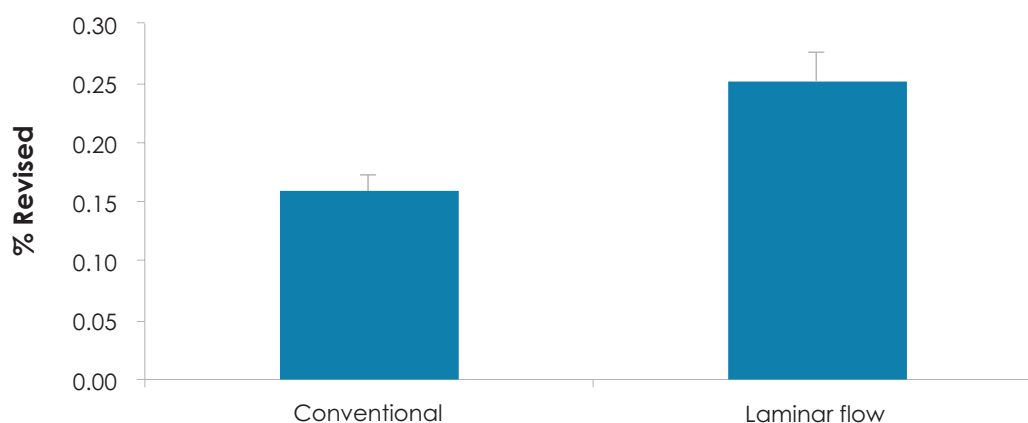
BMI	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
< 19	374	1,057.2	8	0.76	0.33	1.49
19 - 24	8,955	29,052.4	178	0.61	0.53	0.71
25 - 29	16,100	52,170.6	312	0.60	0.53	0.67
30 - 39	15,019	47,463.4	328	0.69	0.62	0.77
40+	1,629	4,716.1	57	1.21	0.92	1.57



### Revision for Deep Infection within six months vs Theatre Environment

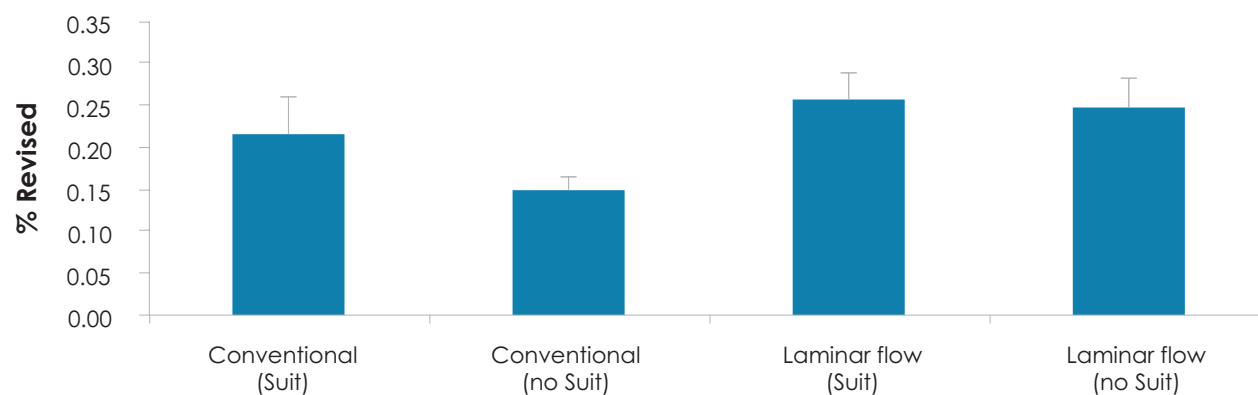
Theatre	Total Number	Number revised	%	Std Error
Conventional	74,401	118	0.159	0.0146
Laminar flow	44,444	112	0.252	0.0238

### % Revision for Deep infection within 6 months



		Total Number	Number revised	%	Std Error
Conventional	Suit	10,230	22	0.215	0.046
	No suit	64,171	96	0.149	0.0150
Laminar flow	Suit	23,065	59	0.256	0.033
	No suit	21,379	53	0.247	0.034

### % Revision for Deep infection within 6 months

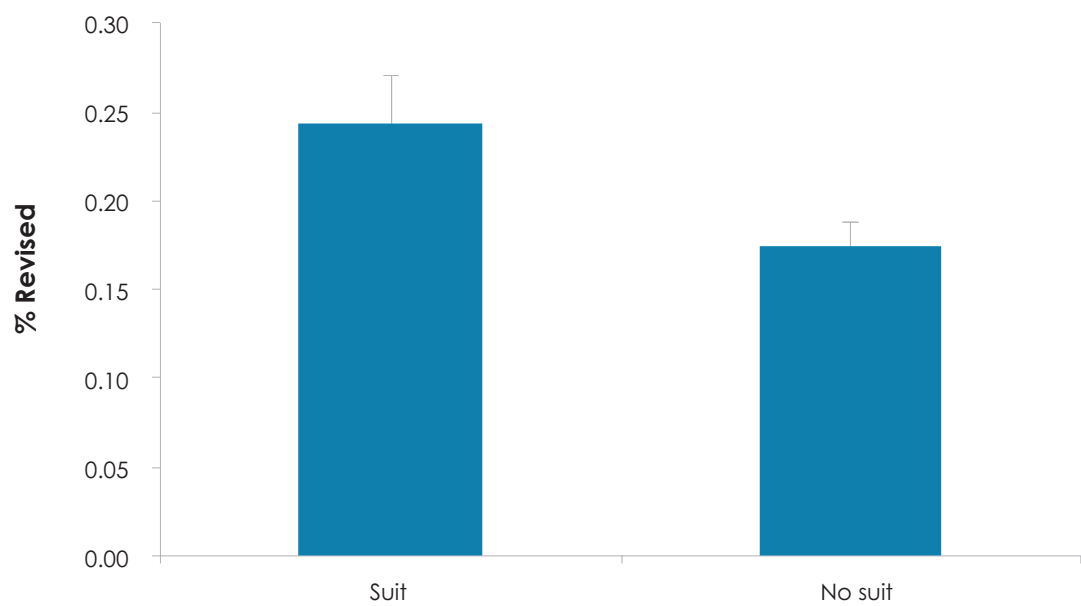


There is a significant difference in revision rates (1.7x) for laminar flow/suit compared to conventional/No suit environments.

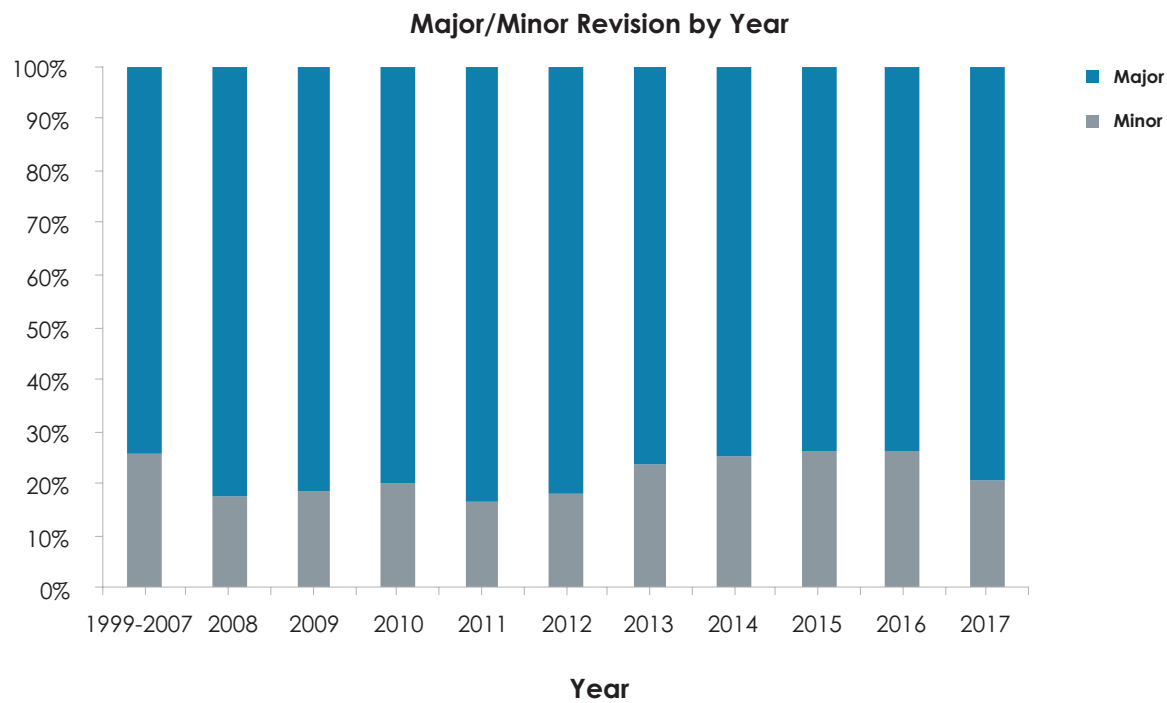


	Total Number	Number revised	%	Std Error
Suit	33,295	81	0.43	0.027
No suit	85,550	149	0.174	0.014

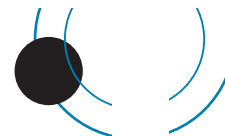
**% Revision for Deep infection within 6 months**



**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.

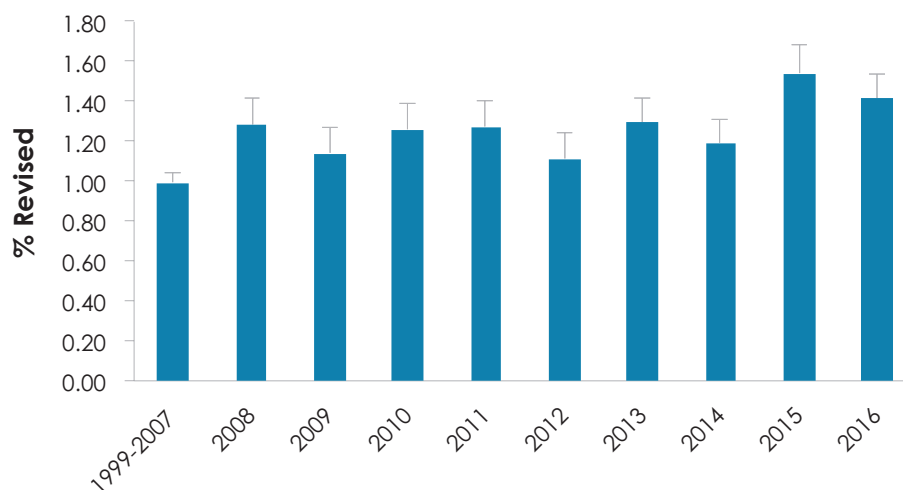


### Re Revisions for Major vs Minor Revisions

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	1,415	6,448.2	243	3.77	3.31	4.27
Major	4,874	22,522.9	651	2.89	2.67	3.12

### Percentage of hips revised in the first year

% Revised within first year



### Resurfacing Arthroplasty

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,759	12,528	144	1.15	0.97	1.35

### Resurfacing Prosthesis vs Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Adept	4	39.1	0	0.00	0.00	9.43
ASR	132	1,263.3	41	3.25	2.30	4.36
BHR	1,576	10,881.4	96	0.88	0.71	1.08
BMHR	28	190.8	1	0.52	0.01	2.92
Conserve Superfinish	3	25.6	0	0.00	0.00	14.41
Durom	4	53.5	0	0.00	0.00	6.89
Mitch TRH Resurfacing Head	12	74.6	6	8.04	2.56	16.58

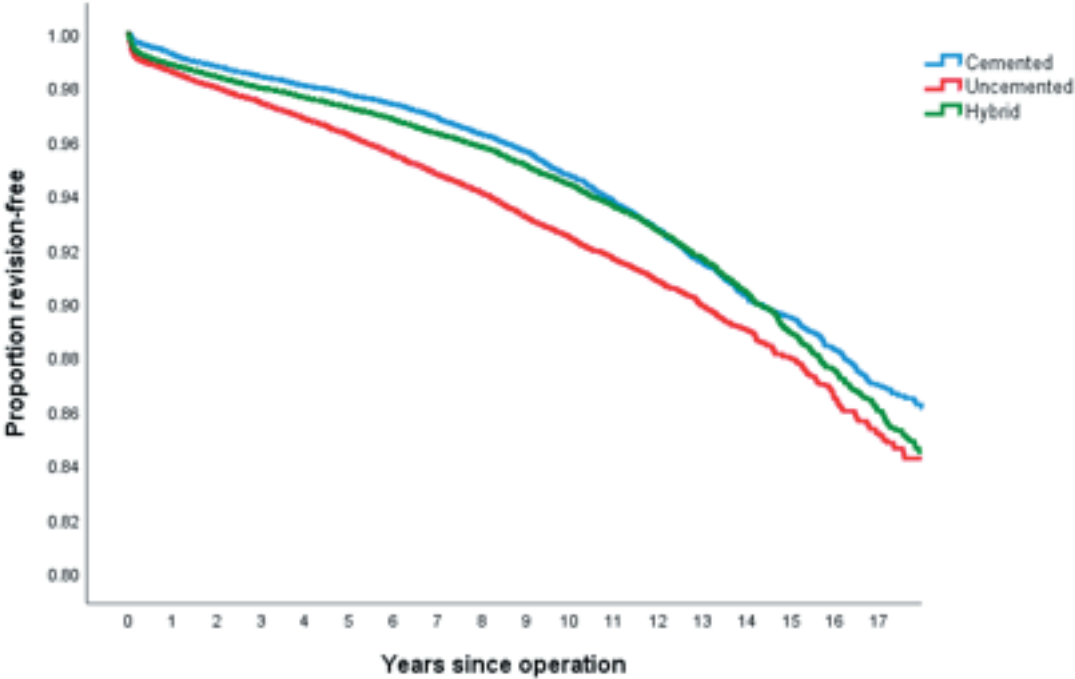
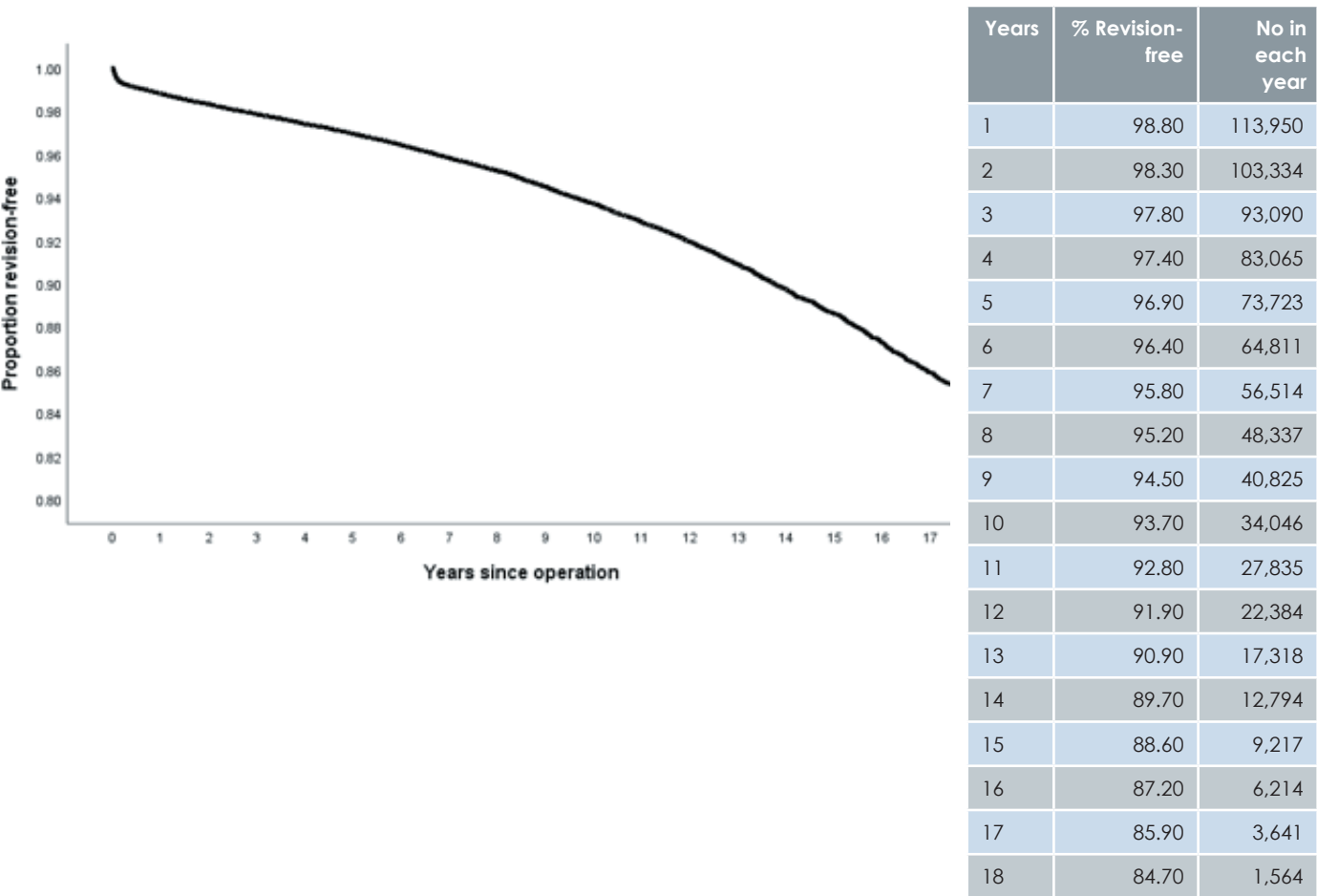
### Head size vs Revision Rate

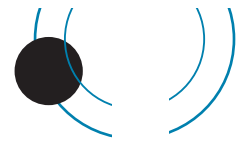
Hips resurfacing head size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=44	99	767.9	31	4.04	2.69	5.65
45-49	346	2,710.0	48	1.77	1.31	2.35
50-54	1,224	8,255.6	56	0.68	0.51	0.88
>=55	90	794.9	9	1.13	0.52	2.15



## KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 19 years 1999 – 2017 with deceased patients censored at time of death.



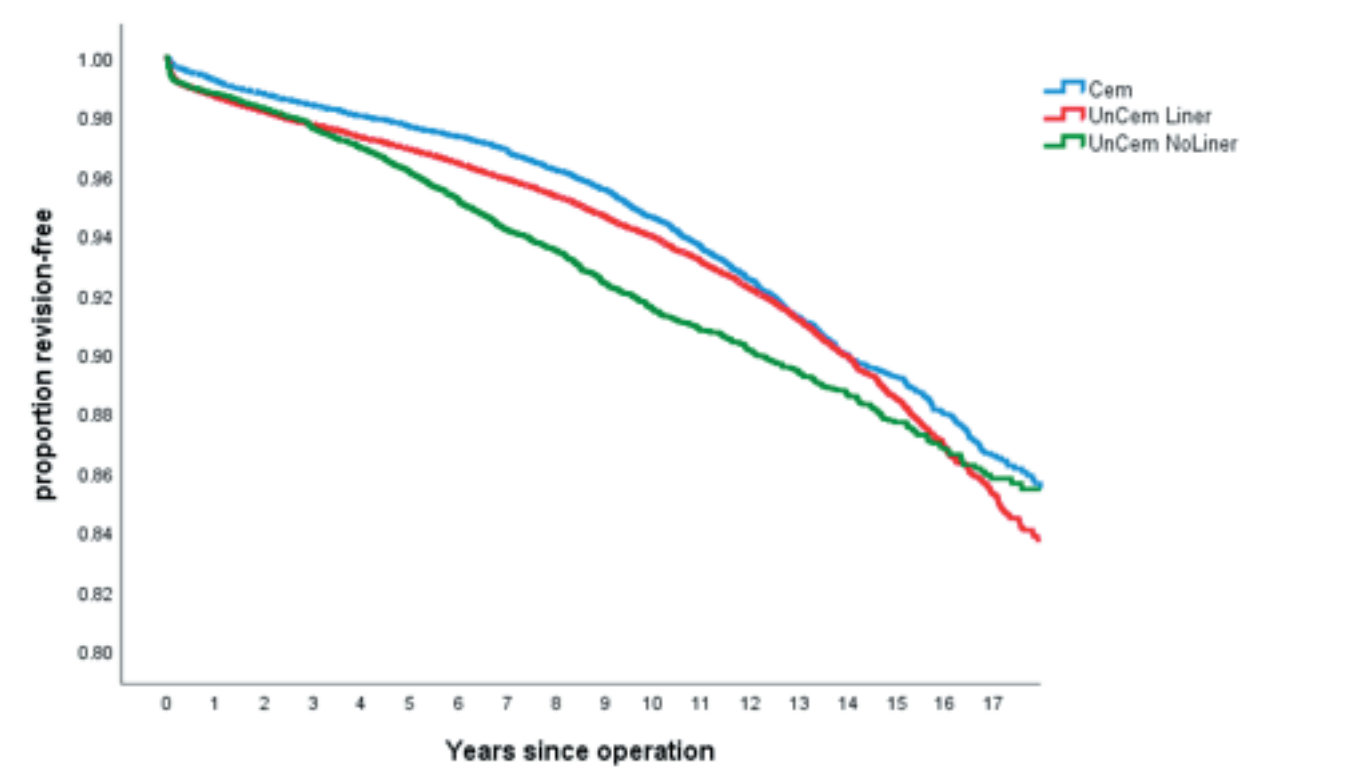


Cemented		
Years	% Revision-free	No in each year
1	99.20	24,753
2	98.80	23,281
3	98.40	21,642
4	98.00	19,835
5	97.70	18,118
6	97.40	16,325
7	96.80	14,627
8	96.20	12,993
9	95.60	11,504
10	94.70	9,963
11	93.70	8,426
12	92.70	6,954
13	91.50	5,480
14	90.20	4,150
15	89.40	3,095
16	88.30	2,160
17	87.00	1,297
18	86.10	615

Uncemented		
Years	% Revision-free	No in each year
1	98.80	44,265
2	98.40	39,592
3	98.00	35,221
4	97.60	31,104
5	97.20	27,350
6	96.80	23,830
7	96.30	20,709
8	95.80	17,900
9	95.10	15,322
10	94.40	12,941
11	93.60	10,636
12	92.70	8,649
13	91.60	6,681
14	90.40	4,893
15	88.90	3,487
16	87.50	2,315
17	86.00	1,326
18	84.50	521

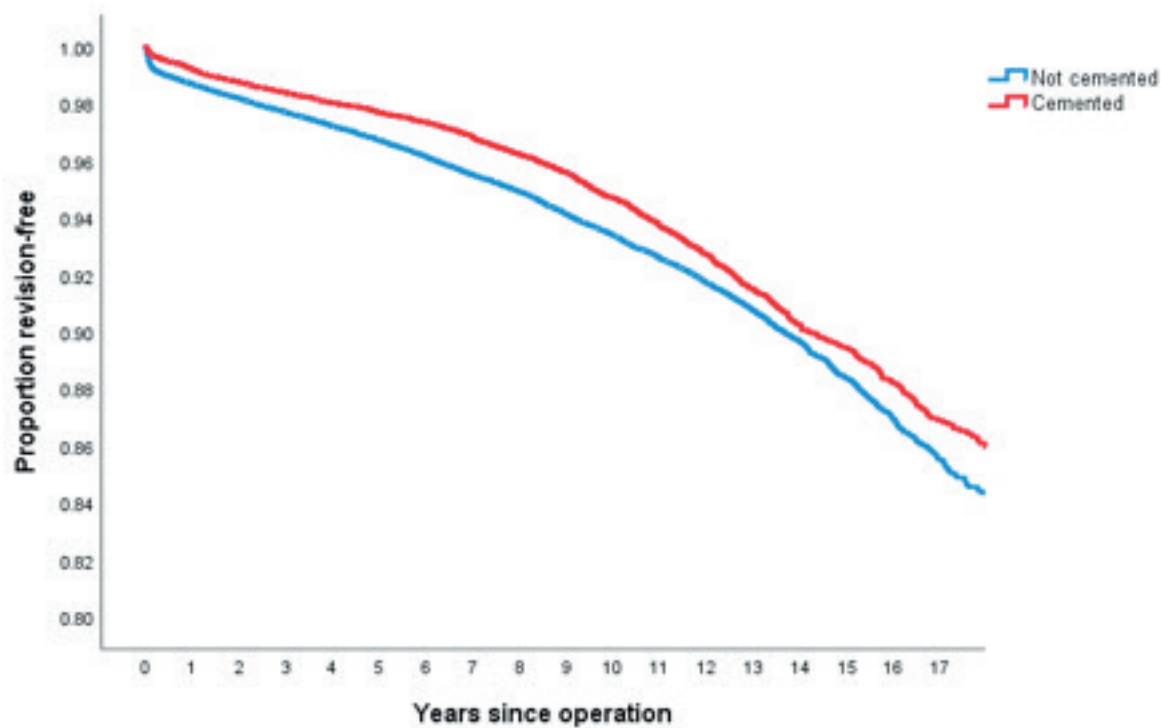
Hybrid		
Years	% Revision-free	No in each year
1	98.50	44,932
2	98.00	40,461
3	97.40	36,227
4	96.80	32,126
5	96.20	28,255
6	95.50	24,656
7	94.80	21,178
8	94.10	17,444
9	93.20	13,999
10	92.40	11,142
11	91.60	8,773
12	90.80	6,781
13	89.90	5,157
14	89.00	3,751
15	88.00	2,635
16	86.50	1,739
17	85.10	1,018
18	84.10	428

Survival of Cemented vs Uncemented no Liner vs Uncemented with Liner

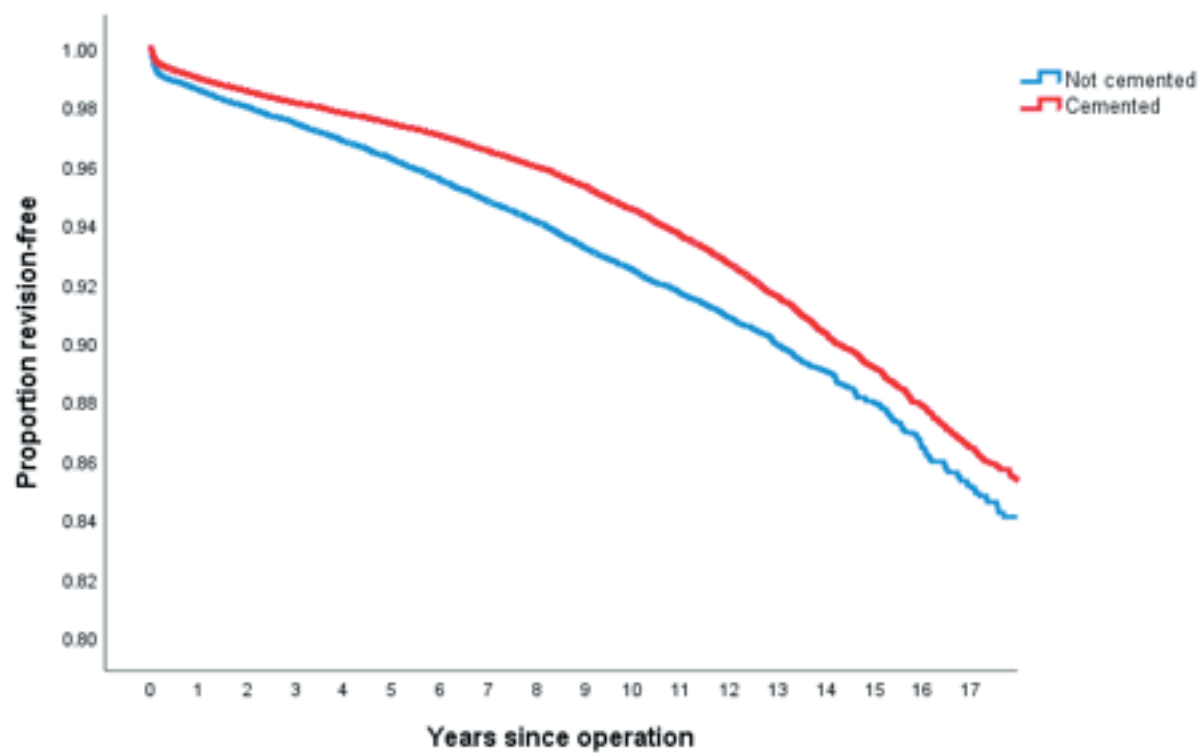


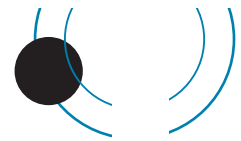


Survival of Cemented vs Uncemented Acetabulae

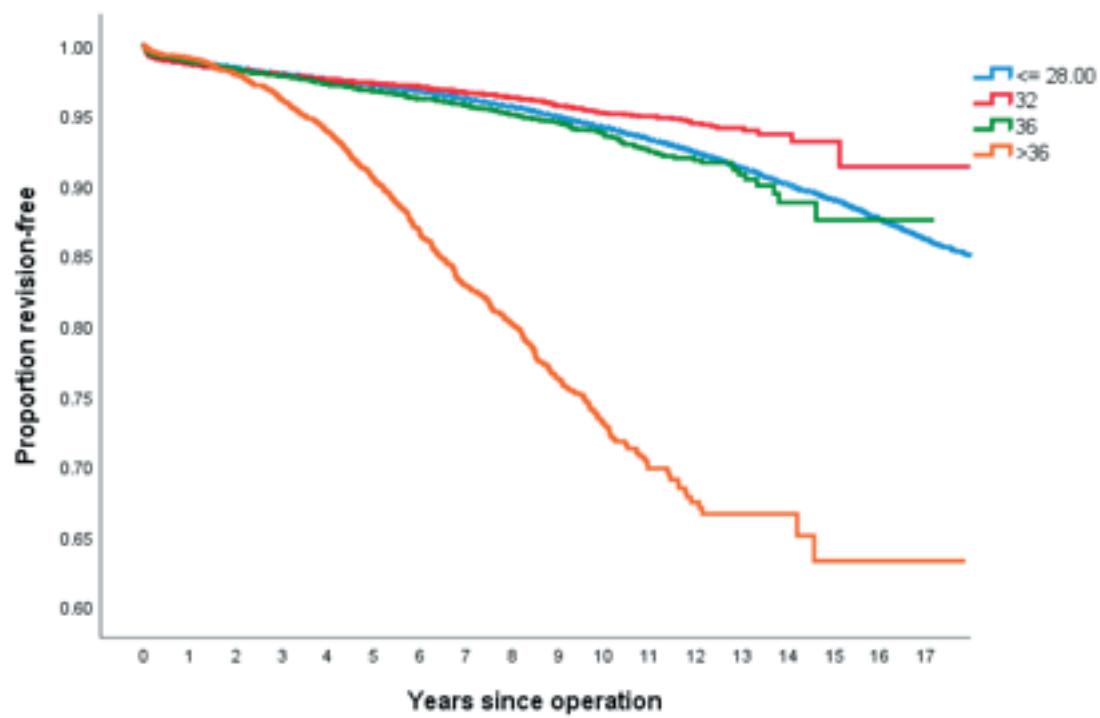


Survival of Cemented vs Uncemented Femoral components

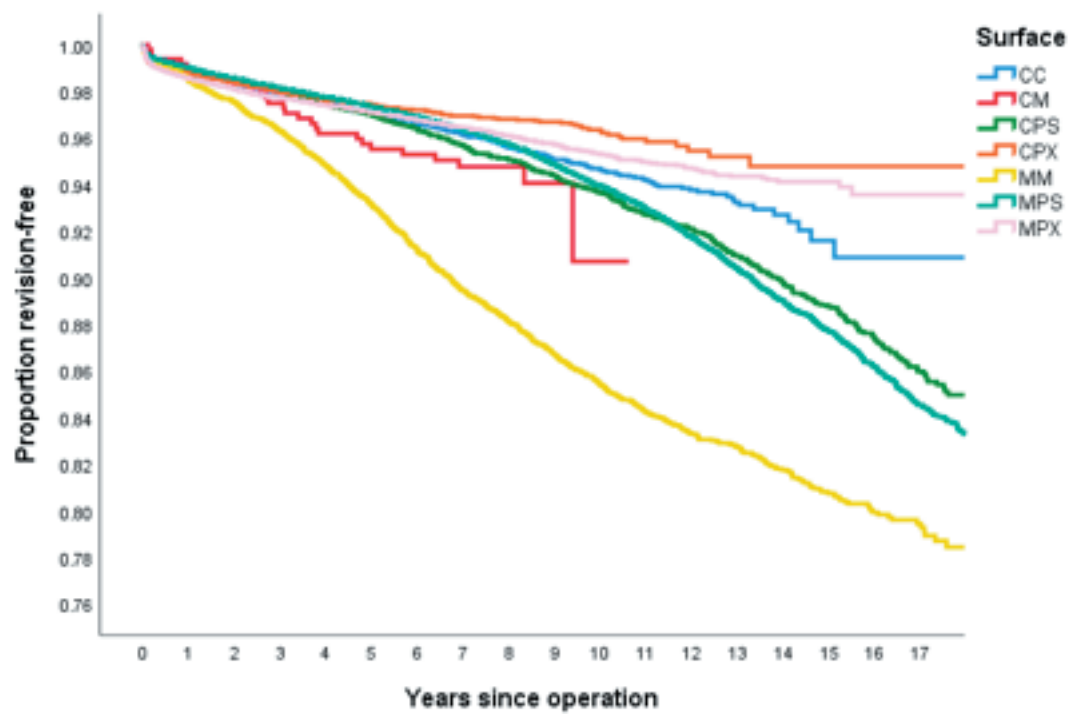




### Survival of Head Sizes

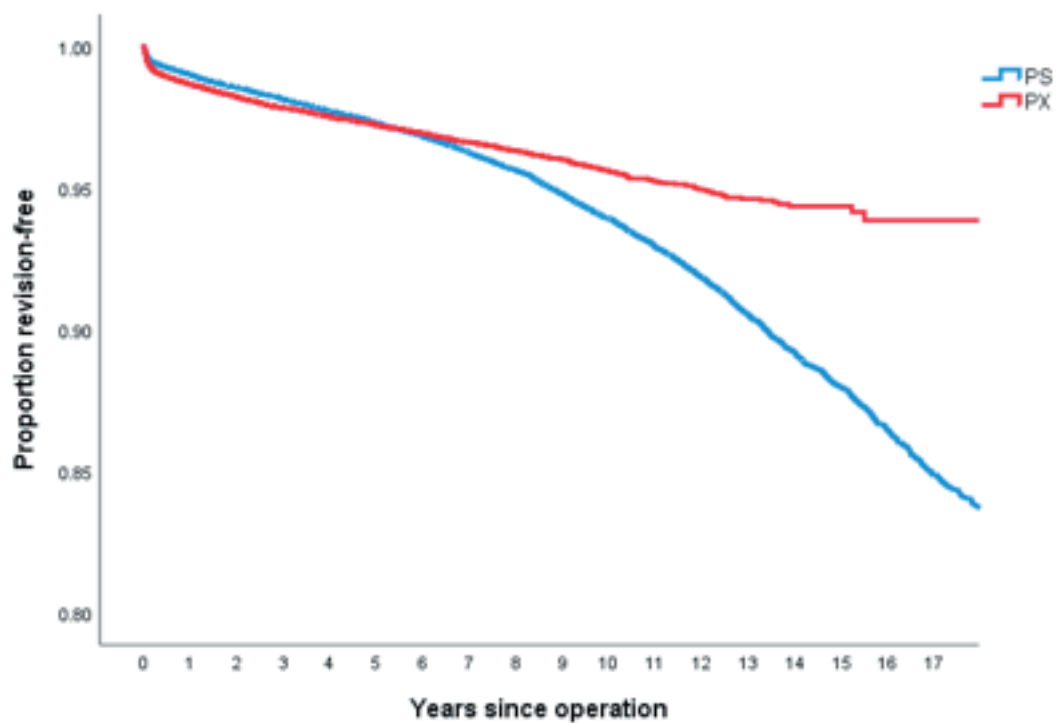


### Survival of Bearing Surfaces

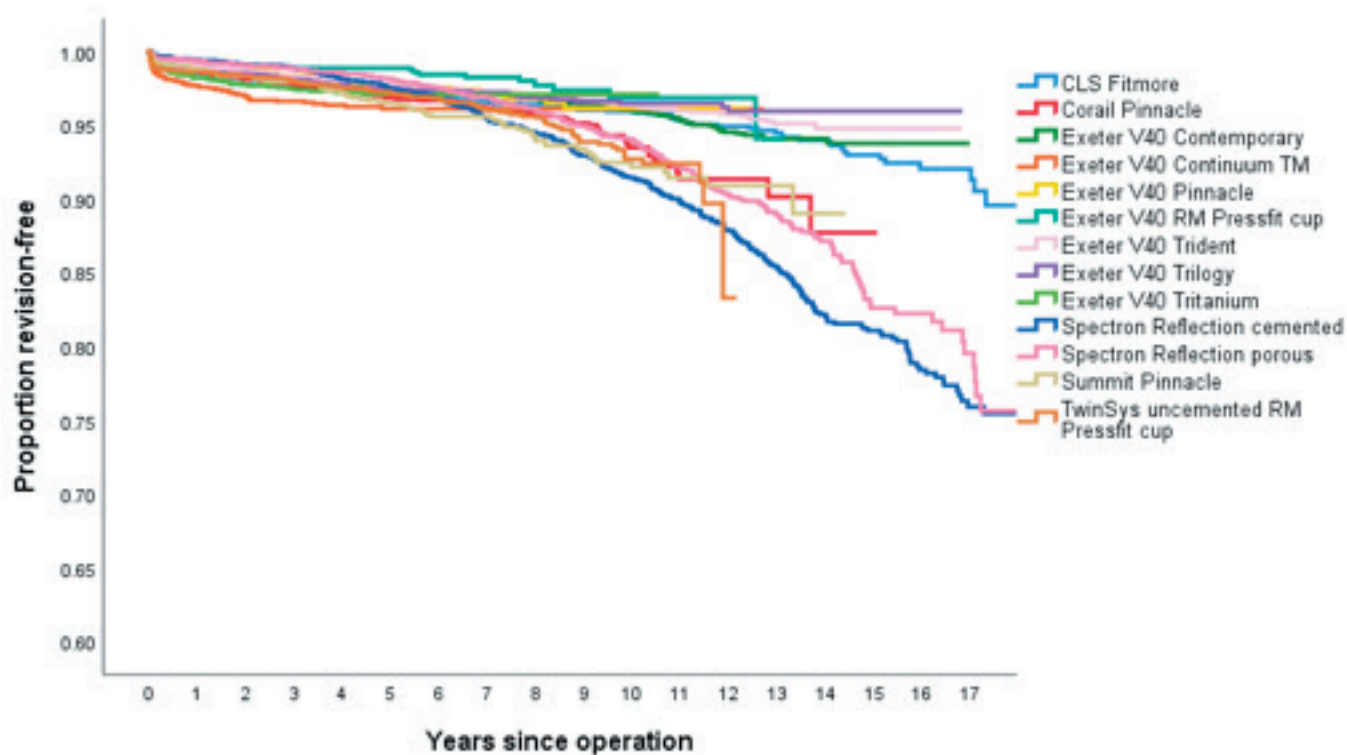


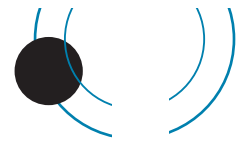


### Survival of Crosslinked vs Standard polyethylene



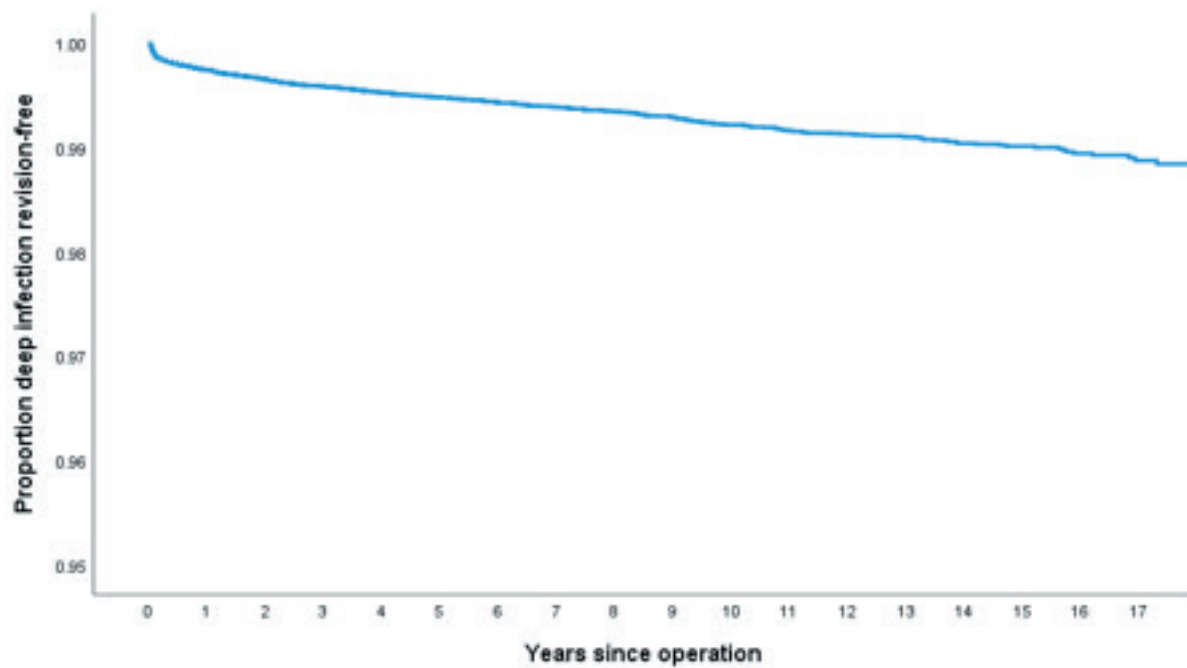
### Survival of combinations with > 2000 procedures



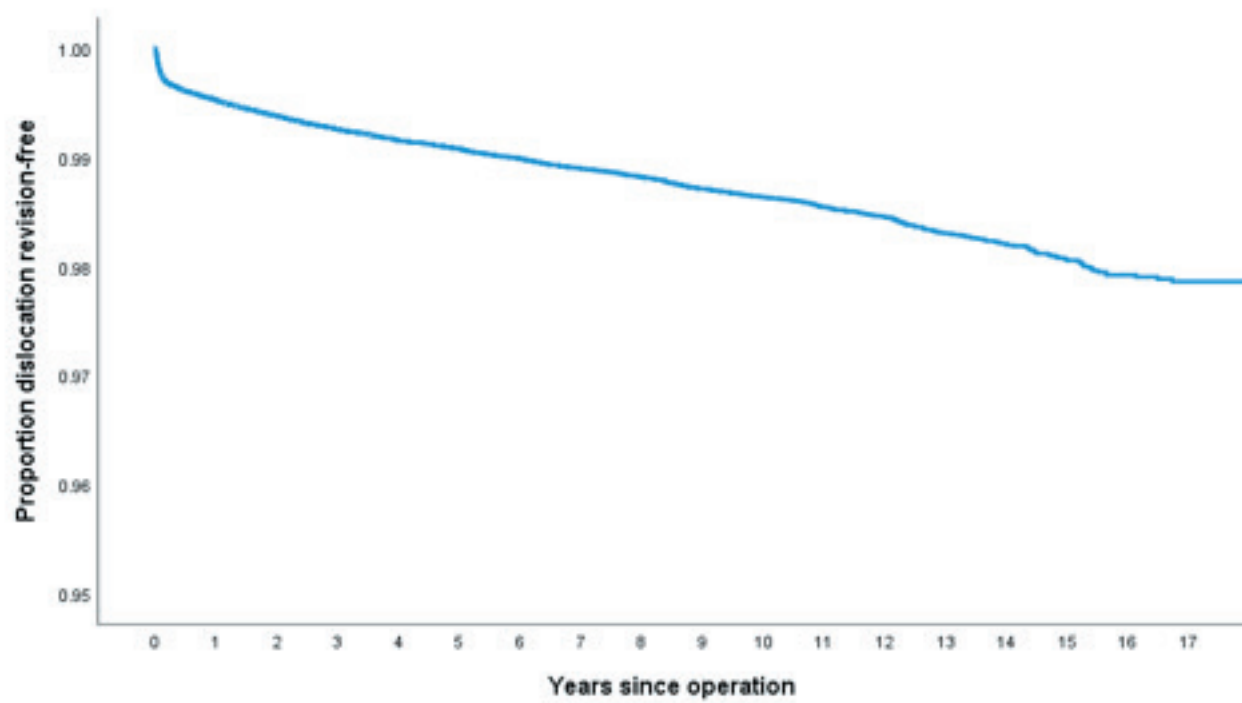


The following K M graphs are for the six main individual reasons for revision:

#### Deep infection

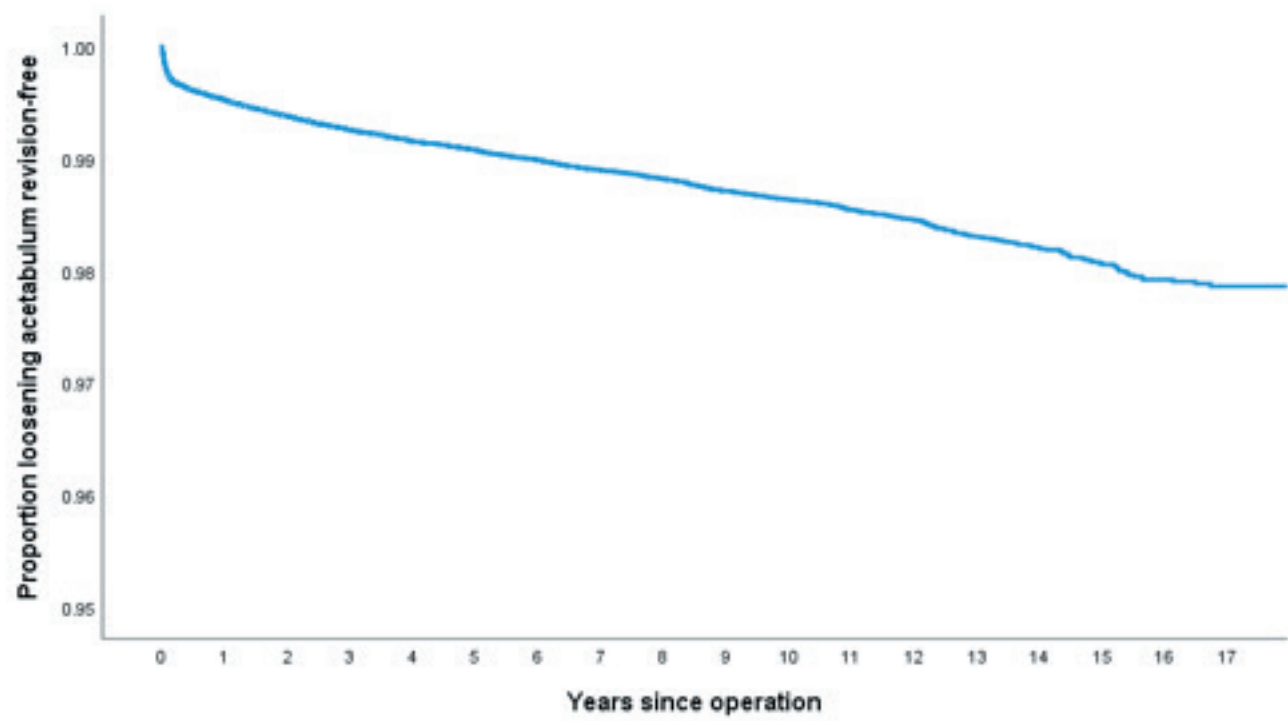


#### Dislocation

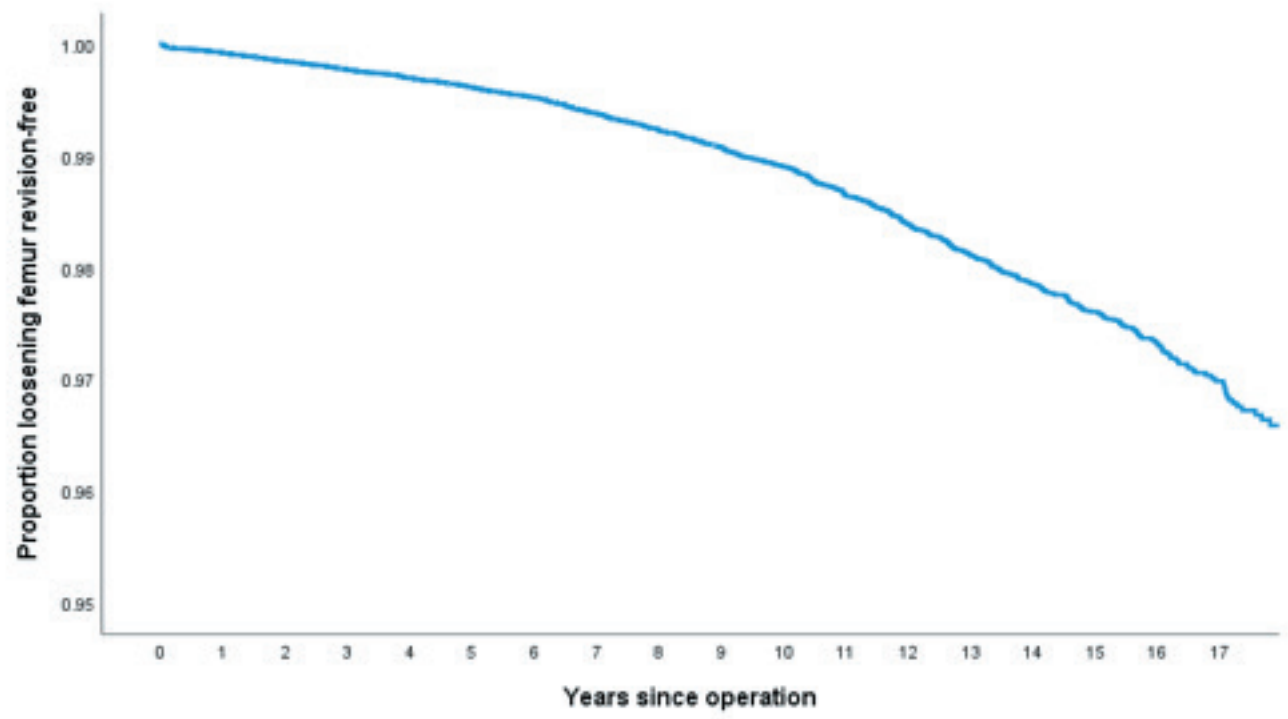


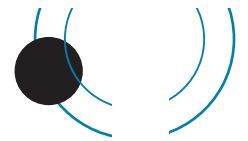


Loosening acetabular component

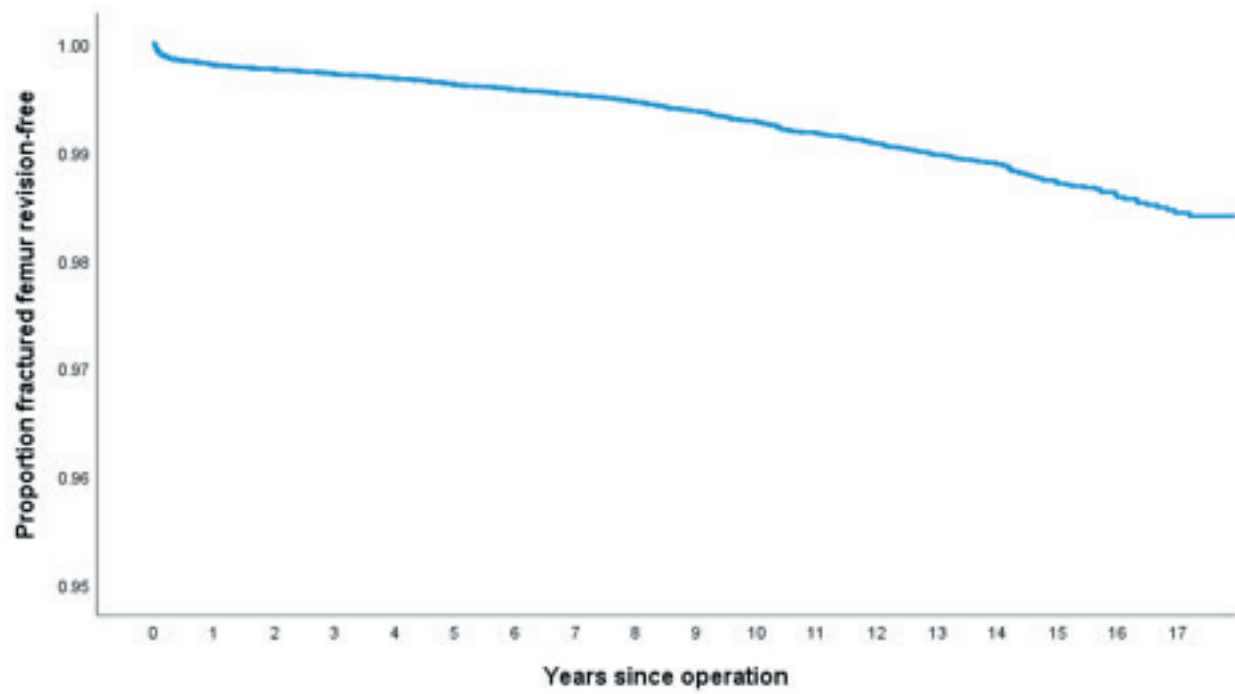


Loosening femoral component

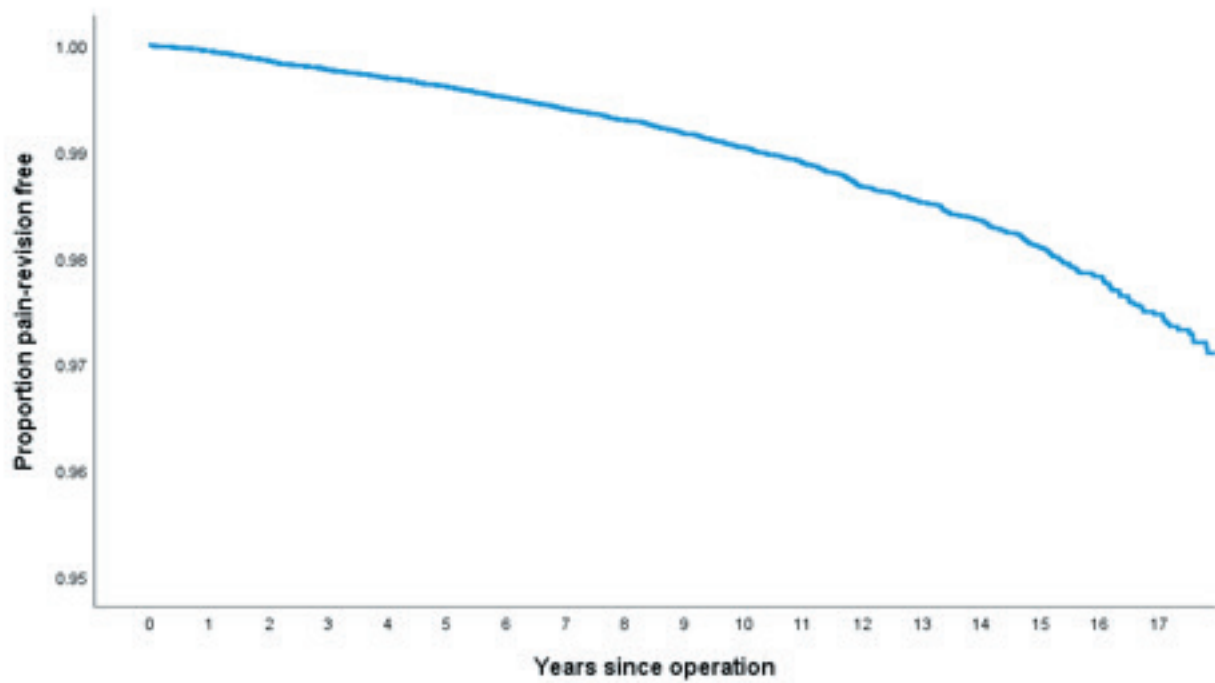




### Fracture of femur

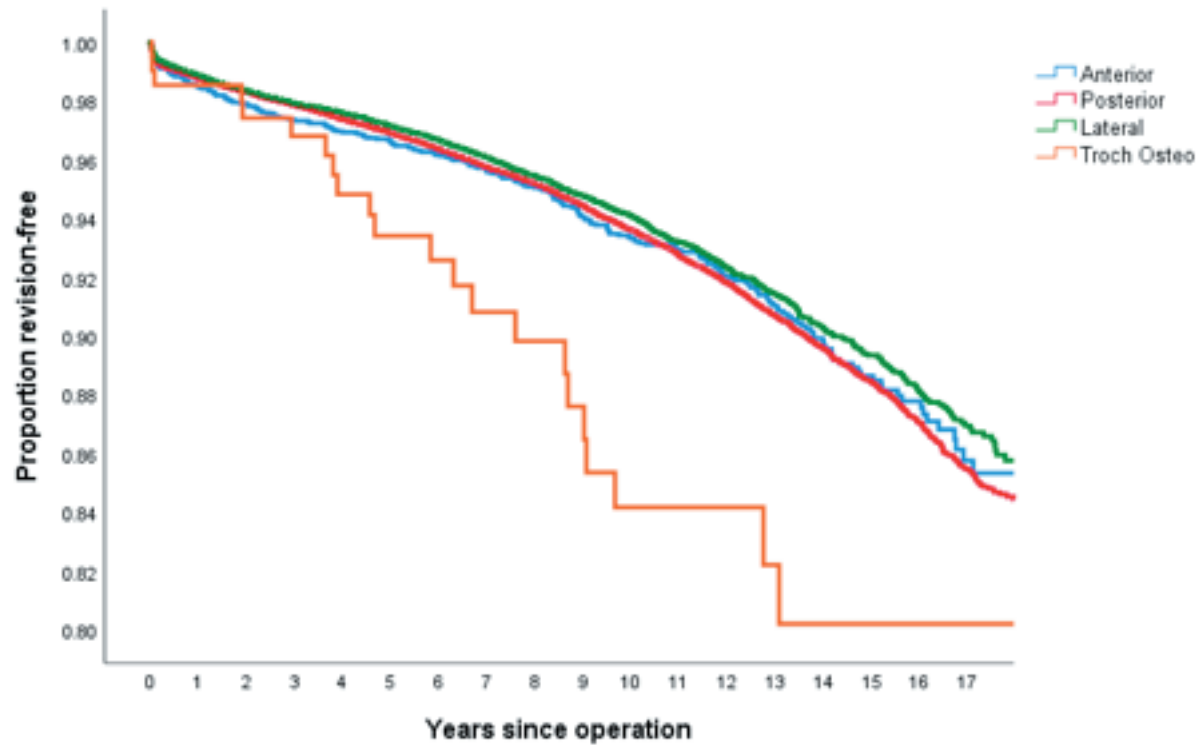


### Pain

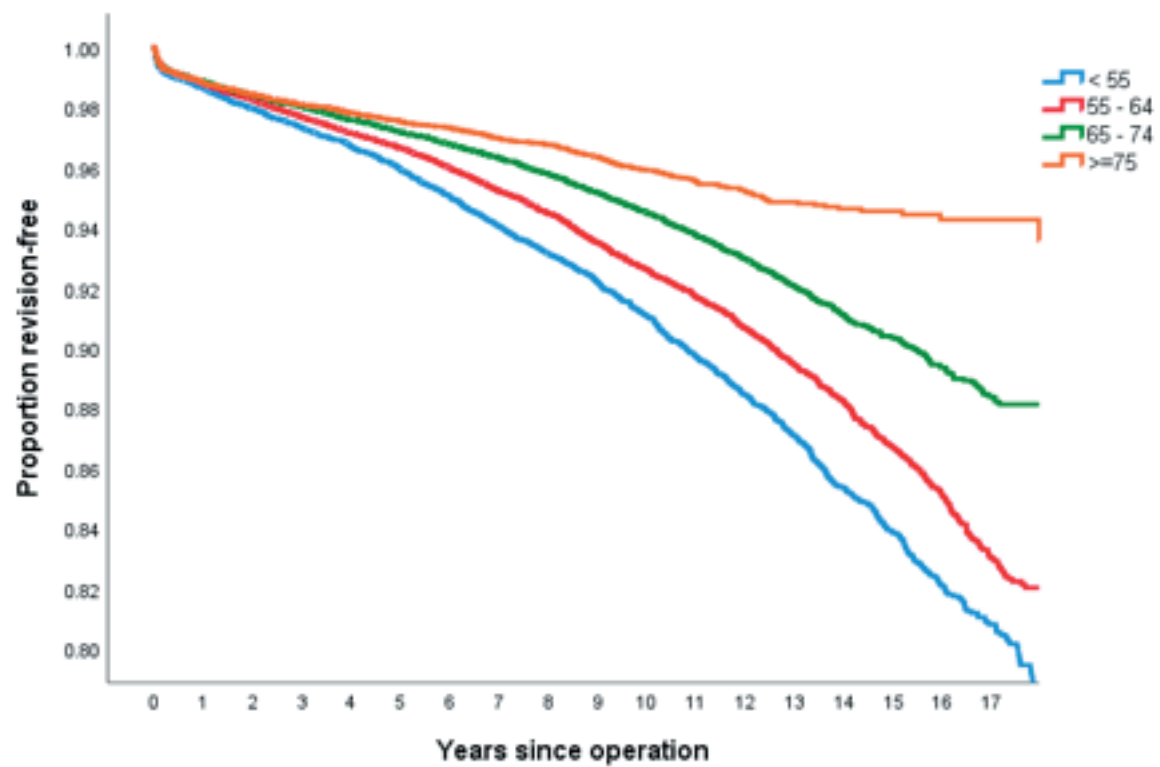


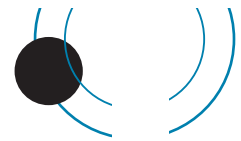


Survival for surgical approach

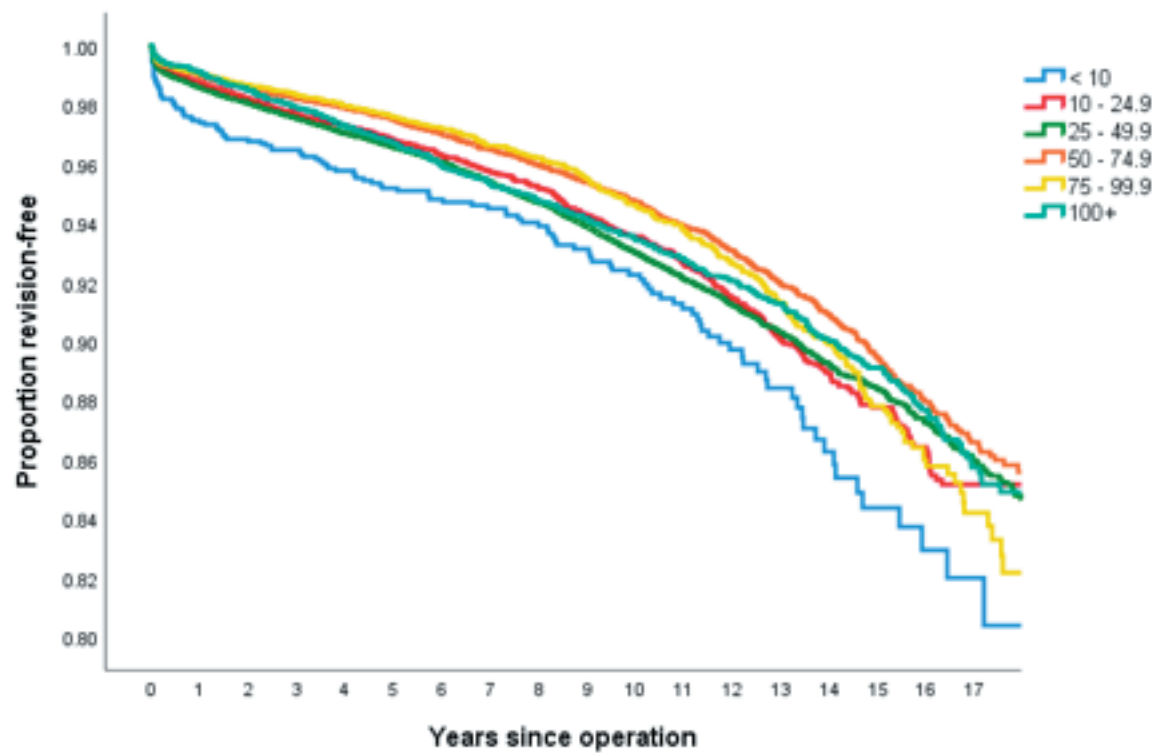


Survival for age bands

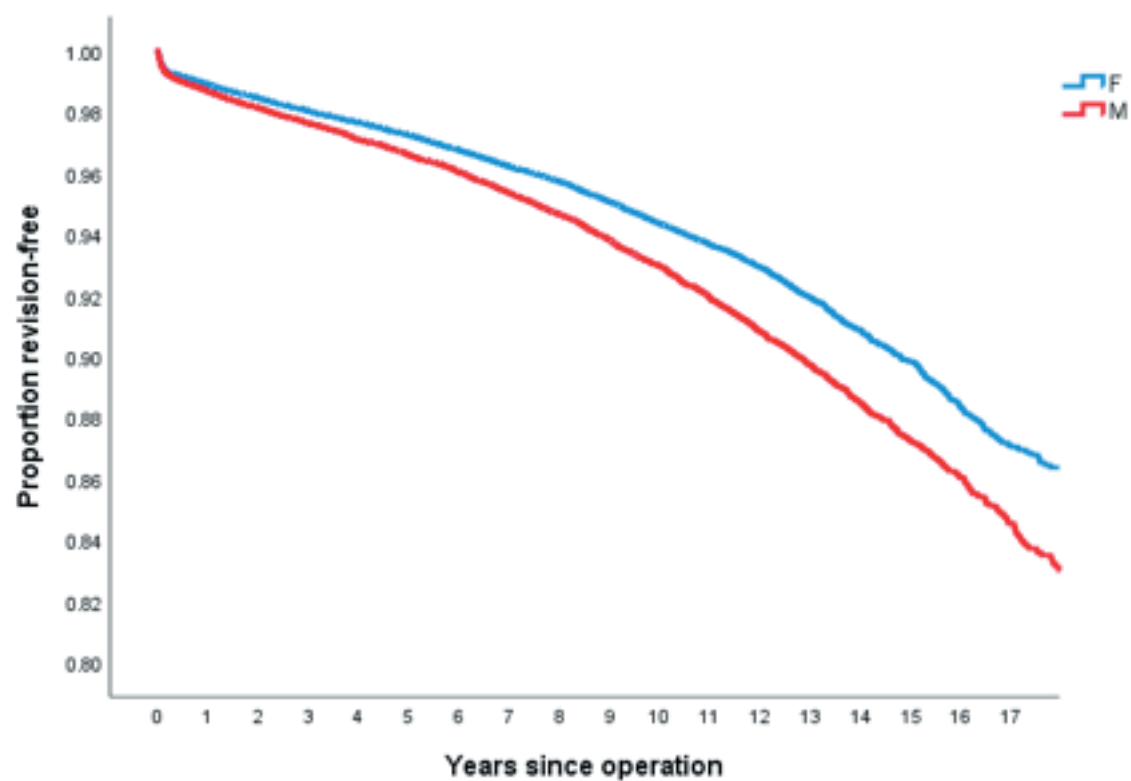




### Survival for surgeon annual output

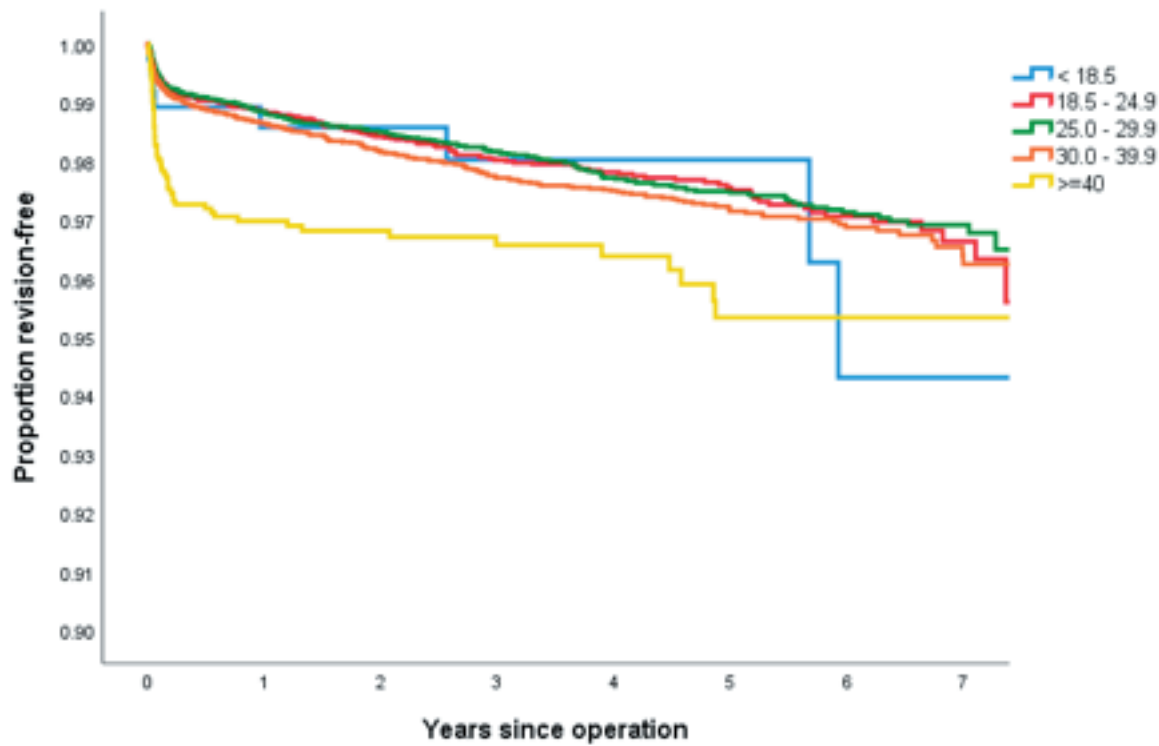


### Survival male vs female





Survival vs BMI



Re-revisions of conventional hips

Analyses were undertaken of hip re-revisions.

There were 898 registered conventional hip replacements that had been revised twice, 213 that had been revised three times, 54 that had been revised four times, 11 that had been revised 5 times and 4 that had been revised 6 times. There was 1 patient who has now had 12 revisions.

Second revision

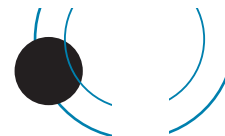
Time between the first and second revisions averaged 835 days, with a range of 1 – 6,257 and a standard deviation of 1,101. This compares to an average of 2,044 days between the primary and first revision.

Reason for revision

Dislocation	263
Deep infection	260
Loosening femoral component	114
Loosening acetabulum component	101
Pain	91
Fracture femur	65

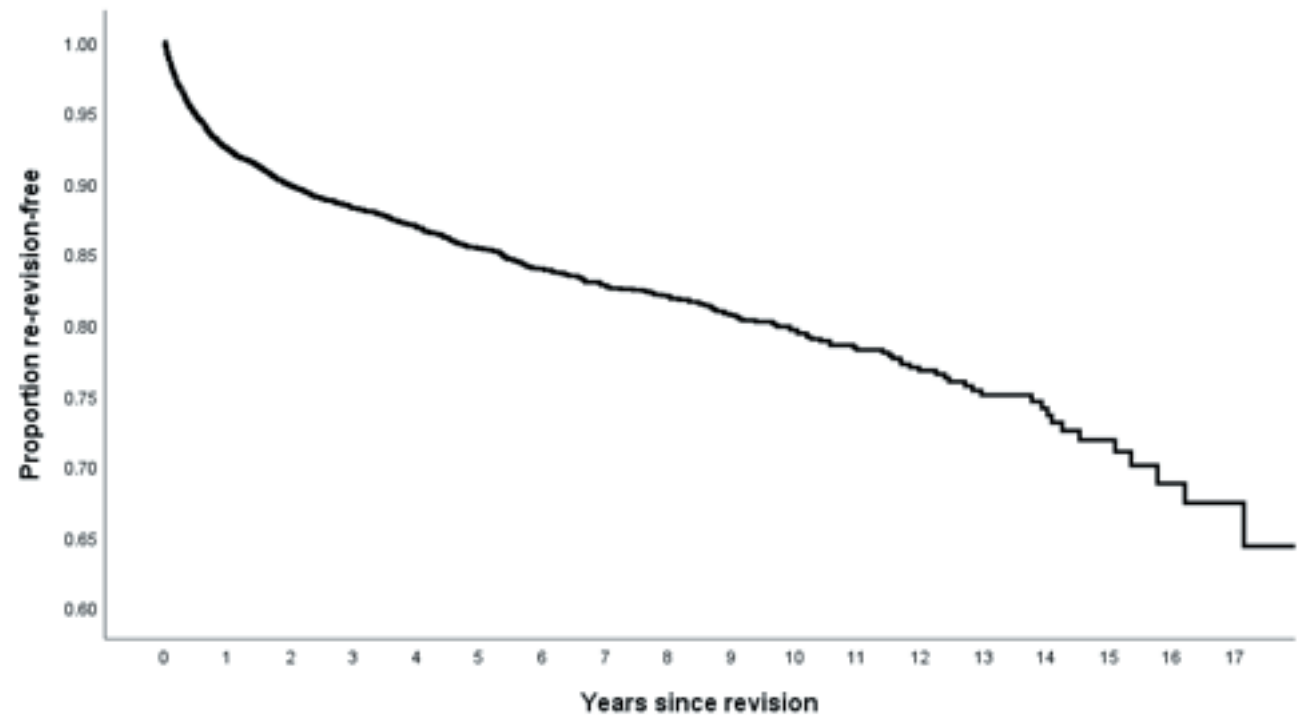
Revision

Change of head	604
Change of acetabulum	253
Change of liner	410
Change of femoral	261
Change of all	231



Re-revisions

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
6,330	29,220	898	3.07	2.88	3.28



Years	% re-revision free	No.in each year
1	92.40	5,138
2	89.80	4,361
3	88.20	3,675
4	86.90	3,081
5	85.40	2,500
6	83.90	1,980
7	82.80	1,510
8	82.00	1,168
9	80.70	890
10	79.60	648
11	78.20	463
12	76.70	335
13	75.00	224
14	74.10	151
15	71.80	90



### **Third revision**

The average time between second and third revisions for the 213 arthroplasties was 615 days with a range of 1 – 4,451 and a standard deviation of 789.

### **Fourth revision**

The average time between the third and fourth revisions for the 54 arthroplasties was 462 days, with a range of 7 – 3,925 and a standard deviation of 764 days.

### **Fifth revision**

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

### **Sixth revision**

There were 4 registered with an average time to revision of 266 days.

### **Eleventh revision**

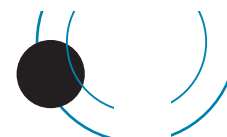
One patient has had 12 revisions.

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

### **Re- revisions of resurfacing hip replacements**

There have been 31 re-revisions.

The average time between the first and second revisions was 722 days, with a range of 11 – 3,036 and a standard deviation of 908. This compares with an average of 2,002 days between the primary resurfacing and the first revision.



## 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.

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 nineteen year period, and as at July 2018, there were 31,665 primary hip questionnaire responses registered six months post-surgery. The average hip score was 40.40 (standard deviation 7.61, range 48 – 2).

Scoring	> 41	17,873
Scoring	34 -41	8,699
Scoring	27 -33	3,030
Scoring	< 27	2,063

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 11,583 individual patients.

At five years post-surgery, 89% of these patients achieved an excellent or good score and had an average of 42.39.

### 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 7,470 individual patients.

At ten years post-surgery, 87% of these patients achieved an excellent or good score and had an average of 41.91.

### 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 2,839 individual patients.

At fifteen years post-surgery, 86% of these patients achieved an excellent or good score and had an average of 41.50.

### Oxford Scores (at 6 m) vs BMI Status

BMI	Mean	Standard Error of Mean	Number/ Group
< 19	38.71	1.054	59
19 - 24	40.94	0.175	1,630
25 - 29	40.77	0.136	2,721
30 - 39	39.27	0.163	2,239
40+	36.88	0.617	215
<b>Total</b>	<b>40.18</b>	<b>0.090</b>	<b>6,864</b>

### Revision hip questionnaire responses

There were 9,894 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 average revision hip score was 35.09 (standard deviation 9.84, range 48 – 2).

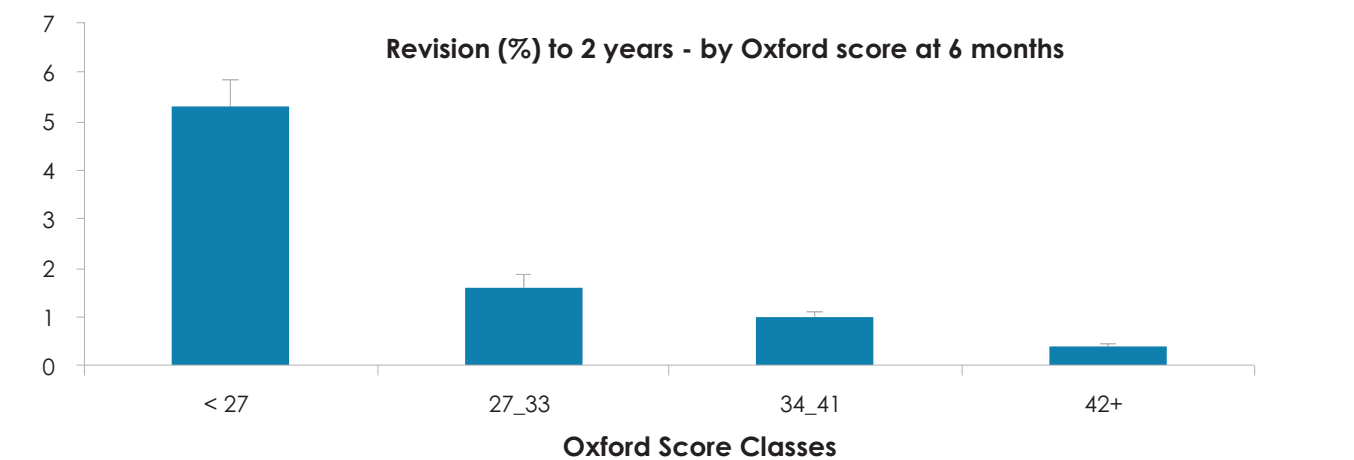


### OXFORD 12 SCORE AS A PREDICTOR OF HIP ARTHROPLASTY REVISION

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

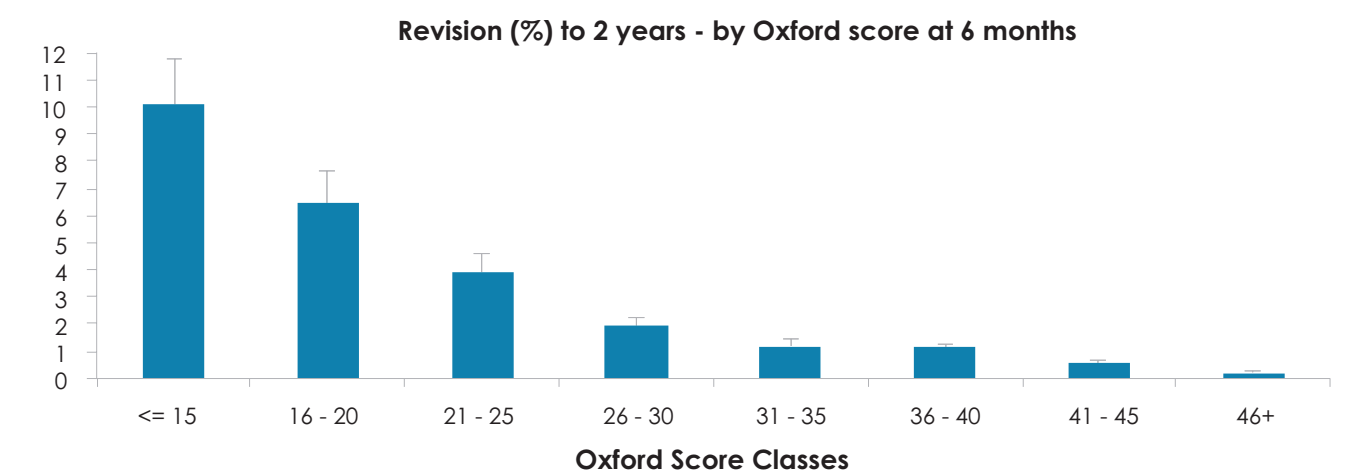
By plotting the patients' six month scores in the Kalairajah groupings against the proportion of hips revised for that same group it demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 12.9 times the risk of a revision within two years compared to a person with a score >41.



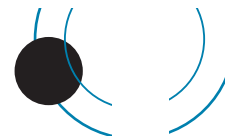
Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	1,757	93	5.29	0.53
27_33	2,605	42	1.61	0.25
34_41	7,509	74	0.99	0.11
42+	15,541	63	0.41	0.05

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.

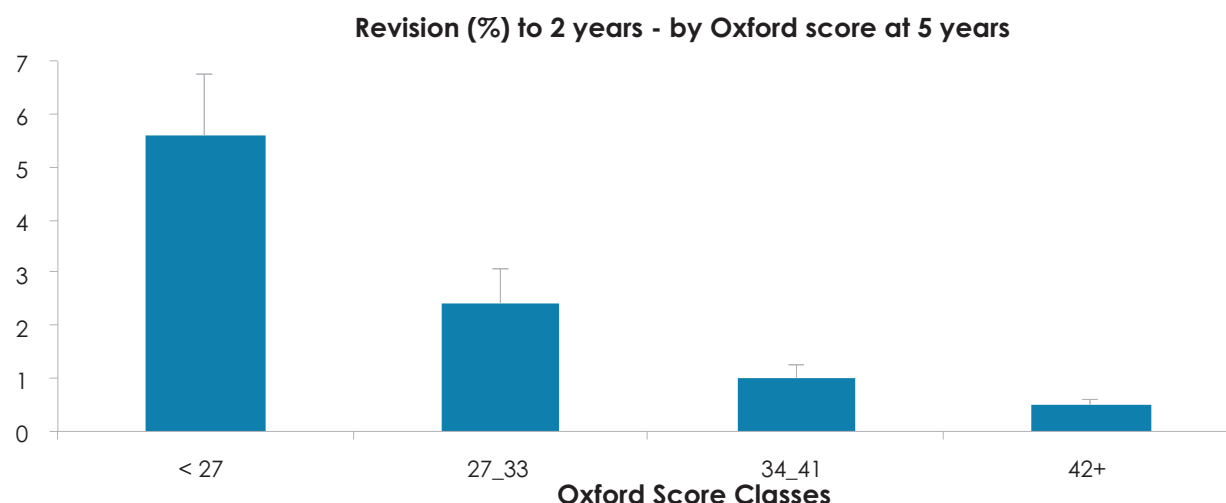


Revision risk versus groupings of Oxford scores within two years of the six month score date



### 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 10.98 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	393	22	5.60	1.16
27_33	576	14	2.43	0.64
34_41	1,707	17	1.00	0.24
42+	6,314	32	0.51	0.09

### 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 7.5 x the risk of a revision within two years compared to a person with a score >41.



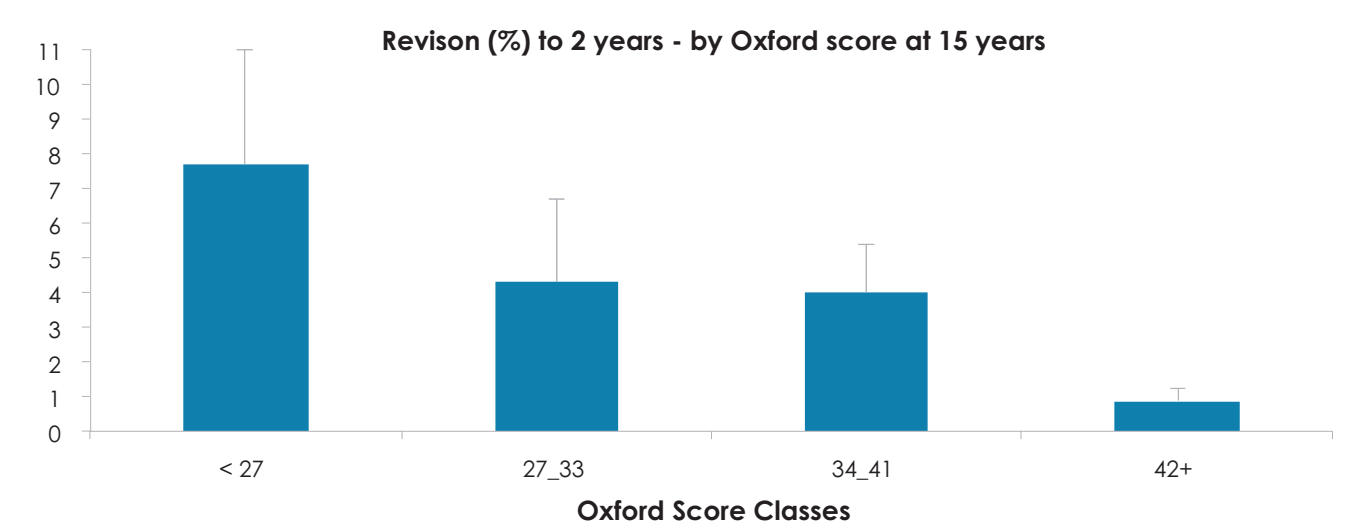


Revision risk versus Kalairajah groupings of Oxford scores within two years of the ten year score date

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	305	30	9.84	1.71
27_33	407	19	4.67	1.05
34_41	1,132	27	2.39	0.45
42+	3,818	50	1.31	0.18

Fifteen year score and revision arthroplasty

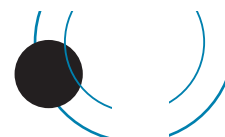
As with the six month, five year and 10 year scores, plotting the patients' fifteen year scores in the Kalairajah groupings against the proportion of hips revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 8.6 x the risk of a revision within two years compared to a person with a score >41.



Kalairajah Group	Revision to 2 yrs.	No. revised	%	Std error
< 27	65	5	7.69	3.31
27_33	70	3	4.29	2.42
34_41	201	8	3.98	1.38
42+	676	6	0.89	0.36

Prediction of second revision from six month score following first revision

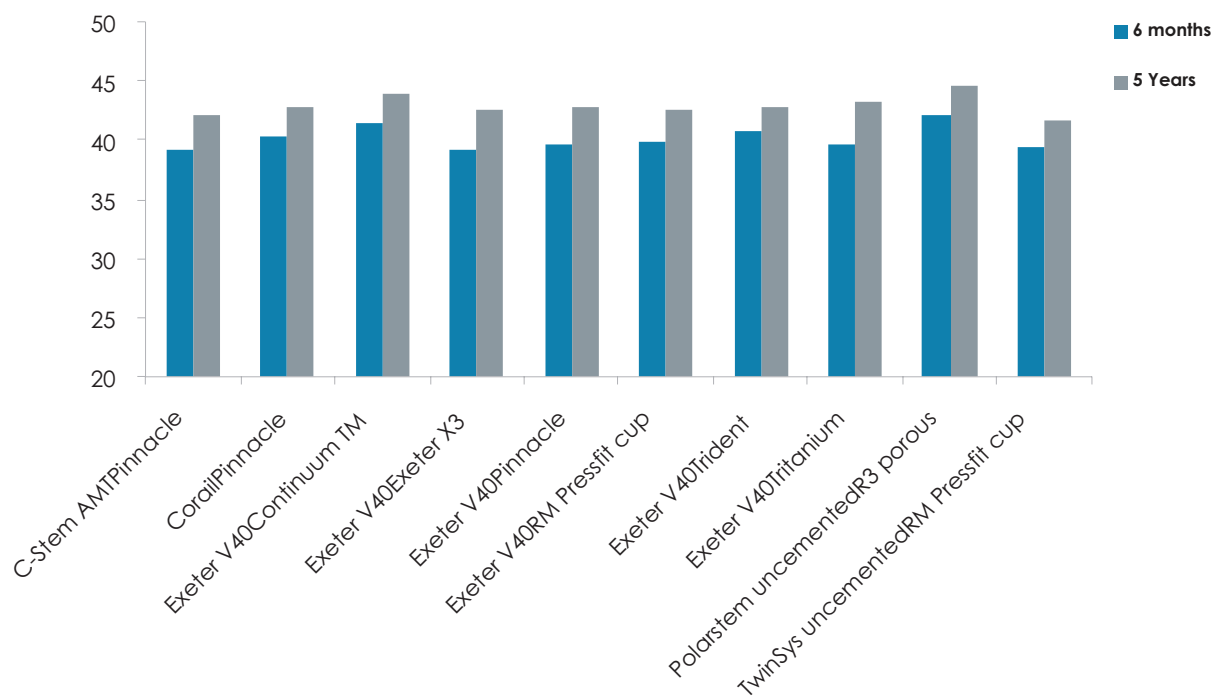
Plotting the patients' six month scores, following their first revision in the Kalairajah groupings, against the proportion of hips revised for that same group, again demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 6.25 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	No in Group	No. revised	%	Std error
< 27	1,361	137	10.07	0.82
27_33	1,325	69	5.21	0.61
34_41	2,410	63	2.61	0.33
42+	2,611	42	1.61	0.25

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

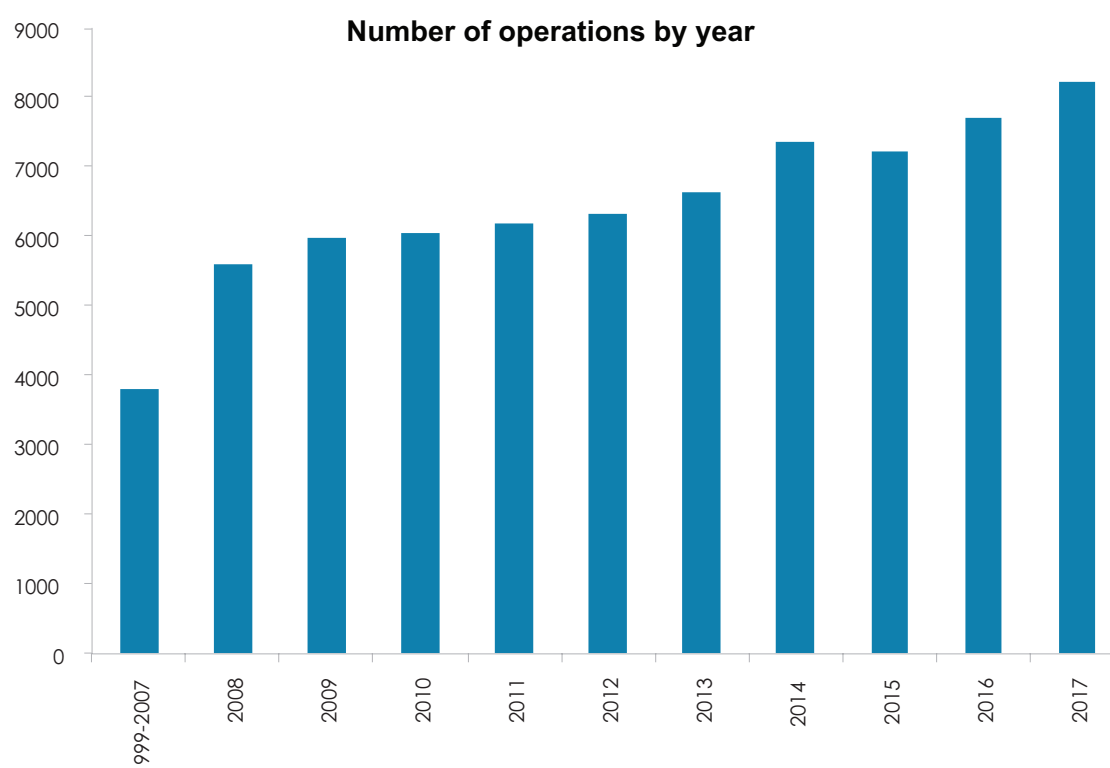


# KNEE ARTHROPLASTY

## PRIMARY KNEE ARTHROPLASTY

The **nineteen year** report analyses data for the period January 1999 – December 2017. There were 102,289 primary knee procedures registered, an additional 8,298 compared to last year's report.

The 102,289 includes 531 patello-femoral prostheses with 65 registered in 2017.



## Data Analysis

### Age and sex distribution

The average age for a knee replacement was 68 years, with a range of 8 – 100 years.

#### All knee arthroplasty

	Female	Male
Number	52,793	49,496
Percentage	51.61	48.39
Mean age	68.55	67.87
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.75	9.28

#### Conventional knee arthroplasty

	Female	Male
Number	52,401	49,357
Percentage	51.50	48.50
Mean age	68.61	67.89
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.70	9.27

### Patello-femoral arthroplasty

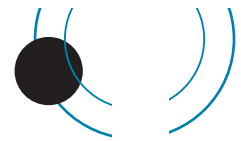
	Female	Male
Number	392	139
Percentage	73.82	26.18
Mean age	59.86	59.84
Maximum age	89.39	88.56
Minimum age	31.15	31.25
Standard dev.	11.43	11.14

### Body Mass Index

For the eight-year period 2010 - 2017, there were 36,774 BMI registrations for primary knee replacements. The average was 31.26 (obese) with a range of 15 – 68.7 and a standard deviation of 6.00.

### Previous operation

None	85,772
Meniscectomy	10,416
Osteotomy	1,514
Ligament reconstruction	1,385
Internal fixation	798
Synovectomy	162



### Diagnosis

Osteoarthritis	97,018
Rheumatoid arthritis	2,248
Post fracture	1,065
Other inflammatory	785
Post ligament reconstruction	807
Avascular necrosis	354
Tumour	92

### Bone graft

Femoral autograft	275
Femoral allograft	15
Femoral synthetic	9
Tibial autograft	98
Tibial allograft	21
Tibial synthetic	4

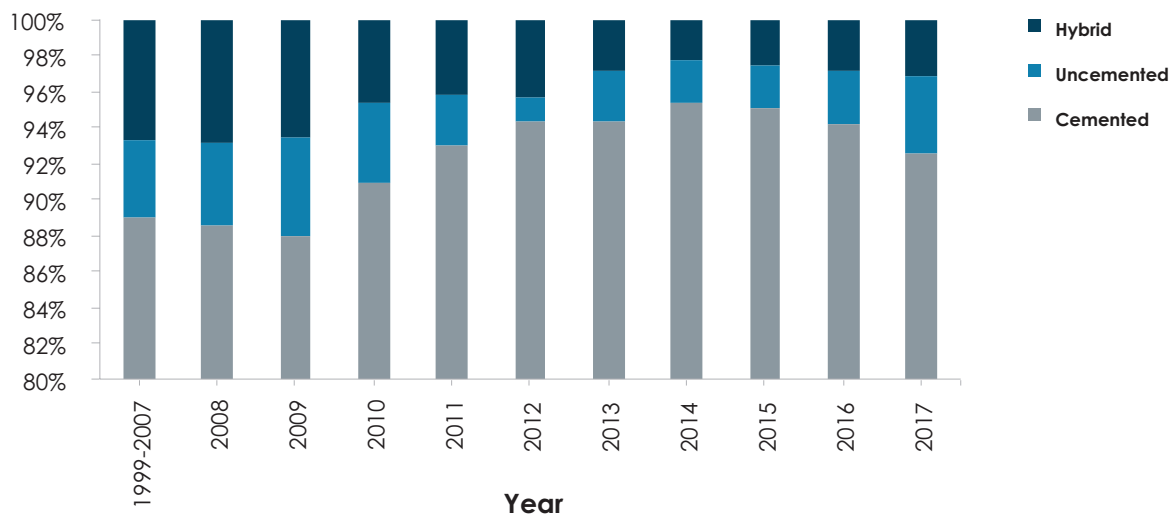
### Approach

Medial parapatellar	92,269
Image guided	12,409
Other	2,499
Lateral parapatellar	1,340
Minimally invasive surgery	218

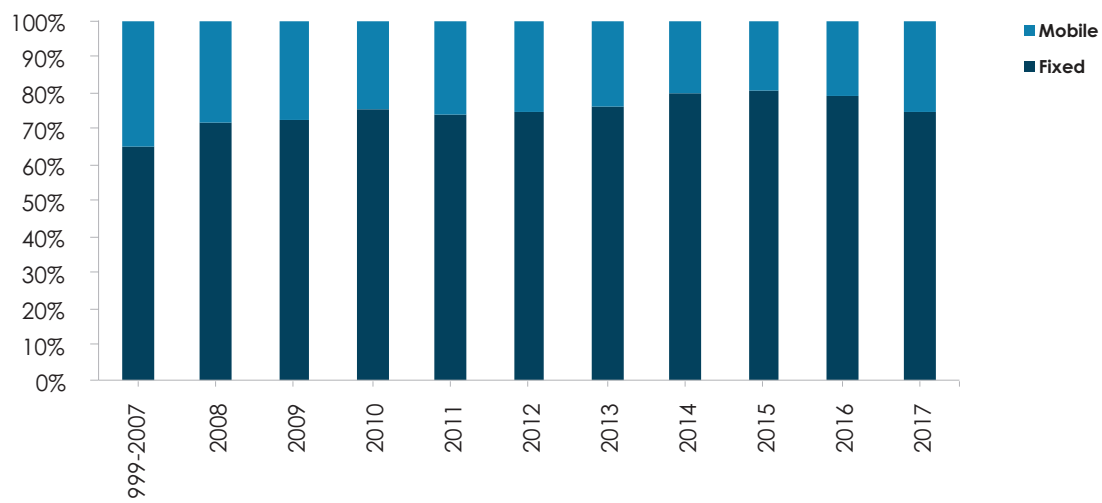
Image guided surgery was added to the updated forms at the beginning of 2005.

## Comparison of proportions of cemented vs uncemented vs hybrid by year

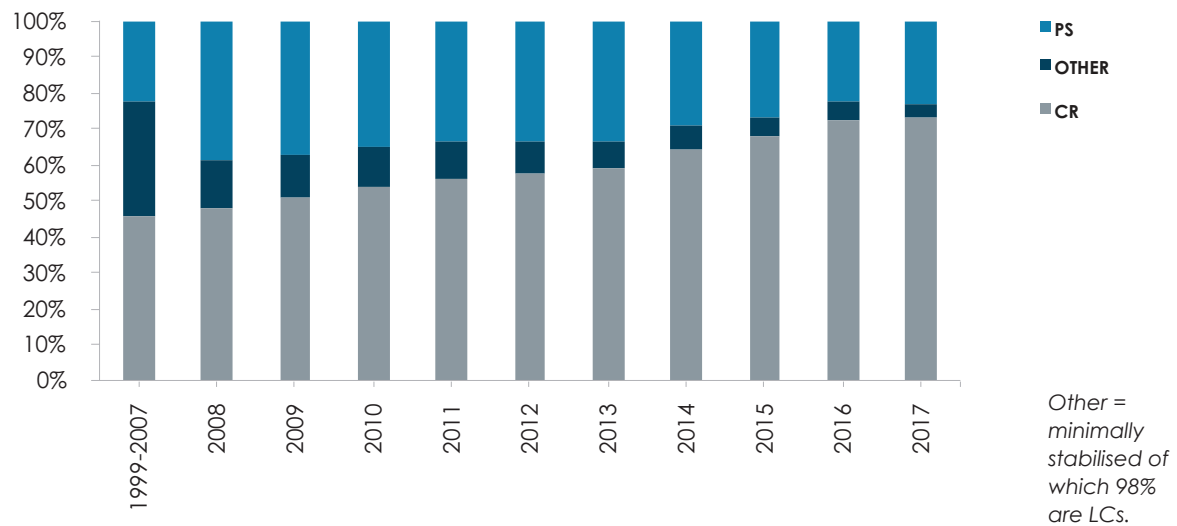
*A hybrid knee has cemented tibia and uncemented femur.*



## Proportion of fixed vs mobile knees by year



### Proportion of posterior stabilized vs cruciate retaining vs minimally stabilized knees by year



#### Cement

Femur cemented	94,108	92%
Antibiotic in cement	62,496	66%
Tibia cemented	97,524	95%
Antibiotic in cement	64,164	66%

#### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	96,934	95%
-----------------------------------------------------------	--------	-----

#### Operating theatre

Conventional	56,641
Laminar flow	44,843
Space suits	34,393

#### 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	9,008	11
2	50,903	64
3	19,723	24
4	333	1

#### Operative time (skin to skin in minutes)

Mean	83 mins
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#### Surgeon grade

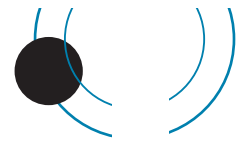
The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the thirteen-year period 2005 – 2017.

Consultant	74,064
Advanced trainee supervised	6,531
Basic trainee	1,666
Advanced trainee unsupervised	1,525

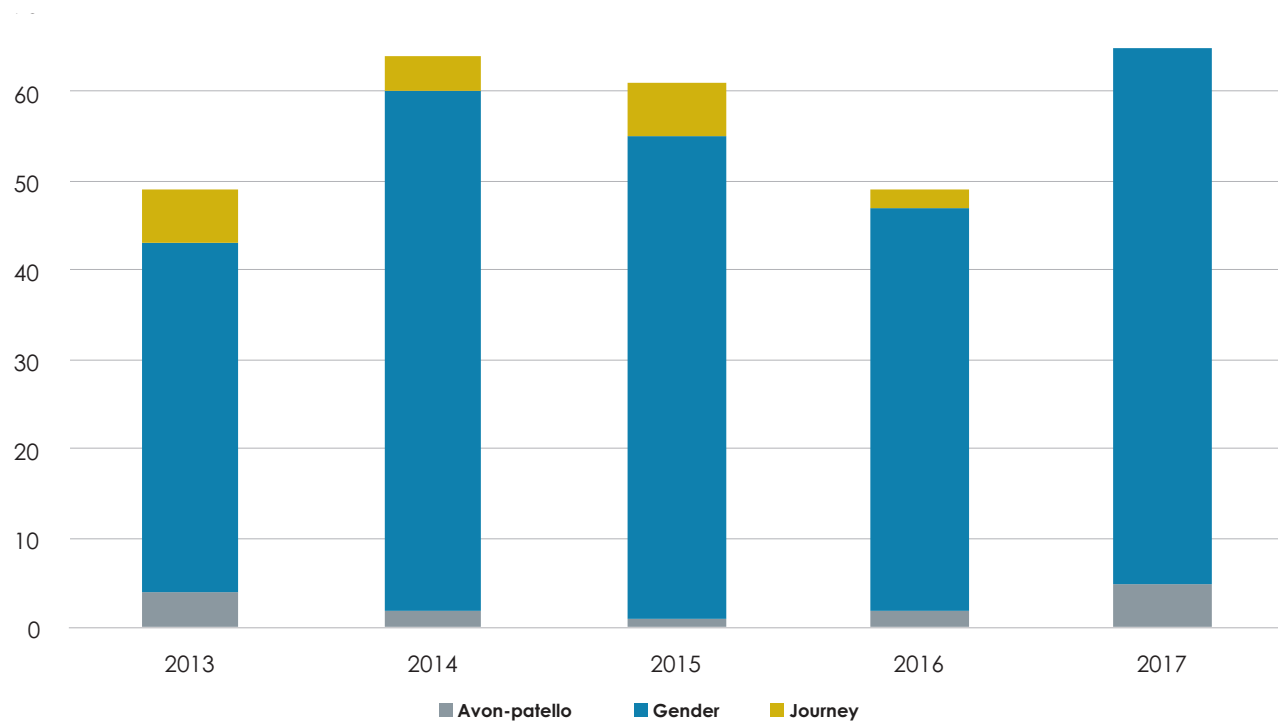
#### Prosthesis usage

##### Patello-femoral prostheses used in 2017

Gender	60
Avon patello	5



### Patello - femoral prostheses used for five years 2013 - 2017



In 2017 there were 65 patello-femoral procedures registered to 26 surgeons.

### Conventional primary knees

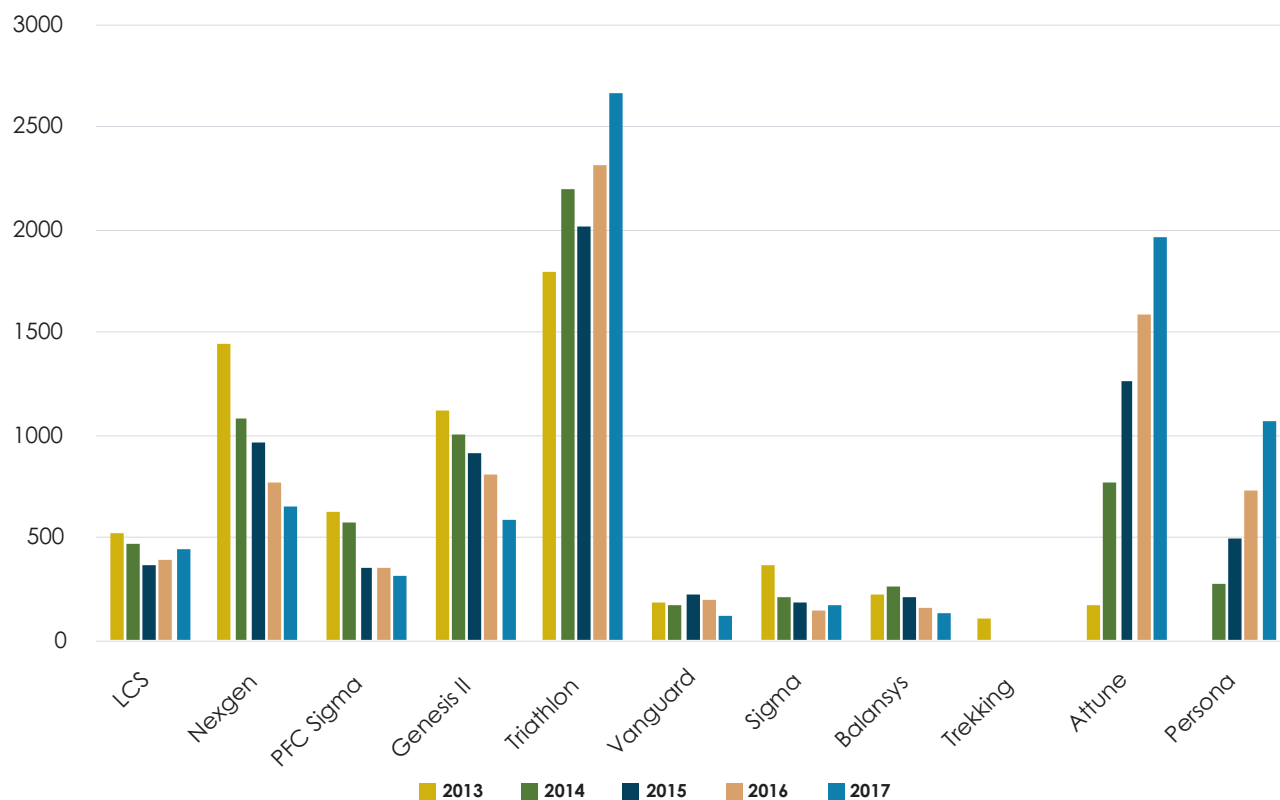
#### Top ten knee prostheses used in 2017

Triathlon	2,671
Attune	1,962
Persona	1,064
Nexgen	653
Genesis II	592
LCS	450
PFC Sigma	319
Sigma	167
Balansys	133
Vanguard	120

The top five implants remain the same as last year, except Persona moving up to third position from fifth last year.



Most Used Knee Prostheses per year for five years 2013 – 2017



## Surgeon and hospital workload

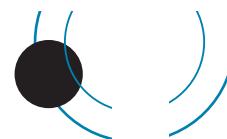
### Surgeons

In 2017, 229 surgeons performed 8,298 total knee replacements, an average of 36 procedures per surgeon.

41 surgeons performed less than ten procedures and 71 performed more than 40.

### Hospitals

In 2017 primary knee replacement was performed in 51 hospitals. 27 were public hospitals and 24 were private.



## 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 nineteen year period January 1999 – December 2017, there were 8,012 revision knee procedures registered. This is an additional 622 compared to last year's report.

The average age for a revision knee replacement was 70 years, with a range of 11 – 98 years.

### Revision knees

	Female	Male
Number	3,786	4,226
Percentage	47.25	52.75
Mean age	69.88	69.25
Maximum age	95.80	98.39
Minimum age	10.57	15.00
Standard dev.	10.30	10.10

### Body Mass Index

For the eight-year period 2010 - 2017, there were 1,575 BMI registrations for revision knee replacements. The average BMI was 31.38 (obese) with a range of 15 – 65 and a standard deviation of 6.07.

## REVISION OF REGISTERED PRIMARY KNEE ARTHROPLASTIES

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

There were 3,307 revisions of the 101,758 primary conventional knee replacements (3.2%) and 52 revisions of the 531 patello-femoral prostheses (9.8%), a total of 3,359 revisions.

### Conventional knee replacement analysis

#### Time to revision

Average	1,446 days
Maximum	6,692 days
Minimum	1 day
Standard deviation	1,384 days

#### Reason for revision

Pain	977
Deep infection	894
Loosening tibial component	751
Patellar resurfacing	796
Loosening femoral component	361
Loosening patellar component	63
Fracture femur	60
Fracture tibia	39

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

*NB each year column 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.*

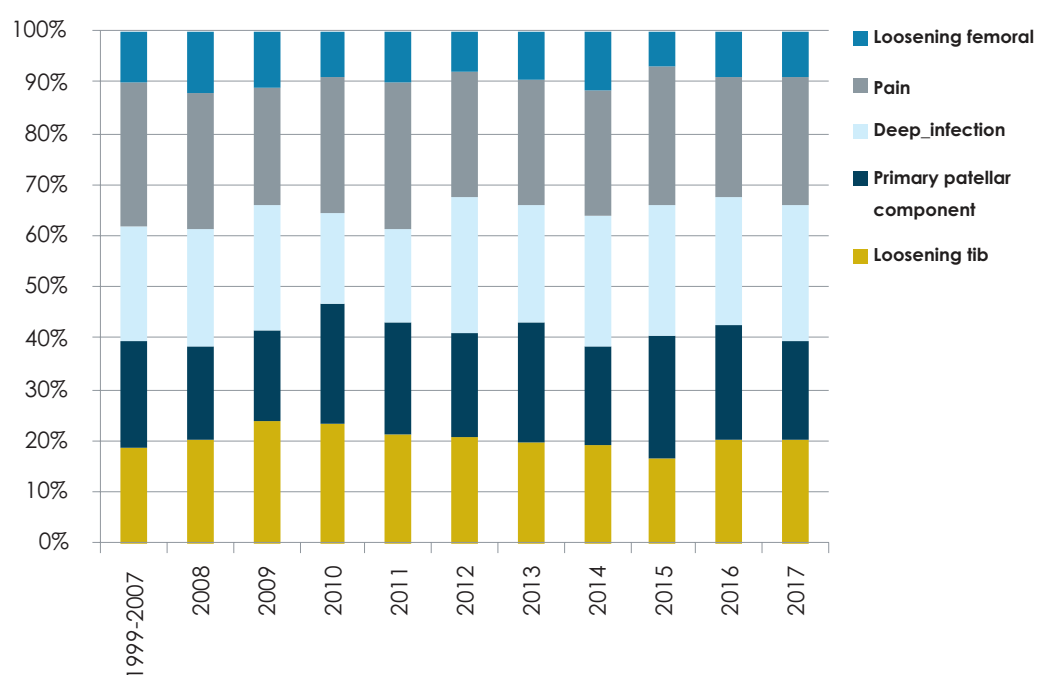
### Analysis of the five main reasons for revision by year after primary procedure

Years	Loosening tibial component		Primary patellar component		Deep infection		Pain		Loosening femoral component	
	Count	%	Count	%	Count	%	Count	%	Count	%
0	41	5.46	103	12.94	360	40.27	134	13.72	15	4.16
1	75	9.99	220	27.64	169	18.90	256	26.20	36	9.97
2	97	12.92	133	16.71	89	9.96	156	15.97	32	8.86
3	86	11.45	84	10.55	80	8.95	96	9.83	29	8.03
4	71	9.45	54	6.78	45	5.03	67	6.86	42	11.63
5	62	8.26	33	4.15	31	3.47	48	4.91	31	8.59
6	74	9.85	34	4.27	30	3.36	40	4.09	29	8.03
7	48	6.39	24	3.02	22	2.46	33	3.38	26	7.20
8	35	4.66	24	3.02	18	2.01	35	3.58	21	5.82
9	44	5.86	20	2.51	13	1.45	20	2.05	22	6.09
10	29	3.86	19	2.39	11	1.23	30	3.07	16	4.43
>10	89	11.85	48	6.03	26	2.91	62	6.35	62	17.17
	<b>751</b>		<b>796</b>		<b>894</b>		<b>977</b>		<b>361</b>	

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

	Loosening tibial component	Primary patellar component	Deep infection	Pain	Loosening femoral component
Years	No.	No.	No.	No.	No.
1999-2007	140	158	169	213	76
2008	42	37	47	55	25
2009	52	39	54	51	24
2010	53	54	40	61	20
2011	52	53	44	70	24
2012	54	52	68	63	21
2013	62	74	73	78	30
2014	63	64	85	81	39
2015	59	84	91	97	24
2016	90	101	114	105	41
2017	84	80	109	103	37

## Percentage of the 5 main reasons for revision by year



## Patello-Femoral Arthroplasty

### Revision of patello-femoral knees

Of the 531 registered, n = 52 have been revised.

#### Time to revision

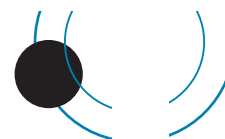
Average	1,577 days
Maximum	5,607 days
Minimum	108 days
Standard deviation	1,301 days

#### Reason for revision

Pain	20
Loosening patellar	4
Deep infection	4

## Patellar resurfacing

64 % of the 101,758 registered conventional primary knees did not have the patella resurfaced and 36% did have the patella resurfaced. Of the group that was not resurfaced, 791 subsequently had the patella resurfaced.



## 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 Conventional Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
101,758	670,325	3,307	0.49	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	
Triathlon	20,686	96,716.1	429	0.444	0.403	0.488
Nexgen	19,365	140,964.7	740	0.525	0.488	0.564
LCS	14,465	130,476.1	638	0.489	0.452	0.528
Genesis II	13,371	89,666.9	437	0.487	0.443	0.535
PFC Sigma	10,510	83,570.7	329	0.394	0.352	0.439
Attune	5,770	9,662.7	63	0.652	0.501	0.834
Duracon	4,212	46,906.0	152	0.324	0.275	0.380
Persona	2,586	3,717.4	30	0.807	0.544	1.152
Vanguard	1,939	9,243.4	62	0.671	0.514	0.860
Sigma	1,459	5,687.8	29	0.510	0.341	0.732
Balansys	1,407	5,109.0	44	0.861	0.626	1.156
Sigma CR150	987	5,296.3	26	0.491	0.321	0.719
Scorpio	852	9,147.5	62	0.678	0.520	0.869
Maxim	822	9,316.9	53	0.569	0.426	0.744
Trekking	682	2,099.5	23	1.095	0.694	1.644
Optetrak	661	5,356.0	48	0.896	0.661	1.188
AGC	376	4,355.6	16	0.367	0.210	0.597
Journey	278	1,245.4	14	1.124	0.615	1.886
MBK	256	3,267.8	18	0.551	0.326	0.871
Insall/Burstein	249	2,922.4	47	1.608	1.182	2.139
Legion	228	694.1	6	0.864	0.317	1.881
Advance	157	1,722.1	5	0.290	0.094	0.678
AMK	95	1,245.0	2	0.161	0.019	0.580



Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
ROCC	66	597.0	5	0.838	0.272	1.955
Saiph	66	75.6	1	1.324	0.034	7.375

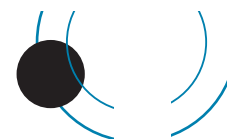
#### Revision Rate of Individual Knee Prostheses Sorted by Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*Insall/B	249	2,922.4	47	1.608	1.182	2.139
Saiph	66	75.6	1	1.324	0.034	7.375
*#Journey	278	1,245.4	14	1.124	0.615	1.886
*#Trekking	682	2,099.5	23	1.095	0.694	1.644
*Optetrak	661	5,356.0	48	0.896	0.661	1.188
Legion	228	694.1	6	0.864	0.317	1.881
*#Balansys	1,407	5,109.0	44	0.861	0.626	1.156
ROCC	66	597.0	5	0.838	0.272	1.955
*#Persona	2,586	3,717.4	30	0.807	0.544	1.152
*Scorpio	852	9,147.5	62	0.678	0.520	0.869
Vanguard	1,939	9,243.4	62	0.671	0.514	0.860
Attune	5,770	9,662.7	63	0.652	0.501	0.834
Maxim	822	9,316.9	53	0.569	0.426	0.744
MBK	256	3,267.8	18	0.551	0.326	0.871
Nexgen	19,365	140,964.7	740	0.525	0.488	0.564
Sigma	1,459	5,687.8	29	0.510	0.341	0.732
Sigma CR150	987	5,296.3	26	0.491	0.321	0.719
LCS	14,465	130,476.1	638	0.489	0.452	0.528
Genesis II	13,371	89,666.9	437	0.487	0.443	0.535
Triathlon	20,686	96,716.1	429	0.444	0.403	0.488
PFC Sigma	10,510	83,570.7	329	0.394	0.352	0.439
AGC	376	4,355.6	16	0.367	0.210	0.597
Duracon	4,212	46,906.0	152	0.324	0.275	0.380
Advance	157	1,722.1	5	0.290	0.094	0.678
AMK	95	1,245.0	2	0.161	0.019	0.580

Those marked with an \* in the above table have revision rates significantly higher than the overall rate of 0.49/100 component years @ 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 2017. The Persona and Balansys were both on the top 10 list for 2017.

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	2,922.4	47	1.608	1.182	2.139
Saiph	66	75.6	1	1.324	0.034	7.375
Optetrak	281	2,334.0	27	1.157	0.762	1.683
Journey	278	1,245.4	14	1.124	0.615	1.886
Trekking	682	2,099.5	23	1.095	0.694	1.644
Legion	226	689.9	6	0.870	0.319	1.893
Balansys	1,407	5,109.0	44	0.861	0.626	1.156
Persona	2,586	3,717.4	30	0.807	0.544	1.152
Scorpio	852	9,147.5	62	0.678	0.520	0.869
Vanguard	1,917	9,153.6	60	0.655	0.500	0.844
Attune	5,670	9,610.9	60	0.624	0.476	0.804
MBK	247	3,163.2	18	0.569	0.337	0.899
Maxim	822	9,316.9	53	0.569	0.426	0.744
Nexgen	18,499	134,426.9	713	0.530	0.492	0.571
Sigma CR150	987	5,296.3	26	0.491	0.321	0.719
Genesis II	13,318	89,090.9	432	0.485	0.440	0.533
Sigma	1,275	5,065.9	23	0.454	0.288	0.681
Triathlon	20,296	95,239.0	419	0.440	0.399	0.484
LCS	9,459	90,040.3	360	0.400	0.360	0.443
PFC Sigma	9,720	78,721.2	301	0.382	0.340	0.428
AGC	376	4,355.6	16	0.367	0.210	0.597
Duracon	3,431	37,761.0	127	0.336	0.280	0.400
Advance	157	1,722.1	5	0.290	0.094	0.678
AMK	95	1,245.0	2	0.161	0.019	0.580

The Insall/Burstein, Trekking, Journey, Scorpio, Persona, Optetrak and Balansys have significantly higher revision rates than the overall rate of 0.49/100 component years at the 95% confidence interval. Balansys, Trekking and Persona prostheses were implanted in 2017.

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

(Minimum of 50 primary registered arthroplasties)

Femur Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Sigma	184	621.9	6	0.965	0.354	2.100
Genesis II	51	567.7	4	0.705	0.192	1.804
Optetrak	380	3,022.0	21	0.695	0.430	1.062
Triathlon	190	1,310.1	9	0.687	0.314	1.304
PFC Sigma	783	4,787.5	28	0.585	0.389	0.845
LCS	2,165	18,771.8	93	0.495	0.400	0.607
Nexgen	743	5,701.2	23	0.403	0.256	0.605
Duracon	321	4,158.1	14	0.337	0.184	0.565

There are no significantly higher revision rates than the overall rate of 0.49/100 component years at the 95% confidence interval.

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

(Minimum of 50 primary registered arthroplasties)

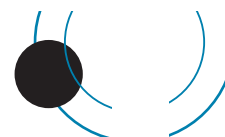
Femur Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Attune	98	51.4	3	5.841	1.205	17.070
LCS	2,841	21,664.0	185	0.854	0.735	0.986
Triathlon	200	167.0	1	0.599	0.015	3.337
Nexgen	123	836.7	4	0.478	0.130	1.224
Duracon	460	4,986.9	11	0.221	0.110	0.395

The uncemented LCS and Attune (both continue to be implanted in 2017) have a significantly higher revision rate than the overall rate of 0.49/100 component years at the 95% confidence interval.

## Revision Rates for Fixed vs Mobile Bearing Knees

Femur Prosthesis	Fixed/ Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
AGC	Fixed	376	4,355.6	16	0.367	0.210	0.597
AMK	Fixed	95	1,245.0	2	0.161	0.019	0.580
Balansys	Fixed	1,404	5,106.0	44	0.862	0.626	1.157
Duracon	Fixed	4,206	46,827.6	151	0.322	0.273	0.378
Genesis II	Fixed	13,363	89,655.1	437	0.487	0.443	0.535
Insall/Burstein	Fixed	249	2,922.4	47	1.608	1.182	2.139
Journey	Fixed	259	1,232.3	14	1.136	0.621	1.906
LCS	Mobile	14,462	130,472.7	638	0.489	0.452	0.528
Maxim	Fixed	822	9,316.9	53	0.569	0.426	0.744
MBK	Mobile	256	3,267.8	18	0.551	0.326	0.871
Trekking	Mobile	674	2,091.1	23	1.100	0.697	1.650
Persona	Fixed	2,580	3,714.6	30	0.808	0.545	1.153
Nexgen	Fixed	16,401	119,038.6	636	0.534	0.494	0.577
	Mobile	2,715	20,506.6	90	0.439	0.353	0.539
PFC Sigma	Fixed	6,390	51,548.1	211	0.409	0.356	0.468
	Mobile	3,441	30,006.0	110	0.367	0.301	0.442
Scorpio	Fixed	737	7,926.2	53	0.669	0.501	0.875
	Mobile	104	1,150.2	6	0.522	0.191	1.135
Sigma	Fixed	339	1,524.7	9	0.590	0.270	1.121
	Mobile	860	3,537.0	20	0.565	0.345	0.873
Sigma CR150	Fixed	172	1,024.5	10	0.976	0.468	1.795
	Mobile	798	4,227.0	16	0.379	0.216	0.615
Triathlon	Fixed	18,801	93,330.4	411	0.440	0.399	0.485
	Mobile	577	2,629.0	11	0.418	0.209	0.749
Attune	Fixed	2,760	4,680.0	30	0.641	0.432	0.915
	Mobile	2,998	4,966.0	33	0.665	0.457	0.933

The Balansys, Insall/Burstein, Journey, Trekking and Persona have a significantly higher revision rate than the overall rate of 0.49/100 component years at the 95% confidence interval.



## Overall Revision Rates for Fixed vs Mobile Bearing Knees

Fixed/Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Fixed	69,041	443,697.3	2,157	0.49	0.47	0.51
Mobile	26,904	202,918.6	965	0.48	0.45	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 5,813 shortfall in the total number.

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

Femur Prosthesis	CR/PS	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Insall/Burstein	PS	249	2,922.4	47	1.608	1.182	2.139
LCS	PS	69	416.2	2	0.481	0.058	1.736
Legion	PS	190	575.9	4	0.695	0.189	1.778
Sigma CR150	CR	987	5,296.3	26	0.491	0.321	0.719
Attune	CR	3,724	6,554.6	47	0.717	0.527	0.954
	PS	2,042	3,106.5	16	0.515	0.294	0.836
Balansys	CR	1,290	4,776.9	37	0.775	0.545	1.068
	PS	113	324.3	7	2.159	0.868	4.448
Genesis II	CR	7,089	53,160.0	187	0.352	0.303	0.406
	PS	6,275	36,465.6	250	0.686	0.603	0.776
Maxim	CR	657	7,399.7	36	0.487	0.341	0.674
	PS	165	1,917.1	17	0.887	0.517	1.420
Nexgen	CR	9,142	65,951.6	280	0.425	0.376	0.477
	PS	9,918	73,696.3	437	0.593	0.539	0.651
Optetrak	CR	437	3,555.0	23	0.647	0.410	0.971
	PS	224	1,801.0	25	1.388	0.898	2.049
Persona	CR	1,901	2,426.2	19	0.783	0.471	1.223
	PS	679	1,288.4	11	0.854	0.426	1.528
PFC Sigma	CR	8,546	65,957.9	241	0.365	0.321	0.415
	PS	1,888	17,061.5	86	0.504	0.403	0.623
Scorpio	CR	739	8,090.2	53	0.655	0.491	0.857
	PS	111	1,042.2	9	0.864	0.395	1.639
Sigma	CR	248	799.0	0	0.000	0.000	0.462
	PS	1,210	4,884.6	29	0.594	0.398	0.853
Trekking	CR	256	821.7	8	0.974	0.420	1.918
	PS	418	1,269.5	15	1.182	0.661	1.949
Triathlon	CR	17,796	79,654.0	353	0.443	0.398	0.492
	PS	2,888	17,056.9	76	0.446	0.351	0.558
Vanguard	CR	1,375	6,686.0	38	0.568	0.402	0.780
	PS	550	2,515.6	24	0.954	0.611	1.420

## 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	54,195	311,154.8	1,349	0.43	0.41	0.46
MS	14,713	133,926.3	659	0.49	0.46	0.53
PS	27,020	166,726.0	1,058	0.63	0.60	0.67

The LCS prostheses account for the majority of the minimally stabilised (MS). There is a significantly higher revision rate for the 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	93,111	602,988.7	2,893	0.48	0.46	0.50
Uncemented	3,734	27,798.5	205	0.74	0.64	0.84
Hybrid	4,913	39,538.2	209	0.53	0.46	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	8,486	60,198.2	567	0.94	0.87	1.02
55-64	28,285	193,450.2	1,204	0.62	0.59	0.66
65-74	39,018	259,250.2	1,129	0.44	0.41	0.46
>=75	25,969	157,426.7	407	0.26	0.23	0.28

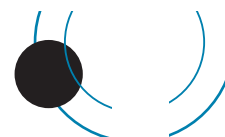
Each successive age band in ascending order has a significantly lower revision rate.

## Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	52,401	351,986.1	1,593	0.45	0.43	0.48
Male	49,357	318,339.2	1,714	0.54	0.51	0.56

## Revision by Age Bands vs Arthroplasty Fixation

Cemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	7,265	49,738.3	446	0.90	0.82	0.98
55-64	25,419	169,971.4	1,042	0.61	0.58	0.65
65-74	36,102	236,928.1	1,129	0.44	0.41	0.46
>=75	24,325	146,350.9	369	0.25	0.23	0.28



### Revision by Age Bands vs Arthroplasty Fixation

Uncemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	626	5,623.9	74	1.32	1.03	1.65
55-64	1,334	10,416.2	81	0.78	0.61	0.96
65-74	1,181	8,226.7	41	0.50	0.36	0.68
>=75	593	3,531.7	9	0.25	0.12	0.48

Hybrid	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	595	4,836.0	47	0.97	0.71	1.29
55-64	1,532	13,062.7	81	0.62	0.49	0.77
65-74	1,735	14,095.5	52	0.37	0.28	0.48
>=75	1,051	7,544.0	29	0.38	0.26	0.55

### Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial	91,541	602,265.0	2,926	0.49	0.47	0.50
Lateral	1,308	10,140.5	72	0.71	0.56	0.89
Other	2,248	16,505.6	70	0.42	0.33	0.54

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	89,357	613,564.2	3,023	0.49	0.48	0.51
Yes	12,401	56,761.1	284	0.50	0.44	0.56

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	2,144	15,681.4	70	0.45	0.35	0.56
10-24	20,963	147,068.4	782	0.53	0.49	0.57
25-49	46,224	308,706.1	1,504	0.49	0.46	0.51
50-74	20,298	129,909.0	608	0.47	0.43	0.51
75-99	7,086	40,555.3	208	0.51	0.45	0.59
>=100	5,043	28,405.1	135	0.48	0.40	0.56

There is no significant difference between the two groups.



### Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	8,866	49,160.9	260	0.53	0.47	0.60
2	50,608	268,098.7	1,329	0.50	0.47	0.52
3	19,672	95,671.1	558	0.58	0.54	0.63
4	332	1,406.7	9	0.64	0.29	1.21

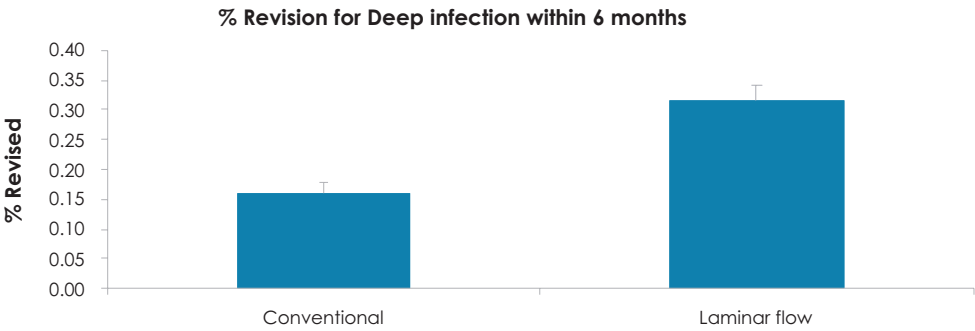
### Revision vs BMI

BMI	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
< 19	78	264.7	0	0.00	0.00	1.39
19 - 24	4,064	12,768.9	84	0.66	0.52	0.81
25 - 29	11,971	38,359.9	240	0.63	0.55	0.71
30 - 39	16,968	53,086.4	331	0.62	0.56	0.69
40+	3,393	10,673.0	103	0.97	0.79	1.17

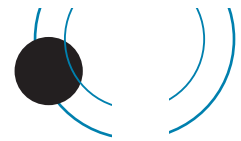
40+ group has a significantly higher revision rate than the two groups before it.

### Revision for Deep Infection within 6 months versus Theatre Environment

Theatre Environment	Total Number	Number Revised	%	Std Error
Conventional	53,932	87	0.16131	0.01728
Laminar flow	42,481	134	0.31544	0.02721

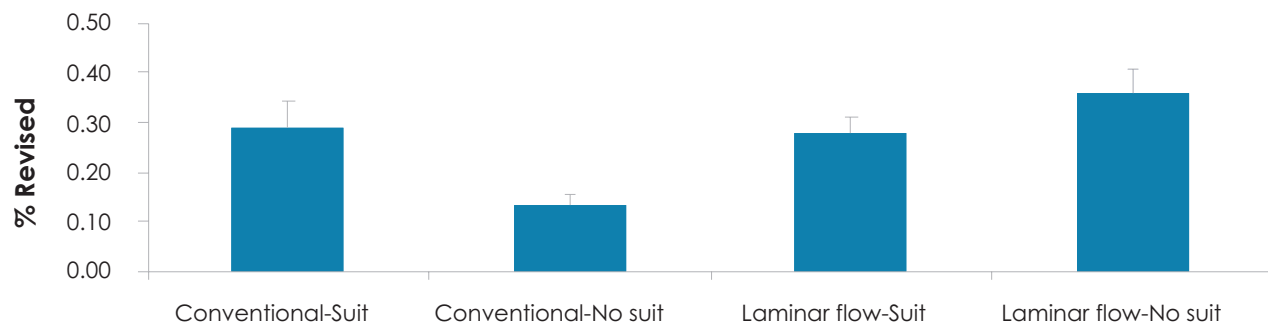


As with hip arthroplasty, there is a significant difference in knee revision rates (2x) for deep infection within six months of surgery between conventional and laminar flow theatres.



Theatre Environment	Suit/No suit	Total Number	Number	%	Std Error
Conventional	Suit	9,002	26	0.28882	0.05656
	No suit	44,930	61	0.13577	0.01737
Laminar flow	Suit	23,149	64	0.27647	0.03451
	No suit	19,332	70	0.36209	0.04320

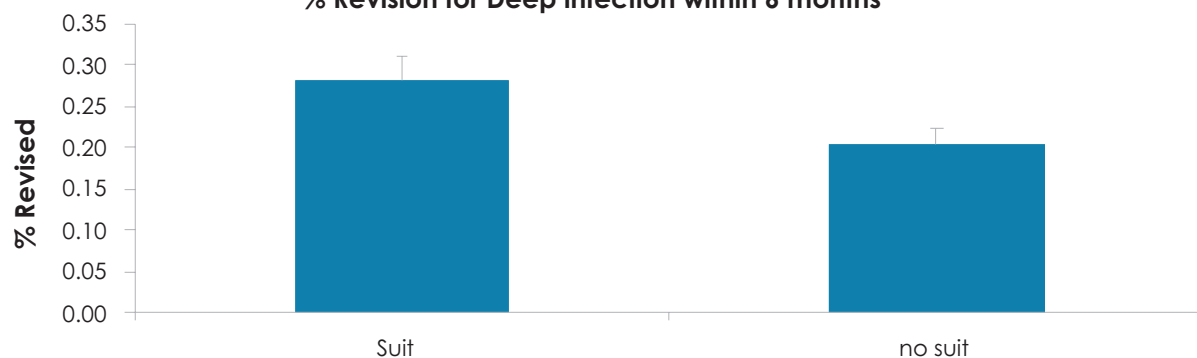
**% Revision for Deep infection within 6 months**



There is a significant difference in the revision rates between conventional/No suit and the conventional/suit and laminar/suit environments. See Tayton et BJJ. 2016 98-B (3), 334-340 for a more detailed analysis of infection data.

	Total Number	Number Revised	%	Std Error
Suit	32,151	90	0.27993	0.02947
No suit	64,262	131	0.20385	0.01779

**% Revision for Deep infection within 6 months**



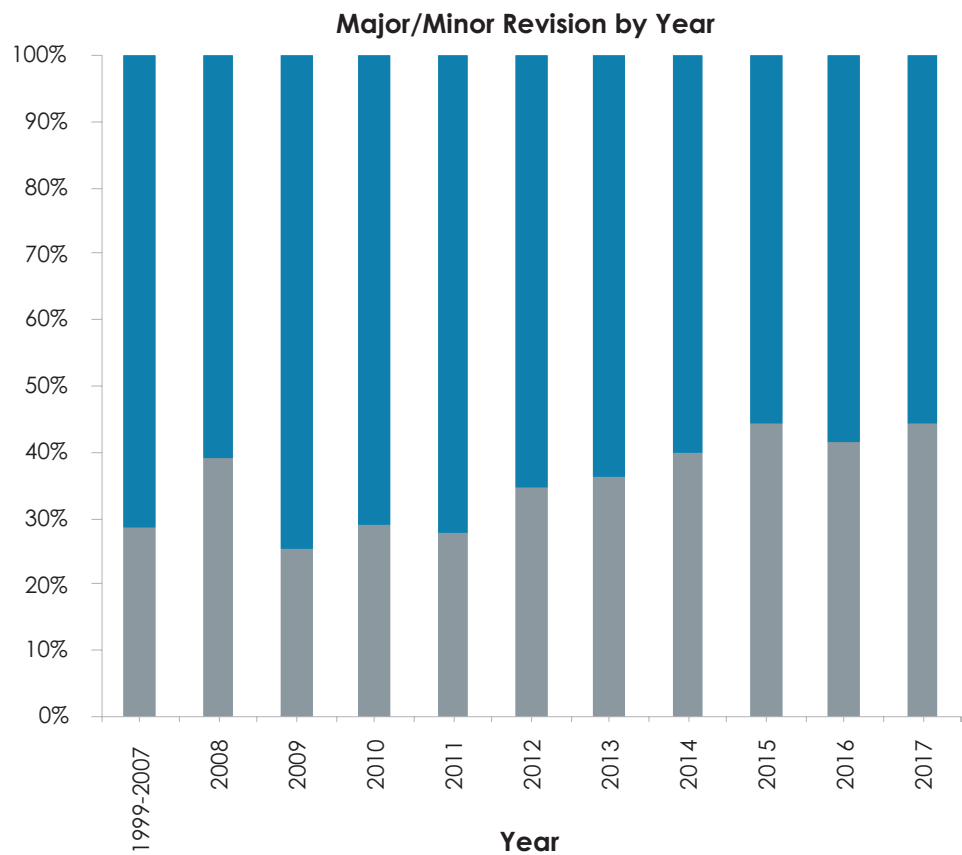
Furthermore, there is a significant increase in revision rates (1.6x) when suits are used in either conventional or laminar flow theatres.

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

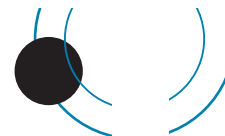
A major revision is defined as revision of tibial and/or femoral components, including any of minor components and minor revision as change of bearing and/or patellar components only.



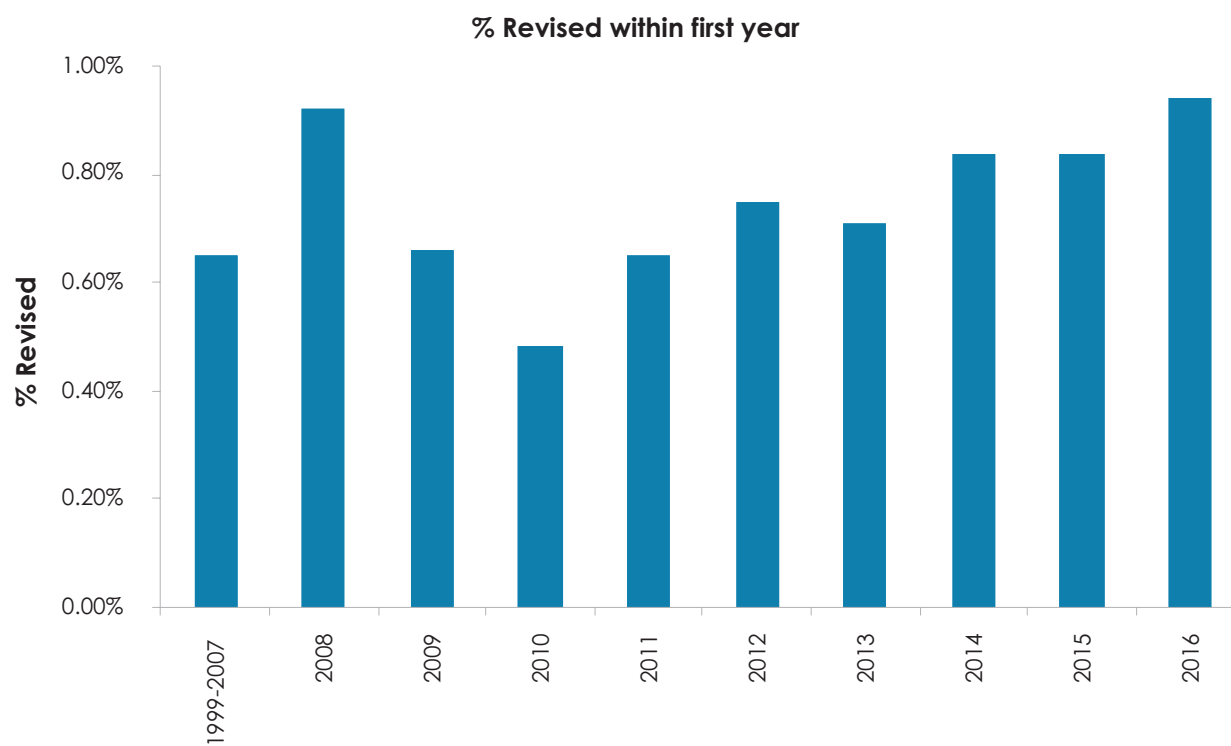
Re-revisions for major vs minor knee revisions

Major/Minor	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	990	3,904.1	168	4.30	3.68	5.01
Major	1,758	8,572.3	254	2.96	2.61	3.35

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



## Percentage of knees revised in the first year



### Patello-Femoral Arthroplasty

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
531	2,564	52	2.03	1.51	2.66

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

#### Revised to:

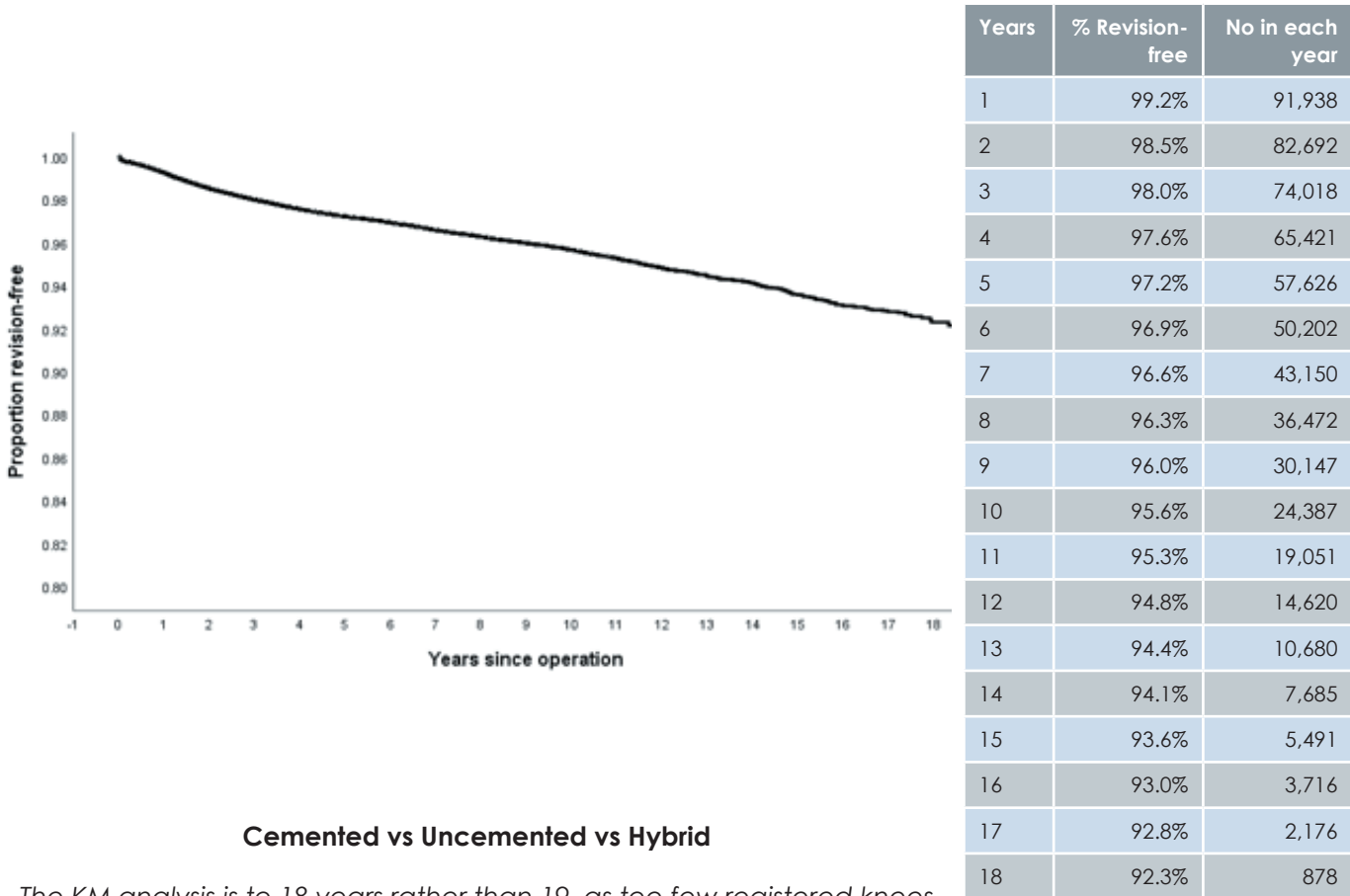
Total	47
Further Patello- Femoral	3
Uniknee	2



# KAPLAN MEIER CURVES

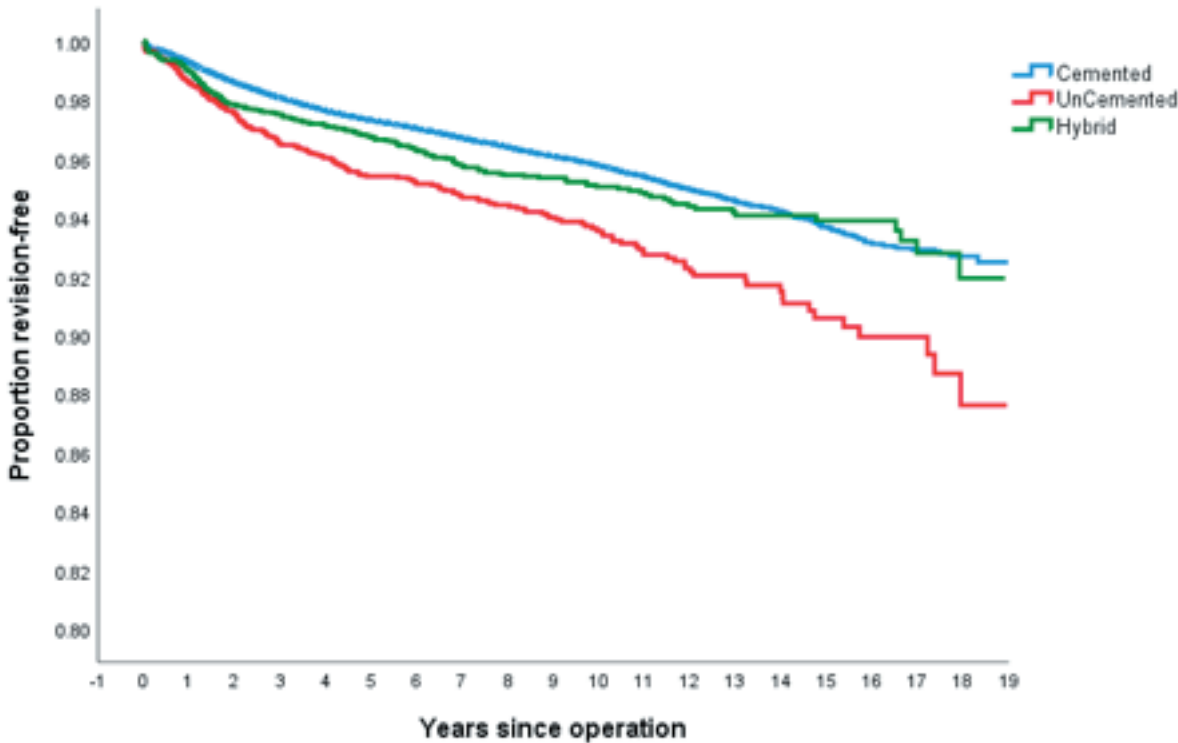
The following Kaplan Meier survival analyses are for years 1999 – 2017 with deceased patients censored at time of death.

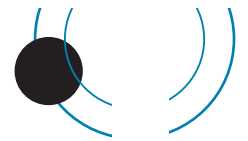
All Knees



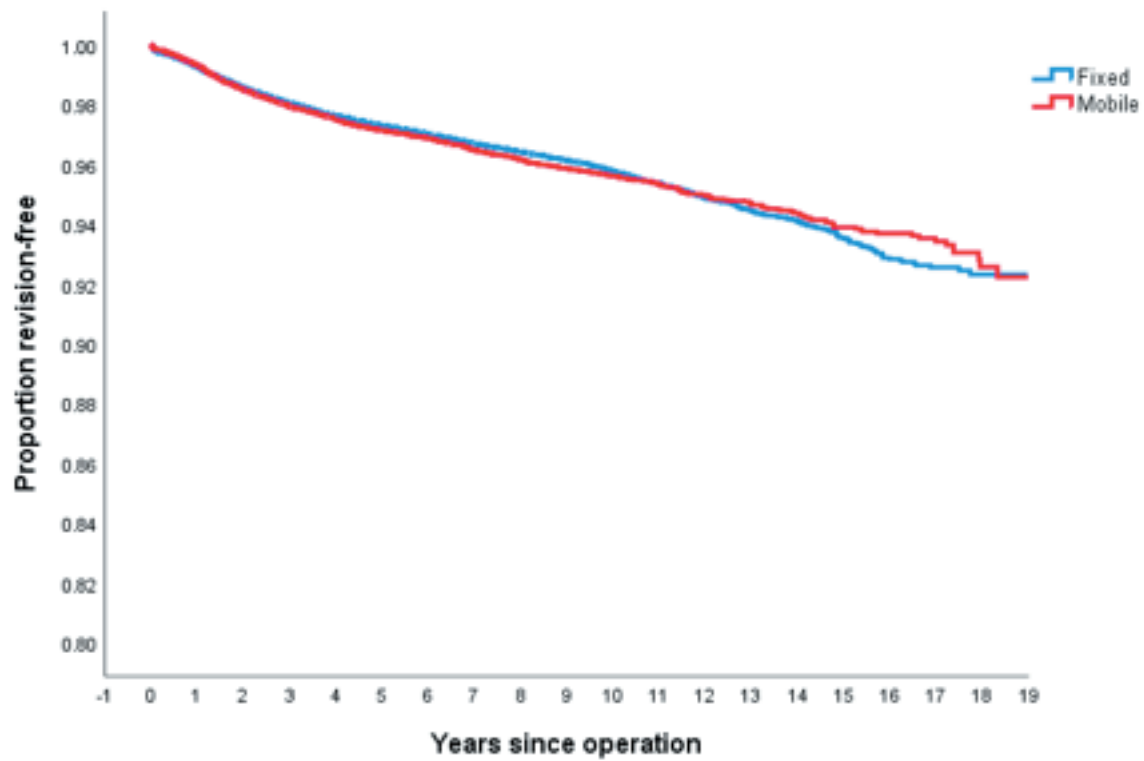
Cemented vs Uncemented vs Hybrid

The KM analysis is to 18 years rather than 19, as too few registered knees were revised in 2017.

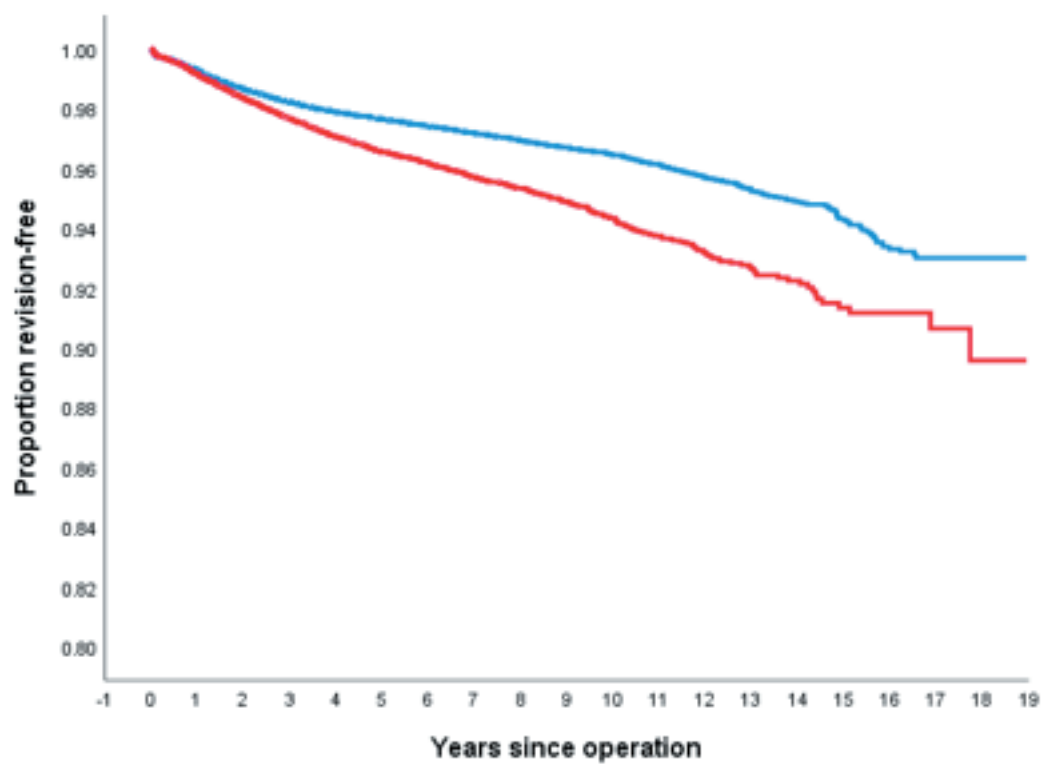




### Fixed vs Mobile knees

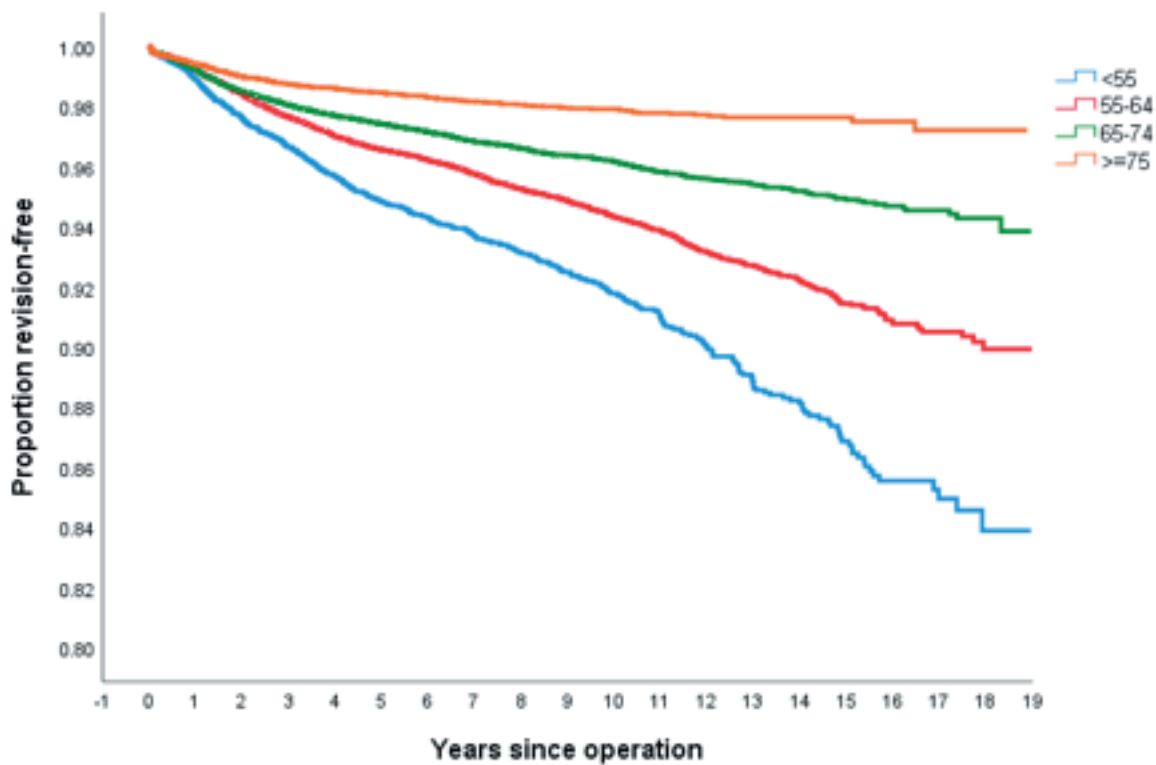


### Posterior Stabilised vs Cruciate Retaining

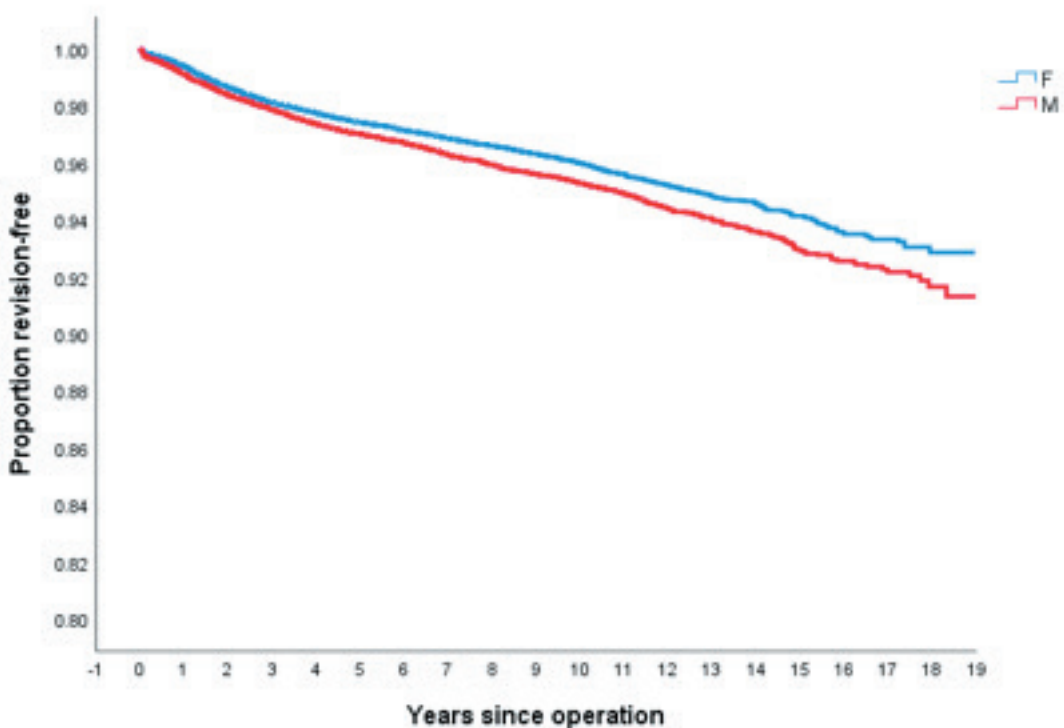


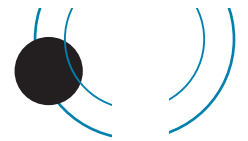


Survival for age bands

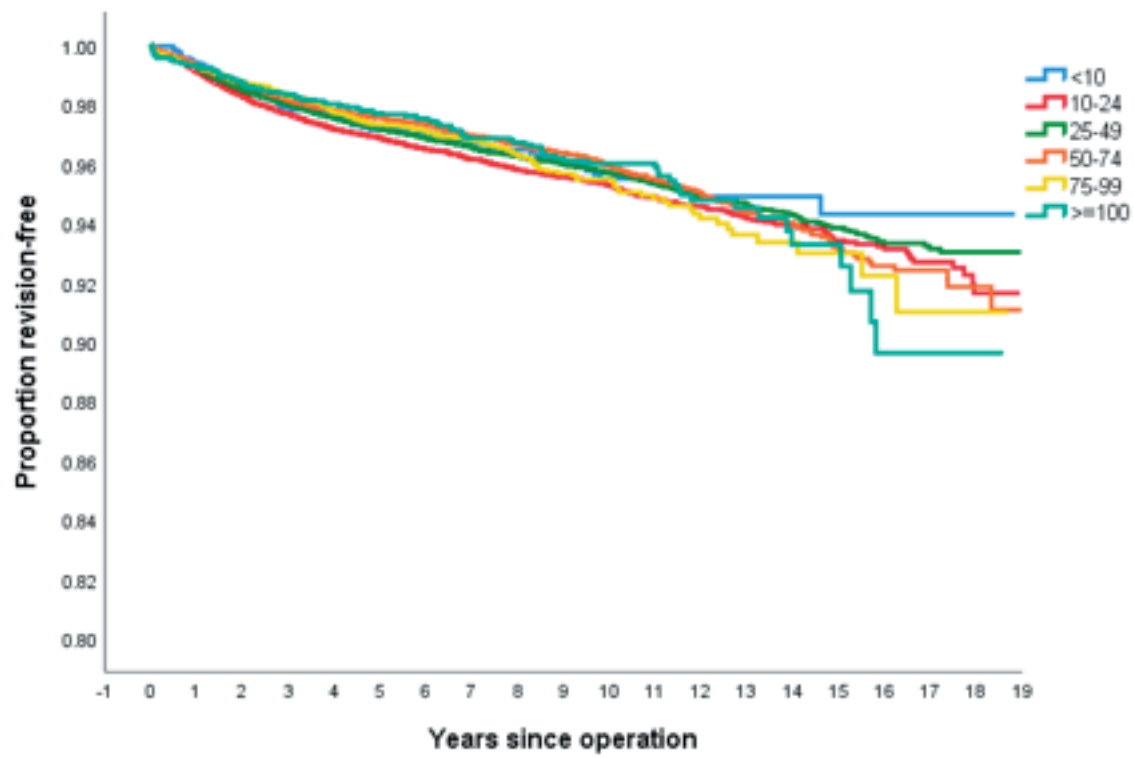


Survival for male vs female

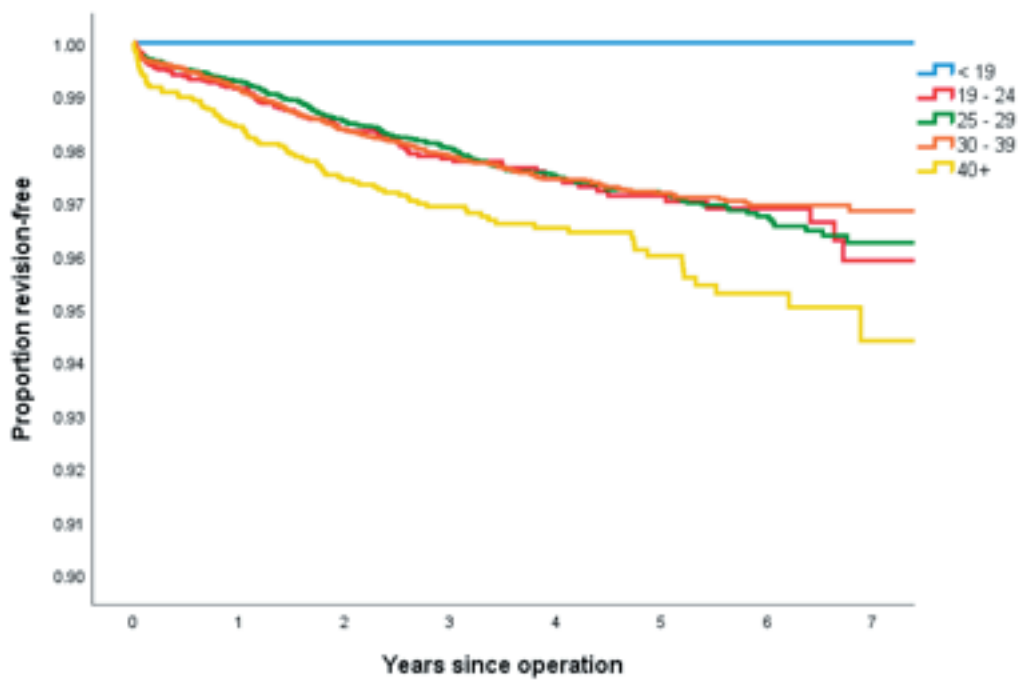




### Survival for surgeon annual output

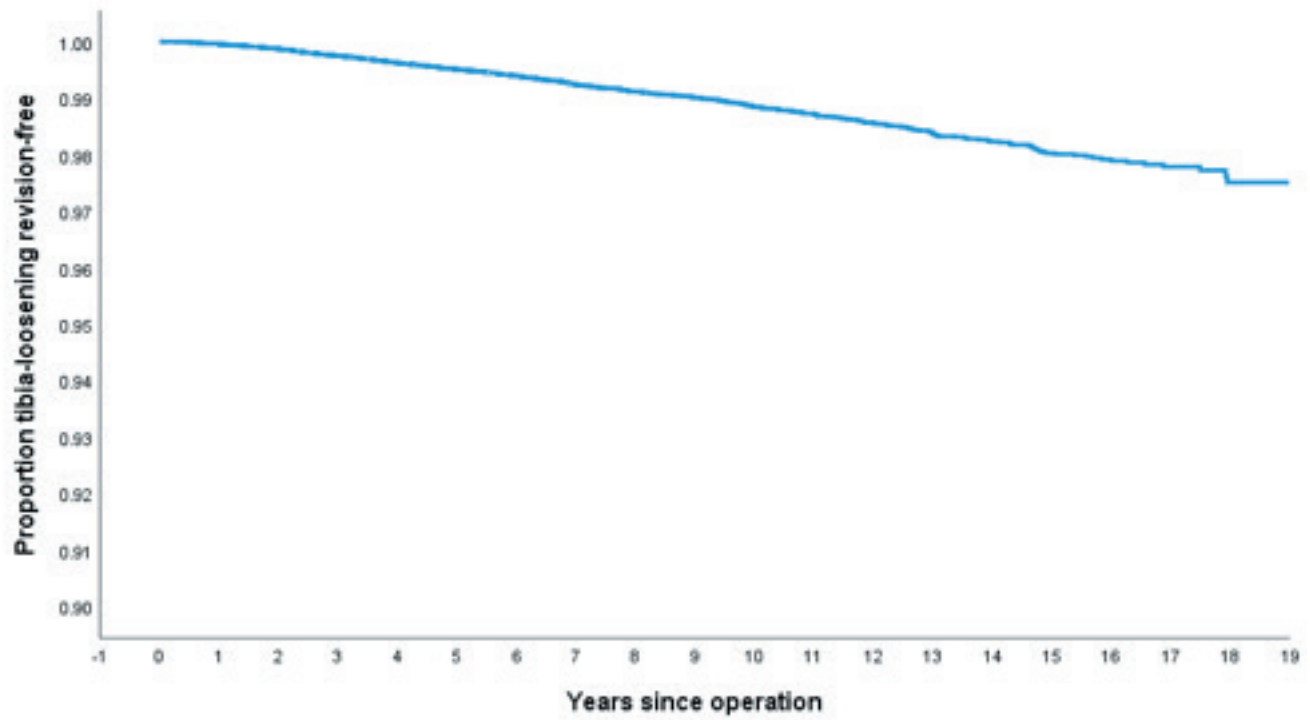


### Survival for BMI groups

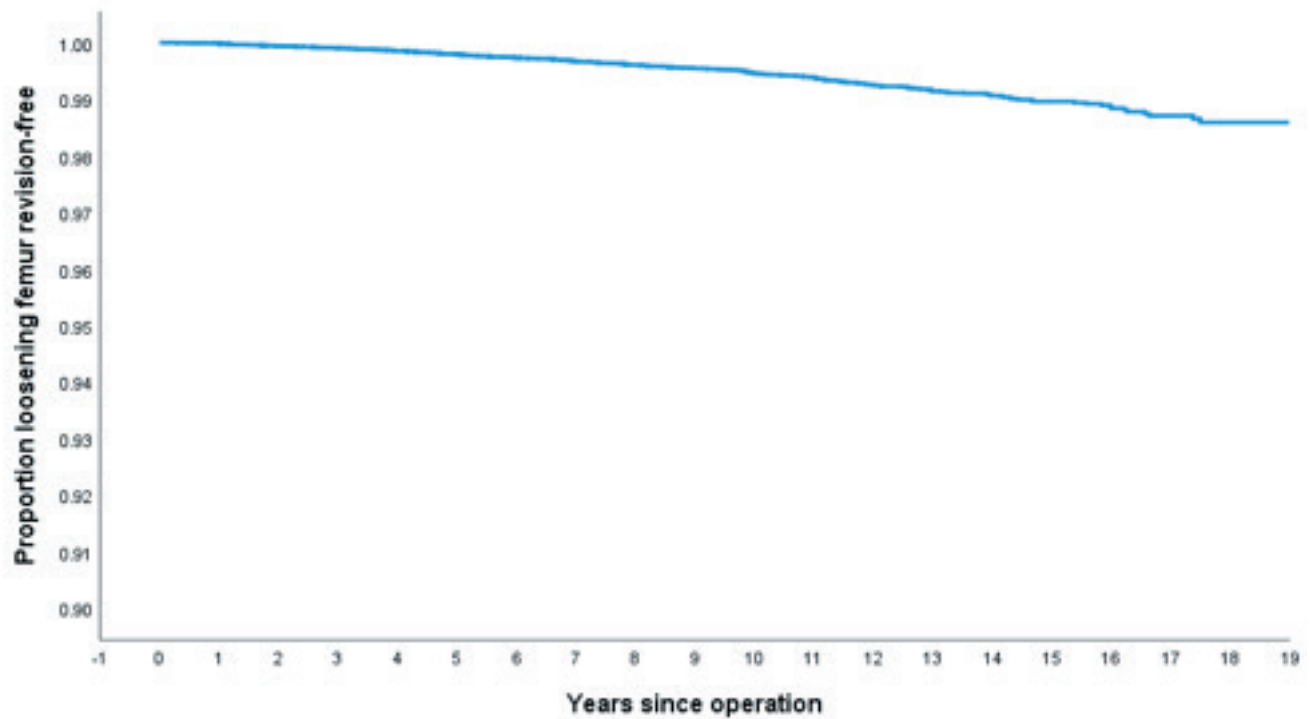


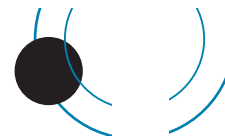


### Tibial loosening

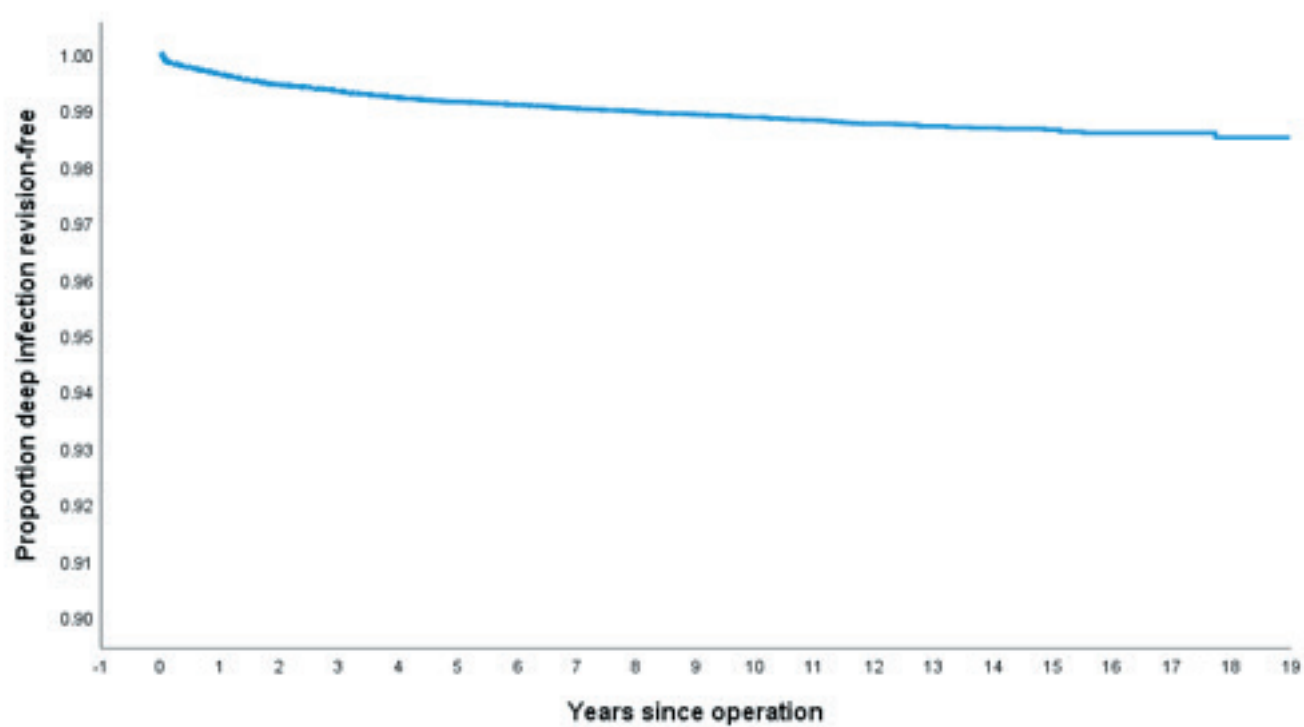


### Femoral loosening

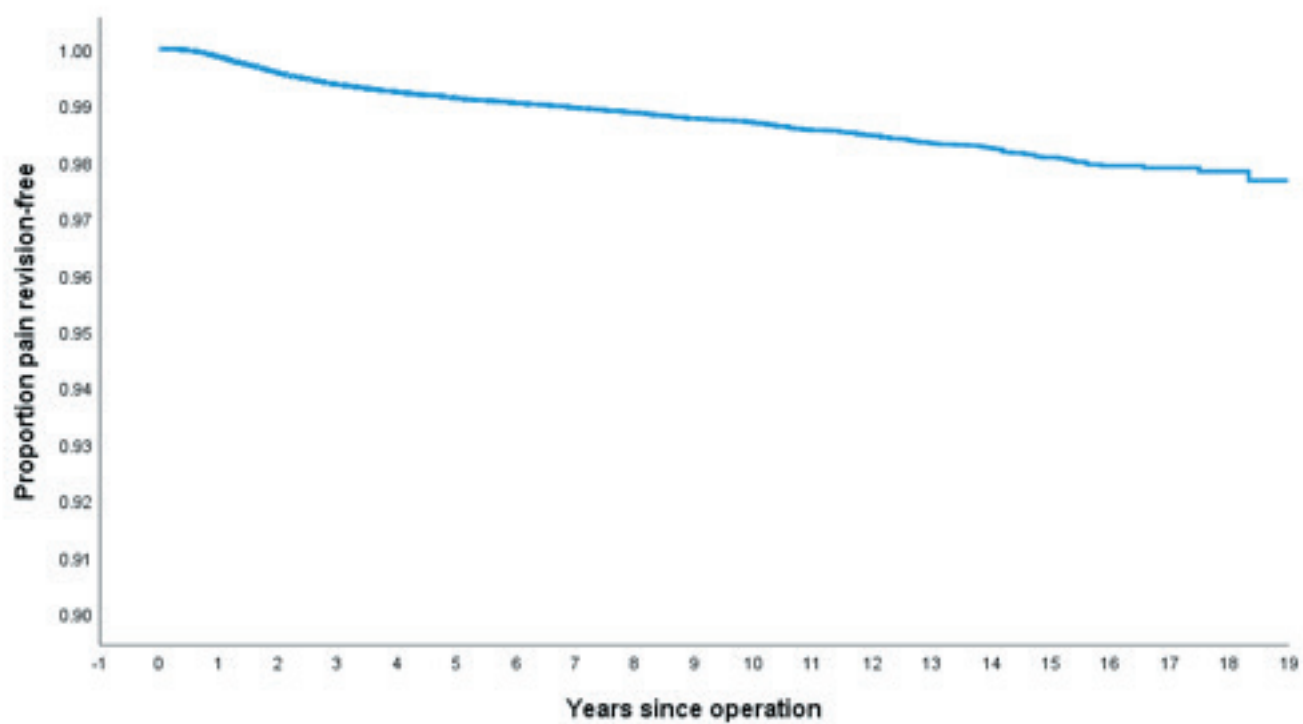




## Deep infection

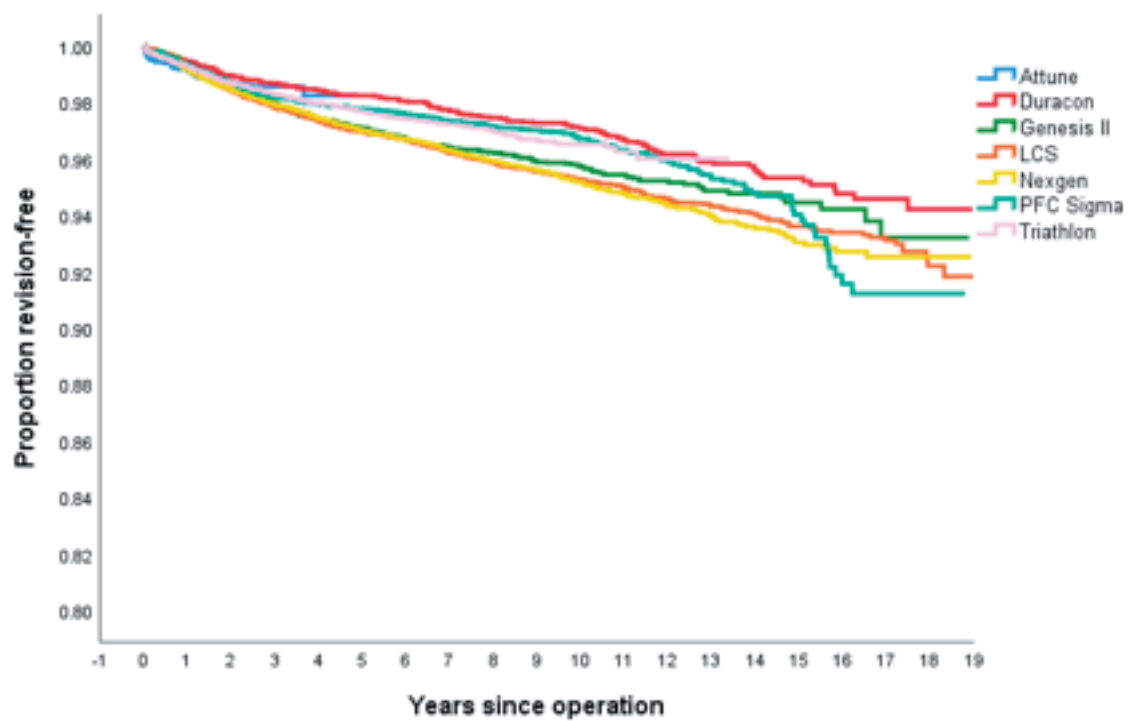
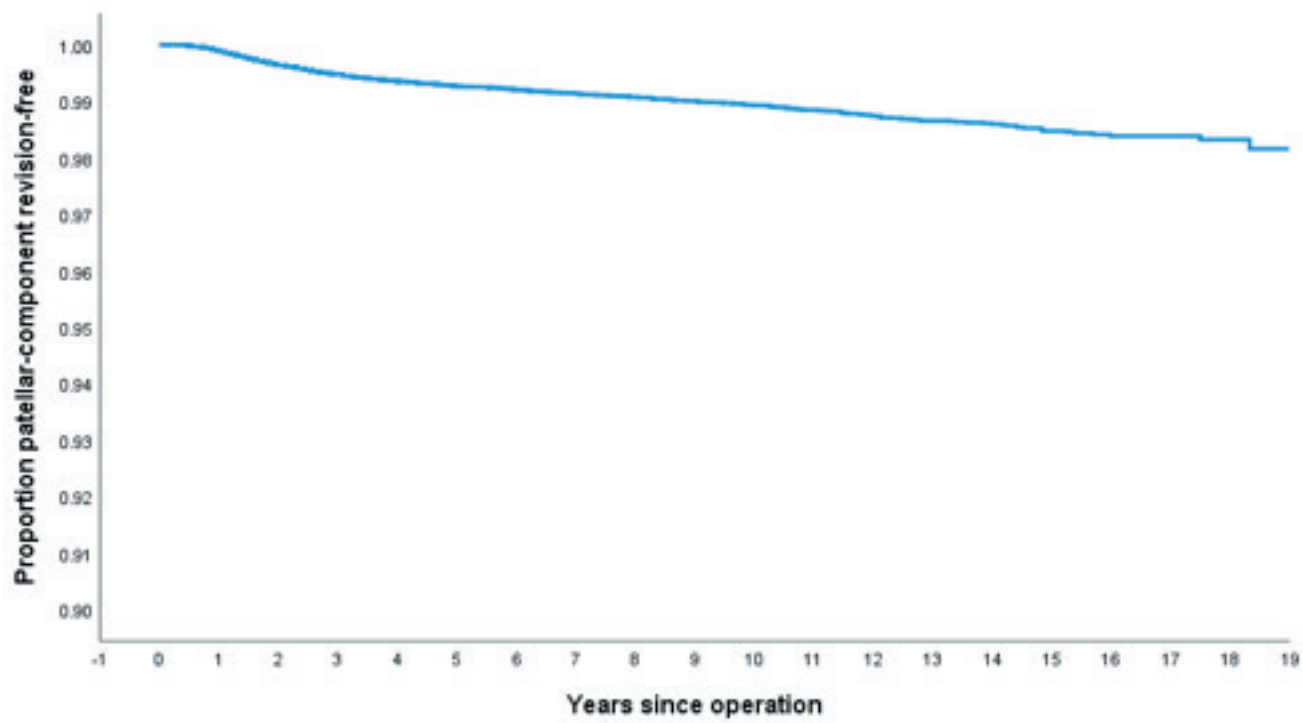


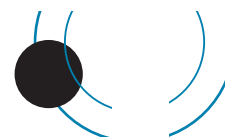
## Pain





Patella





## KNEE RE-REVISIONS

Analysis was undertaken of re-revisions. There were 497 registered primary knee revisions that had been revised twice, 105 that had been revised three times, 24 that had been revised four times, 8 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 497 knee arthroplasties averaged 867 days, with a range of 1 – 5,398 and a standard deviation of 1,005 days. This compares to an average of 1,446 days between primary and first revision knee arthroplasty.

### Reason for revision

Deep infection	244
Pain	100
Loosening tibial component	72
Loosening femoral component	60
Loosening patellar component	7
Fracture femur	2
Fracture tibia	1

### Second Revisions

Number of primary revisions	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
3,307	15,433	497	3.22	2.94	3.52

### Third revision

The average time between second and third revisions for the 105 knee arthroplasties was 657 days, with a range of 5 – 5,185 and a standard deviation of 715 days.

### Fourth revision

The average time between third and fourth revisions for the 24 knee arthroplasties was 549 days, with a range of 10 – 3,136 and a standard deviation of 722 days.

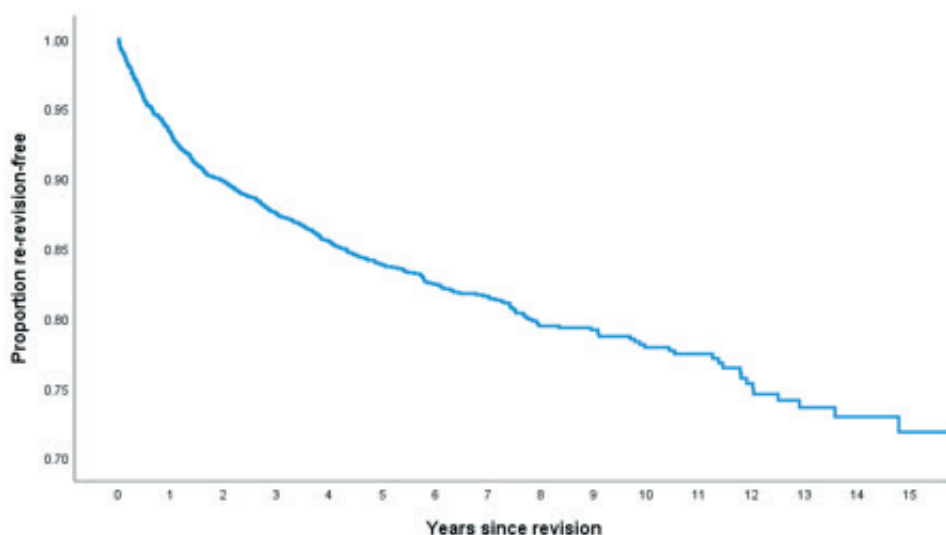
### Fifth revision

The average time between fourth and fifth revisions for the 8 knee arthroplasties was 1,040 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	93.10%	2,682
2	89.80%	2,242
3	87.50%	1,865
4	85.50%	1,546
5	83.80%	1,265
6	82.40%	1,043
7	81.60%	861
8	79.40%	663
9	79.20%	524
10	77.90%	373
11	77.40%	270
12	75.30%	196

## 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 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).

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

For the nineteen year period and as at July 2018, there were 28,834 primary knee questionnaire responses registered at six months post-surgery.

The average knee score was 37.68 (standard deviation 8.03, range 48 – 0).

Scoring	> 41	11,271
Scoring	34 – 41	10,177
Scoring	27 – 33	4,337
Scoring	< 27	3,049

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 11,249 individual patients.

At five years post-surgery, 84% of patients achieved an excellent or good score and had an average of 40.46.

### 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 5,900 individual patients.

At ten years post-surgery, 81% of patients achieved an excellent or good score and had an average 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 2,029 individual patients.

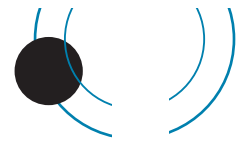
At fifteen years post-surgery, 79% of patients achieved an excellent or good score and had an average of 39.26.

### BMI vs Oxford score at six months

BMI	Mean	Standard Error of Mean	Number/ Group
< 19	39.46	2.385	13
19 - 24	39.80	0.217	1,023
25 - 29	39.28	0.132	2,881
30 - 39	37.93	0.131	3,506
40+	36.17	0.326	584
<b>Total</b>	<b>38.53</b>	<b>0.084</b>	<b>8,007</b>

### Revision knee questionnaire responses

There were 4,466 revision hip responses with 53% achieving an excellent or good score. This group includes all revision knee procedures. The average revision hip score was 32.88 (standard deviation 10.20, range 0 – 48).

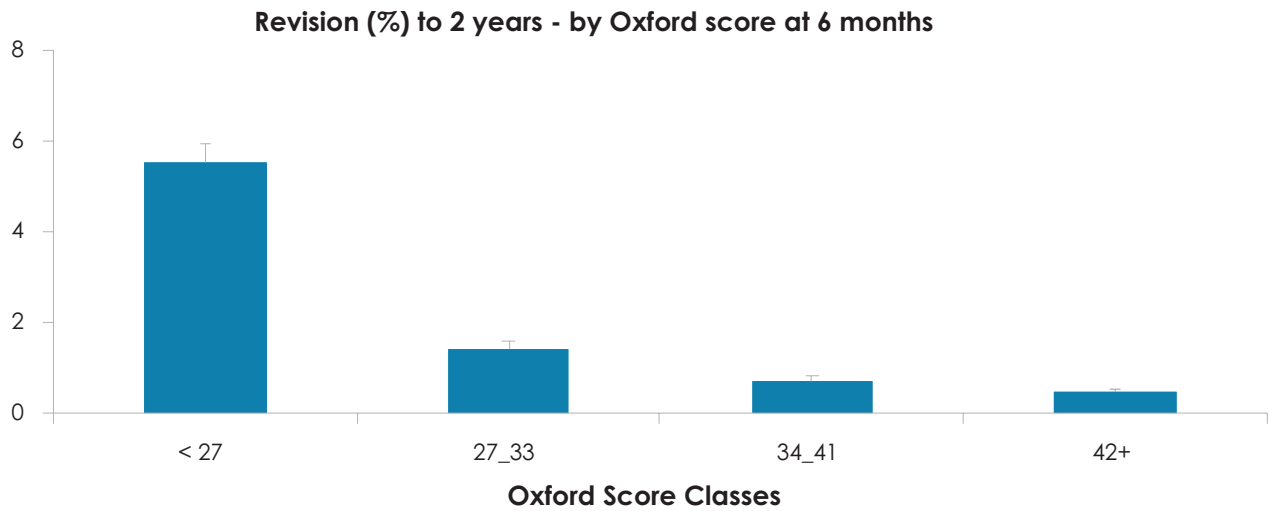


### OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

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



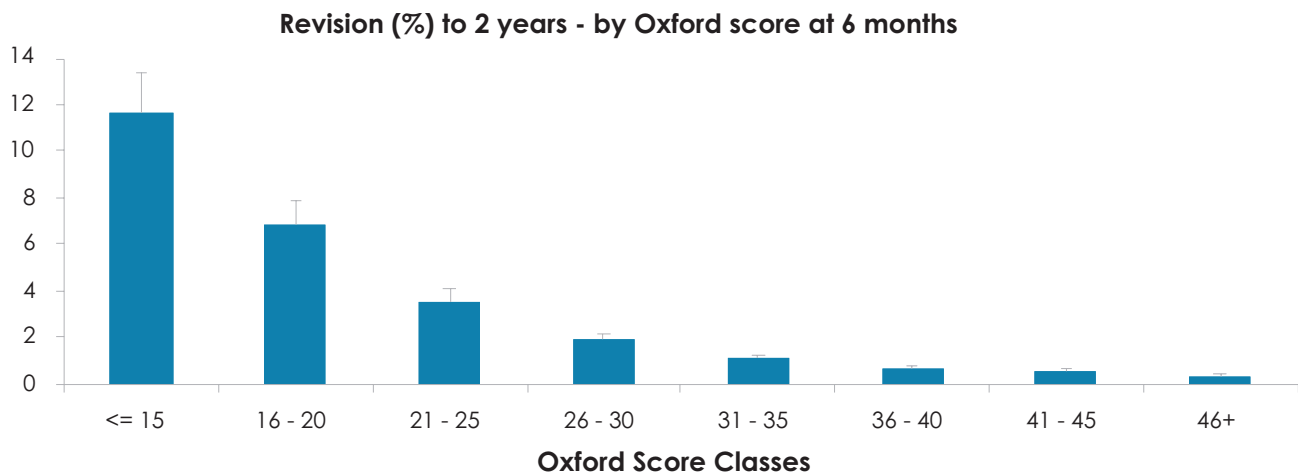
### Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date

Kalairajah group	No in group	No. revised	%	Std error
< 27	2,632	145	5.51	0.44
27_33	3,661	51	1.39	0.19
34_41	8,562	62	0.72	0.09
42+	9,198	42	0.46	0.07

A person with an Oxford score > 42 has a 0.46 risk of revision within two years compared to a 5.5% 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.

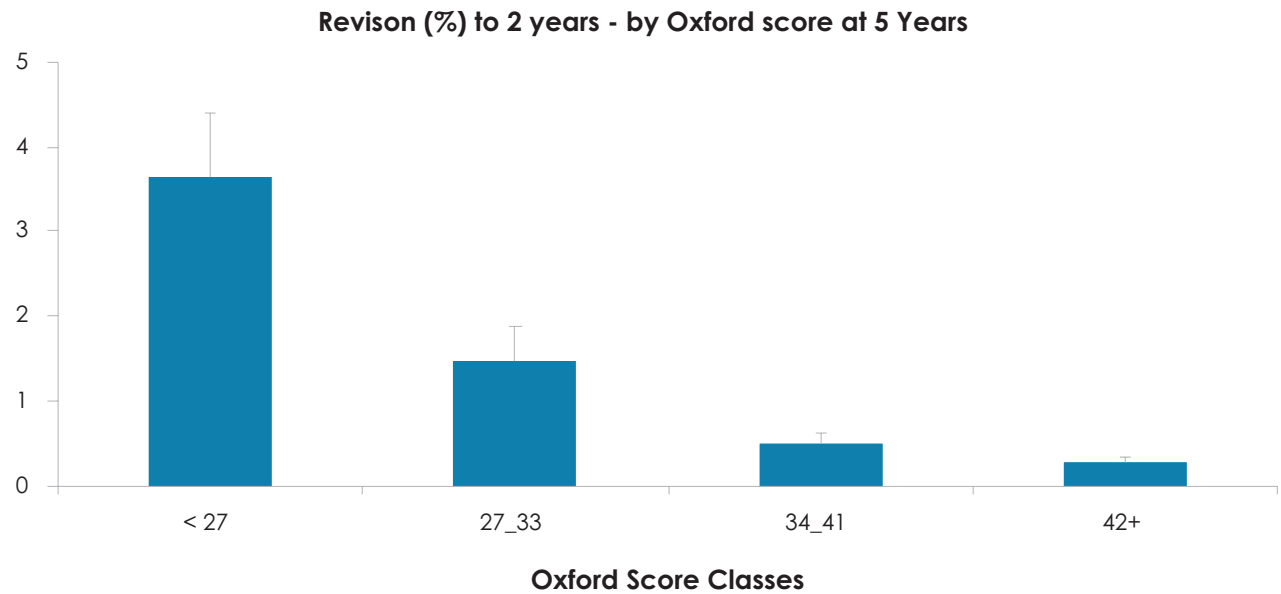
### Revision risk versus groupings of Oxford scores within two years of the 6 month score date





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 13.52 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.

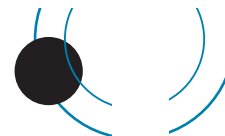
Kalairajah group	No in group	No. revised	%	Std error
< 27	631	23	3.65	0.75
27_33	820	12	1.46	0.42
34_41	2,249	11	0.49	0.15
42+	5,263	14	0.27	0.07

A person with an Oxford score 34-41 has a 0.49% risk of revision within two years compared to a 3.65% 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 9.77 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	327	15	4.59	1.16
27_33	425	11	2.59	0.77
34_41	1,084	6	0.55	0.23
42+	2,347	11	0.47	0.14

A person with an Oxford score of > 41 has a 0.47% risk of revision within two years compared to a 4.59% risk with a score of 27 or less.

### Fifteen year score and revision arthroplasty

As with the six month, five year and ten year scores, plotting the patients' fifteen 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 13.39 times the risk of a revision within two years compared to a person with a score >41.

Score group	Revision to 2 years	Number revised	%	Std error
< 27	80	9	11.25	3.53
27_33	72	0	0.00	0.00
34_41	176	1	0.57	0.57
42+	358	3	0.84	0.48

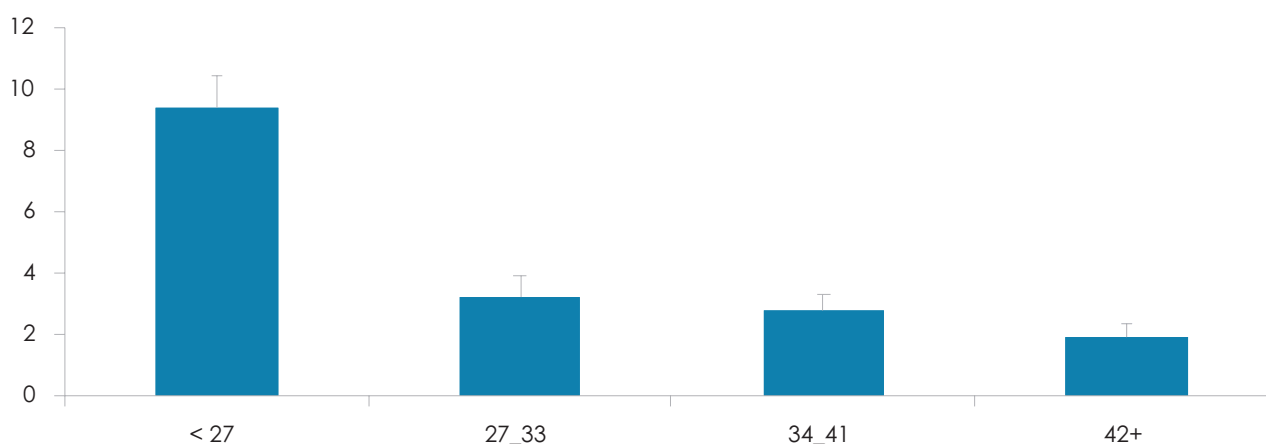
Revision (%) to 2 years - by Oxford score at 15 Years



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

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

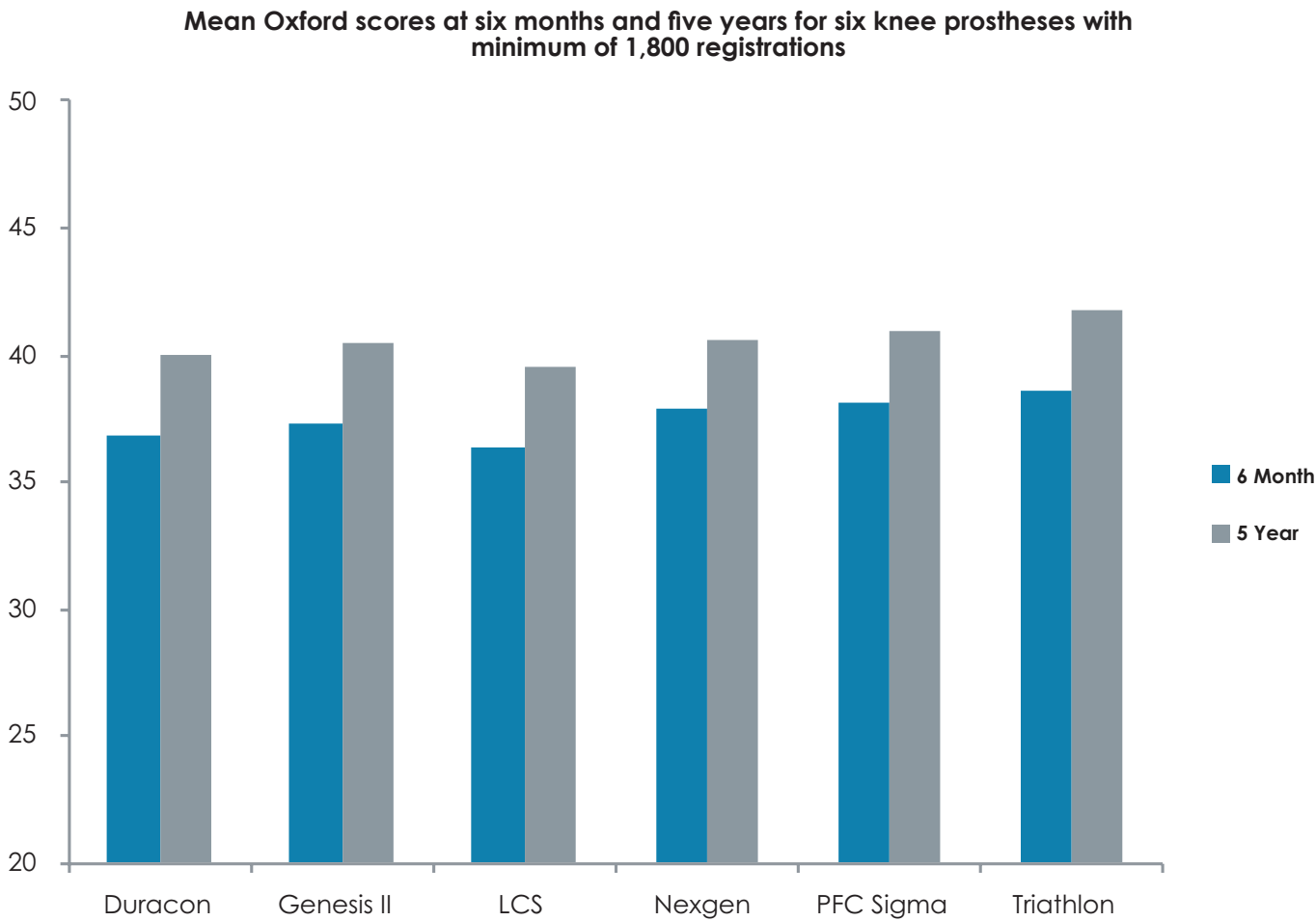


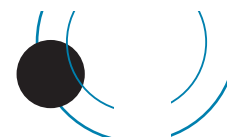


Second revision risk versus Kalairajah groupings of Oxford scores within two years of the six month post-first revision score date.

Kalairajah groups	No in group	No. revised	%	Std error
< 27	862	81	9.40	0.99
27_33	649	21	3.24	0.69
34_41	1,006	28	2.78	0.52
42+	843	16	1.90	0.47

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.





# UNICOMPARTMENTAL KNEE ARTHROPLASTY

## PRIMARY UNICOMPARTMENTAL KNEE ARTHROPLASTY

The **eighteen year** report analyses data for the period January 2000 – December 2017. There were 11,530 unicompartmental knee procedures registered with an additional 1,054 for 2017.

The Oxford uncemented medial UKR remains the most commonly used prosthesis with 701 (66%), followed by the Zimmer UK 224 (21%) and the Oxford lateral dome UKR at 71%.

## Data Analysis

### Age and sex distribution

The average age for a unicompartmental knee replacement was 66 years, with a range of 18 – 95 years.

	Female	Male
Number	5,320	6,210
Percentage	46.14	53.86
Mean age	65.96	66.22
Maximum age	94.71	94.55
Minimum age	18.28	31.62
Standard dev.	10.12	9.17

### Body Mass Index

For the eight- year period 2010 - 2017, there were 4,768 BMI registrations for unicompartmental knee replacements.

The average was 29.87 with a range of 16.60 – 59.50 and a standard deviation of 5.00.

### Previous operation

None	9,298
Meniscectomy	1,719
Ligament reconstruction	65
Osteotomy	41
Internal fixation	33
Synovectomy	5

### Diagnosis

Osteoarthritis	11,285
Avascular necrosis	91
Post ligament disruption	55
Rheumatoid arthritis	25
Other inflammatory	22
Post fracture	21
Tumour	2

### Approach

Medial	8,583
Minimally invasive surgery	2,810
Lateral	243
Other	216
Image guided surgery	129

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	7,614	66%
Antibiotic in cement	4,916	65%
Tibia cemented	8,049	70%
Antibiotic in cement	5,204	65%

### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	11,119	96%
-----------------------------------------------------------	--------	-----

### Operating theatre

Conventional	8,017
Laminar flow	3,393
Space suits	2,675

### ASA Class

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

For the thirteen- year period 2005 – 2017, there were 8,614 (96%) unicompartmental knee procedures with the ASA class recorded.

### Definitions

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

ASA	Number	Percentage
1	1,659	19
2	5,549	64
3	1,387	16
4	19	1

### Operative time (skin to skin)

Mean	74 minutes
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### Surgeon grade

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

The following figures are for the thirteen- year period 2005 – 2017.

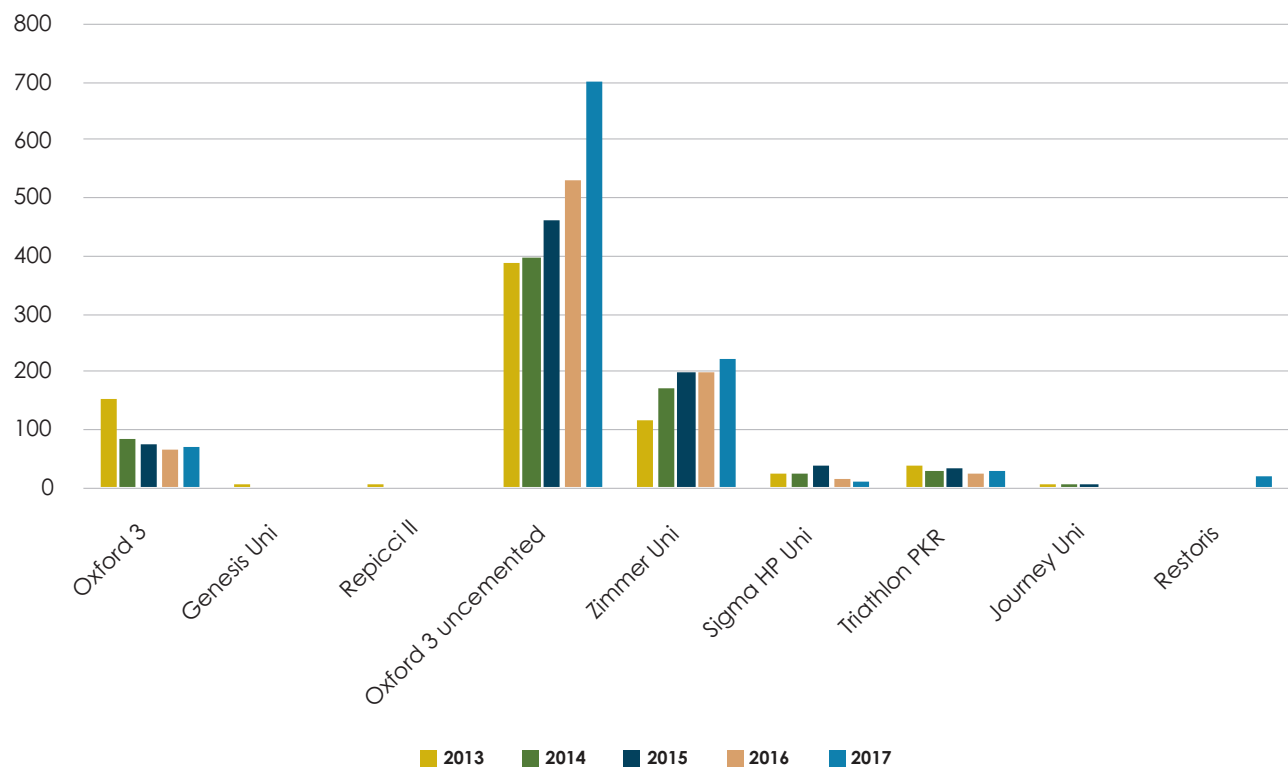
Consultant	8,516
Advanced trainee supervised	381
Advanced trainee unsupervised	37
Basic trainee	15

### Prosthesis usage

#### Unicompartmental knee prostheses used in 2017

Oxford 3 uncemented	701
Zimmer Uni	224
Oxford 3 (lateral dome)	71
Triathlon PKR	29
Restoris	18
Sigma HP Uni	11

## Most used Unicompartmental prostheses for 5 years (2013 – 2017)



### Surgeon and hospital workload

#### Surgeons

In 2017, 79 surgeons performed 1054 unicompartmental knee replacements, an average of 13 procedures per surgeon.

A total of 85 UKR's were performed by 41 surgeons who individually performed less than 5 procedures.

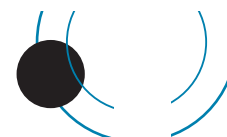
290 UKR's were performed by 31 surgeons doing 5-15 per year.

The remaining 679 UKR's were performed by 8 surgeons.

The 10 highest volume surgeons have performed 4,802 in total (265- 1342).

#### Hospitals

In 2017, unicompartmental knee replacements were performed in 37 hospitals; 18 were public and 19 were private.



## REVISION OF REGISTERED PRIMARY UNICOMPARTMENTAL ARTHROPLASTIES

This section analyses the data for revision of unicompartmental knee replacement over the eighteen-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 931 revisions of the 11,530 registered unicompartmental knee replacements (8%). A further 101 had a second revision, 15 a third revision, 1 a fourth revision and 1 a fifth revision.

750 of the 931 (81%) were revised to total knee replacements and 181 (19%) were revised to further unicompartmental replacements.

Of the implants that were in common use in 2017, 99 medial Oxford UKR were revised (0.71/100 ocys), 25 Zimmer UKR (0.52/100 ocys), 8 Triathlon PKR (0.98/100 ocys) and 16 lateral dome Oxford UKR (1.48/100 ocys).

The observed revision rate remains higher for the more implanted Oxford compared to the Zimmer UK.

However, this difference continues to narrow over time.

### Time to revision

Mean	1,942 days
Maximum	6,171 days
Minimum	4 days
Standard deviation	1,573 days

### Reason for revision

Pain	295
Loosening tibial component	161
Loosening femoral	116
Deep infection	37
Fracture tibia	26
Fracture femur	4

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

Years	Loosening femoral component		Loosening tibial component		Pain	
	Count	%	Count	%	Count	%
0	12	10.3	29	18.0	41	13.9
1	22	19.0	34	21.1	64	21.7
2	9	7.8	12	7.5	35	11.9
3	15	12.9	12	7.5	17	5.8
4	5	4.3	10	6.2	30	10.2
5	9	7.8	7	4.3	15	5.1
6	3	2.6	12	7.5	16	5.4
7	9	7.8	9	5.6	14	4.7
8	7	6.0	5	3.1	13	4.4
9	4	3.4	9	5.6	12	4.1
10	7	6.0	5	3.1	12	4.1
11+	14	12.1	17	10.6	26	8.8
Total	116		161		295	

### 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.



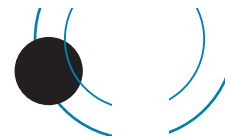
### All Primary Unicompartmental Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
11,530	77,388	931	1.20	1.13	1.28

### Revision Rate of Individual Unicompartmental Knee Prostheses Sorted Alphabetically

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
EIUS Uni Knee	22	220.0	1	0.45	0.01	2.53
Freedom Active Uni	36	167.3	7	4.18	1.68	8.62
Genesis Uni	359	3,540.1	50	1.41	1.05	1.86
HLS Uni Evolution	1	0.5	1	193.25	4.89	1,076.74
Journey Uni	7	21.5	1	4.64	0.12	25.87
LCS Uni	6	61.7	2	3.24	0.39	11.72
Miller/Galante	710	7,629.4	76	1.00	0.78	1.25
Optetrak Unicondylar Cemented	101	759.0	8	1.05	0.46	2.08
Oxford 3 cemented	4,080	37,353.4	516	1.38	1.26	1.50
Oxford 3 uncemented	3,862	15,098.6	115	0.76	0.63	0.91
Oxford TiNbn coated	1	6.5	0	0.00	0.00	57.16
Oxinium Uni	33	262.1	12	4.58	2.37	8.00
Preservation	484	4,840.6	80	1.65	1.31	2.06
Repicci II	98	1,167.4	22	1.88	1.15	2.80
Restoris	18	3.8	0	0.00	0.00	96.79
Sigma HP Uni	145	505.7	4	0.79	0.22	2.03
Triathlon PKR	225	816.6	8	0.98	0.38	1.85
Unix Uni	14	83.4	3	3.60	0.74	10.52
Zimmer Unicompartmental Knee	1,328	4,850.7	25	0.52	0.33	0.76

Oxford 3 uncemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial Oxford	3,566	14,014.87	99	0.71	0.57	0.86
Lateral Dome Oxford	296	1,083.7	16	1.48	0.84	2.40



### Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	7,589	61,775.6	807	1.31	1.22	1.40
Uncemented	3,456	13,480.4	96	0.71	0.58	0.87
Hybrid	485	2,132.3	28	1.31	0.87	1.90

### Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	1,467	9,845.2	180	1.83	1.57	2.12
55-64	3,970	27,550.3	419	1.52	1.38	1.67
65-74	3,875	26,532.0	237	0.89	0.78	1.01
>=75	2,218	13,460.8	95	0.71	0.57	0.86

### Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	5,320	36,546.5	480	1.31	1.20	1.44
Male	6,210	40,841.9	451	1.10	1.00	1.21

### 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	5,279	38,300.2	529	1.38	1.26	1.50
>=10	6,249	39,077.7	401	1.03	0.93	1.13

### Revision vs Surgical Approach

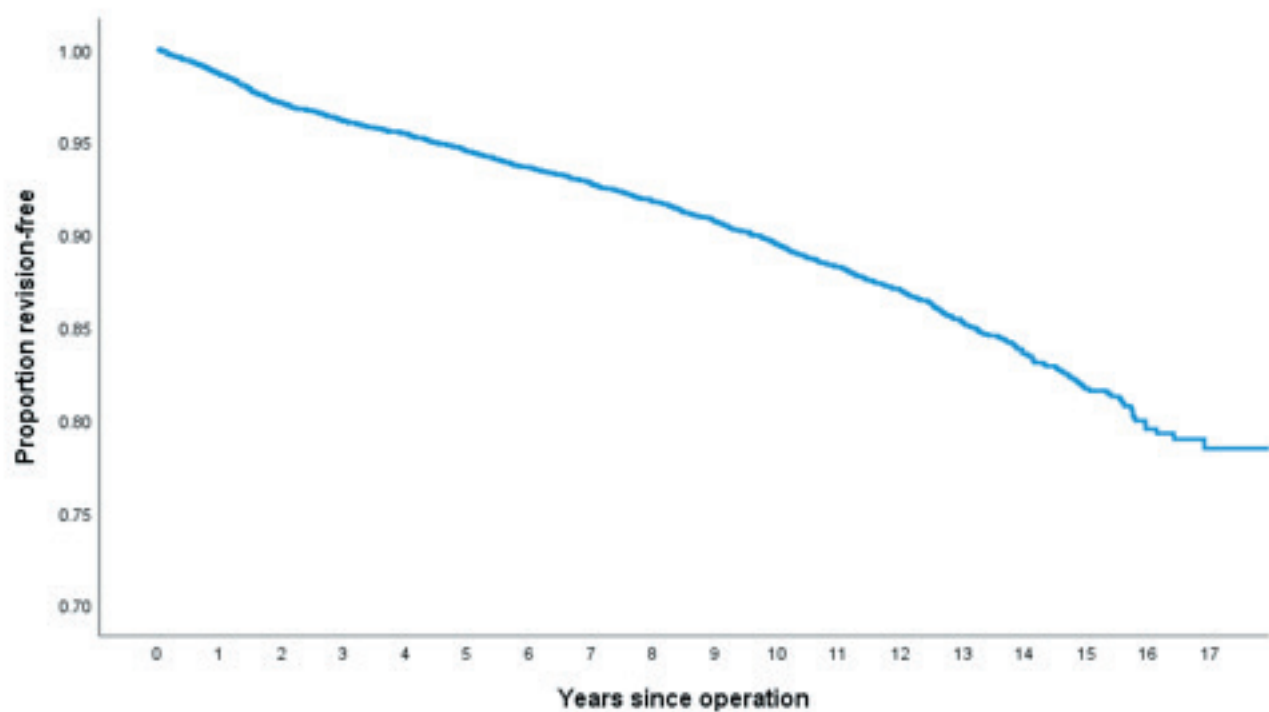
Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial parapatellar	8,583	59,115.6	754	1.28	1.19	1.37
Lateral parapatellar	243	1,726.1	27	1.56	1.01	2.24
Not Minimally Invasive	8,720	59,717.2	766	1.28	1.19	1.38
Minimally Invasive	2,810	17,671.1	165	0.93	0.80	1.09
Not Image guided	11,401	76,977.6	929	1.21	1.13	1.29
Image guided	129	410.7	2	0.49	0.00	1.76



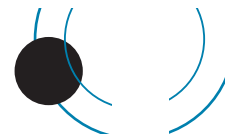
## KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 18 years from 2000 to 2017, with deceased patients censored at time of death

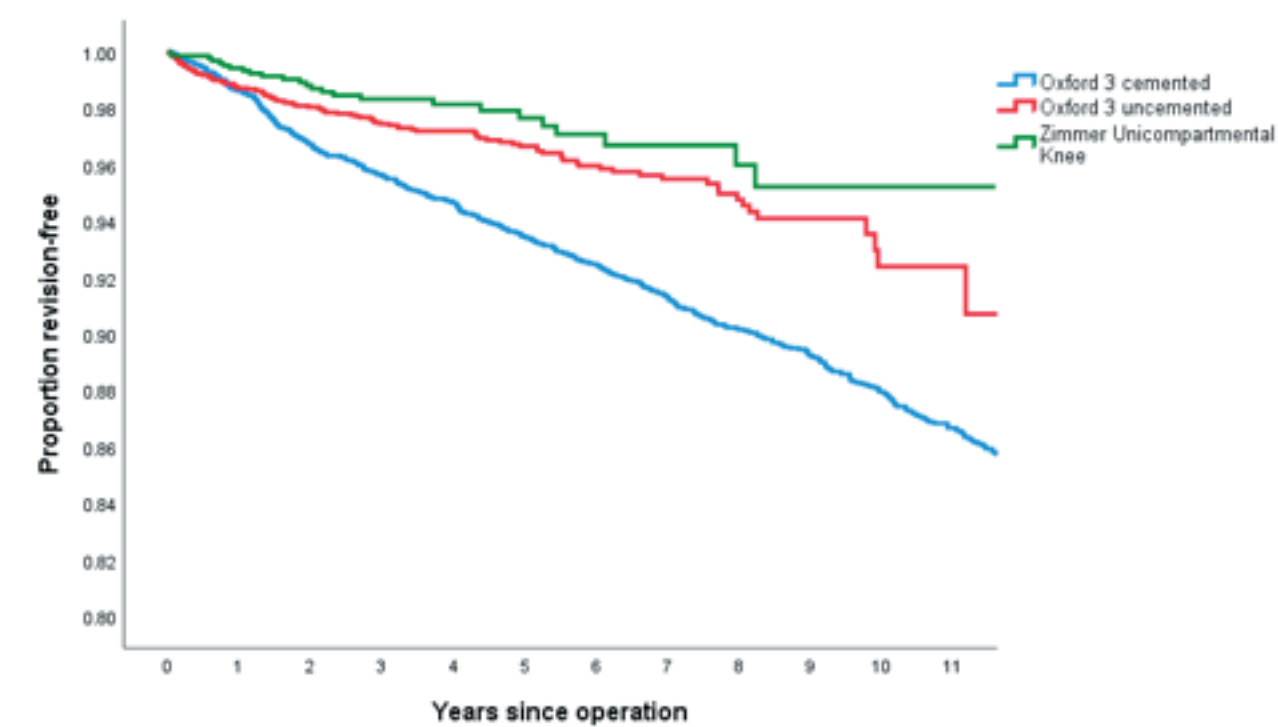
### Unicompartmental Knees



Years	% Revision-free	Number
1	98.6	10,272
2	97.1	9,219
3	96.1	8,237
4	95.5	7,386
5	94.5	6,527
6	93.6	5,720
7	92.8	5,044
8	91.8	4,360
9	90.7	3,678
10	89.5	3,115
11	88.2	2,526
12	87.0	2,000
13	85.3	1,515
14	83.6	1,047
15	81.7	656
16	79.5	344

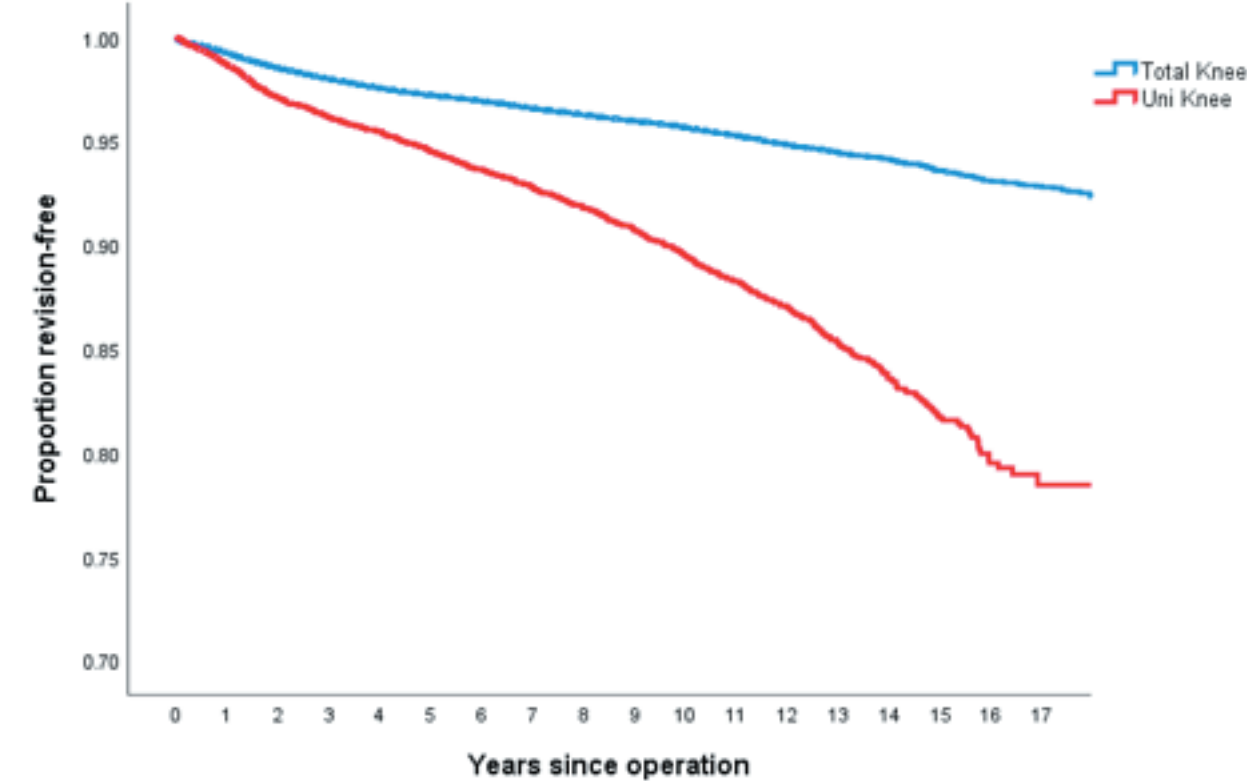


Survival curves for the 3 unicompartmental knees with the biggest number of implantations



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	750	4,291.3	60	1.40	1.07	1.80
Revised to Uni	181	742.1	41	5.53	3.96	7.50
All	931	5,033.4	101	2.01	1.63	2.44





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

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

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 2018, there were 7,564 unicompartmental knee questionnaire responses registered at six months post-surgery. The average unicompartmental knee score was 39.76 (standard deviation 7.19, range 3 – 48).

Scoring > 41	3,886
Scoring 34 - 41	2,409
Scoring 27	33805
Scoring < 27	464

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 3,112 individual patients.

At five years post-surgery, 88% of patients had achieved an excellent or good score and had an average of 41.65.

### 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 1,551 individual patients.

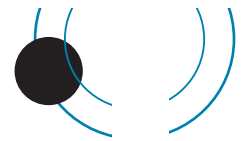
At ten years post-surgery, 83% of patients achieved an excellent or good score and had an average of 40.61.

### 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 343 individual patients.

At fifteen years post-surgery, 84% of patients achieved an excellent or good score and had an average of 40.28.

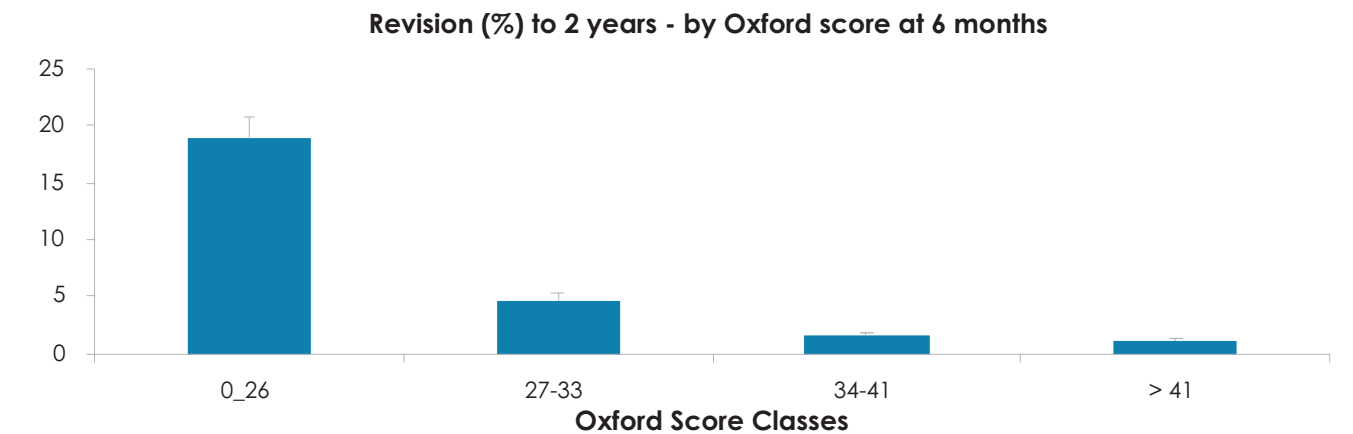


### OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

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



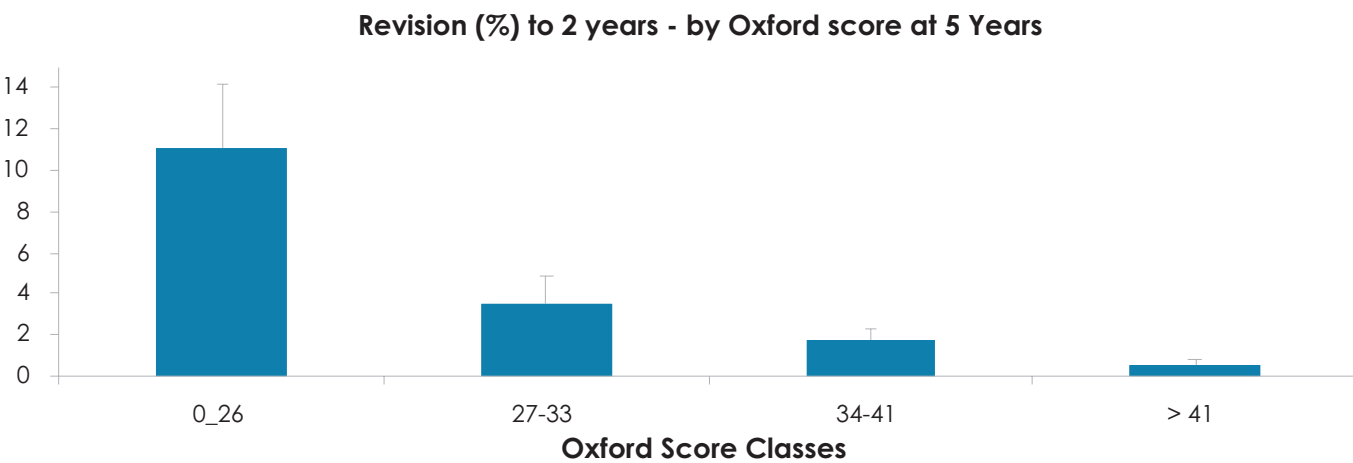
Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	381	72	18.90	2.01
27-33	682	31	4.55	0.80
34-41	1,994	29	1.45	0.27
> 41	3,080	34	1.10	0.19

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



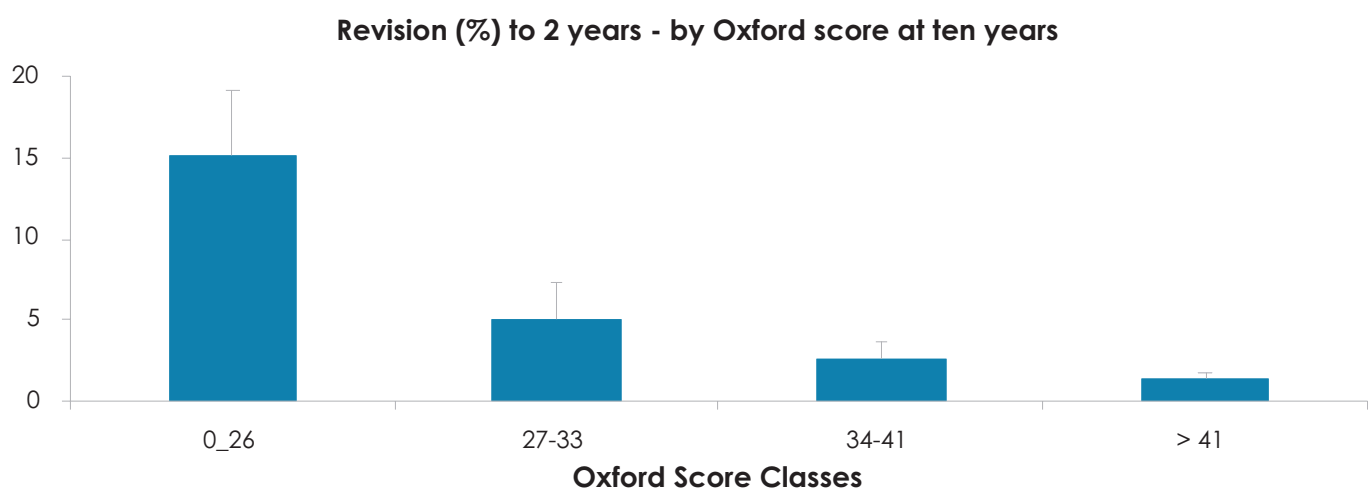


### Revision risk versus Kalairajah groupings of Oxford scores within two years of the five year score date

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	108	12	11.11	3.02
27-33	173	6	3.47	1.39
34-41	569	10	1.76	0.55
> 41	1,544	9	0.58	0.19

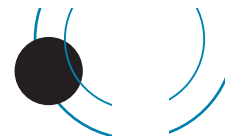
### Ten year score and revision arthroplasty

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 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 10 year score date

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	79	12	15.19	4.04
27-33	99	5	5.05	2.20
34-41	231	6	2.60	1.05
> 41	610	8	1.31	0.46



# ANKLE ARTHROPLASTY

## PRIMARY ANKLE ARTHROPLASTY

The **eighteen year** report analyses data for the period January 2000 – December 2017. There were 1,502 primary ankle procedures registered, an additional 122 compared to last year's report.

## Data Analysis

### Age and sex distribution

The average age for an ankle replacement was 66 years, with a range of 32 – 96 years.

	Female	Male
Number	589	913
Percentage	39.21	60.79
Mean age	63.86	67.54
Maximum age	95.52	90.51
Minimum age	32.32	33.42
Standard dev.	9.68	8.54

### Body Mass Index

For the eight year period 2010 - 2017, there were 543 BMI registrations for primary ankle replacements. The average was 28.44 with a range of 17 – 54 and a standard deviation of 4.66.

### Previous operation

None	1,191
Internal fixation for juxta articular fracture	145
Arthrodesis	43
Osteotomy	23

### Diagnosis

Osteoarthritis	1,135
Post trauma	240
Rheumatoid arthritis	126
Other inflammatory	20
Avascular necrosis	6

### Approach

Anterior	1,294
Anterolateral	48
Other	18

### Bone graft

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

### Cement

Tibia cemented	25
Antibiotic in cement	16
Talus cemented	19
Antibiotic in cement	12

### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	1,446 (96%)
-----------------------------------------------------------	-------------

### Operating theatre

Conventional	748
Laminar flow	739
Space suits	281

### ASA Class

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

For the thirteen year period 2005 -2017, there were 1,231 (91%) primary ankle procedures with the ASA class recorded.

### Definitions

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

ASA	Number
1	233
2	757
3	236
4	5

### Operative time (skin to skin)

Mean	121 minutes
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### Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the thirteen-year period 2005 -2017.

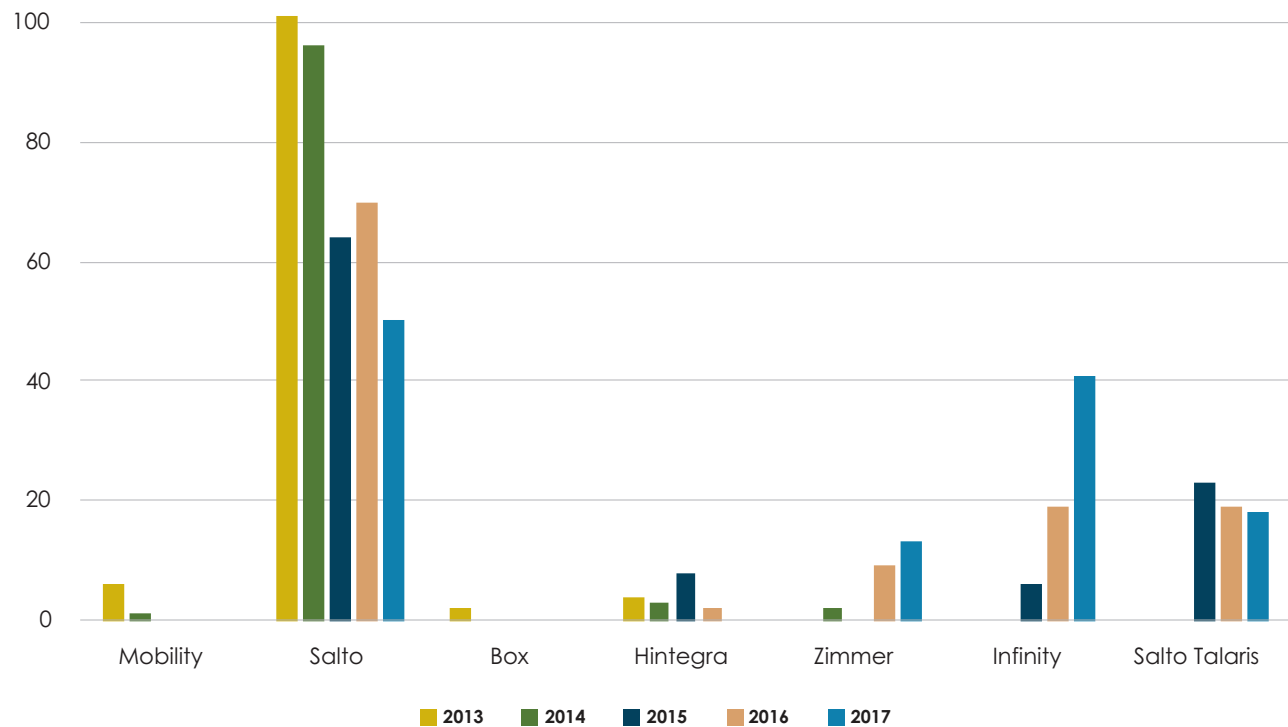
Consultant	1,349
Advanced trainee supervised	8

### Prosthesis usage

#### Ankle prostheses used in 2017

Salto	50
Infinity	41
Salto Talaris	18
Zimmer TM	13

## Most Used Ankle Prostheses 2013 – 2017



### Surgeon and hospital workload

#### Surgeons

In 2017, 20 surgeons performed 122 primary ankle procedures. 2 surgeons performed more than 15 procedures and 11 performed <5 procedures.

#### Hospitals

In 2017, primary ankle replacement was performed in 24 hospitals. 12 were public and 12 were private.

### REVISION ANKLE ARTHROPLASTY

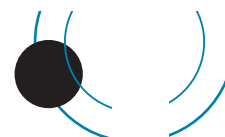
Revision is defined by the Registry as a new operation in a previously replaced ankle joint, during which one or more of the components are exchanged, removed, manipulated or added. It includes arthrodesis or amputation, but not soft tissue procedures. A two or more staged procedure is registered as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

### Data Analysis

For the eighteen year period January 2000–December 2017, there were 218 revision ankle procedures registered.

The average age for an ankle revision was 66 years, with a range of 35 – 85.

	Female	Male
Number	81	137
Percentage	37.16	62.84
Mean	63.97	66.68
Maximum age	81.68	85.43
Minimum age	42.13	34.55
Standard dev.	9.47	8.44



## REVISION OF REGISTERED PRIMARY ANKLE ARTHROPLASTIES

This section analyses data for revisions of primary ankle procedures for the eighteen-year period 2000 – 2017.

There were 167 revisions of the primary total ankle procedures of 1,502 (11%).

### Time to revision

Average	1,585 days
Maximum	5,173 days
Minimum	21 days
Standard deviation	1,204 days

### Reason for revision

Pain	70
Loosening talar component	50
Loosening tibial component	36
Deep infection	17
Fracture talus	3

### Ankle re-revisions

There were 17 registered primary ankle procedures that were revised twice and 2 procedures that were revised three times.

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

Years	Loosening talar component		Loosening tibial component		Pain	
	Count	%	Count	%	Count	%
0	3	6.0	2	5.6	4	5.7
1	6	12.0	11	30.6	16	22.9
2	8	16.0	3	8.3	10	14.3
3	8	16.0	3	8.3	10	14.3
4	8	16.0	5	13.9	10	14.3
5	4	8.0	1	2.8	4	5.7
6	2	4.0	2	5.6	3	4.3
7	2	4.0	1	2.8	3	4.3
8	2	4.0	3	8.3	3	4.3
9	3	6.0	2	5.6	3	4.3
10	1	2.0	1	2.8	3	4.3
11	1	2.0	1	2.8	1	1.4
12	0	0.0	1	2.8	0	0.0
13	1	2.0	0	0.0	0	0.0
14	1	2.0	0	0.0	0	0.0
<b>Total</b>	<b>50</b>		<b>36</b>		<b>70</b>	

### 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	
1,502	8,796	167	1.90	1.62	2.21



### Revision vs Prosthesis Type Sorted in Alphabetical Order

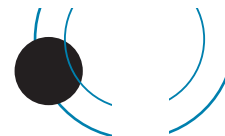
Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Agility	119	1,245.7	35	2.81	1.96	3.91
Box	6	32.5	2	6.16	0.75	22.24
Hintegra	22	75.7	3	3.96	0.82	11.58
Infinity	66	55.8	2	3.58	0.00	12.94
Mobility	450	3,361.9	62	1.84	1.41	2.36
Ramses	11	92.7	5	5.39	1.75	12.58
Salto	691	3,344.8	46	1.38	1.01	1.83
Salto Talaris	66	113.2	0	0.00	0.00	3.26
STAR	47	449.2	12	2.67	1.38	4.67
Zimmer TM	24	24.9	0	0.00	0.00	14.80

### Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	589	3,480.1	64	1.84	1.42	2.35
Males	913	5,316.3	103	1.94	1.58	2.35

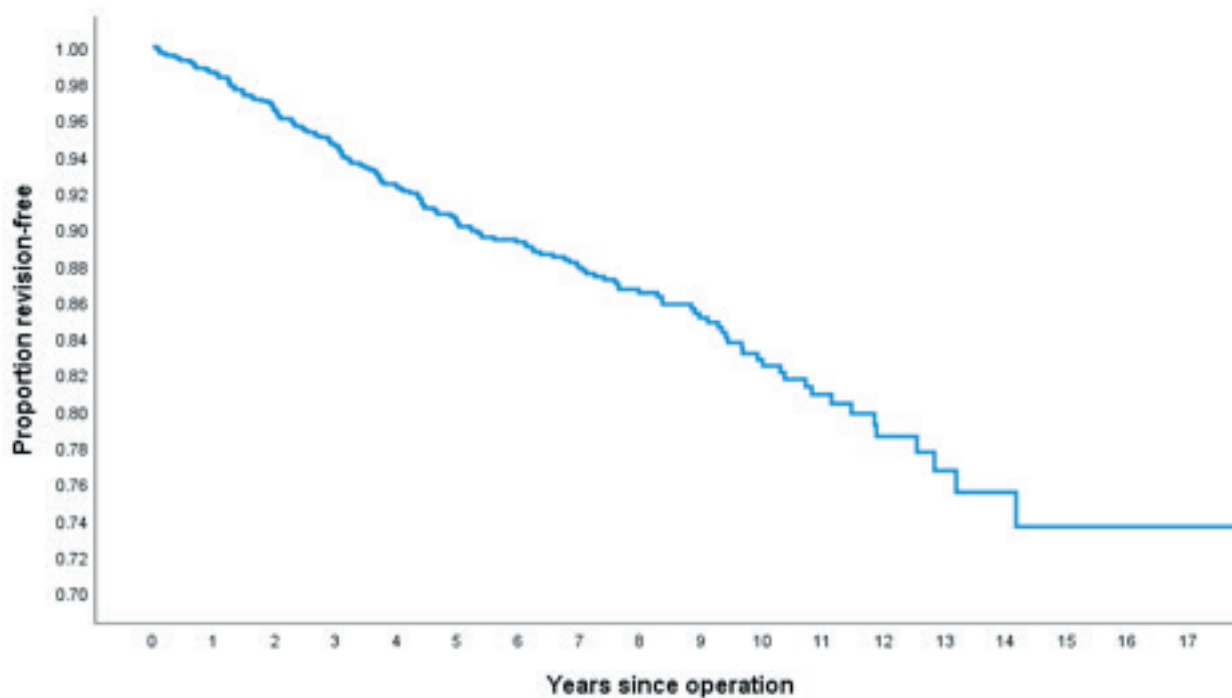
### Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	166	1,010.2	32	3.17	2.17	4.47
55-64	476	3,136.6	72	2.30	1.80	2.89
65-74	606	3,426.3	55	1.61	1.21	2.09
>=75	254	1,223.3	8	0.65	0.28	1.29



## KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 18 years from 2000 to 2017, with deceased patients censored at time of death.



Years	% Revision-free	No in each year
1	98.6	1,350
2	96.5	1,196
3	94.6	1,060
4	92.4	928
5	90.4	794
6	89.3	681
7	87.8	570
8	86.5	452
9	85.1	338
10	82.8	242
11	80.9	177
12	78.6	120
13	76.7	70

## PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS 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 2 year period 2016 – 2017 there were 136 responses.

Average = 15.92, Maximum = 59, Minimum = 0 and Standard deviation = 13.60.

# SHOULDER ARTHROPLASTY

## PRIMARY SHOULDER ARTHROPLASTY

The **eighteen-year** report analyses data for the period January 2000 – December 2017. There were 9,250 primary shoulder procedures registered with an additional 1,000 registered in 2017.

Of the 9,250 shoulder registrations, 1,727 are hemi shoulder replacements, 3,203 are conventional total shoulder replacements, 3,923 are reverse shoulder replacements, 222 are partial resurfacing shoulder replacements, 174 are total resurfacing replacements and 1 is a humeral sphere.

## Data Analysis

### Age and sex distribution

The average age for all patients with a shoulder arthroplasty was 71 years, with a range of 15 – 99 years.

#### All shoulder arthroplasty

	Female	Male
Number	5,842	3,408
Percentage	63.16	36.84
Mean age	72.71	68.47
Maximum age	97.71	99.36
Minimum age	15.02	21.15
Standard dev.	9.41	10.19

#### Hemiarthroplasty

	Female	Male
Number	1,131	596
Percentage	65.49	34.51
Mean age	71.43	65.09
Maximum age	97.71	99.36
Minimum age	15.63	21.15
Standard dev.	11.14	12.49

#### Conventional total shoulder arthroplasty

	Female	Male
Number	2,007	1,196
Percentage	62.66	37.34
Mean age	70.54	66.48
Maximum age	95.43	89.11
Minimum age	15.02	29.38
Standard dev.	8.84	8.83

#### Reverse shoulder arthroplasty

	Female	Male
Number	2,514	1,409
Percentage	64.08	35.92
Mean age	75.54	72.92
Maximum age	96.82	92.65
Minimum age	35.61	44.28
Standard dev.	7.68	7.65

## Partial resurfacing arthroplasty

	Female	Male
Number	80	142
Percentage	36.04	69.96
Mean age	58.46	56.01
Maximum age	87.06	86.12
Minimum age	20.70	21.83
Standard dev.	14.39	11.02

## Total resurfacing arthroplasty

	Female	Male
Number	109	65
Percentage	62.64	37.36
Mean age	71.18	66.73
Maximum age	86.79	81.51
Minimum age	47.24	23.67
Standard dev.	8.00	9.95

### Humeral sphere

One female patient aged 50.11 years.

### Previous operation

None	7,747
Rotator cuff repair	565
Internal fixation for	
Juxta articular fracture	218
Previous stabilisation	192
Arthroscopic debridement	45
Osteotomy	5
Arthrodesis	2

### Diagnosis

Osteoarthritis	4,939
Cuff tear arthropathy	2,089
Acute fracture prox. humerus	869
Rheumatoid arthritis	611
Post old trauma	515
Avascular necrosis	266
Post recurrent dislocation	140
Other inflammatory	80

### Approach

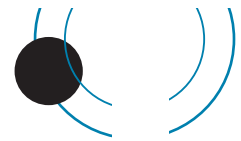
Deltopectoral	8,154
Other including deltoid split	272

### Bone graft

Humeral autograft	114
Humeral allograft	23
Humeral synthetic	3
Glenoid autograft	140
Glenoid allograft	17

### Cement

Humerus cemented	1,717
Antibiotic in cement	1,060
Glenoid cemented	2,300
Antibiotic in cement	1,607



### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic 8,678 (94%)

### Operating theatre

Conventional	5,554
Laminar flow	3,570
Space suits	1,598

### ASA Class

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

For the thirteen year period 2005 – 2017 there were 7,968 (96%) shoulder procedures with the ASA class recorded.

### Definitions

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

ASA	Number	Percentage
1	680	9
2	4,473	56
3	2,721	34
4	94	1

### Operative time (skin to skin in minutes)

	Mean
Hemi Arthroplasty	110
Conventional Total	127
Partial Resurfacing	93
Total Resurfacing	123
Reverse Arthroplasty	112

### Surgeon grade

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

The following figures are for the thirteen-year period 2005 – 2017.

Consultant	7,888
Advanced trainee supervised	389
Advanced trainee unsupervised	19
Basic trainee	5

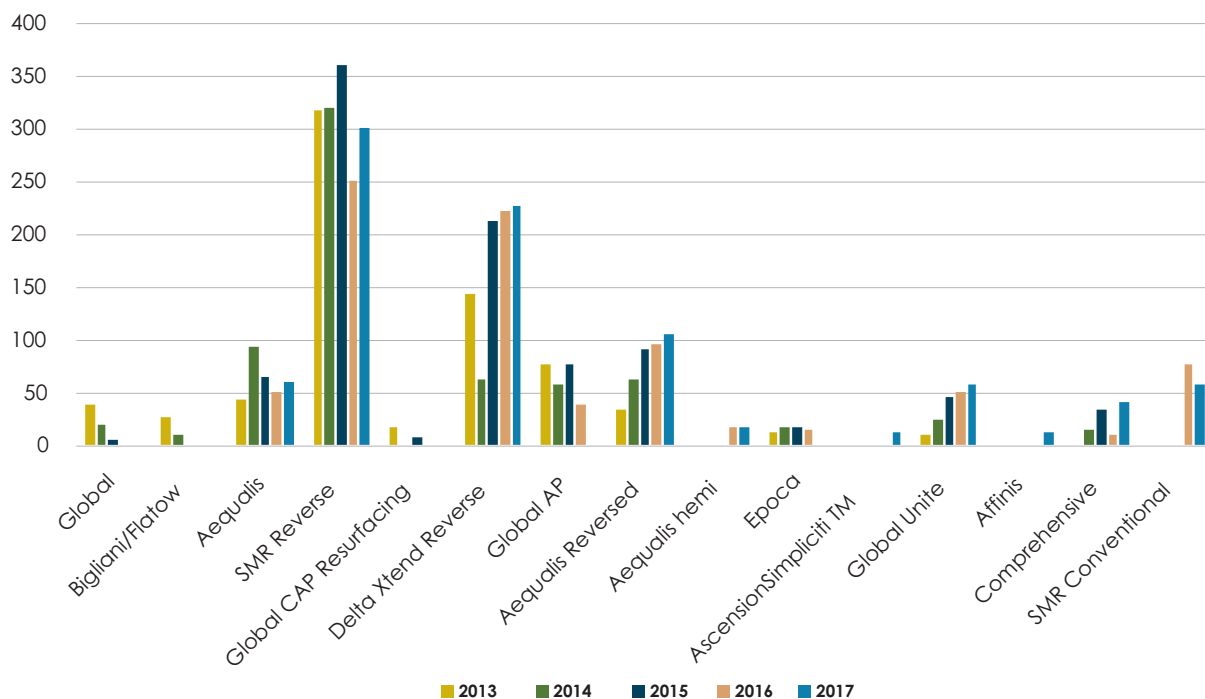
### Top 10 shoulder prostheses 2017

SMR Reverse	300
Delta Xtend Reverse	229
Aequalis reversed	106
Aequalis conventional	60
SMR Conventional/L1 glenoid	58
Global Unite	61
Comprehensive Reverse	41
Global AP	38
Aequalis Hemiarthroplasty	18
Simpliciti TM	13

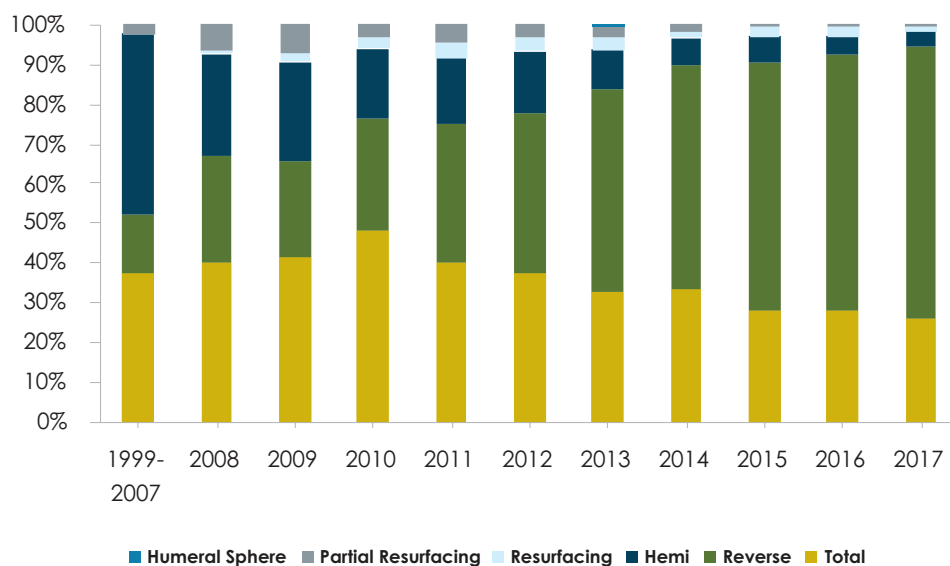
*Simpliciti TM is a new addition to the Top 10 with some mid pack reshuffle in the order.*



## Most used shoulder prostheses for five years 2013 - 2017



## Percentages of the different types of shoulder prostheses used by year



### Surgeon and hospital workload

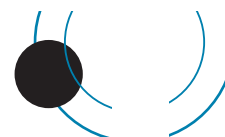
#### Surgeons

In 2017, 73 surgeons performed 1,000 shoulder procedures; an average of 14 procedures per surgeon. 18 surgeons performed more than 20 procedures and 9 surgeons each performed one procedure.

#### Hospitals

In 2017, shoulder replacement was performed in 48 hospitals. 26 were public and 22 were private.

For 2017, the average number of shoulder replacements per hospital was 21.



## 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 eighteen year period January 2000 – December 2017 there were 718 revision shoulder procedures registered.

The average age for a shoulder revision was 69 years with a range of 24 – 90 years.

	Female	Male
Number	414	304
Percentage	57.66	42.34
Mean	70.55	66.32
Maximum age	89.95	88.46
Minimum age	33.20	24.05
Standard dev.	10.05	10.40

## REVISION OF REGISTERED PRIMARY SHOULDER ARTHROPLASTIES

This section analyses data for revisions of primary shoulder procedures for the eighteen year period January 2000 – December 2017.

There were 458 revisions of the primary group of 9,250 (5 %). There were 50 procedures that had been revised twice, 11 that had been revised three times and 2 revised 4 times.

### Time to revision

Average	1,106 days
Maximum	5,517 days
Minimum	0 days
Standard deviation	1,110 days

### Reason for revision

Pain	99
Sub acromial cuff impingement	75
Dislocation/instability anterior	74
Loosening glenoid	63
Deep infection	34
Loosening humeral	21
Instability posterior	16
Sub acromial tuberosity impingement	7
Fracture humerus	8
Loosening both	4

### 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	
0	16	25.4	44	59.5	12	35.3	21	21.2	17	22.7	5	23.8
1	12	19.0	12	16.2	11	32.4	23	23.2	17	22.7	3	14.3
2	6	9.5	3	4.1	5	14.7	14	14.1	13	17.3	1	4.8
3	3	4.8	2	2.7	3	8.8	9	9.1	3	4.0	3	14.3
4	1	1.6	4	5.4	2	5.9	8	8.1	5	6.7	2	9.5
5	4	6.3	4	5.4	0	0.0	4	4.0	7	9.3	3	14.3
6	3	4.8	1	1.4	0	0.0	4	4.0	2	2.7	0	0.0
7	1	1.6	1	1.4	1	2.9	5	5.1	4	5.3	0	0.0
8	2	3.2	2	2.7	0	0.0	3	3.0	1	1.3	1	4.8
9	6	9.5	0	0.0	0	0.0	3	3.0	2	2.7	1	4.8
10	3	4.8	0	0.0	0	0.0	1	1.0	3	4.0	1	4.8
11+	6	9.5	1	1.4	0	0.0	4	4.0	1	1.3	1	4.8
<b>Total</b>	<b>63</b>		<b>74</b>		<b>34</b>		<b>99</b>		<b>75</b>		<b>21</b>	

### 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	
9,250	47,277	458	0.97	0.88	1.06

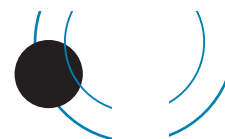
### Revision rate of Shoulder Prostheses vs Arthroplasty Type

Operation Type	No. Ops.	Observed	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total	3,203	18,544.3	172	0.93	0.79	1.08
Reverse	3,923	13,586.6	104	0.77	0.62	0.92
Hemi	1,727	12,922.8	144	1.11	0.94	1.31
Resurfacing	174	761.2	5	0.66	0.21	1.53
Partial resurfacing	222	1,457.6	33	2.26	1.53	3.14
Humeral Sphere	1	4.1	0	0.00	0.00	90.61

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

Prosthesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total	Aequalis	529	2,679.0	15	0.56	0.31	0.92
	Affinis	38	60.0	0	0.00	0.00	6.15
	Anatomical	35	427.2	1	0.23	0.01	1.30
	Arthrex Eclipse	1	3.1	0	0.00	0.00	117.47
	Ascend TM	2	9.4	0	0.00	0.00	39.27
	Bi-Angular	8	52.7	0	0.00	0.00	7.00
	Bigliani/Flatow	290	2,497.4	8	0.32	0.13	0.60
	Cofield 2	21	234.7	0	0.00	0.00	1.57
	Comprehensive	33	54.7	0	0.00	0.00	6.74
	Delta Xtend Reverse	3	4.6	0	0.00	0.00	80.58
	Epoca Humeral stem	4	29.1	0	0.00	0.00	12.70
	Global	517	4,272.9	20	0.47	0.29	0.72
	Global AP	474	2,105.4	4	0.19	0.05	0.49
	Global Unite	157	230.0	0	0.00	0.00	1.60
	Humeral stem	1	5.3	0	0.00	0.00	69.02
	Neer 3	2	27.4	0	0.00	0.00	13.46
	Neer II	12	153.7	1	0.65	0.02	3.63
	Osteonics humeral component	49	492.0	6	1.22	0.39	2.51



Prosthesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total, continued	Sidus	1	3.3	0	0.00	0.00	110.89
	Simpliciti TM	29	53.9	1	1.86	0.05	10.34
	SMR	990	5,120.6	116	2.27	1.87	2.72
	Univers Apex	1	0.6	0	0.00	0.00	606.92
	Univers 3D	5	25.3	0	0.00	0.00	14.55
Reverse	Aequalis	270	463.3	6	1.30	0.48	2.82
	Aequalis Reversed	129	432.0	3	0.69	0.14	2.03
	Aequalis Reversed Fracture	35	95.4	0	0.00	0.00	3.87
	Affinis	13	26.3	0	0.00	0.00	14.03
	Comprehensive	114	167.0	0	0.00	0.00	2.21
	Delta	55	491.3	2	0.41	0.05	1.47
	Delta Xtend Reverse	1,397	4,690.1	43	0.92	0.66	1.23
	Global Unite	2	1.7	0	0.00	0.00	220.52
	RSP	2	2.8	0	0.00	0.00	129.68
	SMR	1,873	7,097.4	49	0.69	0.51	0.91
	Trabecular Metal Reverse	32	112.7	1	0.89	0.02	4.94
	Vaios	1	6.7	0	0.00	0.00	55.06
Hemi	Aequalis	208	1,224.1	15	1.23	0.66	1.97
	Aequalis Reversed	1	2.4	0	0.00	0.00	153.46
	Affinis	8	18.7	1	5.36	0.14	29.84
	Anatomical	19	237.0	0	0.00	0.00	1.56
	Arthrex Eclipse	2	18.2	0	0.00	0.00	20.27
	Ascend TM	1	5.6	0	0.00	0.00	66.21
	Bi-Angular	19	212.7	2	0.94	0.11	3.40
	Bigliani/Flatow	137	1,272.2	14	1.10	0.60	1.85
	Bio-modular	1	7.1	1	14.00	0.35	78.03
	Cofield 2	50	564.3	1	0.18	0.00	0.99
	Comprehensive	3	3.3	0	0.00	0.00	113.41
	Delta	1	8.8	0	0.00	0.00	42.08
	Delta Xtend Reverse	24	90.5	4	4.42	0.93	10.51
	Global	723	6,118.8	56	0.92	0.68	1.18
	Global AP	87	398.9	3	0.75	0.16	2.20
	Global Unite	49	135.8	6	4.42	1.62	9.61
	MRS Humeral	4	17.9	0	0.00	0.00	20.56
	Neer II	24	221.1	0	0.00	0.00	1.67
	Osteonics humeral component	43	394.2	2	0.51	0.06	1.83
	Randelli	1	8.2	0	0.00	0.00	44.82



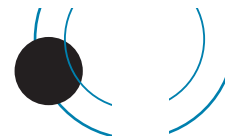
Prosthesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Hemi, <i>continued</i>	Simpliciti TM	1	2.4	0	0.00	0.00	151.05
	SMR	319	1,948.5	39	2.00	1.42	2.74
	Trabecular Metal Reverse	1	8.2	0	0.00	0.00	44.81
	Univers 3D	1	3.8	0	0.00	0.00	96.59
Total Resurfacing	Aequalis Resurfacing Head	10	62.8	0	0.00	0.00	5.87
	Affiniti	1	2.8	0	0.00	0.00	130.35
	Epoca Head	103	390.3	4	1.02	0.28	2.62
	Global CAP Resurfacing	56	288.1	1	0.35	0.01	1.93
	Global Unite	1	2.1	0	0.00	0.00	174.00
	Hemicap Resurfacing	1	1.7	0	0.00	0.00	213.23
	SMR Resurfacing	2	13.3	0	0.00	0.00	27.69
Partial resurfacing	Aequalis Resurfacing Head	1	3.1	0	0.00	0.00	120.95
	Arthrex Eclipse	3	10.9	2	18.30	2.22	66.10
	Ascension	20	102.7	2	1.95	0.24	7.04
	Copeland Resurfacing	19	152.0	4	2.63	0.72	6.74
	Custom Global Cap	1	6.4	0	0.00	0.00	57.55
	Epoca Head	21	91.8	2	2.18	0.26	7.87
	Global AP CTA Humeral Head	1	0.1	0	0.00	0.00	3,688.88
	Global CAP Resurfacing	96	731.2	13	1.78	0.95	3.04
	Global Humeral Head	1	5.2	0	0.00	0.00	70.40
	Hemicap Resurfacing	7	51.5	1	1.94	0.05	10.81
	SMR Resurfacing	45	263.6	7	2.66	1.07	5.47
	SMR Resurfacing CTA	7	39.0	2	5.13	0.62	18.52

**Revision vs Glenoid Fixation**  
(Conventional Total arthroplasties only)

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Uncemented	1,019	5,509	111	2.01	1.66	2.43
Cemented	2,184	13,035	61	0.47	0.35	0.60

**Revision vs Gender**

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	5,842	30,273.0	267	0.88	0.78	0.99
Males	3,408	17,003.5	191	1.12	0.97	1.29



### 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	
Total	<55	202	1,004.0	21	2.09	1.29	3.20
	55-64	765	4,395.7	60	1.36	1.04	1.76
	65-74	1,397	8,313.9	68	0.82	0.63	1.03
	>=75	839	4,830.7	23	0.48	0.30	0.71
Reverse	<55	42	93.3	3	3.22	0.66	9.40
	55-64	404	1,405.0	22	1.57	0.98	2.37
	65-74	1,483	5,115.1	42	0.82	0.58	1.10
	>=75	1,994	6,973.3	37	0.53	0.37	0.73
Hemi	<55	215	1,613.9	26	1.61	1.05	2.36
	55-64	349	2,744.8	52	1.89	1.40	2.46
	65-74	522	4,243.7	41	0.97	0.69	1.31
	>=75	641	4,320.5	25	0.58	0.37	0.84
Resurfacing	<55	7	29.7	1	3.37	0.09	18.75
	55-64	41	206.2	1	0.48	0.00	2.70
	65-74	80	337.7	3	0.89	0.18	2.60
	>=75	46	187.5	0	0.00	0.00	1.97
Partial resurfacing	<55	91	606.1	15	2.47	1.39	4.08
	55-64	71	495.6	9	1.82	0.83	3.45
	65-74	47	281.8	8	2.84	1.23	5.59
	>=75	13	74.0	1	1.35	0.03	7.52

### Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	558	3,351.0	66	1.97	1.52	2.51
55-64	1,630	9,247.3	144	1.56	1.31	1.83
65-74	3,529	18,292.1	162	0.89	0.75	1.03
>=75	3,533	16,385.9	86	0.52	0.42	0.64

### Revision vs Surgeon Annual Workload

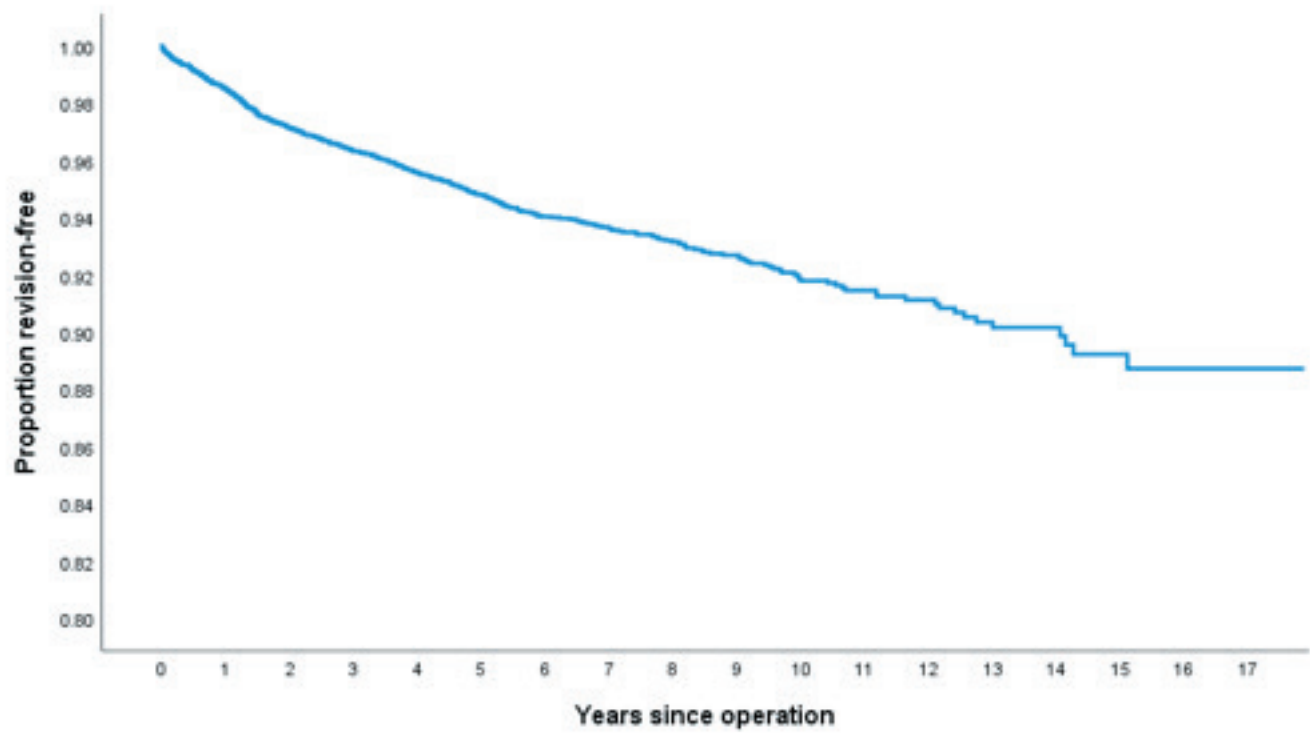
Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	3,446	18,671.6	191	1.02	0.88	1.18
>=10	5,804	28,604.8	267	0.93	0.82	1.05



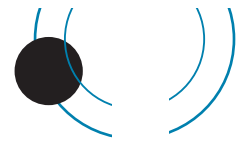
# KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 18 years from 2000 to 2017, with deceased patients censored at time of death.

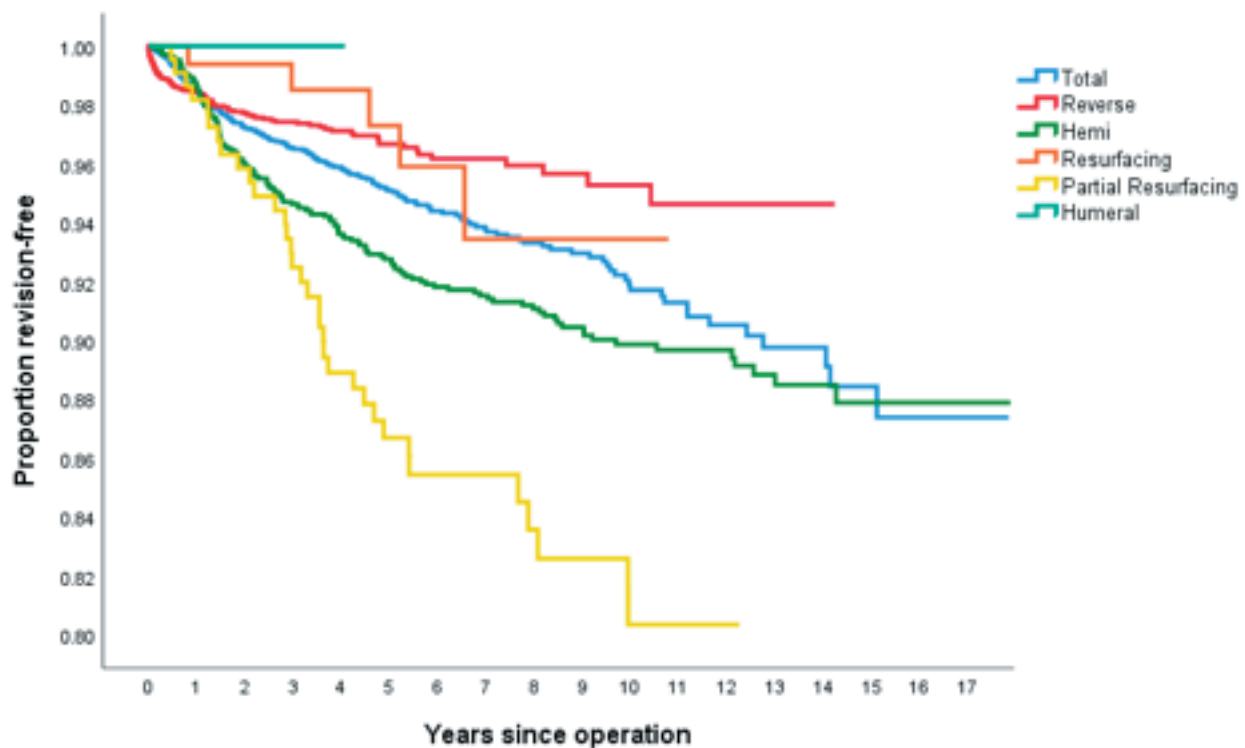
## All Shoulders



Years	% Revision-free	Number
1	98.5	8,000
2	97.1	6,842
3	96.3	5,704
4	95.6	4,754
5	94.8	3,929
6	94.0	3,184
7	93.6	2,609
8	93.2	2,139
9	92.7	1,659
10	91.8	1,279
11	91.5	939
12	91.1	661
13	90.2	477
14	90.2	307
15	89.2	185



## 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 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 eighteen year period and as at July 2018, there were 5,982 shoulder questionnaire responses registered at six months post-surgery.

The average shoulder score was 36.50 (standard deviation 9.41, range 2 – 48)

Scoring > 41	2,224
Scoring 34 - 41	1,925
Scoring 27 - 33	897
Scoring <27	936

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 1,911 individual patients.

At five years post-surgery, 79% of these patients achieved an excellent or good score and had an average of 39.74.

### 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 574 individual patients.

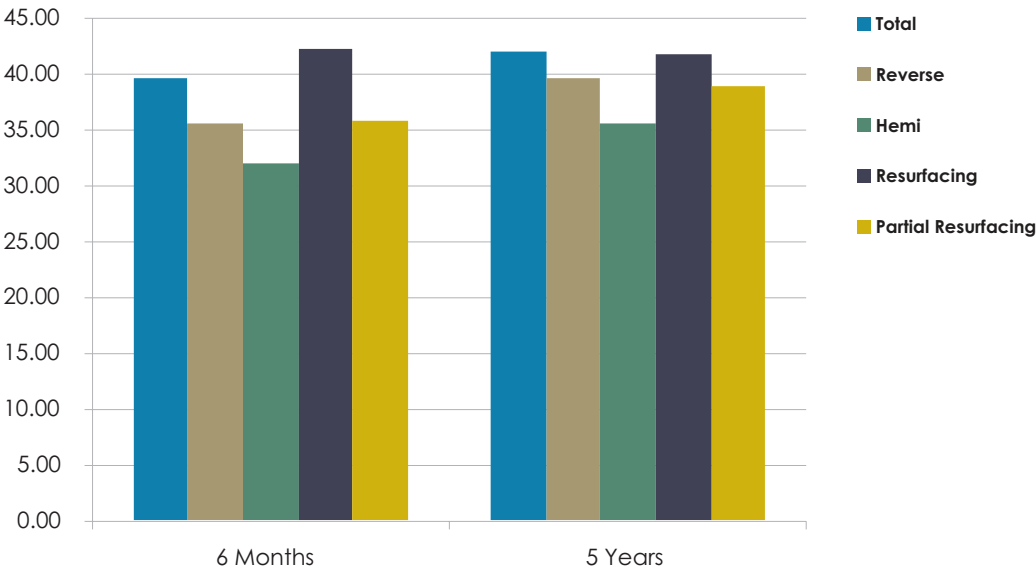
At ten years post-surgery, 76% of these patients achieved an excellent or good score and had an average of 38.92.

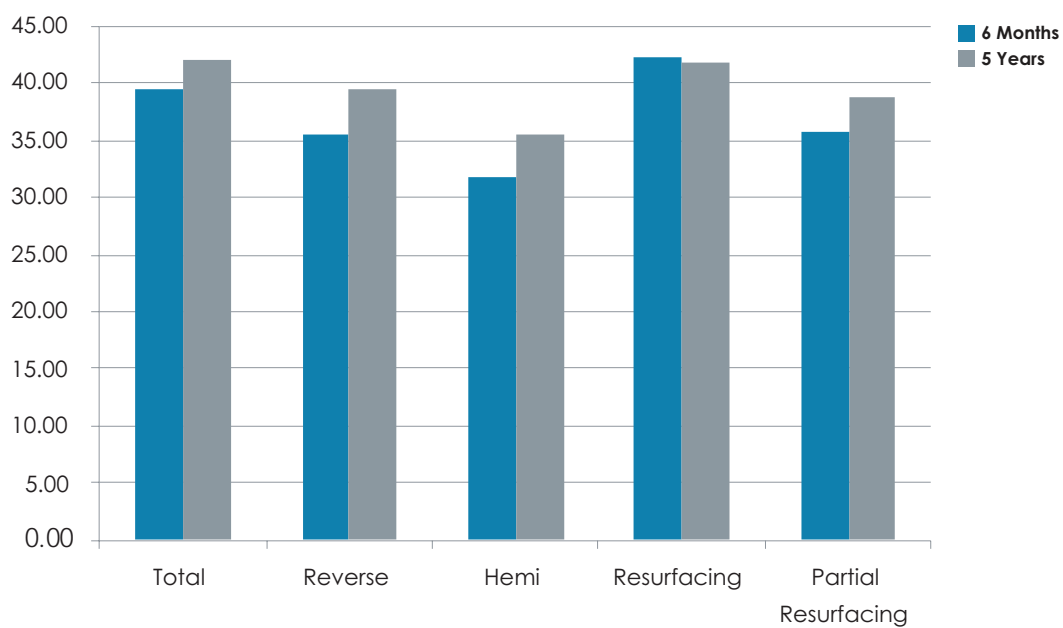
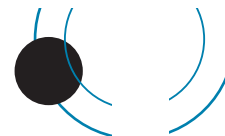


Six Month and Five Year Oxford Scores for the different arthroplasty types

Prosthesis type	Time Post-Surgery	Mean Score	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Total	6 Months	39.49	0.17	39.15	39.83
	5 Years	41.99	0.26	41.48	42.51
Reverse	6 Months	35.55	0.19	35.19	35.92
	5 Years	39.54	0.38	38.80	40.28
Hemi	6 Months	31.82	0.31	31.22	32.43
	5 Years	35.53	0.46	34.62	36.44
Resurfacing	6 Months	42.29	0.46	41.37	43.20
	5 Years	41.81	1.25	39.29	44.33
Partial Resurfacing	6 Months	35.65	0.84	33.99	37.31
	5 Years	38.79	1.26	36.25	41.33

Comparison of six month and five year scores for different arthroplasty types





### Revision shoulder questionnaire responses

There were 395 revision shoulder responses with 46% achieving an excellent or good score. This group includes all revision shoulder responses. The average revision shoulder score was 31.15 (standard deviation 10.53 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.

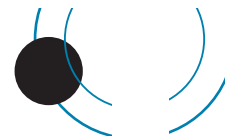
### Six month score and revision arthroplasty

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.



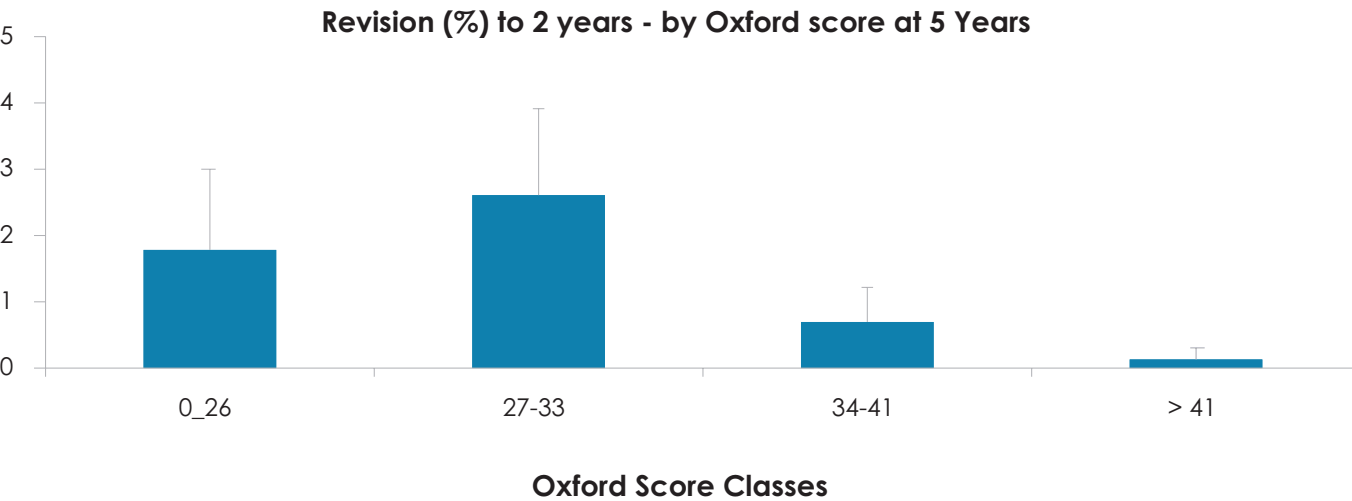
Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date

Kalairajah group	No in group	No. revised	%	Std error
0_26	694	44	6.34	0.93
27-33	668	26	3.89	0.75
34-41	1,391	17	1.22	0.29
> 41	1,648	17	1.03	0.25



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 27 has 13 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	113	2	1.77	1.24
27-33	153	4	2.61	1.29
34-41	281	2	0.71	0.50
> 41	704	1	0.14	0.14

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 **eighteen-year** report analyses data for the period January 2000 – December 2017. There were 560 primary elbow procedures registered with an additional 45 registered in 2017.

## Data Analysis

### Age and sex distribution

The average age for an elbow replacement was 67 years, with a range of 15 – 92 years.

	Female	Male
Number	425	135
Percentage	75.89	24.11
Mean age	67.71	65.51
Maximum age	92.41	91.73
Minimum age	36.38	15.16
Standard dev.	11.66	14.65

### Previous operation

None	465
Internal fixation for juxta articular fracture	30
Synovectomy+-removal radial head	22
Debridement	14
Osteotomy	3
Ligament reconstruction	3
Interposition arthroplasty	1

### Diagnosis

Rheumatoid arthritis	282
Post fracture	168
Osteoarthritis	85
Other inflammatory	12
Post dislocation	10
Post ligament disruption	6

### Approach

Posterior	351
Medial	103
Lateral	38

### Bone graft

Humeral autograft	35
Humeral allograft	3
Humeral synthetic	1
Ulnar autograft	2

### Cement

Humerus cemented	507
Antibiotic in cement	390 (77%)
Ulna cemented	479
Antibiotic in cement	364 (76%)
Radius cemented	27
Antibiotic in cement	26 (96%)

### Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	525 (94%)
-----------------------------------------------------------	-----------

### Operating theatre

Conventional	374
Laminar flow	181
Space suits	77

### ASA Class

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

For the thirteen year period 2005 – 2017, there were 407 (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	19
2	176
3	205
4	7

### Operative time (skin to skin)

Mean	144 minutes
------	-------------

### Surgeon grade

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

The following figures are for the thirteen- year period 2005 – 2017.

Consultant	425
Advanced trainee supervised	7
Advanced trainee unsupervised	3

### Surgeon and hospital workload

In 2017, 24 surgeons performed 45 primary elbow procedures. These ranged from 1 to 6 per surgeon, with 12 performing 1 elbow procedure.

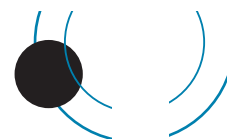
### Hospitals

In 2017, primary elbow replacement was performed in 19 hospitals, of which 12 were public and 7 were private.

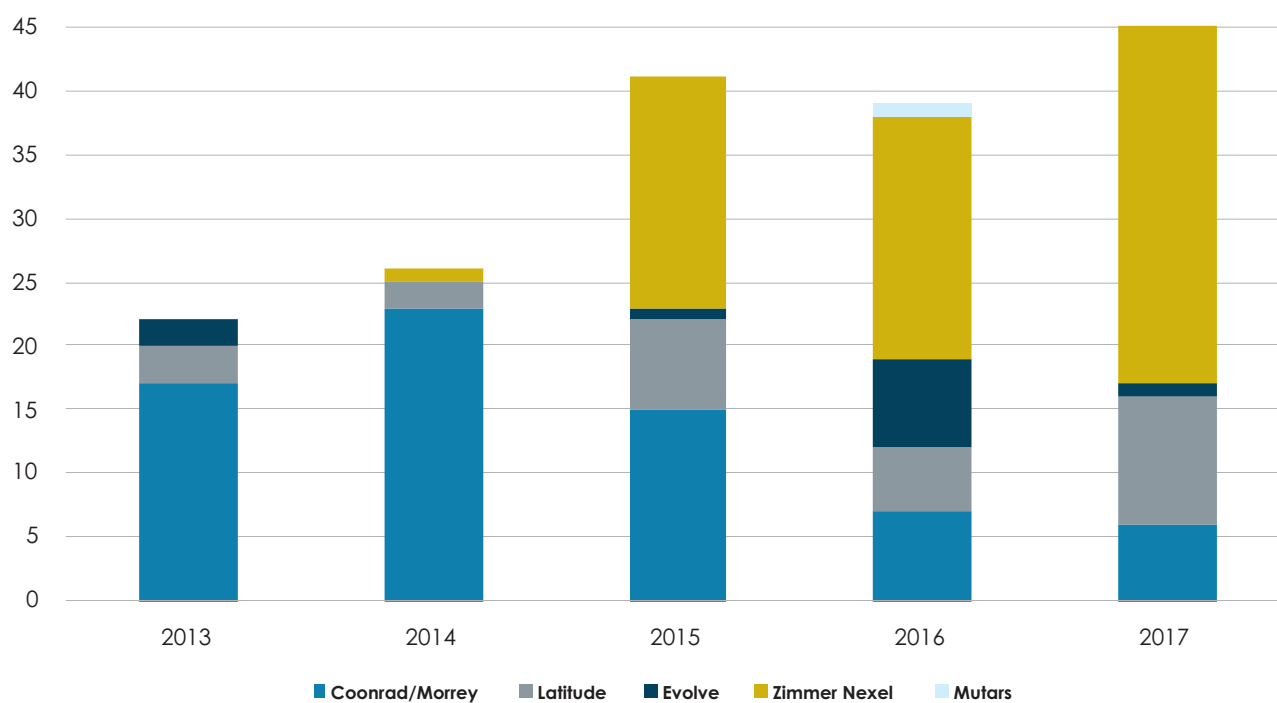
### Prosthesis usage

#### Elbow prostheses used in 2017

Zimmer Nexel	28
Latitude	10
Coonrad/Morrey	6
Evolve	1



**Most used Elbow Prostheses per year for five years (2013 – 2017)**



## 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 eighteen-year period January 2000 – December 2017, there were 93 revision elbow procedures registered.

The average age for a revision elbow replacement was 66 years, with a range of 30 – 91 years.

	Female	Male
Number	64	29
Percentage	68.82	31.18
Mean	66.25	64.89
Maximum age	88.95	90.50
Minimum age	42.23	30.34
Standard dev.	9.46	15.11

## REVISION OF REGISTERED PRIMARY ELBOW ARTHROPLASTIES

This section analyses data for revisions of primary elbow procedures for the eighteen year period January 2000 – December 2017.

There were 37 revisions of the primary group of 560 (6.6%).

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

### Time to revision

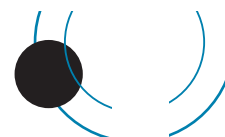
Average	1,570 days
Maximum	5,174 days
Minimum	62 days
Standard deviation	1,412 days

### Reason for revision

Loosening humeral component	13
Deep infection	10
Loosening ulnar component	10
Pain	4
Fracture humerus	3
Loosening radial head component	4
Dislocation	2
Fracture ulna	2

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

Years	Loosening humeral component		Loosening Ulnar component		Deep infection	
	Count	%	Count	%	Count	%
0	1	7.7	1	10.0	2	20.0
1	2	15.4	0	0.0	4	40.0
2	3	23.1	3	30.0	1	10.0
3	2	15.4	2	20.0	0	0.0
4	1	7.7	0	0.0	0	0.0
5	0	0.0	0	0.0	0	0.0
6	0	0.0	0	0.0	1	10.0
7	0	0.0	0	0.0	0	0.0
8	1	7.7	1	10.0	1	10.0
9	1	7.7	1	10.0	0	0.0
10	1	7.7	1	10.0	0	0.0
11	1	7.7	1	10.0	0	0.0
12	0	0.0	0	0.0	0	0.0
13	0	0.0	0	0.0	0	0.0
14	0	0.0	0	0.0	1	10.0
<b>Total</b>	<b>13</b>		<b>10</b>		<b>10</b>	



## 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	
560	3,460	37	1.07	0.75	1.47

## 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	147.2	6	4.08	1.50	8.87
Coonrad/Morrey	345	2,459.1	15	0.61	0.33	0.98
Evolve Stem	19	84.9	2	2.35	0.00	8.51
Kudo	18	160.7	4	2.49	0.68	6.37
Latitude	93	513.0	9	1.75	0.80	3.33
Mutars	1	1.9	0	0.00	0.00	199.02
Sorbie Questor	1	6.8	0	0.00	0.00	54.09
Stanmore custom implant	1	7.4	0	0.00	0.00	49.63
Zimmer Nexel	66	78.81	1	1.27	0.03	7.07

## Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	425	2,797.2	23	0.82	0.52	1.23
Males	135	662.6	14	2.11	1.16	3.55

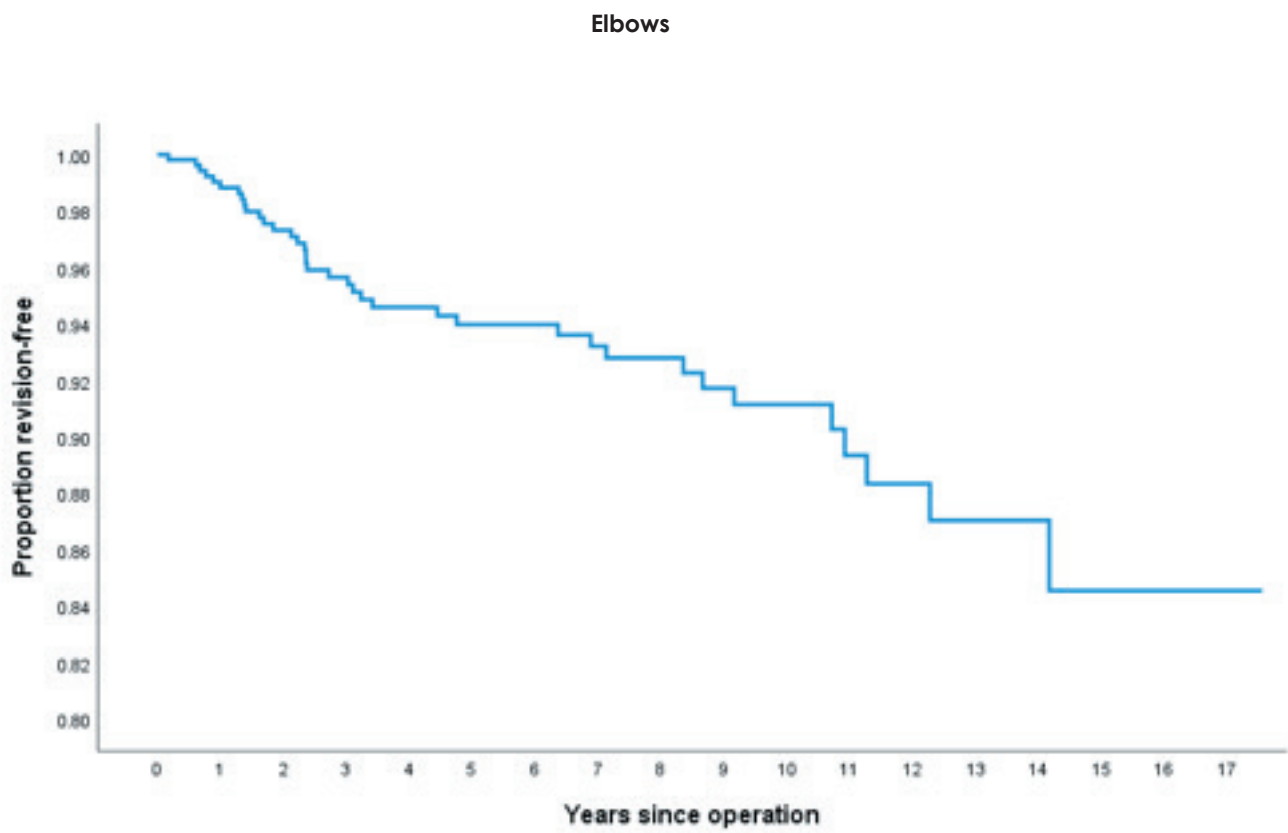
## Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	97	734.1	9	1.23	0.56	2.33
55-64	133	990.4	11	1.11	0.55	1.99
65-74	164	930.5	11	1.18	0.59	2.12
>=75	166	804.7	6	0.75	0.27	1.62



KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 18 years from 2000 to 2017, with deceased patients censored at time of death.



Years	% Revision-free	Number
1	98.8	488
2	97.3	430
3	95.7	367
4	94.6	330
5	94.0	296
6	94.0	267
7	93.2	230
8	92.8	194
9	91.7	162
10	91.2	128
11	89.4	96
12	88.4	74

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 the 2 year period 2016 – 2017 there were n = 41 responses.

For the 2 year period 2016 – 2017 there were n = 41 responses.

Average	32.76
Maximum	48
Minimum	8



# LUMBAR DISC REPLACEMENT

## PRIMARY LUMBAR DISC REPLACEMENT

This report analyses data for the **sixteen-year** period January 2002 – December 2017. There were 160 lumbar disc replacements registered, an additional 4 compared to last year.

### Data Analysis

The average age for a lumbar disc replacement was 40 years, with a range of 22 – 62 years.

	Female	Male
Number	74	86
Percentage	46.25	53.75
Mean age	40.57	39.83
Maximum age	62.19	60.71
Minimum age	24.07	22.25
Standard dev.	8.66	7.37

### Disc replacement levels

L3/4	20
L4/5	108
L5/S1	33

### Fusion levels

L3/4	5
L4/5	21
L5/S1	37

### 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	85

#### Annular tear MRI scan

L3/4	13
L4/5	69
L5/S1	26

#### Discogenic pain on discography

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

### Approach

Retroperitoneal midline	142
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	132
----------------------------------------------------------	-----

### Operating theatre

Conventional	89
Laminar flow	70
Spacesuits	2

### Operative time (skin to skin)

Mean	137 minutes
------	-------------

### Surgeon grade

Consultant	160
------------	-----



## REVISION OF REGISTERED PRIMARY LUMBAR DISC REPLACEMENTS

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

There were three revisions of the primary group of 160 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.

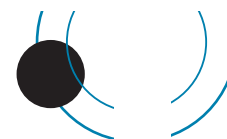
If more than one box is marked in each section, take the highest score.

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

**Example:**  $16 \text{ (total scored)} / 50 \text{ (total possible score)} \times 100 = 32\%$

### Pre operative scores

Oswestry Disability Index	n =21
Average	25



# CERVICAL DISC REPLACEMENT

This report analyses data for the **fourteen-year** period January 2004 – December 2017. There were 393 primary cervical disc replacements, an additional 46 from the previous year.

## Data Analysis

The average age for a cervical disc replacement was 45 years, with a range of 23 – 66 years.

	Female	Male
Number	167	226
Percentage	42.39	57.51
Mean age	46.03	44.30
Maximum age	65.79	64.79
Minimum age	23.26	23.54
Standard dev.	7.98	8.59

## Disc replacement levels

C3/4	11
C4/5	40
C5/6	211
C6/7	189
C7T1	5

## Previous operation

Foraminotomy	11
Adjacent level fusion	20
Adjacent level disc arthroplasty	2

## Diagnosis

Acute disc prolapse	267
Chronic spondylosis	35
Neck pain	25

## Approach

Anterior right	228
Anterior left	72

## Intra operative complications

Equipment failure	1
Removal of implant	1
Tear jugular vein	1

## Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	334
----------------------------------------------------------	-----

## Operating theatre

Conventional	213
Laminar flow	174
Spacesuits	1

## Operative time (skin to skin)

Mean	114 minutes
------	-------------

## Surgeon grade

Consultant	391
Advanced trainee supervised	2

## Revision Cervical disc replacement

There were 3 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:

$$16 \text{ (total scored)} / 50 \text{ (total possible score)} \times 100 = 32\%$$

If one section is missed (or not applicable) the score is calculated:

### Example:

$$16 \text{ (total scored)} / 45 \text{ (total possible score)} \times 100 = 35.5\%$$

0 is the best score and 100 is the worst score.

## Post-operative score

Neck Disability Index	167
Mean	19.85

# RE-OPERATION WITHOUT REPLACEMENT OR REMOVAL OF ANY PROSTHETIC COMPONENTS

The re-operation form was introduced in December 2015.

For the period 2015 – 2017 there were 210 re-operations registered.

## Reason for Re-operation

Deep infection	66
Dislocation of joint	26
Dislocation of bearing	4
Fracture	23
Instability	4
Malalignment	0
Impingement	7
Stiffness	44
Haematoma evacuation	11
Arthrofibrosis	23

## Procedure

Open lavage	74
Arthroscopic lavage	3
Closed reduction of dislocation	19
Open reduction of dislocation	7
Fracture fixation	18
Soft tissue procedure	16
Ligament reconstruction	3
Osteotomy	1
Bone debridement	14
Arthrolysis	3
MUA	45

ASA	Number
1	17
2	99
3	73
4	10

## Surgeon grade

Consultant	161
Advanced trainee supervised	11
Advanced trainee unsupervised	31
Basic trainee	5

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## 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	
	Spectron	
	Basis	Reflection cemented
Smith & Nephew	Polar uncemented	Reflection porous
	Synergy Porus	Polar cemented
	Anthology Porus	Polar uncemented
	Empirion Porus	EP uncemented
	Echelon Porus	R3 porous
	SL PLus	BHR porous
	BHR resurfacing	
	CPCS	
	Twinsys cemented	Selexys
	TwinSys uncemented	RM
Mathys	CCA	CCB
	CCB	

## APPENDIX 3 - PROSTHESIS INVENTORY



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

## APPENDIX 3 - PROSTHESIS INVENTORY

	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

# APPENDIX 4 - DATA FORMS

## 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 <input type="checkbox"/>	Resurfacing Arthroplasty <input type="checkbox"/>	
31.05.2010			
Date: .....	<div style="border: 1px solid black; padding: 5px;">           Patient Name:            Address:             d.o.b. .... NHI: .....  <b>Attach Patient Label</b> </div>		Consultant: .....  [If different from patient label] Hospital: .....  Town/City .....
BMI:.....			
Side:..... **			
<i>Tick Appropriate Boxes</i>			
<b>PREVIOUS OPERATION ON INDEX JOINT</b>			
<input type="checkbox"/> None	<input type="checkbox"/> Arthrodesis		
<input type="checkbox"/> Internal fixation for juxtarticular fractures	<input type="checkbox"/> Other: .....		
<input type="checkbox"/> Osteotomy .....			
<b>DIAGNOSIS</b>			
<input type="checkbox"/> Osteoarthritis	<input type="checkbox"/> Old fracture NOF		
<input type="checkbox"/> Rheumatoid arthritis	<input type="checkbox"/> Post-acute dislocation		
<input type="checkbox"/> Other inflammatory	<input type="checkbox"/> Avascular necrosis		
<input type="checkbox"/> Acute fracture NOF	<input type="checkbox"/> Tumour		
<input type="checkbox"/> Developmental dysplasia/dislocation	<input type="checkbox"/> Other: Name: .....		
<b>APPROACH</b>			
<input type="checkbox"/> Image guided surgery	<input type="checkbox"/> Minimally invasive surgery		
<input type="checkbox"/> Anterior	<input type="checkbox"/> Posterior	<input type="checkbox"/> Lateral	<input type="checkbox"/> Trochanteric
<b>osteotomy</b>			
<b>FEMUR</b>		<b>ACETABULUM</b>	
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>		<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - FEMUR</b>		<b>BONE GRAFT - ACETABULUM</b>	
<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic	<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic
<input type="checkbox"/> Autograft		<input type="checkbox"/> Autograft	
<b>FEMORAL HEAD</b>		<b>AUGMENTS</b>	
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>		<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b>			
<input type="checkbox"/> Femur	<input type="checkbox"/> Acetabulum	<input type="checkbox"/> Antibiotic brand: .....	
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b>			
Name: ..... ASA Class: 1 2 3 4 (please circle one)			
<b>OPERATING THEATRE</b>			
<input type="checkbox"/> Conventional	<input type="checkbox"/> Laminar flow or similar	<input type="checkbox"/> Space suits	
<b>SKIN TO SKIN TIME mins</b> Start skin..... Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b>			
<input type="checkbox"/> Consultant	<input type="checkbox"/> Adv Trainee Unsupervised	<input type="checkbox"/> Basic Trainee	
<input type="checkbox"/> Adv Trainee Supervised	Year.....		

\*\*NB

If bilateral procedure two completed forms are required

## APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Hip Joint</b>			
Free Phone 0800-274-989 07.04.2005			
Date: ..... Side:..... **	Patient Name: Address:  d.o.b.                      NHI:	Consultant: ..... [m patient label] Hospital: ..... Town/City: .....	
Tick Appropriate Boxes <b>Attach Patient Label</b>			
<b>REASON FOR REVISION</b> <input type="checkbox"/> Loosening acetabular component <input type="checkbox"/> Loosening femoral component <input type="checkbox"/> Dislocation <input type="checkbox"/> Pain		<input type="checkbox"/> Previous hemiarthroplasty <input type="checkbox"/> Deep infection <input type="checkbox"/> Fracture femur <input type="checkbox"/> Removal of components <input type="checkbox"/> Other: Name: .....	
Date Index Operation: ..... <b>REVISION</b> <input type="checkbox"/> Change of femoral component <input type="checkbox"/> Change of acetabular component <input type="checkbox"/> Change of head		If re-revision - Date previous revision: ..... <input type="checkbox"/> Change of liner <input type="checkbox"/> Change of all components	
<b>APPROACH</b> <input type="checkbox"/> Image guided surgery <input type="checkbox"/> Minimally invasive surgery <input type="checkbox"/> Anterior <input type="checkbox"/> Posterior <input type="checkbox"/> Lateral <input type="checkbox"/> Trochanteric osteotomy			
<b>FEMUR</b> <div style="border: 1px solid black; height: 60px; text-align: center; padding: 10px;">                         Please do not fold bar-coded label                     </div>		<b>ACETABULUM</b> <div style="border: 1px solid black; height: 60px; text-align: center; padding: 10px;">                         Please do not fold bar-coded label                     </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - FEMUR</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft		<b>BONE GRAFT - ACETABULUM</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft	
<b>FEMORAL HEAD</b> <div style="border: 1px solid black; height: 60px; text-align: center; padding: 10px;">                         Please do not fold bar-coded label                     </div>		<b>AUGMENTS</b> <div style="border: 1px solid black; height: 60px; text-align: center; padding: 10px;">                         Please do not fold bar-coded label                     </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b> <input type="checkbox"/> Femur <input type="checkbox"/> Acetabulum <input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name ..... ASA Class:    1    2    3    4    (please circle one)			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....            Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <input type="checkbox"/> Consultant <input type="checkbox"/> Adv Trainee Supervised    Year..... <input type="checkbox"/> Basic Trainee			

**\*\*NB**

*If bilateral procedure two completed forms are required*

# APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Primary Replacement Knee</b> Free Phone 0800-274-989 <input type="checkbox"/> Total Knee Arthroplasty <input type="checkbox"/> Unicompartmental <input type="checkbox"/> Patellofemoral 31.05.2010			
<b>Date:</b> ..... <b>BMI:</b> ..... <b>Side:</b> ..... **	<b>Patient Name:</b> <b>Address:</b>  d.o.b.                      NHI: <div style="text-align: center; border: 1px solid black; padding: 2px;"><b>Attach Patient Label</b></div>	<b>Consultant:</b> ..... [If different from patient label] <b>Hospital:</b> ..... <b>Town/City:</b> .....	
<b>Tick Appropriate Boxes</b>			
<b>PREVIOUS OPERATION ON INDEX JOINT</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> None  <input type="checkbox"/> Internal fixation for juxtaarticular fracture  <input type="checkbox"/> Ligament reconstruction  <input type="checkbox"/> Meniscectomy                         </div> <div> <input type="checkbox"/> Synovectomy  <input type="checkbox"/> Osteotomy  <input type="checkbox"/> Other: Name: .....                         </div> </div>			
<b>DIAGNOSIS</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Osteoarthritis  <input type="checkbox"/> Rheumatoid arthritis                      disruption/reconstruction  <input type="checkbox"/> Other inflammatory  <input type="checkbox"/> Tumour                         </div> <div> <input type="checkbox"/> Post fracture  <input type="checkbox"/> Post ligament   <input type="checkbox"/> Avascular necrosis  <input type="checkbox"/> Other: Name: .....                         </div> </div>			
<b>APPROACH</b> <input type="checkbox"/> Image guided surgery <input type="checkbox"/> Minimally invasive surgery <input type="checkbox"/> Medial parapatellar <input type="checkbox"/> Lateral parapatellar <input type="checkbox"/> Other			
<b>FEMUR</b> <div style="border: 1px solid black; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <b>Please do not fold bar-coded label</b> </div>		<b>TIBIA</b> <div style="border: 1px solid black; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - FEMUR</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft		<b>BONE GRAFT - TIBIA</b> <input type="checkbox"/> Allograft <input type="checkbox"/> <input type="checkbox"/> Autograft <input type="checkbox"/> Synthetic	
<b>PATELLA</b> <div style="border: 1px solid black; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <b>Please do not fold bar-coded label</b> </div>		<b>AUGMENTS</b> <div style="border: 1px solid black; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b> <input type="checkbox"/> Femur <input type="checkbox"/> Tibia <input type="checkbox"/> Patella <input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name .....                      ASA Class:    1    2    3    4    (please circle one)			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....            Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Consultant    <input type="checkbox"/> Adv Trainee Supervised  <input type="checkbox"/> Trainee                         </div> <div> <input type="checkbox"/> Adv Trainee Unsupervised                      Year.....            <input type="checkbox"/> Basic                         </div> </div>			

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

DO NOT PLACE IN PATIENT NOTES

TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Knee Joint</b>			
Free Phone 0800-274-989 07.04.2005			
Date: .....  <b>Side:..... **</b>	<div style="border: 1px solid black; padding: 2px;">             Patient Name:              Address:               d.o.b.                      NHI:  <b>Attach Patient Label</b> </div>	Consultant: ..... [If different from patient label]  Hospital: .....  Town/City:.....	
<i>Tick Appropriate Boxes</i>			
<b>REASON FOR REVISION</b> <input type="checkbox"/> Loosening femoral component <input type="checkbox"/> Loosening tibial component <input type="checkbox"/> Loosening patellar component <input type="checkbox"/> Pain		<input type="checkbox"/> Previous Unicompartmental <input type="checkbox"/> Deep infection <input type="checkbox"/> Fracture femur <input type="checkbox"/> Fracture tibia <input type="checkbox"/> Other details: .....	
Date Index Operation: ..... <b>REVISION</b> <input type="checkbox"/> Change of femoral component <input type="checkbox"/> Change of tibial component <input type="checkbox"/> Change of patellar component <input type="checkbox"/> Addition of patellar component		If re-revision - Date previous revision: ..... <input type="checkbox"/> Change of tibial polyethylene only <input type="checkbox"/> Change of all components <input type="checkbox"/> Removal of components <input type="checkbox"/> Other	
<b>APPROACH</b> <input type="checkbox"/> Image guided surgery <input type="checkbox"/> Minimally invasive surgery <input type="checkbox"/> Medial parapatellar <input type="checkbox"/> Lateral parapatellar <input type="checkbox"/> Other			
<b>FEMUR</b>  <div style="border: 1px solid black; height: 40px; text-align: center; padding: 5px;"> <b>Please do not fold bar-coded label</b> </div>		<b>TIBIA</b>  <div style="border: 1px solid black; height: 40px; text-align: center; padding: 5px;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT – FEMUR</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft		<b>BONE GRAFT – TIBIA</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft	
<b>PATELLA</b>  <div style="border: 1px solid black; height: 40px; text-align: center; padding: 5px;"> <b>Please do not fold bar-coded label</b> </div>		<b>AUGMENTS</b>  <div style="border: 1px solid black; height: 40px; text-align: center; padding: 5px;"> <b>Please do not fold bar-coded label</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b> <input type="checkbox"/> Femur <input type="checkbox"/> Tibia <input type="checkbox"/> Patella <input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name .....                      ASA Class:    1    2    3    4    (please circle one)			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....                      Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <input type="checkbox"/> Consultant <input type="checkbox"/> Adv Trainee Unsupervised                      Year..... <input type="checkbox"/> Basic Trainee <input type="checkbox"/> Adv Trainee Supervised			

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

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Primary Replacement Shoulder</b> <input type="checkbox"/> Total shoulder Arthroplasty <input type="checkbox"/> Hemiarthroplasty <input type="checkbox"/> Reverse Shoulder			
24.03.2016			
<b>Date:</b> .....		<b>Consultant:</b> ..... [If different from patient label]	
<b>BMI:</b> .....		<div style="border: 1px solid black; padding: 10px; margin: 0 auto; width: 80%;">           Patient Name:            Address:             d.o.b.                      NHI:  <b>Attach Patient Label</b> </div>	
<b>Hospital:</b> .....			
<b>Side:</b> ..... **			
<b>Town/City:</b>			
<b>Tick Appropriate Boxes</b>			
<b>PREVIOUS OPERATION ON INDEX JOINT</b>			
<input type="checkbox"/> None		<input type="checkbox"/> Osteotomy	
<input type="checkbox"/> Internal fixation for juxtaarticular fracture		<input type="checkbox"/> Arthrodesis	
<input type="checkbox"/> Previous stabilisation		<input type="checkbox"/> Arthroscopic debridement/compression	
<input type="checkbox"/> Rotator Cuff Repair		<input type="checkbox"/> Other: Name: .....	
<b>DIAGNOSIS</b>			
<input type="checkbox"/> Rheumatoid arthritis		<input type="checkbox"/> Post recurrent dislocation	
<input type="checkbox"/> Osteoarthritis		<input type="checkbox"/> Avascular necrosis	
<input type="checkbox"/> Other inflammatory		<input type="checkbox"/> Cuff tear arthropathy	
<input type="checkbox"/> Acute fracture proximal humerus		<input type="checkbox"/> Post old trauma	
.....		<input type="checkbox"/> Other: Name: .....	
<b>APPROACH</b>			
<input type="checkbox"/> Deltopectoral		<input type="checkbox"/> Other : specify	
<b>HUMERUS</b>		<b>GLENOID</b>	
<div style="border: 1px solid black; height: 60px; margin: 0 auto; width: 100%;">           Please do not fold bar-coded label         </div>		<div style="border: 1px solid black; height: 60px; margin: 0 auto; width: 100%;">           Please do not fold bar-coded label         </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - HUMERUS</b>		<b>BONE GRAFT - GLENOID</b>	
<input type="checkbox"/> Allograft		<input type="checkbox"/> Allograft	
<input type="checkbox"/> Autograft <input type="checkbox"/> Synthetic		<input type="checkbox"/> Autograft <input type="checkbox"/> Synthetic	
<b>HUMERAL HEAD</b>		<b>AUGMENTS</b>	
<div style="border: 1px solid black; height: 60px; margin: 0 auto; width: 100%;">           Please do not fold bar-coded label         </div>		<div style="border: 1px solid black; height: 60px; margin: 0 auto; width: 100%;">           Please do not fold bar-coded label         </div>	
<b>STICK ALL LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b>			
<input type="checkbox"/> Humerus		<input type="checkbox"/> Glenoid	
<input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> SYSTEMIC ANTIBIOTIC PROPHYLAXIS			
<b>Name:</b> .....		<b>ASA Class:</b> 1    2    3    4    (please circle one)	
<b>OPERATING THEATRE</b>			
<input type="checkbox"/> Conventional		<input type="checkbox"/> Laminar flow or similar	
<input type="checkbox"/> Space suits		<input type="checkbox"/>	
<b>SKIN TO SKIN TIME mins</b> <b>Start skin</b> ..... <b>Finish skin</b> .....			
<b>**NB</b> <i>If bilateral procedure two completed forms are required</i>			

# APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Shoulder</b>			
<b>Free Phone 0800-274-989</b> <b>07.04.2005</b>			
<b>Date:</b> ..... <b>Side:</b> ..... **		<b>Consultant:</b> ..... [If different from patient label] <b>Hospital:</b> ..... <b>Town/City:</b> .....	
<b>Tick Appropriate Boxes</b>		Patient Name: Address:  d.o.b.                      NHI: <b>Attach Patient Label</b>	
<b>REASON FOR REVISION</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> Loosening glenoid component  <input type="checkbox"/> Loosening humeral component  <input type="checkbox"/> Loosening both components  <input type="checkbox"/> Dislocation/instability anterior  <input type="checkbox"/> Instability posterior                         </div> <div style="width: 48%;"> <input type="checkbox"/> Subacromial tuberosity impingement  <input type="checkbox"/> Subacromial cuff impingement/tear  <input type="checkbox"/> Fracture humerus  <input type="checkbox"/> Deep infection  <input type="checkbox"/> Pain  <input type="checkbox"/> Other: Name: .....                         </div> </div>			
<b>Date Index Operation:</b> ..... <b>REVISION</b> <input type="checkbox"/> Change of head only <input type="checkbox"/> Change of humeral component <input type="checkbox"/> Change of glenoid component <input type="checkbox"/> Change of liner (glenoid non cemented)		<b>If re-revision - Date previous revision:</b> ..... <input type="checkbox"/> Change of all components <input type="checkbox"/> Remove glenoid <input type="checkbox"/> Remove humerus <input type="checkbox"/> Removal of components <input type="checkbox"/> Other Specify: .....	
<b>APPROACH</b> <input type="checkbox"/> Deltopectoral <input type="checkbox"/> Other: specify			
<b>HUMERUS</b> <div style="border: 1px solid black; padding: 10px; margin: 5px auto; width: 80%;"> <b>Please do not fold bar-coded labels</b> </div>		<b>GLENOID</b> <div style="border: 1px solid black; padding: 10px; margin: 5px auto; width: 80%;"> <b>Please do not fold bar-coded labels</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - HUMERUS</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft		<b>BONE GRAFT - GLENOID</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft	
<b>HUMERAL HEAD</b> <div style="border: 1px solid black; padding: 10px; margin: 5px auto; width: 80%;"> <b>Please do not fold bar-coded labels</b> </div>		<b>AUGMENTS</b> <div style="border: 1px solid black; padding: 10px; margin: 5px auto; width: 80%;"> <b>Please do not fold bar-coded labels</b> </div>	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b> <input type="checkbox"/> Humerus <input type="checkbox"/> Glenoid <input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name .....                      ASA Class:    1    2    3    4    (please circle one)			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....                      Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <input type="checkbox"/> Adv Trainee Unsupervised <input type="checkbox"/> Consultant <input type="checkbox"/> Adv Trainee <input type="checkbox"/> Supervised Year..... <input type="checkbox"/> Basic Trainee			

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

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Primary Replacement Ankle</b>			
<b>Free Phone 0800-274-989</b> <b>31.05.2010</b>			
<b>Date:</b> .....  <b>BMI:</b> .....  <b>Side:</b> ..... **	<div style="border: 1px solid black; padding: 5px;"> <b>Patient Name:</b>  <b>Address:</b>   <b>d.o.b.</b> </div> <div style="margin-top: 5px;"> <b>NHI:</b> </div>	<b>Consultant:</b> ..... <b>[If different from patient label]</b> <b>Hospital:</b> .....  <b>Town/City:</b> .....	
<b>Tick Appropriate Boxes</b>			
<b>PREVIOUS OPERATION ON INDEX JOINT</b>			
<input type="checkbox"/> None	<input type="checkbox"/> Arthrodesis	<input type="checkbox"/> Other: Name: .....	
<input type="checkbox"/> Internal fixation for juxtaarticular fractures	<input type="checkbox"/>	<input type="checkbox"/> Osteotomy	
<b>DIAGNOSIS</b>			
<input type="checkbox"/> Osteoarthritis	<input type="checkbox"/> Post trauma	<input type="checkbox"/> Rheumatoid arthritis	
<input type="checkbox"/> Other inflammatory	<input type="checkbox"/> Avascular necrosis talus	<input type="checkbox"/> Other: Name: .....	
<b>APPROACH</b>			
<input type="checkbox"/> Anterior	<input type="checkbox"/> Anterio-lateral	<input type="checkbox"/> Other	
<b>TIBIA</b>	<b>TALUS</b>		
<div style="border: 1px solid black; padding: 20px; width: 100%;"> <b>Please do not fold bar-coded label</b> </div>	<div style="border: 1px solid black; padding: 20px; width: 100%;"> <b>Please do not fold bar-coded label</b> </div>		
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - TIBIA</b>		<b>BONE GRAFT - TALUS</b>	
<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic	<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic
<input type="checkbox"/> Autograft	<input type="checkbox"/>	<input type="checkbox"/> Autograft	<input type="checkbox"/>
<b>AUGMENTS</b>		<b>FUSION DISTAL TFJ</b>	
<div style="border: 1px solid black; padding: 20px; width: 100%;"> <b>Please do not fold bar-coded label</b> </div>			
<b>STICK ALL LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b>			
<input type="checkbox"/> Tibia	<input type="checkbox"/> Talus	<input type="checkbox"/> Antibiotic Brand: .....	
<b>0 SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b>			
<b>Name:</b> .....		<b>ASA Class:</b> 1   2   3   4 (please circle one)	
<b>OPERATING THEATRE</b>			
<input type="checkbox"/> Conventional	<input type="checkbox"/> Laminar flow or similar	<input type="checkbox"/> Space suits	
<b>SKIN TO SKIN TIME mins</b>		<b>Start skin..... Finish skin.....</b>	
<b>PRIMARY OPERATING SURGEON</b>			
<input type="checkbox"/> Consultant	<input type="checkbox"/> Adv Trainee Unsupervised	<input type="checkbox"/> Year.....	<input type="checkbox"/> Basic
<input type="checkbox"/> Trainee	<input type="checkbox"/> Adv Trainee Supervised		

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# APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES

TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Ankle Joint</b>									
Free Phone 0800-274-989		07.04.2005							
<b>Date:</b> .....  <b>Side:</b> ..... **	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Patient Name:</td> <td></td> </tr> <tr> <td style="padding: 2px;">Address:</td> <td></td> </tr> <tr> <td style="padding: 2px;">d.o.b.</td> <td style="padding: 2px;">NHI:</td> </tr> </table> <p style="text-align: center; margin-top: 5px;"><b>Attach Patient Label</b></p>		Patient Name:		Address:		d.o.b.	NHI:	<b>Consultant:</b> ..... [If different from patient label]  <b>Hospital:</b> .....  <b>Town/City:</b> .....
Patient Name:									
Address:									
d.o.b.	NHI:								
<b>Tick Appropriate Boxes</b>									
<b>REASON FOR REVISION</b>									
<input type="checkbox"/> Loosening talar component	<input type="checkbox"/> Deep infection								
<input type="checkbox"/> Loosening tibial component	<input type="checkbox"/> Fracture talus								
<input type="checkbox"/> Dislocation	<input type="checkbox"/> Fracture tibia								
<input type="checkbox"/> Pain	<input type="checkbox"/> Dislocations								
		<input type="checkbox"/> Other details: .....							
<b>Date Index Operation:</b> .....		<b>If re-revision - Date previous revision:</b> .....							
<b>REVISION</b>									
<input type="checkbox"/> Change of talar component	<input type="checkbox"/> Change of all components								
<input type="checkbox"/> Change of tibial component	<input type="checkbox"/> Removal of components								
<input type="checkbox"/> Change of polyethylene only	<input type="checkbox"/> Other Name: .....								
<b>APPROACH</b>									
<input type="checkbox"/> Anterior	<input type="checkbox"/> Anterio-lateral	<input type="checkbox"/> Posterior							
<b>TIBIA</b>		<b>TALUS</b>							
Please do not fold bar-coded label		Please do not fold bar-coded label							
<b>STICK ALL LABELS ON REVERSE SIDE</b>									
<b>BONE GRAFT - TIBIA</b>		<b>BONE GRAFT - TALUS</b>							
<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic	<input type="checkbox"/> Allograft	<input type="checkbox"/> Synthetic						
<input type="checkbox"/> Autograft		<input type="checkbox"/> Autograft							
<b>AUGUMENTS</b>		<b>FUSION DISTAL TFJ</b>							
Please do not fold bar-coded label		Yes <input type="checkbox"/> No <input type="checkbox"/>							
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>									
<b>CEMENT</b>									
<input type="checkbox"/> Talus	<input type="checkbox"/> Tibia	<input type="checkbox"/> Antibiotic brand: .....							
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b>									
Name .....		ASA Class: 1 2 3 4 (please circle one)							
<b>OPERATING THEATRE</b>									
<input type="checkbox"/> Conventional	<input type="checkbox"/> Laminar flow or similar	<input type="checkbox"/> Space suits							
<b>SKIN TO SKIN TIME mins</b>		<b>Start skin..... Finish skin.....</b>							
<b>PRIMARY OPERATING SURGEON</b>									
<input type="checkbox"/> Consultant	<input type="checkbox"/> Adv Trainee Unsupervised								
<input type="checkbox"/> Trainee	<input type="checkbox"/> Adv Trainee Supervised Year.....	<input type="checkbox"/> Basic							

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

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Primary Replacement Elbow</b>				<b>Free Phone 0800-274-989</b> 07.04.2005
<b>Date:</b> .....		<b>Consultant:</b> ..... [If different from patient label]		<b>Hospital:</b> ..... <b>Town/City:</b> .....
<b>Side:</b> ..... **		<div style="border: 1px solid black; padding: 5px;"> <b>Patient Name:</b>  <b>Address:</b>    d.o.b.                      NHI: </div>		
<i>Tick Appropriate Boxes</i>				
<b>PREVIOUS OPERATION ON INDEX JOINT</b>				
<input type="checkbox"/> None		<input type="checkbox"/> Debridement		
<input type="checkbox"/> Internal fixation for juxtarticular fracture		<input type="checkbox"/> Synovectomy ± removal radial head		
<input type="checkbox"/> Ligament reconstruction		<input type="checkbox"/> Osteotomy		
<input type="checkbox"/> Interposition arthroplasty		<input type="checkbox"/> Other: Name: .....		
<b>DIAGNOSIS</b>				
<input type="checkbox"/> Rheumatoid arthritis		<input type="checkbox"/> Post fracture		
<input type="checkbox"/> Osteoarthritis		<input type="checkbox"/> Post ligament disruption		
<input type="checkbox"/> Other inflammatory		<input type="checkbox"/> Other: Name: .....		
<input type="checkbox"/> Post dislocation				
<b>APPROACH</b>				
<input type="checkbox"/> Medial		<input type="checkbox"/> Lateral		<input type="checkbox"/> Posterior
<b>HUMERUS</b>		<b>ULNA</b>		
<div style="border: 1px solid black; padding: 10px; width: 100%;"> Please do not fold bar-coded label </div>		<div style="border: 1px solid black; padding: 10px; width: 100%;"> Please do not fold bar-coded label </div>		
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>				
<b>BONE GRAFT - HUMERUS</b>		<b>BONE GRAFT - ULNA</b>		
<input type="checkbox"/> Allograft		<input type="checkbox"/> Allograft		
<input type="checkbox"/> Autograft <input type="checkbox"/>		<input type="checkbox"/> Autograft <input type="checkbox"/> Synthetic		
<input type="checkbox"/> Synthetic				
<b>RADIAL HEAD</b>		<b>AUGMENTS</b>		
<div style="border: 1px solid black; padding: 10px; width: 100%;"> Please do not fold bar-coded label </div>		<div style="border: 1px solid black; padding: 10px; width: 100%;"> Please do not fold bar-coded label </div>		
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>				
<b>CEMENT</b>				
<input type="checkbox"/> Humerus		<input type="checkbox"/> Ulna <input type="checkbox"/> Radius <input type="checkbox"/> Antibiotic brand: .....		
<input type="checkbox"/> SYSTEMIC ANTIBIOTIC PROPHYLAXIS				
Name .....		ASA Class: 1   2   3   4   (please circle one)		
<b>OPERATING THEATRE</b>				
<input type="checkbox"/> Conventional		<input type="checkbox"/> Laminar flow or similar		<input type="checkbox"/> Space suits
<b>SKIN TO SKIN TIME mins</b> Start skin.....      Finish skin.....				
<b>PRIMARY OPERATING SURGEON</b>				
<input type="checkbox"/> Consultant		<input type="checkbox"/> Adv Trainee Unsupervised		
<input type="checkbox"/> Adv Trainee Supervised      Year.....		<input type="checkbox"/> Basic Trainee		

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

DO NOT PLACE IN PATIENT NOTES

TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Elbow Joint</b>			
Free Phone 0800-274-989		07.04.2005	
Date: .....  Side: ..... **	<div style="border: 1px solid black; padding: 5px;">             Patient Name:              Address:               d.o.b.                      NHI:  <b>Attach Patient Label</b> </div>		Consultant: ..... [If different from patient label] Hospital: ..... Town/City: .....
<i>Tick Appropriate Boxes</i>			
<b>REASON FOR REVISION</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> Loosening humeral component  <input type="checkbox"/> Loosening ulnar component  <input type="checkbox"/> Loosening radial head component  <input type="checkbox"/> Pain             </div> <div style="width: 48%;"> <input type="checkbox"/> Deep infection  <input type="checkbox"/> Fracture humerus  <input type="checkbox"/> Fracture ulna  <input type="checkbox"/> Dislocations  <input type="checkbox"/> Other Name: .....             </div> </div>			
Date Index Operation: .....		If re-revision - Date previous revision: .....	
<b>REVISION</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> Change of humeral component  <input type="checkbox"/> Change of ulnar component  <input type="checkbox"/> Change of radial head component             </div> <div style="width: 48%;"> <input type="checkbox"/> Change of all components  <input type="checkbox"/> Removal of components  <input type="checkbox"/> Other Name: .....             </div> </div>			
<b>APPROACH</b> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Medial                      <input type="checkbox"/> Lateral                      <input type="checkbox"/> Posterior             </div>			
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>		
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>BONE GRAFT - HUMERUS</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft		<b>BONE GRAFT - ULNA</b> <input type="checkbox"/> Allograft <input type="checkbox"/> Synthetic <input type="checkbox"/> Autograft	
<b>RADIAL HEAD</b> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>	<b>AUGMENTS</b> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Please do not fold bar-coded label</b> </div>		
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>CEMENT</b> <input type="checkbox"/> Humerus <input type="checkbox"/> Ulna <input type="checkbox"/> Radius <input type="checkbox"/> Antibiotic brand: .....			
<input type="checkbox"/> <b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name .....    ASA Class:    1    2    3    4    (please circle one)			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....    Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Consultant                      <input type="checkbox"/> Adv Trainee Supervised    Year.....             </div> <div> <input type="checkbox"/> Adv Trainee Unsupervised                      <input type="checkbox"/> Basic Trainee             </div> </div>			

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

NEW ZEALAND JOINT REGISTRY Primary Cervical Disc Replacement			
Free Phone 0800-274-989		14.08.2008	
Date: .....  Tick Appropriate Boxes No: .....		<div> <div>           Patient Name: Address:             DOB: ..... NHI: .....  <b>Attach Patient Label</b> </div> <div>           Consultant: .....            [If different from patient label]            Hospital: .....            Town/City:.....            ACC <input type="checkbox"/> ACC Claim         </div> </div>	
LEVELS OF DISC REPLACEMENT		PRE OP PATIENT SCORE (NECK DISABILITY INDEX)	
..... 0 C3/4      0 C6/7 0 C4/5      0 C7/T1 0 C5/6      Other .....			
PREVIOUS OPERATION			
0 Foreminotomy 0 Adjacent Level Fusion		0 Adjacent Level Disc Arthroplasty 0 Other.....	
DIAGNOSIS			
0 Acute Disc Prolapse 0 Chronic Spondylosis 0 Neck Pain 0 Other .....			
APPROACH			
0 Anterior Right      0 Anterior Left      0 Other .....			
IMPLANTS			
<div>Affix Supplier Label</div>		<div>Affix Supplier Label</div>	
STICK EXTRA LABELS ON REVERSE SIDE			
<div>Affix Supplier Label</div>		<div>Affix Supplier Label</div>	
STICK EXTRA LABELS ON REVERSE SIDE			
INTRAOPERATIVE COMPLICATIONS			
.....			
SYSTEMIC ANTIBIOTIC PROPHYLAXIS			
0 Yes      0 No			
OPERATIVE THEATRE			
0 Conventional      0 Laminar flow or similar      0 Space suits			
SKIN TO SKIN TIME mins      Start skin.....      Finish skin.....			
PRIMARY OPERATING SURGEON			
0 Adv Trainee Unsupervised 0 Consultant      0 Adv Trainee Supervised      Year .....      0 Basic Trainee			

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Cervical Disc Replacement</b>			
Free Phone 0800-274-989 14.08.2008			
Date: .....	Patient Name: Address:  DOB: ..... NHI: ..... <b><i>Attach Patient Label</i></b>	Consultant: ..... [If different from patient label] Hospital:  Town/City: .....	
<b>LEVEL OF REVISION</b> ..... <input type="checkbox"/> C3/4 <input type="checkbox"/> C6/7 <input type="checkbox"/> C4/5 <input type="checkbox"/> C7/T1  <input type="checkbox"/> C5/6 <input type="checkbox"/> Other:			
Tick Appropriate Boxes		ACC <input type="checkbox"/>	ACC Claim No: .....
<b>REASON FOR REVISION</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> Dislocation of component  <input type="checkbox"/> Failure of component  <input type="checkbox"/> Infection  <input type="checkbox"/> Pain (Neck)             </div> <div style="width: 48%;"> <input type="checkbox"/> Adjacent level surgery  <input type="checkbox"/> Additional decompression required  <input type="checkbox"/> Heterotopic calcification  <input type="checkbox"/> Other: Name: .....             </div> </div>			
Date Index Operation: ..... <b>REVISION</b> <input type="checkbox"/> Replace disc prosthesis (same) <input type="checkbox"/> Replace disc prosthesis (different) <input type="checkbox"/> Fuse		If re-revision - Date previous revision: ... <input type="checkbox"/> Removal only <input type="checkbox"/> Other: .....	
<b>APPROACH</b> <input type="checkbox"/> Image guided surgery <input type="checkbox"/> Minimally invasive surgery <input type="checkbox"/> Anterior <input type="checkbox"/> Posterior <input type="checkbox"/> Lateral <input type="checkbox"/> Trochanteric Osteotomy			
<b>IMPLANTS</b>			
Please do not fold bar-coded label		Please do not fold bar-coded label	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
Please do not fold bar-coded label		Please do not fold bar-coded label	
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>			
<b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Name .....			
<b>OPERATING THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b> Start skin.....    Finish skin.....			
<b>PRIMARY OPERATING SURGEON</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Consultant    <input type="checkbox"/> Adv Trainee Supervised             </div> <div style="width: 10%;">           Year.....         </div> <div style="width: 45%;"> <input type="checkbox"/> Adv Trainee Unsupervised    <input type="checkbox"/> Basic Trainee             </div> </div>			

## APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Primary Lumbar Disc Replacement</b> Free Phone 0800-274-989 14.08.2008		
Date: .....	Patient Name: Address:  d.o.b. NHI: <b>Attach Patient Label</b>	Consultant: ..... [If different from patient label] Hospital: .....  Town/City.....
Tick Appropriate Boxes		ACC <input type="checkbox"/> ACC Claim No. ....
<b>DISC REPLACEMENT Levels</b>  <input type="checkbox"/> L3/4 responses..... <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1	<b>FUSION Levels</b>  <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 Percentage score	<b>PRE OP PATIENT SCORE</b> <i>Modified Roland and Morris</i> Total number of "Yes"  <i>Oswestry Score</i> <input type="checkbox"/> L5/S1 Other .....
<b>PREVIOUS OPERATION</b> <input type="checkbox"/> Discectomy <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1 <input type="checkbox"/> Other ..... <input type="checkbox"/> Other ..... <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1		
<b>DIAGNOSIS</b> 1. Degenerative Disc disease (plain x-ray changes present) <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1 <input type="checkbox"/> Other ..... 2. Annular tear MRI scan (normal plain x-ray) <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1 <input type="checkbox"/> Other ..... 3. Discogenic pain on discography <input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1 <input type="checkbox"/> Other .....		
<b>APPROACH</b> <input type="checkbox"/> Retroperitoneal midline abdominal wall incision <input type="checkbox"/> Transperitoneal <input type="checkbox"/> Retroperitoneal lateral abdominal wall incision <input type="checkbox"/> Other .....		
<b>IMPLANTS</b>		
<div style="border: 1px solid black; padding: 10px; text-align: center;">Affix Supplier Label</div>		<div style="border: 1px solid black; padding: 10px; text-align: center;">Affix Supplier Label</div>
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>		
<div style="border: 1px solid black; padding: 10px; text-align: center;">Affix Supplier Label</div>		<div style="border: 1px solid black; padding: 10px; text-align: center;">Affix Supplier Label</div>
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>		
<b>INTRAOPERATIVE COMPLICATIONS</b> .....		
<b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Yes <input type="checkbox"/> No <input type="checkbox"/>		
<b>OPERATIVE THEATRE</b> <input type="checkbox"/> Conventional <input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits		
<b>SKIN TO SKIN TIME mins</b> Start skin ..... Finish skin .....		
<b>PRIMARY OPERATING SURGEON</b> <input type="checkbox"/> Consultant <input type="checkbox"/> Adv Trainee Year..... <input type="checkbox"/> Basic Trainee		

## APPENDIX 4 - DATA FORMS

DO NOT PLACE IN PATIENT NOTES TO BE RETAINED IN THEATRE SUITE

<b>NEW ZEALAND JOINT REGISTRY</b> <b>Revision Lumbar Disc Replacement</b>					
Free Phone 0800-274-989 14.08.2008					
Date: .....	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">                         Patient Name:                          Address:                           d.o.b.                      NHI:                     </td> <td style="text-align: center; padding: 5px;"> <b>Attach Patient Label</b> </td> </tr> </table>	Patient Name: Address:  d.o.b.                      NHI:	<b>Attach Patient Label</b>	Consultant: ..... [If different from patient label] Hospital: ..... Town/City: .....	
Patient Name: Address:  d.o.b.                      NHI:	<b>Attach Patient Label</b>				
Tick Appropriate Boxes		ACC <input type="checkbox"/>	ACC Claim No: .....		
<b>REASON FOR REVISION</b>					
<input type="checkbox"/> Loosening of components <input type="checkbox"/> Dislocation of articulating core <input type="checkbox"/> Loss of spinal alignment <input type="checkbox"/> Pain		<input type="checkbox"/> Deep infection <input type="checkbox"/> Fracture of vertebra <input type="checkbox"/> Removal of components <input type="checkbox"/> Other: Name: .....			
Date Index Operation: .....		If re-revision - Date previous revision: .....			
<b>REVISION</b>					
<input type="checkbox"/> Change of TDR components <input type="checkbox"/> Change to Anterior Fusion		<input type="checkbox"/> Change of articulating core <input type="checkbox"/> In-situ posterior instrumented fusion			
<b>APPROACH</b>					
<input type="checkbox"/> Retroperitoneal midline abdominal wall incision <input type="checkbox"/> Retroperitoneal lateral abdominal wall incision <input type="checkbox"/> Posterior Approach for in-situ fusion		<input type="checkbox"/> Transperitoneal <input type="checkbox"/> Other .....			
<b>NEW DISC REPLACEMENT Levels</b>		<b>NEW FUSION Levels</b>			
<input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1		<input type="checkbox"/> L3/4 <input type="checkbox"/> L4/5 <input type="checkbox"/> L5/S1			
<b>PRE OP PATIENT SCORE</b> <i>Modified Roland and Morris</i> Total number of "Yes" responses..... <i>Oswestry Score</i> Percentage score					
Other .....					
<b>IMPLANTS</b>					
<table border="1" style="width: 100%; height: 40px;"> <tr> <td style="text-align: center;">Affix Supplier Label</td> </tr> </table>		Affix Supplier Label	<table border="1" style="width: 100%; height: 40px;"> <tr> <td style="text-align: center;">Affix Supplier Label</td> </tr> </table>		Affix Supplier Label
Affix Supplier Label					
Affix Supplier Label					
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>					
<table border="1" style="width: 100%; height: 40px;"> <tr> <td style="text-align: center;">Affix Supplier Label</td> </tr> </table>		Affix Supplier Label	<table border="1" style="width: 100%; height: 40px;"> <tr> <td style="text-align: center;">Affix Supplier Label</td> </tr> </table>		Affix Supplier Label
Affix Supplier Label					
Affix Supplier Label					
<b>STICK EXTRA LABELS ON REVERSE SIDE</b>					
<b>INTRAOPERATIVE COMPLICATIONS</b> ..... .....					
<b>SYSTEMIC ANTIBIOTIC PROPHYLAXIS</b> Yes <input type="checkbox"/> No <input type="checkbox"/>					
<b>OPERATIVE THEATRE</b>					
<input type="checkbox"/> Conventional		<input type="checkbox"/> Laminar flow or similar <input type="checkbox"/> Space suits			
<b>SKIN TO SKIN TIME mins</b>		<b>Start skin .....</b>			
<b>Finish skin .....</b>		<b>PRIMARY OPERATING SURGEON</b>			
<input type="checkbox"/> Consultant		<input type="checkbox"/> Adv Trainee      Year..... <input type="checkbox"/> Basic Trainee			

200 of 210 Data Forms The New Zealand Joint Registry

**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	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
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	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
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	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
	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	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
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	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
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	

- ☐ 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**

<p>1 How would you describe the pain you usually had from your operated on hip?</p> <p>4 None</p> <p>3 Very mild</p> <p>2 Mild</p> <p>1 Moderate</p> <p>0 Severe</p> <p>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)</p> <p>4 No pain/more than 30 minutes</p> <p>3 16 to 30 minutes</p> <p>2 5 to 15 minutes</p> <p>1 Around the house only</p> <p>0 Unable to walk because of severe pain</p> <p>3 Have you had any trouble getting in and out of a car or using public transport because of your operated on hip?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>4 Have you been able to put on a pair of socks, stockings or tights?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>5 Could you do the household shopping on your own?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>6 Have you had any trouble with washing and drying yourself (all over) because of your operated on hip?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>7 How much has pain from your operated on hip interfered with your usual work (including housework)?</p> <p>4 Not at all</p> <p>3 A little bit</p> <p>2 Moderately</p> <p>1 Greatly</p> <p>0 Totally</p>	<p>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?</p> <p>4 Not at all painful</p> <p>3 Slightly painful</p> <p>2 Moderately painful</p> <p>1 Very painful</p> <p>0 Unbearable</p> <p>9 Have you had any sudden, severe pain - 'shooting', 'stabbing' or 'spasms' - from the affected operated on hip?</p> <p>4 No days</p> <p>3 Only 1 or 2 days</p> <p>2 Some days</p> <p>1 Most days</p> <p>0 Every day</p> <p>10 Have you been limping when walking, because of your operated on hip?</p> <p>4 Rarely/never</p> <p>3 Sometimes, or just at first</p> <p>2 Often, not just at first</p> <p>1 Most of the time</p> <p>0 All of the time</p> <p>11 Have you been able to climb a flight of stairs?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>12 Have you been troubled by pain from your operated on hip in bed at night?</p> <p>4 No nights</p> <p>3 Only 1 or 2 nights</p> <p>2 Some nights</p> <p>1 Most nights</p> <p>0 Every night</p>
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☐ 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**

<p>1 How would you describe the pain you usually have from your operated on knee?</p> <p>4 None</p> <p>3 Very mild</p> <p>2 Mild</p> <p>1 Moderate</p> <p>0 Severe</p> <p>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)</p> <p>4 No pain/more than 30 minutes</p> <p>3 16 to 30 minutes</p> <p>2 5 to 15 minutes</p> <p>1 Around the house only</p> <p>0 Unable to walk because of severe pain</p> <p>3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>4 Could you kneel down and get up again afterwards on your operated knee?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>5 Could you do the household shopping on your own?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>7 How much has pain from your operated on knee interfered with your usual work (including housework)?</p> <p>4 Not at all</p> <p>3 A little bit</p> <p>2 Moderately</p> <p>1 Greatly</p> <p>0 Totally</p>	<p>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?</p> <p>4 Not at all painful</p> <p>3 Slightly painful</p> <p>2 Moderately painful</p> <p>1 Very painful</p> <p>0 Unbearable</p> <p>9 Have you felt that your operated on knee might suddenly "give way" or let you down?</p> <p>4 Rarely/never</p> <p>3 Sometimes, or just at first</p> <p>2 Often, not just at first</p> <p>1 Most of the time</p> <p>0 All of the time</p> <p>10 Have you been limping when walking, because of your operated on knee?</p> <p>4 Rarely/never</p> <p>3 Sometimes, or just at first</p> <p>2 Often, not just at first</p> <p>1 Most of the time</p> <p>0 All of the time</p> <p>11 Could you walk down one flight of stairs?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>12 Have you been troubled by pain from your operated on knee in bed at night?</p> <p>4 No nights</p> <p>3 Only 1 or 2 nights</p> <p>2 Some nights</p> <p>1 Most nights</p> <p>0 Every night</p> <p>.....</p>
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- ☐ 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.

## APPENDIX 5 - OXFORD QUESTIONNAIRE FORMS

### 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**

<p>1 How would you describe the pain you usually have from your operated on knee?</p> <p>4 None</p> <p>3 Very mild</p> <p>2 Mild</p> <p>1 Moderate</p> <p>0 Severe</p> <p>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)</p> <p>4 No pain/more than 30 minutes</p> <p>3 16 to 30 minutes</p> <p>2 5 to 15 minutes</p> <p>1 Around the house only</p> <p>0 Unable to walk because of severe pain</p> <p>3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>4 Could you kneel down and get up again afterwards?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>5 Could you do the household shopping on your own?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?</p> <p>4 No trouble at all</p> <p>3 Very little trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>7 How much has pain from your operated on knee interfered with your usual work (including housework)?</p> <p>4 Not at all</p> <p>3 A little bit</p> <p>2 Moderately</p> <p>1 Greatly</p> <p>0 Totally</p>	<p>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?</p> <p>4 Not at all painful</p> <p>3 Slightly painful</p> <p>2 Moderately painful</p> <p>1 Very painful</p> <p>0 Unbearable</p> <p>9 Have you felt that your operated on knee might suddenly "give way" or let you down?</p> <p>4 Rarely/never</p> <p>3 Sometimes, or just at first</p> <p>2 Often, not just at first</p> <p>1 Most of the time</p> <p>0 All of the time</p> <p>10 Have you been limping when walking, because of your operated on knee?</p> <p>4 Rarely/never</p> <p>3 Sometimes, or just at first</p> <p>2 Often, not just at first</p> <p>1 Most of the time</p> <p>0 All of the time</p> <p>11 Could you walk down one flight of stairs?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>12 Have you been troubled by pain from your operated on knee in bed at night?</p> <p>4 No nights</p> <p>3 Only 1 or 2 nights</p> <p>2 Some nights</p> <p>1 Most nights</p> <p>0 Every night</p> <p><b>Additional Information</b></p>
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- ☐ 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<br>Time      | Rarely                   | Some of the<br>time      | Most of the<br>time      | All of the time          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
12. During the past 4 weeks this has applied to me:  
I get shooting pains in my foot/ankle
- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| None of the<br>Time      | Rarely                   | Some of the<br>time      | Most of the<br>time      | All of the time          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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<br>Time      | Rarely                   | Some of the<br>time      | Most of the<br>time      | All of the time          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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<br>Time      | Rarely                   | Some of the<br>time      | Most of the<br>time      | All of the time          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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                   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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<br>nights    | Some nights              | Most nights              | Every night              |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## APPENDIX 5 - OXFORD QUESTIONNAIRE FORMS

### 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 <b>worst</b> pain you have had from your operated on shoulder? 4 None 3 Mild 2 Moderate 1 Severe 0 Unbearable	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
2 How would you describe the pain you <b>usually</b> have from your operated on shoulder? 4 None 3 Very mild 2 Mild 1 Moderate 0 Severe	9 Could you hang your clothes up in a wardrobe – using the operated on arm? 4 Yes, easily 3 With little difficulty 2 With moderate difficulty 1 With extreme difficulty 0 No, impossible
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	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
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	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
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	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 .....
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	

☐ 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 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

<p>1 How would you describe the <b>worst</b> pain you have had from your operated on shoulder?</p> <p>4 None</p> <p>3 Mild</p> <p>2 Moderate</p> <p>1 Severe</p> <p>0 Unbearable</p> <p>2 How would you describe the pain you <b>usually</b> have from your operated on shoulder?</p> <p>4 None</p> <p>3 Very mild</p> <p>2 Mild</p> <p>1 Moderate</p> <p>0 Severe</p> <p>3 Have you had any trouble getting in and out of a car or using public transport because of your operated on shoulder?</p> <p>4 No trouble at all</p> <p>3 A little bit of trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>4 Have you been able to use a knife and fork at the same time?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>5 Could you do the household shopping on your own?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>6 Could you carry a tray containing a plate of food across a room?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>7 Could you brush/comb your hair with the operated on arm?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, Impossible</p>	<p>8 Have you had any trouble dressing yourself because of your operated on shoulder?</p> <p>4 No trouble at all</p> <p>3 A little bit of trouble</p> <p>2 Moderate trouble</p> <p>1 Extreme difficulty</p> <p>0 Impossible to do</p> <p>9 Could you hang your clothes up in a wardrobe – using the operated on arm?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>10 Have you been able to wash and dry yourself under both arms?</p> <p>4 Yes, easily</p> <p>3 With little difficulty</p> <p>2 With moderate difficulty</p> <p>1 With extreme difficulty</p> <p>0 No, impossible</p> <p>11 How much has pain from your operated on shoulder interfered with your usual work hobbies or recreational activities (including housework)?</p> <p>4 Not at all</p> <p>3 A little bit</p> <p>2 Moderately</p> <p>1 Greatly</p> <p>0 Totally</p> <p>12 Have you been troubled by pain from your operated on shoulder in bed at night?</p> <p>4 No nights</p> <p>3 Only 1 or 2 nights</p> <p>2 Some nights</p> <p>1 Most nights</p> <p>0 Every night</p> <p>.....</p>
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☐ 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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





