THE NEW ZEALAND JOINT REGISTRY

SIXTEEN YEAR REPORT

JANUARY 1999 TO DECEMBER 2014

16 YEARS

NZOA
New Zealand Orthopaedic Association

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EDITORIAL COMMENT

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

This year's report contains updated data in the same format as the previous report as well as some new tables and KM survival data.

The total number of registered joint arthroplasties at 31st of December 2014 was 219,856, which had been performed on 154,220 individual patients, of which 26,973 (17%) have died during the 16 year period. Primary hip arthroplasty registrations have broken through the 100,000 barrier.

The number of observed component years (ocys) contained within the Registry is now well in excess of one million. The increase of 19,040 registered joints for 2014 compared to the 18,046 in 2013 represents an overall annual gain of 5.5%, which is similar to the percentage gain in 2013. There were increased registrations for hip (8.2%), knee (4.3% including a 30% increase for patello-femoral replacements), ankle (1.7%) shoulder (7.2%) elbow (18%) and a fall for unicompartmental knee (1.9%) replacements, when compared to 2013 registrations.

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

It is of interest that the proportion of knees to hips has increased slightly further in 2014 to 47% from 46% in 2013 and furthermore, whereas the yearly number of registered hips has doubled since 1999, the yearly number of knees has tripled during the same period. The mean BMIs are 31.2 (knees) and 28.81(hips). There are significant numbers of morbidly obese (BMI>40) people receiving arthroplasties.

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

Hip Arthroplasty

There are 101,833 primary hip arthroplasties in the Registry with an overall revision rate of 0.73 per 100 ocys (95% confidence interval; 0.70 -0.75) with a 15 year prosthesis survival of 87.3% (cemented 89.5%; uncemented and hybrid 87.0%). The proportion of uncemented arthroplasties has slightly fallen from 45.7% in 2013 to 44.8% in 2014, the lowest since 2007. The KM survival curves continue to demonstrate better longer term survival for fully cemented arthroplasties.

There are 1001 (976 in 2013) hip prosthesis combinations in the Registry but only 202 with 50 or more registrations.

As in previous years, the three types of hip fixation have been analysed against the four age bands: less than 55 years; 55-64 years; 65-74 years, and greater than 75 years. The data shows that overall the hybrid hip has the lowest revision rate across the four age bands.

When the bearing surface revision rates are compared, the metal on metal have twice the revision rate of the ceramic on ceramic, ceramic on plastic and metal on plastic. The ceramic on plastic bearing surface continues to increase in popularity and rose to 28% of total in 2014. It is noteworthy that no metal on metal hip arthroplasties were registered in 2014 for head size > 28mm. The use of head sizes >/= to 36mm continues to fall and in 2014 constituted just 21% of total.

The use of cross linked polyethylene continues its upward trend, making up 87.4% of the total polyethylene in 2014.

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

The Corail/Pinnacle combination remains currently the most popular but the ExeterV40/ Trident combination has accumulated the most component years at 34,056 from 6,712 primary arthroplasties and has the very low revision rate of 0.46/100 ocys.

Revision rates for individual hip component combinations (minimum of 50 primary procedures) assembled in order of numbers of arthroplasties as well as revision rates have been calculated. In addition, tables listing combinations by fixation method have been added to make it easier for readers to determine the combination options used within the three types of prosthesis fixation. There is also a new table of prosthesis combinations based on the femoral component which should make it easier for readers to find specific combinations. Four combinations (seven in 2013) which are still currently being used have revision rates significantly higher ($p<0.05$) than the overall rate of 0.73/100 ocys but only the Exeter V40/Continuum combination had significant numbers (332) implanted in 2014. It is also worth noting that the revision rate for monoblock stems which have been implanted for an average of 10 years is very low at 0.44/100 ocys.

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

KM survival curves for some of the hip combinations with a minimum of 1,500 arthroplasties and 10 years of analysable data have once again been included as well as 12 year survival curves for those combinations with a minimum of 2,000 procedures. It is noted that the Exeter combinations, except for Exeter/Contemporary, are among the better and the Spectron combinations among the poorer survival curves. Note the excellent survival of the Muller/Muller combination.

"This year's report contains updated data in the same format as the previous report as well as some new tables and KM survival data."

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

There has been a further increase in the number of primary hip revisions with ALVAL (aseptic lymphocytic vascular-associated lesions), or similar, listed as the reason for revision. In 2011 the number increased from15 to 72; in 2012 to102; in 2013 to146; and in 2014 to 182. This reflects the continuing failure rate of metal on metal hip prosthesis combinations which have >36mm heads. This is reflected in the ASA analyses which show for the first time that there is a higher revision rate for ASA 1 compared to ASA 2. It is worth noting in this context that 49% of the conventional ASR prostheses have been revised.

Other analyses introduced last year, including yearly stacked graphs to demonstrate changes over the last 15 years of head size, bearing surfaces, polyethylene and reasons for revision, have again been included, as well as survival curves for the five main reasons for revision and also for cemented/uncemented stems and cups.

New this year are KMs for the different head sizes, for the different bearing surfaces and for cross linked vs standard polyethylene. All three graphically illustrate different survival trends.

Resurfacing hip arthroplasty registrations continue to flatten off and in 2014 were 89 compared to 90 in 2013. The revision rate has fallen slightly to 1.28/100 ocys.

The Best and the Worst Combinations

From the 16 years of accumulated data it is possible to recommend the generic component combinations which currently should provide the best long term survival. These are: acetabulum – cemented; bearing surfaces - ceramic head with X linked polyethylene liner; head size 32 mm; stem - cemented.

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

Knee Arthroplasty

78,542 primary knee arthroplasties have been registered totalling 456,154 ocys with the overall revision rate 0.49/100 ocys, (95% confidence interval; 0.47-0.51) and the excellent fifteen year survival of 93.68%.

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

There are 48 different types of knee prostheses in the Registry with 19(40%) having less than 10 registrations.

The Triathlon remains as the current most popular with over twice the number of registrations in 2014 compared to second placed Nexgen. Calculation of revision rates for individual prostheses with a minimum of 50 arthroplasties shows that among the bigger usage numbers the Duracon has the lowest revision rate of 0.30/100ocys. The Nexgen has the biggest number of registrations at 16,950 and 9,8021 ocys.

For fully cemented knees, the Insall/Burstein, Scorpio and Optetrak prostheses have significantly higher revision rates than the overall rate of 0.49 /100 ocys @ the 95% confidence but none of them were implanted in 2014 except for two Scorpio prostheses. For fully uncemented knees the LCS has a significantly higher revision rate.

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

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

Image guidance (IG), first recorded by the Registry in 2005, remains quite popular for primary knee arthroplasty and during 2014 was used in 18% of procedures - the highest annual usage yet. Comparison of revision rates for IG with non IG procedures demonstrates a rate of 0.51 versus 0.49/100 ocys. There is no statistical difference between the two at this early stage.

The analyses comparing revision rates and 15 year survival of fixed versus mobile bearing knees continue to show that there is no longer a significantly higher revision rate for mobile bearings and the survival curves beyond 10 years are superimposed.

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

There are 356 patello-femoral prostheses registered, with 64 added in 2014, compared to 5% in 2013. This represents a 30% increase. Thirty (8.4%) have been revised and the revision rate at 2.12/100 ocys is four times that for total knee arthroplasty. All except four were revised to a total knee arthroplasty.

Unicompartmental knee arthroplasty

There are 8,826 registered primary unicompartmental prostheses with a total of 53,350 ocys, a mean revision rate of 1.25/100 ocys and a 13 year survival of 84.1%. Pain is the main reason for revision in almost 50% of cases.

Once again the Oxford uncemented prosthesis was very dominant, accounting for more than the total of all the others in 2014. It also continues to have a low revision rate at 0.68/100 ocys. However, the lowest revision rate is currently the Zimmer unicompartmental prosthesis at 0.58/100 ocys. Both of these prostheses have a mean implantation time of three years compared to 7.5 years for the Oxford 3, which for many years was the most popular unicompartmental replacement but has a current revision rate of 1.39/100 ocys.

The minimally invasive approach for the unicompartmental knee arthroplasty was a little less popular in 2014 when it was used in 25% of procedures, compared to 31% in 2013.

Ankle arthroplasty

There are 1,160 primary registered ankle prostheses with a total of 5,642 ocys, a mean revision rate of 2.13/100 ocys and a nine year survival of 83%. The big increase in the number of revision procedures in 2014 (51) was due to the Registry receiving a considerable number of back dated revision forms obtained through the Foot and Ankle Society after the discovery that a significant number of revision procedures had not been recorded in the Registry. This resulted in an increase in the revision rate from 1.42 in 2013 to the current 2.13/100 ocys. The retrospectively registered revisions were spread proportionately among the various ankle prostheses.

There were 102 primary ankle arthroplasties registered in 2014 which was 11(10.7%) fewer than the previous year. The Salto prosthesis totally overshadowed all others, accounting for 94% of the 2014 registrations. It also has by far the lowest revision rate with a mean implantation time of 3.3 years.

Shoulder arthroplasty

There are 6,331 registered primary shoulder prostheses with a total of 29,122 ocys, a mean revision rate of 1.06/100 ocys and a 10 year survival of 91.6%. There were 801 shoulder prostheses within 5 different categories registered during 2014, the highest number ever.

There was no further addition to the Humeral Sphere category and the stack graph demonstrates the evolution over time of the six categories.

With regard to revision rates, there is a significantly higher revision rate for Partial Resurfacing compared to the overall mean and Conventional Total, Reverse and Hemi arthroplasty. This is also graphically illustrated in the KMs for the six different prosthesis categories. Revision rates also vary greatly among the large number of registered prostheses within the different categories but it is noteworthy that the conventional SMR, which for some years has been among the most popular of the prosthesis options, has six times the revision rate of the long established Global and the Bigliani/Flatow and 12 times that of the Global AP conventional total prostheses. The SMR conventional total prosthesis analyses do, however, include SMR L2 glenoid data which, because of its high failure rate, was withdrawn in 2011.

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

Elbow arthroplasty

There are 435 registered primary elbow prostheses with a total of 2,524 ocys, a mean revision rate of 1.11/100 ocys and a five year survival of 93.4%. Numbers registered in 2014 increased by 26, an increase of four over 2013, which arrested the annual decline from 2009. The Coonrad Morrey prosthesis continues to be the most popular with 23 of the 26 implanted.

Deep Infection

Once again we have compared the deep infection revision rates within six months of the arthroplasty for primary hip and knee arthroplasty against the theatre environment. Six months has been chosen, as infection within this time period is highly likely to have been introduced at the time of surgery. This year's analyses again demonstrate that for primary hip and knee arthroplasty there was an increased risk for revision for deep infection when the primary procedure was carried out in a laminar flow theatre with a space suit compared to a conventional theatre without a space suit (2.4 & 2.7 times respectively for hip and knee). The use of space suits also significantly increases the risk of revision for deep infection in both conventional and laminar flow theatres. There has been no change in the percentage of arthroplasties performed in laminar flow theatres nor in the use of space suits in 2014 compared to 2013.

Oxford 12 Questionnaire

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

For the first time, 15 year scores have been analysed. For the 680 hip scores available for analysis, 87% had excellent/good scores which compares well with the 84% at 6 months post - primary arthroplasty. Similar findings occur with the 470 available 15 year knee scores, with 79% excellent/good compared to 73% at 6 months post primary arthroplasty.

For revision arthroplasty scores at 6 months just 65% (hip) and 54% (knee) were excellent/good.

As noted in previous years, the statistically significant relationship between the six month, five and ten year scores and revision within two years of the score date for primary hips, knees (including unicompartmental) and shoulders has again been demonstrated. In addition, revision within two years of 10 year Oxford scores demonstrates a similar significant relationship for hip and knee arthroplasty.

This year Receiver Operating Curves (ROC) have not been generated as they do not add to the information obtained from the bar graphs. Instead, because of the large number of recorded 6 month Oxford scores the score groupings have been 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.

Deceased Person's Data

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

Publications and Presentations

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

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

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PROFILE OF THE AVERAGE NEW ZEALAND ORTHOPAEDIC SURGEON*

From our analyses, in 2014 the average orthopaedic surgeon performed

39
Total hip arthroplasties

with 45% using uncemented,12% fully cemented and 43% hybrid prostheses; has a 87.3% survival at 15 years and a revision rate of 0.73 per 100 component years; 0.5% have been revised for deep infection; 84% at six months, 89% at 5 years and 87% at 10 and 15 years had an excellent or good Oxford score.

33
Total knee arthroplasties

with almost all cemented but only 11 with patellae resurfaced; has a 93.68% survival at 15 years and a revision rate of 0.49 per 100 component years; 0.74 % have been revised for deep infection; 73% at six months, 83% at 5 years, 81% at 10 years and 79% at 15 years had an excellent or good Oxford score.

10
Unicompartmental knee arthroplasties

with most cemented; has an 84.1% survival at 13 years and a revision rate of 1.25 per 100 component years; 0.28% have been revised for deep infection; 82% at six months, 88% at 5 years and 83% at ten years had an excellent or good Oxford score.

10
Shoulder arthroplasties

with a 3:1 split between total arthroplasty varieties and hemiarthroplasty; has a 91.6% survival at 10 years and a revision rate of 1.06 per 100 component years; 0.33% have been revised for deep infection; 69% at six months, 78% at 5 years and 73% at 10 years had excellent or good Oxford scores.

6
Total ankle arthroplasties

mostly uncemented; 83.1% survival at 9 years and a revision rate of 2.13 per 100 component years; 2.13% revised for deep infection; 58% at six months and 69% at 5 years had excellent or good Oxford derived scores.

<1
Total elbow arthroplasties

most likely a cemented Coonrad-Morrey prosthesis; 93.4% survival at four years and a revision rate of 1.11 per 100 component years; 1.6% have been revised for deep infection; 69% at six months and 88% at five years had excellent or good Oxford derived scores.

** Averages derived from the number of surgeons recorded performing the above procedures during 2014 and not from the **total pool** of orthopaedic surgeons.*

DEVELOPMENT AND IMPLEMENTATION OF THE NEW ZEALAND JOINT REGISTRY

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

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

Administrative Network

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

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

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

Data Collection Forms

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

Data Base

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

Patient Generated Outcomes

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

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

Funding

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

Ethical Approval

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

A reapplication had to be made when the Ethics Committee of a private hospital chain refused to allow their nurses to participate in the project unless there was prior written patient consent. This view was supported by the Privacy Commissioner on the grounds that the Registry data includes patient identification details. The approval process was eventually successful but did delay the New Zealand-wide launch.

Surgeon and Hospital Reports

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

Introduction of the Registry

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

Stage I: November 1997 to March 1998

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

Stage II: April 1998 to June 1998

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

Stage III: July 1998 to March 1999

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

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

Stage IV: April 1st 1999

The National Joint Registry became fully operational throughout New Zealand.

DEVELOPMENT SINCE THE INTRODUCTION OF THE REGISTRY

INCLUSION OF OTHER JOINT REPLACEMENT ARTHROPLASTIES

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

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

Monitoring of Data Collection

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

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

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

The most recent compliance audit in March 2015 again demonstrated a New Zealand-wide public hospital compliance of > 95% when compared to NZHIS data.

Registered patient deaths are also obtained from the NZHIS.

Data Entry by Scanning

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

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

Staffing

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

The 2015 Registry staff are: Alastair Rothwell, Supervisor; Toni Hobbs, Coordinator; Lynley Diggs, Anne McHugh and Shona Tredinnick, Data Processors.

Use of Registry Data

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

Registry Board

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

NUMBER OF JOINTS ANALYSED
1ST JANUARY 1999- 31ST DECEMBER 2014

Numbers of procedures registered

Procedure	16 years	15 years	14 years	13 years	12 years	11 years	10 years	1-9 years
Hip, primary	101,835	93,491	85,780	78,289	71,069	63,702	56,396	49,392
Knee, primary	78,898	71,506	64,812	58,452	52,196	46,107	40,091	34,487
Hip, revision	15,083	13,954	12,713	11,593	10,462	9,451	8,414	7,362
Knee,unicompartmental	8,826	8,114	7,388	6,668	6,059	5,457	4,829	4,289
Shoulder, primary	6,331	5,530	4,783	4,085	3,506	3,012	2,498	2,041
Knee, revision	6,122	5,580	5,092	4,608	4,160	3,732	3,297	2,888
Ankle, primary	1,160	1,058	945	837	728	603	484	377
Shoulder, revision	502	436	360	306	256	214	180	139
Elbow, primary	435	409	387	363	330	300	266	226
Cervical disc, primary	268	224	200	168	122	98	66	41
Ankle, revision	161	141	116	94	69	56	44	38
Lumbar disc, primary	151	149	142	140	129	111	94	75
Elbow, revision	78	70	67	64	56	49	41	36
Lumbar disc, revision	4	3	3	3	3	3	1	1
Cervical disc, revision	2	1	1	1	1	1		
TOTAL	**219,856**	**200,666**	**182,789**	**165,671**	**149,146**	**132,896**	**116,701**	**101,392**

Bilateral joint replacements carried out under the same anaesthetic

Bilateral hips

1,973 patients (3,946 hips) 4% of primary hips

Bilateral knees

3,261 patients (6,522 knees) 8% of primary knees

Bilateral Unicompartmental knees

716 patients (1,432 knees) 16% of unicompartmental knees

Bilateral ankles

2 patients (4 ankles)

Bilateral shoulders

4 patients (8 shoulders)

During the 16 year period, 154,220 individual patients were registered, of which 26,973 (17%) have died.

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

HIP ARTHROPLASTY

PRIMARY HIP ARTHROPLASTY

The **sixteen**-year report analyses data for the period January 1999 – December 2014. There were 101,833 primary hip procedures registered including 1,518 resurfacing arthroplasties. This is an additional 8,344 compared to last year's report which is double the number registered in 1999.

1999	4,114
2000	4,715
2001	4,932
2002	4,830
2003	5,058
2004	6,029
2005	6,320
2006	6,430
2007	6,962
2008	7,004
2009	7,306
2010	7,367
2011	7,220
2012	7,491
2013	7,711
2014	8,344

There was an 8.2% increase in hip registrations for 2014 which is nearly three times that of 2013.

Data Analysis

Age and sex distribution

The average age for all patients with primary hip arthroplasty was 66.92 years, with a range of 13.43 – 100.95 years.

All hip arthroplasty

	Female	Male
Number	53,672	48,161
Percentage	52.71	47.29
Mean age	68.38	65.29
Maximum age	100.95	99.62
Minimum age	13.43	15.86
Standard dev.	11.57	11.51

Conventional hip arthroplasty

	Female	Male
Number	53,414	46,901
Percentage	53.25	46.75
Mean age	68.45	65.65
Maximum age	100.95	97.62
Minimum age	13.43	15.86
Standard dev.	11.52	11.36

Resurfacing hip arthroplasty

	Female	Male
Number	258	1,260
Percentage	17.00	83.00
Mean age	50.07	51.84
Maximum age	65.88	75.69
Minimum age	25.72	17.74
Standard dev.	7.15	8.57

A further 89 resurfacing hips were registered during 2014.

2004	21
2005	38
2006	169
2007	188
2008	191
2009	203
2010	185
2011	142
2012	102
2013	90
2014	89

Body Mass Index

For the five year period 2010 - 2014, there were 22,115 BMI registrations for primary hip replacements. The average was 28.81 with a range of 14 – 62 and a standard deviation of 5.56.

Previous operation

None	97,534
Internal fixation	1,975
Osteotomy	554
Arthrodesis	80

Diagnosis

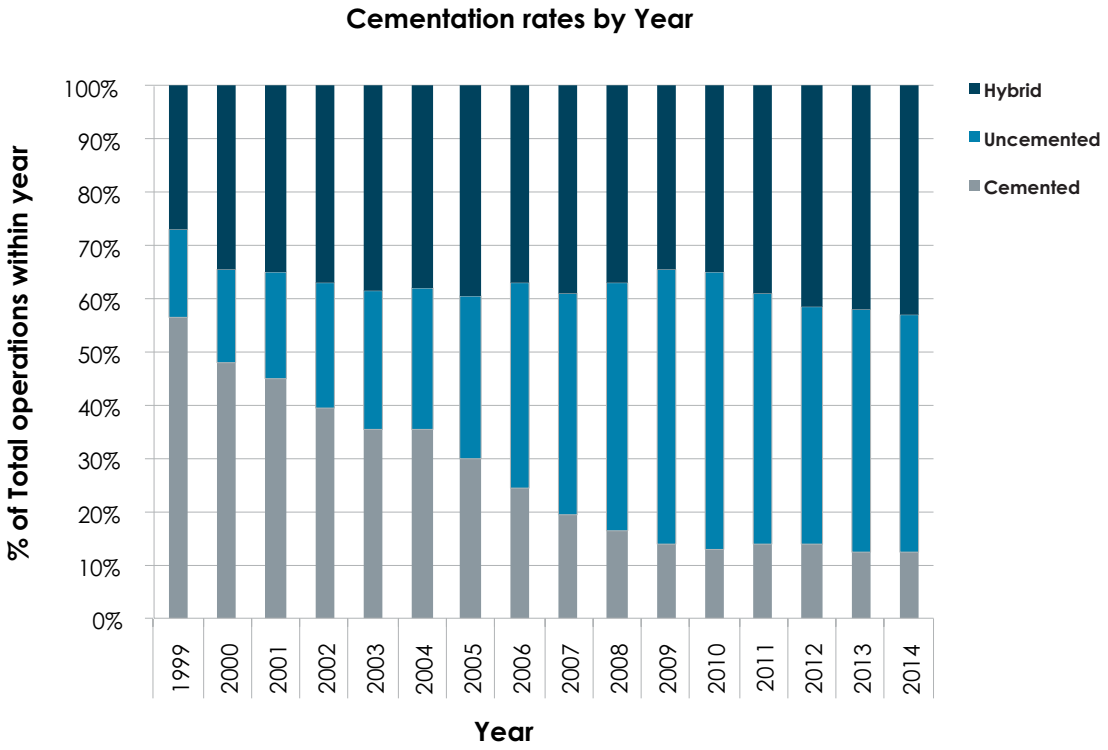
Osteoarthritis	88,738
Acute fracture NOF	3,705
Avascular necrosis	3,142
Developmental dysplasia	2,536
Rheumatoid arthritis	1,388
Old fracture NOF	1,270
Other inflammatory	791
Tumour	476
Post-acute dislocation	301

Approach

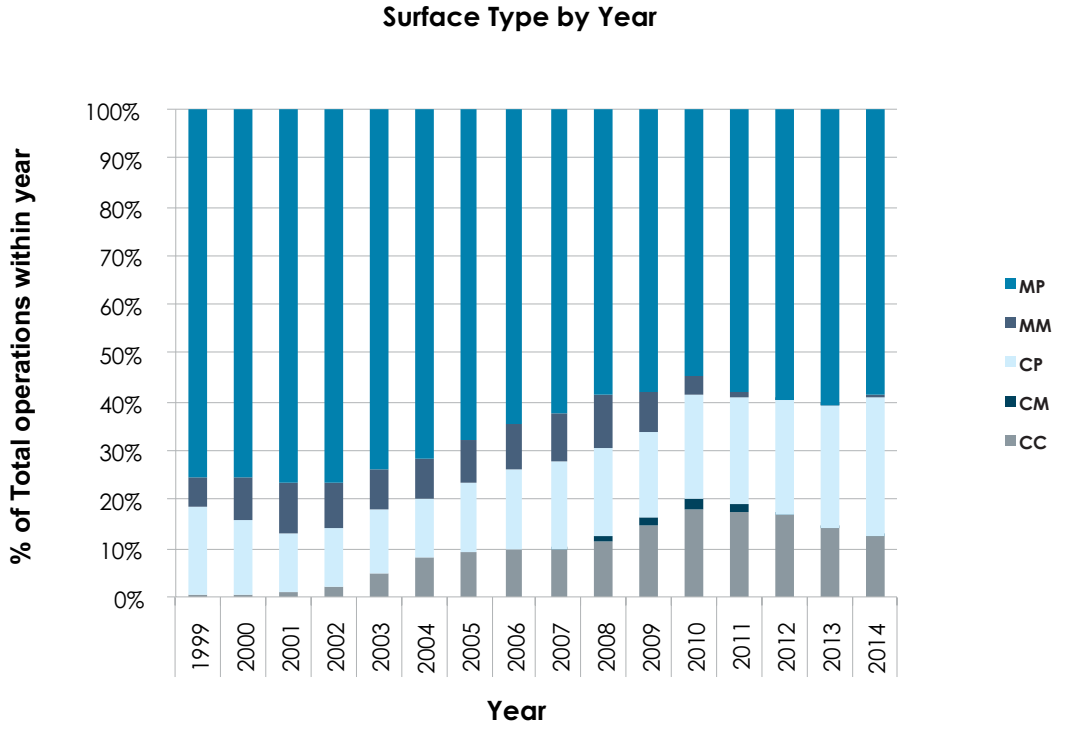
Posterior	65,279
Lateral	26,927
Anterior	3,844
Minimally invasive	1,638
Trochanteric osteotomy	188
Image guided surgery	430

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

Comparison of proportions of cemented vs uncemented vs hybrid by year

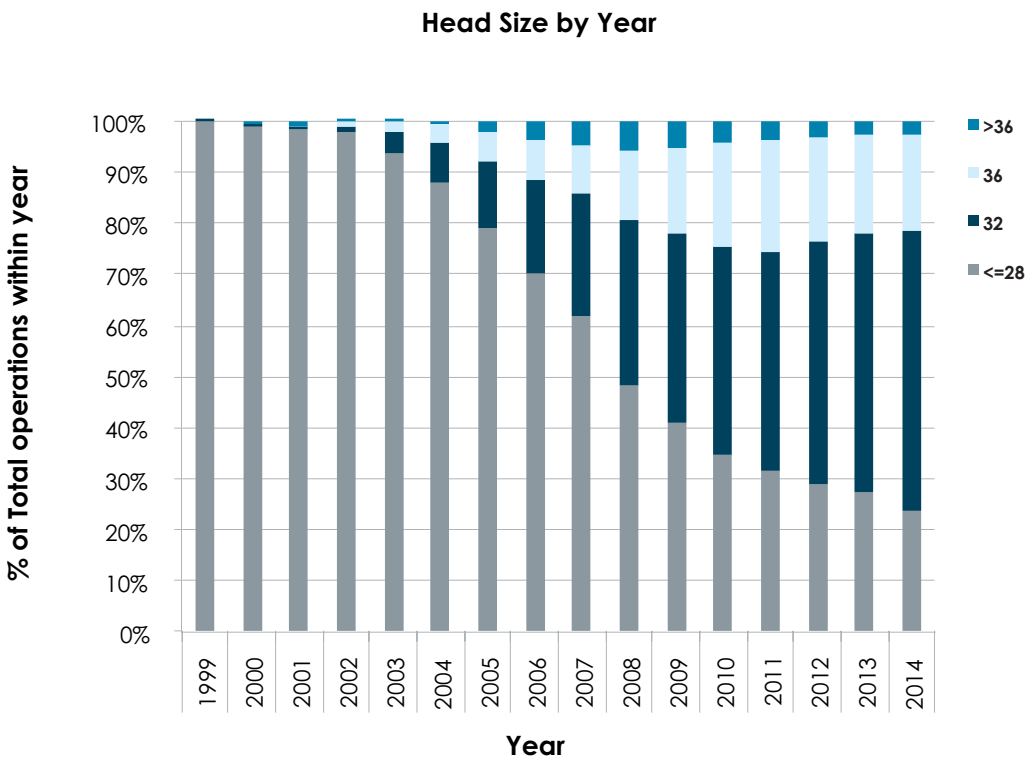


Comparison of different bearing surface usage over time

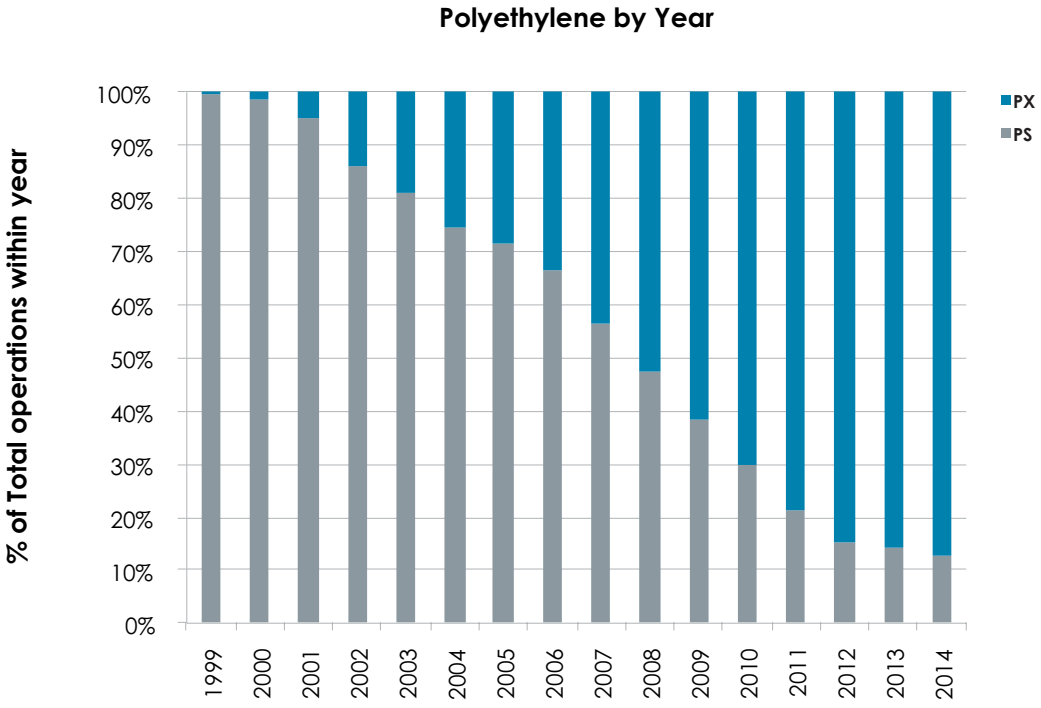


CC = ceramic/ceramic; CP = ceramic/polyethylene; CM = ceramic/metal; MM = metal/metal & MP = metal/polyethylene

Comparison of head size usage over time



Comparison usage of standard vs cross linked polyethylene over time



PS = standard & PX = cross linked polyethylene

Bone graft

Femoral autograft	224
Femoral allograft	42
Femoral synthetic	6
Acetabular autograft	814
Acetabular allograft	111
Acetabular synthetic	4

Cement

Femur cemented	62,918 (62%)
Antibiotic in cement	40,454 (64%)
Acetabulum cemented	4,990 (25%)
Antibiotic in cement	15,315 (61%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic:	97,617 (96%)

A cephalosporin was used in 87% of patients.

Operating theatre

Conventional	61,508
Laminar flow	38,670
Space suits	29,649

In 2014, 42% of arthroplasties were performed in laminar flow theatres, and 33% with space suits, both 1% lower than in 2013.

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	11,718	17
2	40,384	59
3	15,535	23
4	562	1

For the ten-year period 2005 – 2014, there were 68,199 (95%) primary hip procedures with the ASA class recorded.

Operative time (skin to skin in minutes)

Mean	79 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the ten-year period 2005 – 2014.

Consultant	62,349
Advanced trainee supervised	5,985
Advanced trainee unsupervised	2,044
Basic trainee	1,598

Prosthesis usage

Conventional primary hips

Top 10 femoral components used in 2014

Exeter V40	3,138
Corail	1,136
Twinsys uncemented	432
Stemsys	336
C-Stem AMT	302
CPT	289
Synergy porous	277
MS 30	273
Twinsys cemented	267
CLS	265

The only change from 2013 is that the C-Stem AMT has returned at the expense of the Polarstem uncemented.

Top 10 acetabular components used in 2014

Pinnacle	1,609
RM Pressfit cup	1,057
Continuum TM	1,015
Trident	962
R3 porous	683
Tritanium	496
Fitmore	387
Contemporary	319
Exeter X3	316
Trilogy	256

The only change from 2013 is that the Exeter X3 has replaced the Reflection Porous.

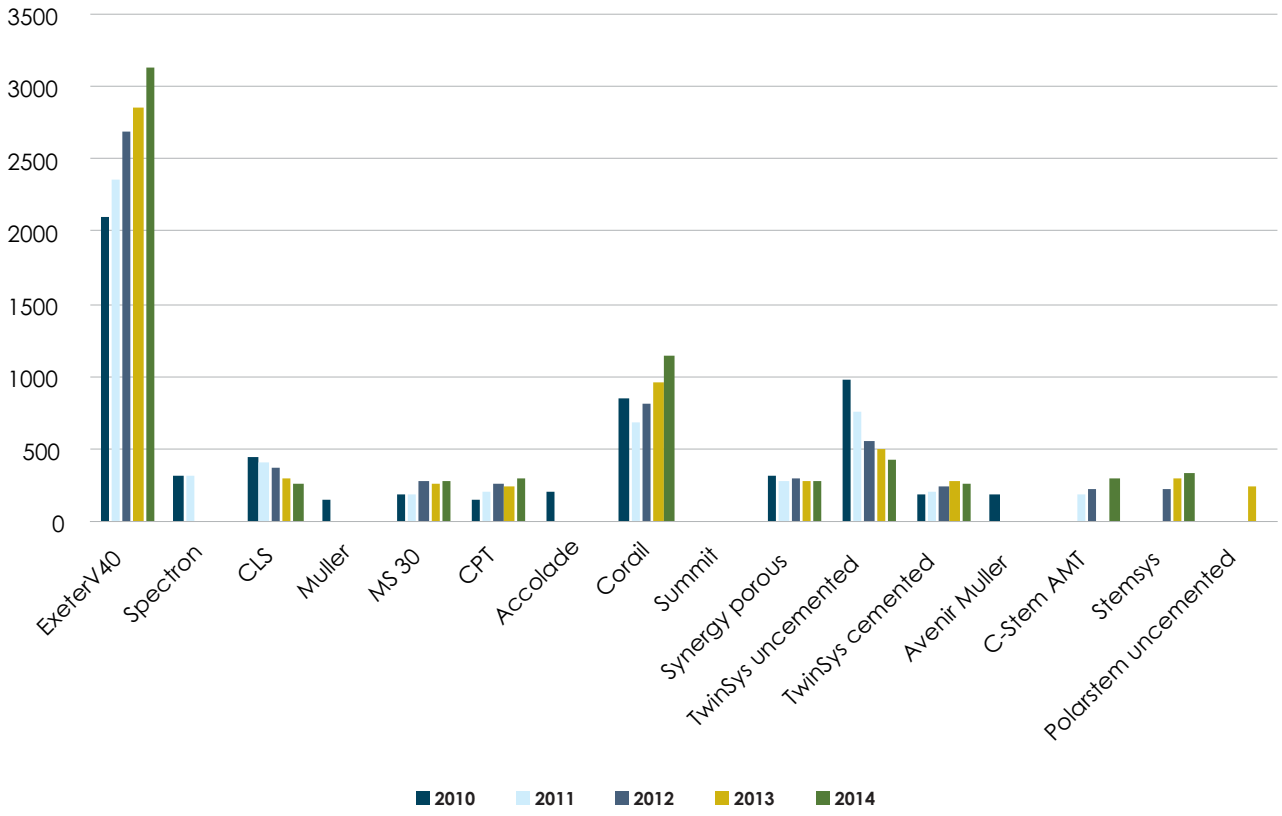
Top Ten Combinations used in 2014

Corail / Pinnacle	929
Exeter V40 / Trident	797
TwinSys uncemented / RM Pressfit cup	397
Exeter V40 / Tritanium	342
Exeter V40 / Continuum TM	332
Exeter V40 / Exeter X3	311
Exeter V40 / Contemporary	304
Synergy Porous / R3 porous	255
Polarstem uncemented / R3 porous	226
C-Stem AMT / Pinnacle	216

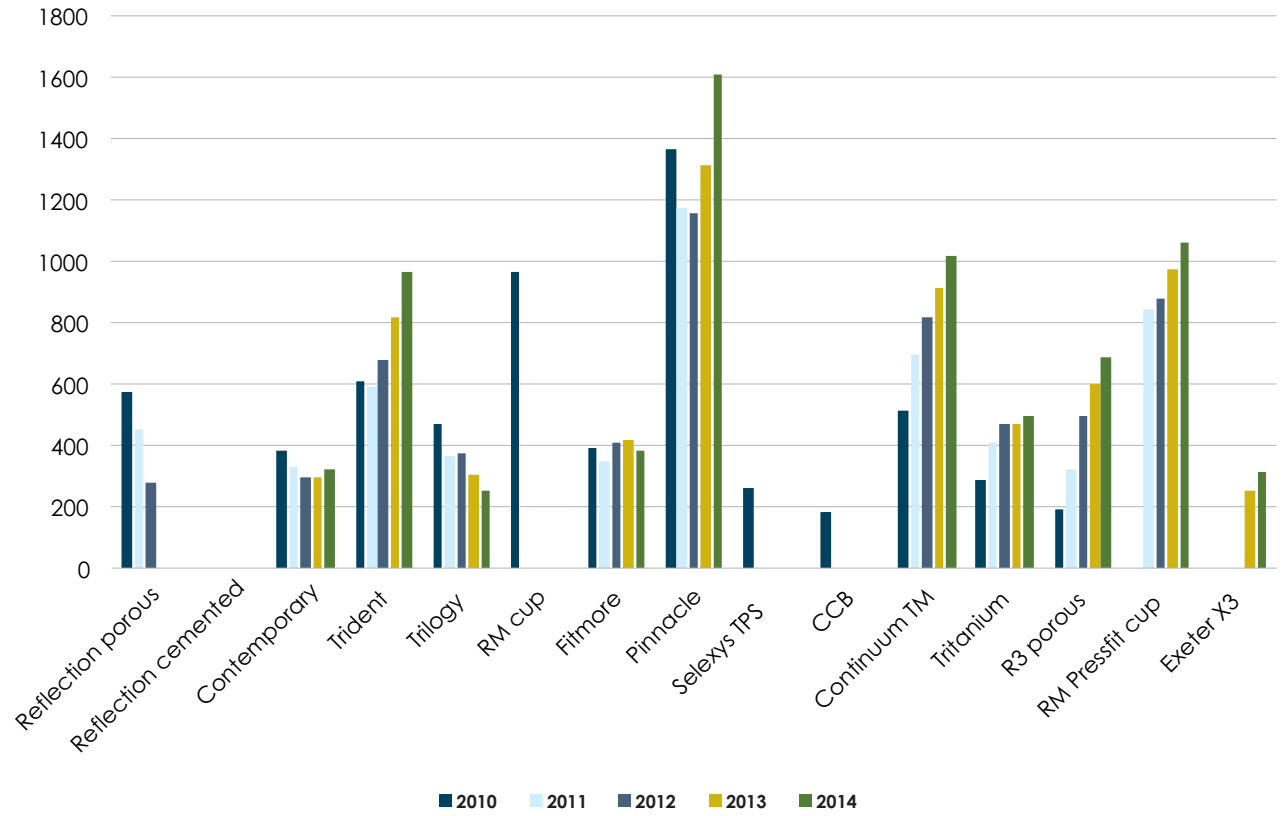
The Polarstem uncemented / R3 porous and the C-Stem AMT / Pinnacle have replaced the

Exeter V 40/ RM Pressfit and the TwinSys cemented / R M Pressfit respectively from the 2013 list.

Most Used Femoral Components 5 years 2010- 2014



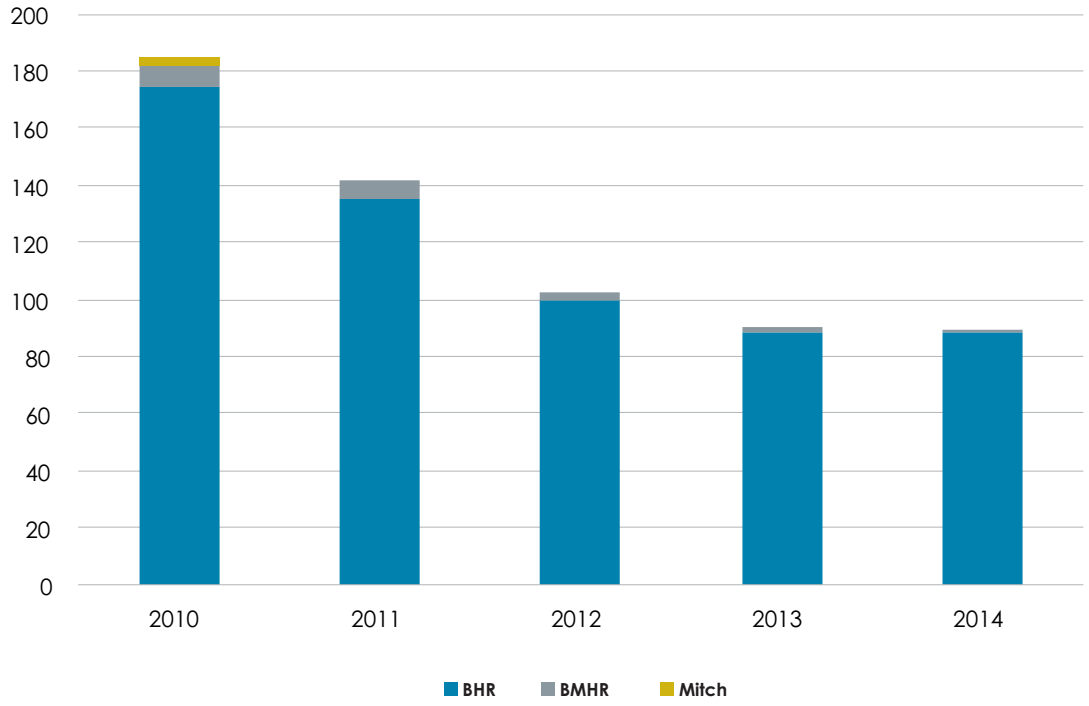
Most used acetabular components 5 years 2010 - 2014



Resurfacing hips components used in 2014

BHR	88
BMHR	1

Resurfacing Components 5 years 2010-2014



Surgeon and Hospital Workload

Surgeons

In 2014, 214 surgeons performed 8,344 total hip replacements, an average of 39 procedures per surgeon.

40 surgeons performed less than 10 procedures and 61 performed more than 50.

Hospitals

In 2014, 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 sixteen-year period January 1999 – December 2014, there were 15,082 revision hip procedures registered. This is an additional 1,128 compared to last year's report.

The average age for a revision hip replacement was 69.95 years, with a range of 17.52–100.28 years.

Revision hips

	Female	Male
Number	7,287	7,795
Percentage	48.32	51.68
Mean age	70.15	69.76
Maximum age	100.28	97.17
Minimum age	17.52	25.68
Standard dev.	12.13	10.82

The percentage of revision hips to primary hips is 15% and the ratio is 1:8.

Body Mass Index

For the five year period 2010 - 2014, there were 1,626 BMI registrations for revision hip replacements. The average BMI was 28.88 with a range of 15- 55 and a standard deviation of 5.60.

Revision of Registered Primary Hip Arthroplasties

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

There were 4,475 revisions of the 100,315 primary conventional hip replacements (4.5%) and 104 revisions of the 1,518 resurfacing hip replacements (6.8%), a total of 4,579 revisions.

Conventional hip arthroplasty analyses

Time to revision for conventional hips

Mean	1,764 days
Maximum	5,755 days
Minimum	0 days
Standard deviation	1,510 days

Reason for revision

Dislocation	1078
Loosening acetabular component	1016
Loosening femoral component	773
Pain	631
Deep infection	514
Fracture femur	448
ALVAL*	182
High blood level of metal ions	28

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

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

Analysis by time of the 6 main reasons for revision

Years	Dislocation		Loosening Acetabulum		Loosening Femur		Deep infection		Pain		Fracture Femur	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	481	44.60	122	12.00	76	9.80	191	37.20	58	9.20	172	38.40
1	135	12.50	66	6.50	61	7.90	82	16.00	76	12.00	26	5.80
2	93	8.60	63	6.20	59	7.60	57	11.10	70	11.10	30	6.70
3	75	7.00	74	7.30	58	7.50	37	7.20	57	9.00	24	5.40
4	45	4.20	62	6.10	58	7.50	26	5.10	50	7.90	34	7.60
5	54	5.00	68	6.70	58	7.50	21	4.10	54	8.60	22	4.90
6	47	4.40	81	8.00	72	9.30	21	4.10	52	8.20	16	3.60
7	32	3.00	71	7.00	67	8.70	15	2.90	35	5.50	20	4.50
8	34	3.20	79	7.80	48	6.20	18	3.50	38	6.00	21	4.70
9	16	1.50	87	8.60	48	6.20	19	3.70	34	5.40	21	4.70
10	21	1.90	63	6.20	58	7.50	13	2.50	32	5.10	20	4.50
11	14	1.30	59	5.80	44	5.70	5	1.00	36	5.70	12	2.70
12	15	1.40	48	4.70	35	4.50	4	0.80	18	2.90	15	3.30
13	8	0.70	49	4.80	19	2.50	3	0.60	11	1.70	6	1.30
14	5	0.50	16	1.60	9	1.20	1	0.20	6	1.00	9	2.00
15	3	0.30	8	0.80	3	0.40	1	0.20	4	0.60	0	0.00
Total	**1078**	**100.00**	**1016**	**100.00**	**773**	**100.00**	**514**	**100.00**	**631**	**100.00**	**448**	**100.00**

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

	Dislocation	Loosening Acetabulum	Loosening Femur	Deep infection	Pain	Fracture Femur
	%	%	%	%	%	%
1999	54.50	3.00	6.10	9.10	6.10	3.00
2000	61.80	7.30	10.90	16.40	5.50	3.60
2001	56.00	9.50	2.40	19.00	10.70	4.80
2002	44.90	20.20	7.90	14.60	16.90	3.40
2003	42.30	25.40	10.00	17.70	8.50	8.50
2004	33.80	20.90	20.30	17.60	9.50	9.50
2005	34.10	19.20	16.20	15.60	9.00	7.20
2006	32.70	22.00	21.50	9.80	7.90	8.90
2007	29.50	24.30	18.30	14.90	7.50	9.30
2008	24.90	26.70	19.50	11.20	10.00	12.20
2009	22.20	29.60	20.50	10.10	10.40	11.80
2010	21.60	25.80	19.60	12.20	16.60	10.90
2011	20.70	22.70	17.00	8.80	20.70	10.40
2012	17.30	23.90	16.70	8.70	18.40	9.90
2013	15.90	21.90	17.20	10.30	18.50	9.10
2014	15.60	18.80	17.20	11.10	13.30	12.70

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

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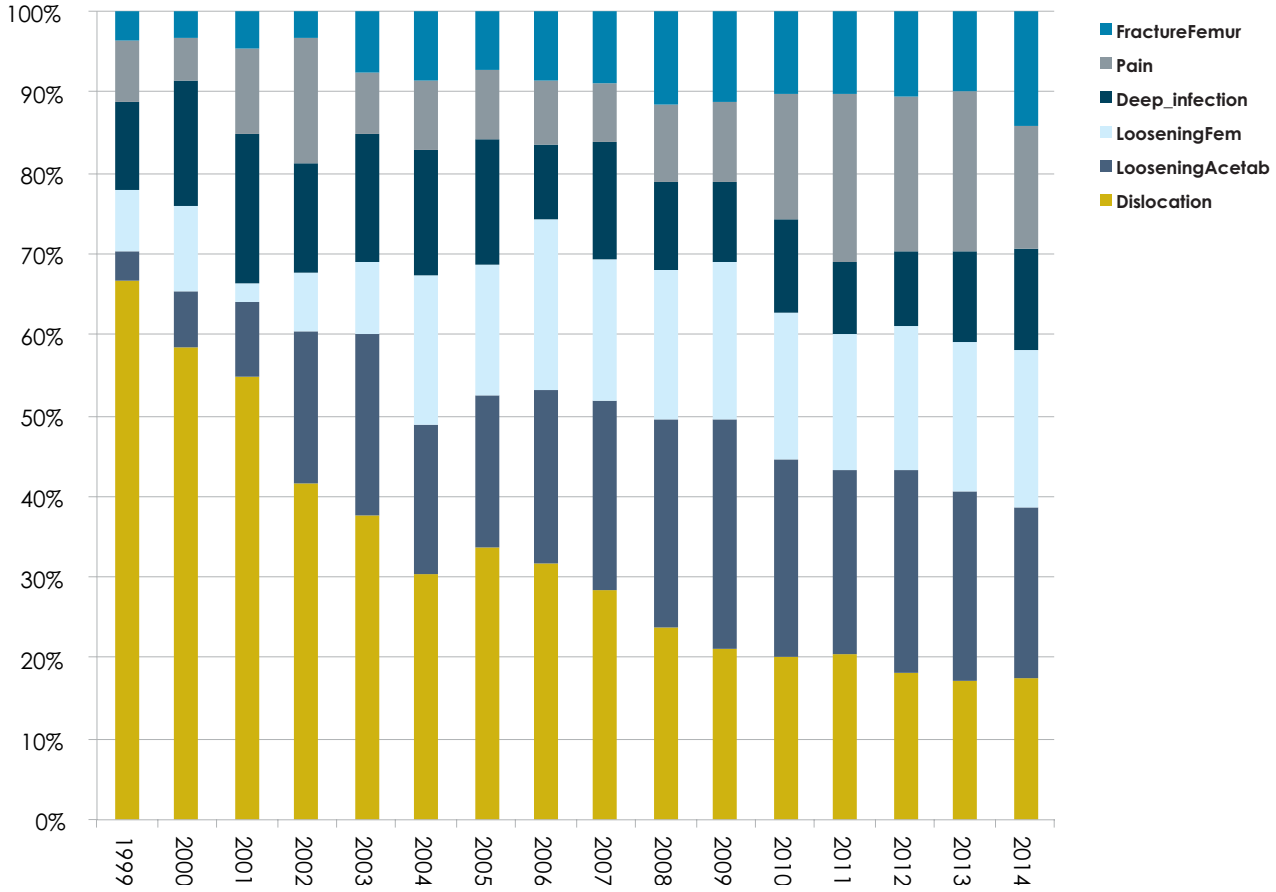


Resurfaced Hip Analyses

There were 1,518 resurfacing hips registered and 104 have been revised.

Time to revision for resurfaced hips

Mean	1,568 days
Maximum	3,668 days
Minimum	10 days
Standard deviation	939 days

Reason for revision

Pain	30
Loosening acetabulum	14
Deep infection	13
Loosening femoral component	12
Fracture femur	10
Dislocation	1

Statistical note

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

i) Observed component years

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

ii) Rate/100 component years

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

Statistical Significance

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

Conventional Primary Hip Arthroplasties

All Primary Total Hip Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
100,315	616,736.2	4,475	0.73	0.70	0.75

There are 1,001 (976 in 2013) hip prosthesis combinations in the Registry; 726 (72%) have 10 or fewer registered procedures and 322 (32%) one only.

The tables below contain the analyses of the 202 that have a minimum of 50 primary registered procedures. As stated above it is important to note the confidence intervals and observed component years in conjunction with the revision rates.

Revisions versus Hip Prostheses Combinations Sorted on Number of Implantations

Minimum of 50 primary registered arthroplasties

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	6,712	34,410.2	158	0.46	0.39	0.54
Exeter V40	Contemporary	5,666	34,056.4	144	0.42	0.36	0.50
Corail	Pinnacle	5,532	19,990.0	142	0.71	0.60	0.84
TwinSys uncemented	RM Pressfit cup	3,735	15,116.5	90	0.60	0.48	0.73
Spectron	Reflection cemented	2,945	25,725.1	252	0.98	0.86	1.11
Spectron	Reflection porous	2,755	20,599.5	151	0.73	0.62	0.86
Exeter V40	Trilogy	2,190	11,676.9	53	0.45	0.34	0.59
CLS	Fitmore	2,090	15,854.4	80	0.50	0.40	0.63
Accolade	Trident	1,867	14,246.0	79	0.55	0.44	0.69
Muller	Muller PE cup	1,693	14,530.0	57	0.39	0.30	0.51
CLS	Morscher	1,682	17,317.8	84	0.49	0.39	0.60
Exeter V40	Exeter	1,635	11,950.3	56	0.47	0.35	0.61
Exeter	Contemporary	1,551	16,334.7	158	0.97	0.82	1.13
MS 30	Fitmore	1,497	8,018.1	27	0.34	0.22	0.49
Summit	Pinnacle	1,460	6,577.6	62	0.94	0.72	1.21
Exeter V40	Pinnacle	1,413	5,062.3	25	0.49	0.32	0.73
Exeter V40	Tritanium	1,374	2,906.7	27	0.93	0.61	1.35
Exeter	Exeter	1,326	13,420.2	90	0.67	0.54	0.82
Exeter V40	Continuum TM	1,314	2,794.2	35	1.25	0.87	1.74
CLS	CLS Expansion	1,263	1,2101.1	95	0.79	0.64	0.96
Exeter V40	RM Pressfit cup	1,247	4,653.8	11	0.24	0.12	0.42
TwinSys uncemented	Selexys TPS	1,231	6,158.6	79	1.28	1.02	1.60
Synergy Porous	Reflection porous	1,162	7,613.6	35	0.46	0.32	0.64
Spectron	Duraloc	1,153	11,665.4	138	1.18	0.99	1.40
TwinSys cemented	RM Pressfit cup	1,098	3,621.1	21	0.58	0.36	0.89
Synergy Porous	R3 porous	1,060	2,448.2	25	1.02	0.66	1.51
Muller	RM cup	1,013	9,159.3	71	0.78	0.61	0.98
Exeter V40	Exeter X3	993	1,730.4	11	0.64	0.32	1.14

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Duraloc	987	8,211.7	71	0.86	0.68	1.09
C-Stem AMT	Pinnacle	902	2,319.7	13	0.56	0.30	0.96
Exeter	Osteolock	836	9,449.5	59	0.62	0.48	0.81
MS 30	Morscher	787	7,842.8	51	0.65	0.48	0.85
CCA	CCB	727	4,643.6	22	0.47	0.30	0.72
Exeter V40	Reflection cemented	718	3,124.9	11	0.35	0.18	0.63
CLS	Duraloc	699	7,272.5	62	0.85	0.65	1.09
CPT	Trilogy	697	4,213.6	41	0.97	0.70	1.32
CPT	Continuum TM	635	1,111.4	11	0.99	0.49	1.77
Exeter V40	Morscher	630	5,410.1	25	0.46	0.30	0.68
Elite plus	Duraloc	608	5,677.5	93	1.64	1.32	2.01
Exeter	Duraloc	553	6,645.3	76	1.14	0.90	1.43
Exeter	Morscher	551	6,829.9	29	0.42	0.28	0.61
CPT	ZCA	536	4,557.2	24	0.53	0.34	0.78
Exeter V40	Fitmore	528	1,937.9	4	0.21	0.06	0.53
Polarstem uncemented	R3 porous	503	690.0	7	1.01	0.41	2.09
CLS	Trilogy	469	2,322.7	13	0.56	0.30	0.96
Exeter V40	Reflection porous	466	2,502.1	7	0.28	0.11	0.58
Corail	Duraloc	464	3,810.8	32	0.84	0.57	1.19
MS 30	Muller PE cup	462	3,906.8	15	0.38	0.21	0.63
Charnley	Charnley	456	4,508.2	18	0.40	0.24	0.63
CLS	RM Pressfit cup	452	2,037.5	14	0.69	0.38	1.15
Femoral Stem Press Fit	Continuum TM	408	968.7	11	1.14	0.57	2.03
H-Max S	Delta-TT Cup	391	700.4	8	1.14	0.49	2.25
Versys cemented	ZCA	391	3,466.9	20	0.58	0.35	0.89
CLS	Continuum TM	383	831.2	7	0.84	0.34	1.74
Exeter V40	CCB	380	1,486.8	5	0.34	0.11	0.78
Stemsys	Fixa Ti Por	378	612.2	6	0.98	0.36	2.13
Muller	Weber	377	3,051.2	12	0.39	0.20	0.69
Spectron	R3 porous	375	1,006.3	5	0.50	0.16	1.16
TwinSys uncemented	Delta-PF Cup	370	1,575.7	1	0.06	0.00	0.35
TwinSys cemented	CCB	351	1,295.3	4	0.31	0.08	0.79
ABGII	Trident	342	2,914.7	21	0.72	0.45	1.10
Polarstem uncemented	Reflection porous	334	892.9	12	1.34	0.69	2.35
CBC Stem	RM Pressfit cup	322	1,335.3	13	0.97	0.52	1.66
S-Rom	Pinnacle	321	2,400.2	25	1.04	0.67	1.54
CLS	Reflection porous	318	1,852.5	13	0.70	0.37	1.20
Charnley	Charnley Cup Ogee	303	3,247.0	19	0.59	0.35	0.91
Elite plus	Charnley	298	3,219.2	21	0.65	0.40	1.00

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Trabecular Metal Stem	Continuum TM	298	653.3	13	1.99	1.06	3.40
Exeter V40	R3 porous	297	543.1	2	0.37	0.04	1.33
Elite plus	Elite Plus LPW	282	2,606.7	11	0.42	0.21	0.76
Muller	RM Pressfit cup	277	1,418.3	3	0.21	0.04	0.62
Versys	Trilogy	272	3,083.7	13	0.42	0.22	0.72
Exeter V40	Osteolock	270	2,575.2	10	0.39	0.19	0.71
Stemsys	DeltaMotion Cup	268	935.4	4	0.43	0.12	1.09
C-Stem AMT	Marathon cemented	260	873.9	6	0.69	0.25	1.49
Versys cemented	Trilogy	237	2,170.4	7	0.32	0.13	0.66
Accolade II	Trident	229	214.6	2	0.93	0.11	3.37
Accolade II	Tritanium	216	211.9	2	0.94	0.11	3.41
MS 30	Trilogy	216	1,019.8	3	0.29	0.06	0.86
Exeter	Trilogy	213	2,440.4	13	0.53	0.28	0.91
CPT	Duraloc	212	2,082.7	12	0.58	0.30	1.01
Spectron	Morscher	210	2,315.5	21	0.91	0.56	1.39
TwinSys uncemented	Trilogy	209	1,080.7	8	0.74	0.32	1.46
MS 30	Continuum TM	199	434.9	2	0.46	0.06	1.66
CLS	Durom	198	1,399.2	38	2.72	1.92	3.73
CLS	Allofit	192	1,315.8	15	1.14	0.64	1.88
CBC Stem	Expansys shell	183	1,295.0	19	1.47	0.88	2.29
Accolade	Pinnacle	180	970.8	2	0.21	0.02	0.74
Stemsys	Agilis Ti-por	179	227.2	1	0.44	0.01	2.45
Avenir Muller uncemented	Continuum TM	166	481.2	8	1.66	0.72	3.28
CLS	Trident	162	1,371.4	11	0.80	0.40	1.44
Stemsys	RM Pressfit cup	162	280.1	1	0.36	0.01	1.99
Friendly	Delta-PF Cup	159	1,076.6	3	0.28	0.06	0.81
Corail	ASR	156	915.0	71	7.76	6.06	9.79
Accolade	Tritanium	152	499.4	2	0.40	0.05	1.45
Lateral straight stem	Muller PE cup	152	1,290.7	9	0.70	0.32	1.32
Spectron	Mallory-Head	152	1,377.5	6	0.44	0.16	0.95
Exeter V40	Trabecular Metal Shell	149	547.3	8	1.46	0.63	2.88
Omnifit	Trident	149	1,350.2	12	0.89	0.46	1.55
TwinSys cemented	RM cup	148	1,005.6	4	0.40	0.11	1.02
CPT	Trident	145	1,146.7	11	0.96	0.48	1.72
Corail	Reflection porous	140	889.9	1	0.11	0.00	0.63
ABGII	Duraloc	139	1,560.9	24	1.54	0.99	2.29
Femoral Stem Press Fit	Trilogy	139	728.0	4	0.55	0.15	1.41
Muller	ZCA	138	667.5	2	0.30	0.04	1.08

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	Continuum TM	137	244.7	2	0.82	0.10	2.95
Corail	Ultima	135	1,014.3	3	0.30	0.06	0.86
Summit	Trilogy	135	757.7	5	0.66	0.21	1.54
CCA	RM Pressfit cup	132	937.9	3	0.32	0.07	0.93
CPT	Fitmore	131	537.8	8	1.49	0.64	2.93
S-Rom	ASR	130	661.4	87	13.15	10.54	16.23
Exeter	CLS Expansion	129	1,409.7	9	0.64	0.29	1.21
MS 30	Contemporary	128	1,028.4	7	0.68	0.27	1.40
Corail	Tritanium	127	283.4	3	1.06	0.22	3.09
Corail	Trilogy	125	356.7	3	0.84	0.17	2.46
Exeter V40	Monoblock Acetabular Cup	123	1,205.9	5	0.41	0.13	0.97
Muller	Continuum TM	123	304.9	2	0.66	0.08	2.37
Exeter V40	Bio-clad poly	122	634.0	2	0.32	0.04	1.14
TwinSys uncemented	RM cup	122	609.6	3	0.49	0.10	1.44
Exeter	Muller PE cup	119	1,288.1	6	0.47	0.17	1.01
TwinSys uncemented	Continuum TM	118	340.8	3	0.88	0.18	2.57
ABG	Duraloc	116	1,584.7	26	1.64	1.07	2.40
Muller	ZCA all-poly cup	116	298.9	1	0.33	0.01	1.86
Muller	Trilogy	115	634.9	13	2.05	1.09	3.50
Accolade	Muller PE cup	114	948.7	1	0.11	0.00	0.59
Synergy Porous	BHR Acetabular Cup	114	722.1	13	1.80	0.96	3.08
CLS	RM cup	113	856.9	13	1.52	0.81	2.59
Exeter	Bio-clad poly	113	1,144.8	6	0.52	0.19	1.14
Prodigy	Duraloc	113	1,267.8	16	1.26	0.72	2.05
Corail	Fitmore	110	95.8	2	2.09	0.25	7.54
Elite plus	Elite Plus Ogee	110	968.5	5	0.52	0.17	1.20
CPCS	R3 porous	109	125.1	0	0.00	0.00	2.95
ABGII	Delta-PF Cup	107	929.8	9	0.97	0.44	1.84
CLS	Weill ring	106	1,267.5	7	0.55	0.22	1.14
Avenir Muller uncemented	RM cup	105	455.4	1	0.22	0.01	1.22
Basis	Reflection porous	105	504.0	1	0.20	0.01	1.11
Mallory-Head	M2A	105	907.7	11	1.21	0.60	2.17
Stemsys	Delta-PF Cup	105	84.8	0	0.00	0.00	4.35
SL monoblock	Muller PE cup	101	910.4	3	0.33	0.07	0.96
Summit	Duraloc	101	883.7	5	0.57	0.18	1.32
Avenir Muller uncemented	Pinnacle	99	434.8	3	0.69	0.14	2.02
Corail	Monoblock Acetabular Cup	95	611.4	4	0.65	0.18	1.68
Exeter V40	Muller PE cup	94	718.4	3	0.42	0.09	1.22

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	ZCA all-poly cup	94	185.9	0	0.00	0.00	1.98
Anthology Porous	BHR Acetabular Cup	93	496.1	12	2.42	1.25	4.23
Exeter V40	Delta-TT Cup	92	170.1	0	0.00	0.00	2.17
Avenir Muller uncemented	Tritanium	91	322.4	0	0.00	0.00	1.14
Exeter V40	CLS Expansion	88	818.9	1	0.12	0.00	0.68
Summit	ASR	88	540.6	26	4.81	3.14	7.05
Synergy Porous	Delta-PF Cup	88	441.1	0	0.00	0.00	0.84
MS 30	RM Pressfit cup	87	535.4	2	0.37	0.05	1.35
H-Max M	Delta-TT Cup	86	350.5	2	0.57	0.07	2.06
CPT	Tritanium	85	298.5	5	1.68	0.54	3.91
CPT	Monoblock Acetabular Cup	84	690.6	7	1.01	0.41	2.09
Exeter	Trident	84	997.3	0	0.00	0.00	0.37
Exeter V40	ZCA all-poly cup	81	123.9	0	0.00	0.00	2.98
CLS	Monoblock Acetabular Cup	80	584.2	4	0.68	0.19	1.75
Corail	Delta-PF Cup	78	608.7	1	0.16	0.00	0.92
Muller	Duraloc	78	860.8	9	1.05	0.48	1.98
S-Rom	Ultima	78	989.4	8	0.81	0.35	1.59
Spectron	Fitmore	78	827.3	4	0.48	0.13	1.24
Spectron	Trident	78	692.4	3	0.43	0.09	1.27
CPT	ZCA all-poly cup	76	177.8	1	0.56	0.01	3.13
Muller	Trident	76	594.5	9	1.51	0.69	2.87
Corail	DeltaMotion Cup	75	211.0	0	0.00	0.00	1.75
AML MMA	Duraloc	74	829.4	9	1.09	0.50	2.06
CCA	Contemporary	74	723.0	10	1.38	0.66	2.54
Trabecular Metal Stem	Monoblock Acetabular Cup	74	543.9	3	0.55	0.11	1.61
ABG	ABGII	72	948.2	14	1.48	0.81	2.48
Contemporary	Contemporary	71	801.0	10	1.25	0.60	2.30
Exeter V40	ZCA	71	378.2	1	0.26	0.01	1.47
H-Max M	Delta-PF Cup	71	302.9	6	1.98	0.73	4.31
C-stem AMT	Pinnacle	70	54.2	2	3.69	0.45	13.33
Echo(TM) Bi-metric	G7 acetabular shell	70	61.0	1	1.64	0.04	9.14
Muller	Morscher	70	747.3	4	0.54	0.15	1.37
Spectron	Biomex acet shell porous	68	827.6	1	0.12	0.00	0.67
ABGII	Pinnacle	67	411.9	3	0.73	0.15	2.13
CLS	Pinnacle	66	339.4	0	0.00	0.00	1.09
Spectron	Muller PE cup	66	598.3	7	1.17	0.47	2.41
Anthology Porous	R3 porous	65	340.6	12	3.52	1.82	6.16

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
TwinSys cemented	Selexys TPS	65	251.1	4	1.59	0.43	4.08
CPT	Pinnacle	64	338.3	2	0.59	0.07	2.14
Furlong	Furlong	64	566.3	5	0.88	0.29	2.06
Tri-Lock BPS	Pinnacle	62	195.3	3	1.54	0.32	4.49
Wagner cone stem	Fitmore	62	558.6	3	0.54	0.11	1.57
Corail	Trident	61	195.2	3	1.54	0.32	4.49
CBC Stem	Fitmore	59	381.8	5	1.31	0.43	3.06
CLS	Artek	59	603.6	22	3.65	2.28	5.52
Femoral Stem Press Fit	Trident	59	126.9	1	0.79	0.02	4.39
Muller	CLS Expansion	59	409.3	4	0.98	0.27	2.50
Zimmer Femoral Stem Press-Fit	Continuum TM	59	142.6	2	1.40	0.17	5.06
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	96.2	1	1.04	0.03	5.79
Muller	Fitmore	57	309.4	1	0.32	0.01	1.80
C-Stem	Elite Plus Ogee	55	472.2	2	0.42	0.05	1.53
Friendly	Delta-TT Cup	55	186.3	2	1.07	0.13	3.88
MS 30	Duraloc	55	661.3	6	0.91	0.33	1.97
TwinSys cemented	Continuum TM	54	66.7	0	0.00	0.00	5.53
AML	Duraloc	53	638.6	2	0.31	0.04	1.13
C-Stem	Duraloc	53	527.6	5	0.95	0.31	2.21
Corail	RM Pressfit cup	53	93.1	1	1.07	0.03	5.98
Exeter V40	Weber	53	449.5	0	0.00	0.00	0.82
Lateral straight stem	Weber	53	506.6	0	0.00	0.00	0.73
Femoral Stem Press Fit	Delta-TT Cup	52	87.0	2	2.30	0.28	8.30

Revisions versus Hip Prostheses Combinations Sorted on Revision Rate

Minimum of 50 primary registered arthroplasties

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*S-Rom	ASR	130	661.4	87	13.15	10.54	16.23
*Corail	ASR	156	915.0	71	7.76	6.06	9.79
*Summit	ASR	88	540.6	26	4.81	3.14	7.05
*C-stem AMT	Pinnacle	70	54.2	2	3.69	0.45	13.33
*CLS	Artek	59	603.6	22	3.65	2.28	5.52
*Anthology Porous	R3 porous	65	340.6	12	3.52	1.82	6.16
*CLS	Durom	198	1,399.2	38	2.72	1.92	3.73
*Anthology Porous	BHR Acetabular Cup	93	496.1	12	2.42	1.25	4.23
Femoral Stem Press Fit	Delta-TT Cup	52	87.0	2	2.30	0.28	8.30
Corail	Fitmore	110	95.8	2	2.09	0.25	7.54

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
*#Muller	Trilogy	115	634.9	13	2.05	1.09	3.50
*#Trabecular Metal Stem	Continuum TM	298	653.3	13	1.99	1.06	3.40
H-Max M	Delta-PF Cup	71	302.9	6	1.98	0.73	4.31
*Synergy Porous	BHR Acetabular Cup	114	722.1	13	1.80	0.96	3.08
CPT	Tritanium	85	298.5	5	1.68	0.54	3.91
Avenir Muller uncemented	Continuum TM	166	481.2	8	1.66	0.72	3.28
*ABG	Duraloc	116	1,584.7	26	1.64	1.07	2.40
Echo(TM) Bi-metric	G7 acetabular shell	70	61.0	1	1.64	0.04	9.14
*Elite plus	Duraloc	608	5,677.5	93	1.64	1.32	2.01
TwinSys cemented	Selexys TPS	65	251.1	4	1.59	0.43	4.08
*ABGII	Duraloc	139	1,560.9	24	1.54	0.99	2.29
Corail	Trident	61	195.2	3	1.54	0.32	4.49
Tri-Lock BPS	Pinnacle	62	195.3	3	1.54	0.32	4.49
*CLS	RM cup	113	856.9	13	1.52	0.81	2.59
Muller	Trident	76	594.5	9	1.51	0.69	2.87
CPT	Fitmore	131	537.8	8	1.49	0.64	2.93
*ABG	ABGII	72	948.2	14	1.48	0.81	2.48
*CBC Stem	Expansys shell	183	1,295.0	19	1.47	0.88	2.29
Exeter V40	Trabecular Metal Shell	149	547.3	8	1.46	0.63	2.88
Zimmer Femoral Stem Press-Fit	Continuum TM	59	142.6	2	1.40	0.17	5.06
CCA	Contemporary	74	723.0	10	1.38	0.66	2.54
Polarstem uncemented	Reflection porous	334	892.9	12	1.34	0.69	2.35
CBC Stem	Fitmore	59	381.8	5	1.31	0.43	3.06
*#TwinSys uncemented	Selexys TPS	1,231	6,158.6	79	1.28	1.02	1.60
Prodigy	Duraloc	113	1,267.8	16	1.26	0.72	2.05
*#Exeter V40	Continuum TM	1,314	2,794.2	35	1.25	0.87	1.74
Contemporary	Contemporary	71	801.0	10	1.25	0.60	2.30
Mallory-Head	M2A	105	907.7	11	1.21	0.60	2.17
*Spectron	Duraloc	1,153	11,665.4	138	1.18	0.99	1.40
Spectron	Muller PE cup	66	598.3	7	1.17	0.47	2.41
*Exeter	Duraloc	553	6,645.3	76	1.14	0.90	1.43
H-Max S	Delta-TT Cup	391	700.4	8	1.14	0.49	2.25
CLS	Allofit	192	1,315.8	15	1.14	0.64	1.88
Femoral Stem Press Fit	Continuum TM	408	968.7	11	1.14	0.57	2.03
AML MMA	Duraloc	74	829.4	9	1.09	0.50	2.06
Corail	RM Pressfit cup	53	93.1	1	1.07	0.03	5.98
Friendly	Delta-TT Cup	55	186.3	2	1.07	0.13	3.88

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	Tritanium	127	283.4	3	1.06	0.22	3.09
Muller	Duraloc	78	860.8	9	1.05	0.48	1.98
S-Rom	Pinnacle	321	2,400.2	25	1.04	0.67	1.54
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	96.2	1	1.04	0.03	5.79
Synergy Porous	R3 porous	1,060	2,448.2	25	1.02	0.66	1.51
Polarstem uncemented	R3 porous	503	690.0	7	1.01	0.41	2.09
CPT	Monoblock Acetabular Cup	84	690.6	7	1.01	0.41	2.09
CPT	Continuum TM	635	1,111.4	11	0.99	0.49	1.77
Stemsys	Fixa Ti Por	378	612.2	6	0.98	0.36	2.13
*#Spectron	Reflection cemented	2,945	25,725.1	252	0.98	0.86	1.11
Muller	CLS Expansion	59	409.3	4	0.98	0.27	2.50
CBC Stem	RM Pressfit cup	322	1,335.3	13	0.97	0.52	1.66
CPT	Trilogy	697	4,213.6	41	0.97	0.70	1.32
ABGII	Delta-PF Cup	107	929.8	9	0.97	0.44	1.84
*Exeter	Contemporary	1,551	16,334.7	158	0.97	0.82	1.13
CPT	Trident	145	1,146.7	11	0.96	0.48	1.72
C-Stem	Duraloc	53	527.6	5	0.95	0.31	2.21
Accolade II	Tritanium	216	211.9	2	0.94	0.11	3.41
Summit	Pinnacle	1,460	6,577.6	62	0.94	0.72	1.21
Accolade II	Trident	229	214.6	2	0.93	0.11	3.37
Exeter V40	Tritanium	1,374	2,906.7	27	0.93	0.61	1.35
MS 30	Duraloc	55	661.3	6	0.91	0.33	1.97
Spectron	Morscher	210	2,315.5	21	0.91	0.56	1.39
Omnifit	Trident	149	1,350.2	12	0.89	0.46	1.55
Furlong	Furlong	64	566.3	5	0.88	0.29	2.06
TwinSys uncemented	Continuum TM	118	340.8	3	0.88	0.18	2.57
Exeter V40	Duraloc	987	8,211.7	71	0.86	0.68	1.09
CLS	Duraloc	699	7,272.5	62	0.85	0.65	1.09
CLS	Continuum TM	383	831.2	7	0.84	0.34	1.74
Corail	Trilogy	125	356.7	3	0.84	0.17	2.46
Corail	Duraloc	464	3,810.8	32	0.84	0.57	1.19
Corail	Continuum TM	137	244.7	2	0.82	0.10	2.95
S-Rom	Ultima	78	989.4	8	0.81	0.35	1.59
CLS	Trident	162	1,371.4	11	0.80	0.40	1.44
Femoral Stem Press Fit	Trident	59	126.9	1	0.79	0.02	4.39
CLS	CLS Expansion	1,263	12,101.1	95	0.79	0.64	0.96
Muller	RM cup	1,013	9,159.3	71	0.78	0.61	0.98
TwinSys uncemented	Trilogy	209	1,080.7	8	0.74	0.32	1.46

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Spectron	Reflection porous	2,755	20,599.5	151	0.73	0.62	0.86
ABGII	Pinnacle	67	411.9	3	0.73	0.15	2.13
ABGII	Trident	342	2,914.7	21	0.72	0.45	1.10
Corail	Pinnacle	5,532	19,990.0	142	0.71	0.60	0.84
CLS	Reflection porous	318	1,852.5	13	0.70	0.37	1.20
Lateral straight stem	Muller PE cup	152	1,290.7	9	0.70	0.32	1.32
Avenir Muller uncemented	Pinnacle	99	434.8	3	0.69	0.14	2.02
CLS	RM Pressfit cup	452	2,037.5	14	0.69	0.38	1.15
C-Stem AMT	Marathon cemented	260	873.9	6	0.69	0.25	1.49
CLS	Monoblock Acetabular Cup	80	584.2	4	0.68	0.19	1.75
MS 30	Contemporary	128	1,028.4	7	0.68	0.27	1.40
Exeter	Exeter	1,326	13,420.2	90	0.67	0.54	0.82
Summit	Trilogy	135	757.7	5	0.66	0.21	1.54
Muller	Continuum TM	123	304.9	2	0.66	0.08	2.37
Corail	Monoblock Acetabular Cup	95	611.4	4	0.65	0.18	1.68
Elite plus	Charnley	298	3,219.2	21	0.65	0.40	1.00
MS 30	Morscher	787	7,842.8	51	0.65	0.48	0.85
Exeter	CLS Expansion	129	1,409.7	9	0.64	0.29	1.21
Exeter V40	Exeter X3	993	1,730.4	11	0.64	0.32	1.14
Exeter	Osteolock	836	9,449.5	59	0.62	0.48	0.81
TwinSys uncemented	RM Pressfit cup	3,735	15,116.5	90	0.60	0.48	0.73
CPT	Pinnacle	64	338.3	2	0.59	0.07	2.14
Charnley	Charnley Cup Ogee	303	3,247.0	19	0.59	0.35	0.91
TwinSys cemented	RM Pressfit cup	1,098	3,621.1	21	0.58	0.36	0.89
Versys cemented	ZCA	391	3,466.9	20	0.58	0.35	0.89
CPT	Duraloc	212	2,082.7	12	0.58	0.30	1.01
H-Max M	Delta-TT Cup	86	350.5	2	0.57	0.07	2.06
Summit	Duraloc	101	883.7	5	0.57	0.18	1.32
CPT	ZCA all-poly cup	76	177.8	1	0.56	0.01	3.13
C-Stem AMT	Pinnacle	902	2,319.7	13	0.56	0.30	0.96
CLS	Trilogy	469	2,322.7	13	0.56	0.30	0.96
Accolade	Trident	1,867	14,246.0	79	0.55	0.44	0.69
CLS	Weill ring	106	1,267.5	7	0.55	0.22	1.14
Trabecular Metal Stem	Monoblock Acetabular Cup	74	543.9	3	0.55	0.11	1.61
Femoral Stem Press Fit	Trilogy	139	728.0	4	0.55	0.15	1.41
Wagner cone stem	Fitmore	62	558.6	3	0.54	0.11	1.57
Muller	Morscher	70	747.3	4	0.54	0.15	1.37

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter	Trilogy	213	2,440.4	13	0.53	0.28	0.91
CPT	ZCA	536	4,557.2	24	0.53	0.34	0.78
Exeter	Bio-clad poly	113	1,144.8	6	0.52	0.19	1.14
Elite plus	Elite Plus Ogee	110	968.5	5	0.52	0.17	1.20
CLS	Fitmore	2,090	15,854.4	80	0.50	0.40	0.63
Spectron	R3 porous	375	1,006.3	5	0.50	0.16	1.16
Exeter V40	Pinnacle	1,413	5,062.3	25	0.49	0.32	0.73
TwinSys uncemented	RM cup	122	609.6	3	0.49	0.10	1.44
CLS	Morscher	1,682	17,317.8	84	0.49	0.39	0.60
Spectron	Fitmore	78	827.3	4	0.48	0.13	1.24
CCA	CCB	727	4,643.6	22	0.47	0.30	0.72
Exeter V40	Exeter	1,635	11,950.3	56	0.47	0.35	0.61
Exeter	Muller PE cup	119	1,288.1	6	0.47	0.17	1.01
Exeter V40	Morscher	630	5,410.1	25	0.46	0.30	0.68
MS 30	Continuum TM	199	434.9	2	0.46	0.06	1.66
Synergy Porous	Reflection porous	1,162	7,613.6	35	0.46	0.32	0.64
Exeter V40	Trident	6,712	34,410.2	158	0.46	0.39	0.54
Exeter V40	Trilogy	2,190	11,676.9	53	0.45	0.34	0.59
Stemsys	Agilis Ti-por	179	227.2	1	0.44	0.01	2.45
Spectron	Mallory-Head	152	1,377.5	6	0.44	0.16	0.95
Spectron	Trident	78	692.4	3	0.43	0.09	1.27
Stemsys	DeltaMotion Cup	268	935.4	4	0.43	0.12	1.09
Exeter	Morscher	551	6,829.9	29	0.42	0.28	0.61
C-Stem	Elite Plus Ogee	55	472.2	2	0.42	0.05	1.53
Exeter V40	Contemporary	5,666	34,056.4	144	0.42	0.36	0.50
Elite plus	Elite Plus LPW	282	2,606.7	11	0.42	0.21	0.76
Versys	Trilogy	272	3,083.7	13	0.42	0.22	0.72
Exeter V40	Muller PE cup	94	718.4	3	0.42	0.09	1.22
Exeter V40	Monoblock Acetabular Cup	123	1,205.9	5	0.41	0.13	0.97
Accolade	Tritanium	152	499.4	2	0.40	0.05	1.45
Charnley	Charnley	456	4,508.2	18	0.40	0.24	0.63
TwinSys cemented	RM cup	148	1,005.6	4	0.40	0.11	1.02
Muller	Weber	377	3,051.2	12	0.39	0.20	0.69
Muller	Muller PE cup	1,693	14,530.0	57	0.39	0.30	0.51
Exeter V40	Osteolock	270	2,575.2	10	0.39	0.19	0.71
MS 30	Muller PE cup	462	3,906.8	15	0.38	0.21	0.63
MS 30	RM Pressfit cup	87	535.4	2	0.37	0.05	1.35
Exeter V40	R3 porous	297	543.1	2	0.37	0.04	1.33
Stemsys	RM Pressfit cup	162	280.1	1	0.36	0.01	1.99

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Reflection cemented	718	3,124.9	11	0.35	0.18	0.63
MS 30	Fitmore	1,497	8,018.1	27	0.34	0.22	0.49
Exeter V40	CCB	380	1,486.8	5	0.34	0.11	0.78
Muller	ZCA all-poly cup	116	298.9	1	0.33	0.01	1.86
SL monoblock	Muller PE cup	101	910.4	3	0.33	0.07	0.96
Muller	Fitmore	57	309.4	1	0.32	0.01	1.80
Versys cemented	Trilogy	237	2,170.4	7	0.32	0.13	0.66
CCA	RM Pressfit cup	132	937.9	3	0.32	0.07	0.93
Exeter V40	Bio-clad poly	122	634.0	2	0.32	0.04	1.14
AML	Duraloc	53	638.6	2	0.31	0.04	1.13
TwinSys cemented	CCB	351	1,295.3	4	0.31	0.08	0.79
Muller	ZCA	138	667.5	2	0.30	0.04	1.08
Corail	Ultima	135	1,014.3	3	0.30	0.06	0.86
MS 30	Trilogy	216	1,019.8	3	0.29	0.06	0.86
Exeter V40	Reflection porous	466	2,502.1	7	0.28	0.11	0.58
Friendly	Delta-PF Cup	159	1,076.6	3	0.28	0.06	0.81
Exeter V40	ZCA	71	378.2	1	0.26	0.01	1.47
Exeter V40	RM Pressfit cup	1,247	4,653.8	11	0.24	0.12	0.42
Avenir Muller uncemented	RM cup	105	455.4	1	0.22	0.01	1.22
Muller	RM Pressfit cup	277	1,418.3	3	0.21	0.04	0.62
Exeter V40	Fitmore	528	1,937.9	4	0.21	0.06	0.53
Accolade	Pinnacle	180	970.8	2	0.21	0.02	0.74
Basis	Reflection porous	105	504.0	1	0.20	0.01	1.11
Corail	Delta-PF Cup	78	608.7	1	0.16	0.00	0.92
Exeter V40	CLS Expansion	88	818.9	1	0.12	0.00	0.68
Spectron	Biomex acet shell porous	68	827.6	1	0.12	0.00	0.67
Corail	Reflection porous	140	889.9	1	0.11	0.00	0.63
Accolade	Muller PE cup	114	948.7	1	0.11	0.00	0.59
TwinSys uncemented	Delta-PF Cup	370	1,575.7	1	0.06	0.00	0.35
CPCS	R3 porous	109	125.1	0	0.00	0.00	2.95
Stemsys	Delta-PF Cup	105	84.8	0	0.00	0.00	4.35
MS 30	ZCA all-poly cup	94	185.9	0	0.00	0.00	1.98
Exeter V40	Delta-TT Cup	92	170.1	0	0.00	0.00	2.17
Avenir Muller uncemented	Tritanium	91	322.4	0	0.00	0.00	1.14
Synergy Porous	Delta-PF Cup	88	441.1	0	0.00	0.00	0.84
Exeter	Trident	84	997.3	0	0.00	0.00	0.37
Exeter V40	ZCA all-poly cup	81	123.9	0	0.00	0.00	2.98

Femur Prosthesis	Acetabular Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	DeltaMotion Cup	75	211.0	0	0.00	0.00	1.75
CLS	Pinnacle	66	339.4	0	0.00	0.00	1.09
TwinSys cemented	Continuum TM	54	66.7	0	0.00	0.00	5.53
Exeter V40	Weber	53	449.5	0	0.00	0.00	0.82
Lateral straight stem	Weber	53	506.6	0	0.00	0.00	0.73

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

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

It is noteworthy that 49% of the ASR combinations have been revised.

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

Minimum of 50 primary registered arthroplasties

Fully Cemented

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Contemporary	5,666	34,056.4	144	0.42	0.36	0.50
Spectron	Reflection cemented	2,945	25,725.1	252	0.98	0.86	1.11
Muller	Muller PE cup	1,693	14,530.0	57	0.39	0.30	0.51
Exeter V40	Exeter	1,635	11,950.3	56	0.47	0.35	0.61
Exeter	Contemporary	1,551	16,334.7	158	0.97	0.82	1.13
Exeter	Exeter	1,326	13,420.2	90	0.67	0.54	0.82
Exeter V40	Exeter X3	993	1,730.4	11	0.64	0.32	1.14
CCA	CCB	727	4,643.6	22	0.47	0.30	0.72
Exeter V40	Reflection cemented	718	3,124.9	11	0.35	0.18	0.63
CPT	ZCA	536	4,557.2	24	0.53	0.34	0.78
MS 30	Muller PE cup	462	3,906.8	15	0.38	0.21	0.63
Charnley	Charnley	456	4,508.2	18	0.40	0.24	0.63
Versys cemented	ZCA	391	3,466.9	20	0.58	0.35	0.89
Exeter V40	CCB	380	1,486.8	5	0.34	0.11	0.78
Muller	Weber	377	3,051.2	12	0.39	0.20	0.69
TwinSys cemented	CCB	351	1,295.3	4	0.31	0.08	0.79
Charnley	Charnley Cup Ogee	303	3,247.0	19	0.59	0.35	0.91
Elite plus	Charnley	298	3,219.2	21	0.65	0.40	1.00
Elite plus	Elite Plus LPW	282	2,606.7	11	0.42	0.21	0.76
C-Stem AMT	Marathon cemented	260	873.9	6	0.69	0.25	1.49
Lateral straight stem	Muller PE cup	152	1,290.7	9	0.70	0.32	1.32
Muller	ZCA	138	667.5	2	0.30	0.04	1.08

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
MS 30	Contemporary	128	1,028.4	7	0.68	0.27	1.40
Exeter V40	Bio-clad poly	122	634.0	2	0.32	0.04	1.14
Exeter	Muller PE cup	119	1,288.1	6	0.47	0.17	1.01
Muller	ZCA all-poly cup	116	298.9	1	0.33	0.01	1.86
Exeter	Bio-clad poly	113	1,144.8	6	0.52	0.19	1.14
Elite plus	Elite Plus Ogee	110	968.5	5	0.52	0.17	1.20
SL monoblock	Muller PE cup	101	910.4	3	0.33	0.07	0.96
Exeter V40	Muller PE cup	94	718.4	3	0.42	0.09	1.22
MS 30	ZCA all-poly cup	94	185.9	0	0.00	0.00	1.98
Exeter V40	ZCA all-poly cup	81	123.9	0	0.00	0.00	2.98
CPT	ZCA all-poly cup	76	177.8	1	0.56	0.01	3.13
CCA	Contemporary	74	723.0	10	1.38	0.66	2.54
Contemporary	Contemporary	71	801.0	10	1.25	0.60	2.30
Exeter V40	ZCA	71	378.2	1	0.26	0.01	1.47
Spectron	Muller PE cup	66	598.3	7	1.17	0.47	2.41
C-Stem	Elite Plus Ogee	55	472.2	2	0.42	0.05	1.53
Exeter V40	Weber	53	449.5	0	0.00	0.00	0.82
Lateral straight stem	Weber	53	506.6	0	0.00	0.00	0.73

Uncemented

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Corail	Pinnacle	5,532	19,989.99	142	0.71	0.60	0.84
TwinSys uncemented	RM Pressfit cup	3,735	15,116.51	90	0.60	0.48	0.73
CLS	Fitmore	2,090	15,854.37	80	0.50	0.40	0.63
Accolade	Trident	1,867	14,246.04	79	0.55	0.44	0.69
CLS	Morscher	1,682	17,317.79	84	0.49	0.39	0.60
Summit	Pinnacle	1,460	6,577.59	62	0.94	0.72	1.21
CLS	CLS Expansion	1,263	12,101.08	95	0.79	0.64	0.96
TwinSys uncemented	Selexys TPS	1,231	6,158.56	79	1.28	1.02	1.60
Synergy Porous	Reflection porous	1,162	7,613.58	35	0.46	0.32	0.64
Synergy Porous	R3 porous	1,060	2,448.18	25	1.02	0.66	1.51
CLS	Duraloc	699	7,272.46	62	0.85	0.65	1.09
Polarstem uncemented	R3 porous	503	689.96	7	1.01	0.41	2.09
CLS	Trilogy	469	2,322.68	13	0.56	0.30	0.96
Corail	Duraloc	464	3,810.84	32	0.84	0.57	1.19
CLS	RM Pressfit cup	452	2,037.51	14	0.69	0.38	1.15
Femoral Stem Press Fit	Continuum TM	408	968.66	11	1.14	0.57	2.03
H-Max S	Delta-TT Cup	388	695.76	8	1.15	0.50	2.27

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Continuum TM	383	831.22	7	0.84	0.34	1.74
Stemsys	Fixa Ti Por	378	612.21	6	0.98	0.36	2.13
TwinSys uncemented	Delta-PF Cup	370	1,575.74	1	0.06	0.00	0.35
ABGII	Trident	342	2,914.74	21	0.72	0.45	1.10
Polarstem uncemented	Reflection porous	334	892.92	12	1.34	0.69	2.35
CBC Stem	RM Pressfit cup	322	1,335.26	13	0.97	0.52	1.66
S-Rom	Pinnacle	321	2,400.24	25	1.04	0.67	1.54
CLS	Reflection porous	318	1,852.47	13	0.70	0.37	1.20
Trabecular Metal Stem	Continuum TM	298	653.25	13	1.99	1.06	3.40
Versys	Trilogy	272	3,083.67	13	0.42	0.22	0.72
Stemsys	DeltaMotion Cup	268	935.44	4	0.43	0.12	1.09
Accolade II	Trident	229	214.64	2	0.93	0.11	3.37
Accolade II	Tritanium	216	211.93	2	0.94	0.11	3.41
TwinSys uncemented	Trilogy	209	1,080.70	8	0.74	0.32	1.46
CLS	Durom	198	1,399.24	38	2.72	1.92	3.73
CLS	Allofit	192	1,315.82	15	1.14	0.64	1.88
CBC Stem	Expansys shell	183	1,295.00	19	1.47	0.88	2.29
Accolade	Pinnacle	180	970.79	2	0.21	0.02	0.74
Stemsys	Agilis Ti-por	179	227.19	1	0.44	0.01	2.45
Avenir Muller uncemented	Continuum TM	166	481.21	8	1.66	0.72	3.28
CLS	Trident	162	1,371.40	11	0.80	0.40	1.44
Stemsys	RM Pressfit cup	162	280.13	1	0.36	0.01	1.99
Corail	ASR	156	914.95	71	7.76	6.06	9.79
Accolade	Tritanium	152	499.35	2	0.40	0.05	1.45
Corail	Reflection porous	140	889.92	1	0.11	0.00	0.63
ABGII	Duraloc	139	1,560.93	24	1.54	0.99	2.29
Femoral Stem Press Fit	Trilogy	139	728.05	4	0.55	0.15	1.41
Corail	Continuum TM	137	244.68	2	0.82	0.10	2.95
Summit	Trilogy	135	757.69	5	0.66	0.21	1.54
S-Rom	ASR	130	661.40	87	13.15	10.54	16.23
Corail	Tritanium	127	283.36	3	1.06	0.22	3.09
Omnifit	Trident	126	1,144.87	11	0.96	0.48	1.72
Corail	Trilogy	125	356.71	3	0.84	0.17	2.46
TwinSys uncemented	RM cup	122	609.56	3	0.49	0.10	1.44
TwinSys uncemented	Continuum TM	118	340.79	3	0.88	0.18	2.57
ABG	Duraloc	116	1,584.74	26	1.64	1.07	2.40
Synergy Porous	BHR Acetabular Cup	114	722.11	13	1.80	0.96	3.08
CLS	RM cup	113	856.87	13	1.52	0.81	2.59

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Prodigy	Duraloc	113	1,267.85	16	1.26	0.72	2.05
Corail	Fitmore	110	95.84	2	2.09	0.25	7.54
ABGII	Delta-PF Cup	107	929.78	9	0.97	0.44	1.84
CLS	Weill ring	106	1,267.47	7	0.55	0.22	1.14
Avenir Muller uncemented	RM cup	105	455.36	1	0.22	0.01	1.22
Mallory-Head	M2A	105	907.68	11	1.21	0.60	2.17
Stemsys	Delta-PF Cup	105	84.83	0	0.00	0.00	4.35
Summit	Duraloc	101	883.69	5	0.57	0.18	1.32
Avenir Muller uncemented	Pinnacle	99	434.80	3	0.69	0.14	2.02
Corail	Monoblock Acetabular Cup	95	611.39	4	0.65	0.18	1.68
Anthology Porous	BHR Acetabular Cup	91	487.66	11	2.26	1.13	4.04
Avenir Muller uncemented	Tritanium	91	322.38	0	0.00	0.00	1.14
Summit	ASR	88	540.56	26	4.81	3.14	7.05
Synergy Porous	Delta-PF Cup	88	441.15	0	0.00	0.00	0.84
H-Max M	Delta-TT Cup	86	350.46	2	0.57	0.07	2.06
CLS	Monoblock Acetabular Cup	80	584.19	4	0.68	0.19	1.75
Corail	Delta-PF Cup	78	608.69	1	0.16	0.00	0.92
S-Rom	Ultima	78	989.39	8	0.81	0.35	1.59
Corail	DeltaMotion Cup	75	211.03	0	0.00	0.00	1.75
AML MMA	Duraloc	74	829.45	9	1.09	0.50	2.06
Trabecular Metal Stem	Monoblock Acetabular Cup	74	543.93	3	0.55	0.11	1.61
ABG	ABGII	72	948.18	14	1.48	0.81	2.48
H-Max M	Delta-PF Cup	71	302.85	6	1.98	0.73	4.31
Echo(TM) Bi-metric	G7 acetabular shell	70	60.98	1	1.64	0.04	9.14
ABGII	Pinnacle	67	411.88	3	0.73	0.15	2.13
CLS	Pinnacle	66	339.35	0	0.00	0.00	1.09
Anthology Porous	R3 porous	65	340.56	12	3.52	1.82	6.16
Furlong	Furlong	64	566.25	5	0.88	0.29	2.06
Tri-Lock BPS	Pinnacle	62	195.30	3	1.54	0.32	4.49
Wagner cone stem	Fitmore	62	558.64	3	0.54	0.11	1.57
Corail	Trident	61	195.24	3	1.54	0.32	4.49
CBC Stem	Fitmore	59	381.82	5	1.31	0.43	3.06
CLS	Artek	59	603.55	22	3.65	2.28	5.52
Femoral Stem Press Fit	Trident	59	126.92	1	0.79	0.02	4.39
Zimmer Femoral Stem Press-Fit	Continuum TM	59	142.65	2	1.40	0.17	5.06

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	96.16	1	1.04	0.03	5.79
AML	Duraloc	53	638.61	2	0.31	0.04	1.13
Corail	RM Pressfit cup	53	93.13	1	1.07	0.03	5.98
Femoral Stem Press Fit	Delta-TT Cup	52	87.01	2	2.30	0.28	8.30

Hybrid

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Trident	6,712	34,410.2	158	0.46	0.39	0.54
Spectron	Reflection porous	2,755	20,599.5	151	0.73	0.62	0.86
Exeter V40	Trilogy	2,190	11,676.9	53	0.45	0.34	0.59
MS 30	Fitmore	1,497	8,018.1	27	0.34	0.22	0.49
Exeter V40	Pinnacle	1,413	5,062.3	25	0.49	0.32	0.73
Exeter V40	Tritanium	1,374	2,906.7	27	0.93	0.61	1.35
Exeter V40	Continuum TM	1,314	2,794.2	35	1.25	0.87	1.74
Exeter V40	RM Pressfit cup	1,247	4,653.8	11	0.24	0.12	0.42
Spectron	Duraloc	1,153	11,665.4	138	1.18	0.99	1.40
TwinSys cemented	RM Pressfit cup	1,098	3,621.1	21	0.58	0.36	0.89
Muller	RM cup	1,013	9,159.3	71	0.78	0.61	0.98
Exeter V40	Duraloc	987	8,211.7	71	0.86	0.68	1.09
C-Stem AMT	Pinnacle	902	2,319.7	13	0.56	0.30	0.96
Exeter	Osteolock	836	9,449.5	59	0.62	0.48	0.81
MS 30	Morscher	787	7,842.8	51	0.65	0.48	0.85
CPT	Trilogy	697	4,213.6	41	0.97	0.70	1.32
CPT	Continuum TM	635	1,111.4	11	0.99	0.49	1.77
Exeter V40	Morscher	630	5,410.1	25	0.46	0.30	0.68
Elite plus	Duraloc	608	5,677.5	93	1.64	1.32	2.01
Exeter	Duraloc	553	6,645.3	76	1.14	0.90	1.43
Exeter	Morscher	551	6,829.9	29	0.42	0.28	0.61
Exeter V40	Fitmore	528	1,937.9	4	0.21	0.06	0.53
Exeter V40	Reflection porous	466	2,502.1	7	0.28	0.11	0.58
Spectron	R3 porous	375	1,006.3	5	0.50	0.16	1.16
Exeter V40	R3 porous	297	543.1	2	0.37	0.04	1.33
Muller	RM Pressfit cup	277	1,418.3	3	0.21	0.04	0.62
Exeter V40	Osteolock	270	2,575.2	10	0.39	0.19	0.71
Versys cemented	Trilogy	237	2,170.4	7	0.32	0.13	0.66
MS 30	Trilogy	216	1,019.8	3	0.29	0.06	0.86
Exeter	Trilogy	213	2,440.4	13	0.53	0.28	0.91
CPT	Duraloc	212	2,082.7	12	0.58	0.30	1.01

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Spectron	Morscher	210	2,315.5	21	0.91	0.56	1.39
MS 30	Continuum TM	199	434.9	2	0.46	0.06	1.66
Friendly	Delta-PF Cup	159	1,076.6	3	0.28	0.06	0.81
Spectron	Mallory-Head	152	1,377.5	6	0.44	0.16	0.95
Exeter V40	Trabecular Metal Shell	149	547.3	8	1.46	0.63	2.88
TwinSys cemented	RM cup	148	1,005.6	4	0.40	0.11	1.02
CPT	Trident	145	1,146.7	11	0.96	0.48	1.72
Corail	Ultima	134	1,006.6	3	0.30	0.06	0.87
CCA	RM Pressfit cup	132	937.9	3	0.32	0.07	0.93
CPT	Fitmore	131	537.8	8	1.49	0.64	2.93
Exeter	CLS Expansion	129	1,409.7	9	0.64	0.29	1.21
Exeter V40	Monoblock Acetabular Cup	123	1,205.9	5	0.41	0.13	0.97
Muller	Continuum TM	123	304.9	2	0.66	0.08	2.37
Muller	Trilogy	115	634.9	13	2.05	1.09	3.50
Accolade	Muller PE cup	114	948.7	1	0.11	0.00	0.59
CPCS	R3 porous	109	125.1	0	0.00	0.00	2.95
Basis	Reflection porous	105	504.0	1	0.20	0.01	1.11
Exeter V40	Delta-TT Cup	92	170.1	0	0.00	0.00	2.17
Exeter V40	CLS Expansion	88	818.9	1	0.12	0.00	0.68
MS 30	RM Pressfit cup	87	535.4	2	0.37	0.05	1.35
CPT	Tritanium	85	298.5	5	1.68	0.54	3.91
CPT	Monoblock Acetabular Cup	84	690.6	7	1.01	0.41	2.09
Exeter	Trident	84	997.3	0	0.00	0.00	0.37
Muller	Duraloc	78	860.8	9	1.05	0.48	1.98
Spectron	Fitmore	78	827.3	4	0.48	0.13	1.24
Spectron	Trident	78	692.4	3	0.43	0.09	1.27
Muller	Trident	76	594.5	9	1.51	0.69	2.87
C-stem AMT	Pinnacle	70	54.2	2	3.69	0.45	13.33
Muller	Morscher	70	747.3	4	0.54	0.15	1.37
Spectron	Biomex acet shell porous	68	827.6	1	0.12	0.00	0.67
TwinSys cemented	Selexys TPS	65	251.1	4	1.59	0.43	4.08
CPT	Pinnacle	64	338.3	2	0.59	0.07	2.14
Muller	CLS Expansion	59	409.3	4	0.98	0.27	2.50
Muller	Fitmore	57	309.4	1	0.32	0.01	1.80
Friendly	Delta-TT Cup	55	186.3	2	1.07	0.13	3.88
MS 30	Duraloc	55	661.3	6	0.91	0.33	1.97
TwinSys cemented	Continuum TM	54	66.7	0	0.00	0.00	5.53
C-Stem	Duraloc	53	527.6	5	0.95	0.31	2.21

Prosthesis Combinations based on Femur in alphabetical order

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
ABG	Duraloc	116	1,584.7	26	1.64	1.07	2.40
ABG	ABGII	72	948.2	14	1.48	0.81	2.48
ABGII	Duraloc	139	1,560.9	24	1.54	0.99	2.29
ABGII	Delta-PF Cup	107	929.8	9	0.97	0.44	1.84
ABGII	Pinnacle	67	411.9	3	0.73	0.15	2.13
ABGII	Trident	342	2,914.7	21	0.72	0.45	1.10
Accolade	Trident	1,867	14,246.0	79	0.55	0.44	0.69
Accolade	Tritanium	152	499.4	2	0.40	0.05	1.45
Accolade	Pinnacle	180	970.8	2	0.21	0.02	0.74
Accolade	Muller PE cup	114	948.7	1	0.11	0.00	0.59
Accolade II	Tritanium	216	211.9	2	0.94	0.11	3.41
Accolade II	Trident	229	214.6	2	0.93	0.11	3.37
AML	Duraloc	53	638.6	2	0.31	0.04	1.13
AML MMA	Duraloc	74	829.4	9	1.09	0.50	2.06
Anthology Porous	R3 porous	65	340.6	12	3.52	1.82	6.16
Anthology Porous	BHR Acetabular Cup	93	496.1	12	2.42	1.25	4.23
Avenir Muller uncemented	Continuum TM	166	481.2	8	1.66	0.72	3.28
Avenir Muller uncemented	Pinnacle	99	434.8	3	0.69	0.14	2.02
Avenir Muller uncemented	RM cup	105	455.4	1	0.22	0.01	1.22
Avenir Muller uncemented	Tritanium	91	322.4	0	0.00	0.00	1.14
Basis	Reflection porous	105	504.0	1	0.20	0.01	1.11
CBC Stem	Expansys shell	183	1,295.0	19	1.47	0.88	2.29
CBC Stem	Fitmore	59	381.8	5	1.31	0.43	3.06
CBC Stem	RM Pressfit cup	322	1,335.3	13	0.97	0.52	1.66
CCA	Contemporary	74	723.0	10	1.38	0.66	2.54
CCA	CCB	727	4,643.6	22	0.47	0.30	0.72
CCA	RM Pressfit cup	132	937.9	3	0.32	0.07	0.93
Charnley	Charnley Cup Ogee	303	3,247.0	19	0.59	0.35	0.91
Charnley	Charnley	456	4,508.2	18	0.40	0.24	0.63
CLS	Artek	59	603.6	22	3.65	2.28	5.52
CLS	Durom	198	1,399.2	38	2.72	1.92	3.73
CLS	RM cup	113	856.9	13	1.52	0.81	2.59
CLS	Allofit	192	1,315.8	15	1.14	0.64	1.88
CLS	Duraloc	699	7,272.5	62	0.85	0.65	1.09
CLS	Continuum TM	383	831.2	7	0.84	0.34	1.74
CLS	Trident	162	1,371.4	11	0.80	0.40	1.44
CLS	CLS Expansion	1,263	12,101.1	95	0.79	0.64	0.96

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CLS	Reflection porous	318	1,852.5	13	0.70	0.37	1.20
CLS	RM Pressfit cup	452	2,037.5	14	0.69	0.38	1.15
CLS	Monoblock Acetabular Cup	80	584.2	4	0.68	0.19	1.75
CLS	Trilogy	469	2,322.7	13	0.56	0.30	0.96
CLS	Weill ring	106	1,267.5	7	0.55	0.22	1.14
CLS	Fitmore	2,090	15,854.4	80	0.50	0.40	0.63
CLS	Morscher	1,682	17,317.8	84	0.49	0.39	0.60
CLS	Pinnacle	66	339.4	0	0.00	0.00	1.09
Contemporary	Contemporary	71	801.0	10	1.25	0.60	2.30
Corail	ASR	156	915.0	71	7.76	6.06	9.79
Corail	Fitmore	110	95.8	2	2.09	0.25	7.54
Corail	Trident	61	195.2	3	1.54	0.32	4.49
Corail	RM Pressfit cup	53	93.1	1	1.07	0.03	5.98
Corail	Tritanium	127	283.4	3	1.06	0.22	3.09
Corail	Trilogy	125	356.7	3	0.84	0.17	2.46
Corail	Duraloc	464	3,810.8	32	0.84	0.57	1.19
Corail	Continuum TM	137	244.7	2	0.82	0.10	2.95
Corail	Pinnacle	5,532	19,990.0	142	0.71	0.60	0.84
Corail	Monoblock Acetabular Cup	95	611.4	4	0.65	0.18	1.68
Corail	Ultima	135	1,014.3	3	0.30	0.06	0.86
Corail	Delta-PF Cup	78	608.7	1	0.16	0.00	0.92
Corail	Reflection porous	140	889.9	1	0.11	0.00	0.63
Corail	DeltaMotion Cup	75	211.0	0	0.00	0.00	1.75
CPCS	R3 porous	109	125.1	0	0.00	0.00	2.95
CPT	Tritanium	85	298.5	5	1.68	0.54	3.91
CPT	Fitmore	131	537.8	8	1.49	0.64	2.93
CPT	Monoblock Acetabular Cup	84	690.6	7	1.01	0.41	2.09
CPT	Continuum TM	635	1,111.4	11	0.99	0.49	1.77
CPT	Trilogy	697	4,213.6	41	0.97	0.70	1.32
CPT	Trident	145	1,146.7	11	0.96	0.48	1.72
CPT	Pinnacle	64	338.3	2	0.59	0.07	2.14
CPT	Duraloc	212	2,082.7	12	0.58	0.30	1.01
CPT	ZCA all-poly cup	76	177.8	1	0.56	0.01	3.13
CPT	ZCA	536	4,557.2	24	0.53	0.34	0.78
C-Stem	Duraloc	53	527.6	5	0.95	0.31	2.21
C-Stem	Elite Plus Ogee	55	472.2	2	0.42	0.05	1.53
C-stem AMT	Pinnacle	70	54.2	2	3.69	0.45	13.33
C-Stem AMT	Marathon cemented	260	873.9	6	0.69	0.25	1.49

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
C-Stem AMT	Pinnacle	902	2,319.7	13	0.56	0.30	0.96
Echo(TM) Bi-metric	G7 acetabular shell	70	61.0	1	1.64	0.04	9.14
Echo(TM) Bi-metric	Exceed ABT Ringloc-X	57	96.2	1	1.04	0.03	5.79
Elite plus	Duraloc	608	5,677.5	93	1.64	1.32	2.01
Elite plus	Charnley	298	3,219.2	21	0.65	0.40	1.00
Elite plus	Elite Plus Ogee	110	968.5	5	0.52	0.17	1.20
Elite plus	Elite Plus LPW	282	2,606.7	11	0.42	0.21	0.76
Exeter	Duraloc	553	6,645.3	76	1.14	0.90	1.43
Exeter	Contemporary	1,551	16,334.7	158	0.97	0.82	1.13
Exeter	Exeter	1,326	13,420.2	90	0.67	0.54	0.82
Exeter	CLS Expansion	129	1,409.7	9	0.64	0.29	1.21
Exeter	Osteolock	836	9,449.5	59	0.62	0.48	0.81
Exeter	Trilogy	213	2,440.4	13	0.53	0.28	0.91
Exeter	Bio-clad poly	113	1,144.8	6	0.52	0.19	1.14
Exeter	Muller PE cup	119	1,288.1	6	0.47	0.17	1.01
Exeter	Morscher	551	6,829.9	29	0.42	0.28	0.61
Exeter	Trident	84	997.3	0	0.00	0.00	0.37
Exeter V40	Trabecular Metal Shell	149	547.3	8	1.46	0.63	2.88
Exeter V40	Continuum TM	1,314	2,794.2	35	1.25	0.87	1.74
Exeter V40	Tritanium	1,374	2,906.7	27	0.93	0.61	1.35
Exeter V40	Duraloc	987	8,211.7	71	0.86	0.68	1.09
Exeter V40	Exeter X3	993	1,730.4	11	0.64	0.32	1.14
Exeter V40	Pinnacle	1,413	5,062.3	25	0.49	0.32	0.73
Exeter V40	Exeter	1,635	11,950.3	56	0.47	0.35	0.61
Exeter V40	Morscher	630	5,410.1	25	0.46	0.30	0.68
Exeter V40	Trident	6,712	34,410.2	158	0.46	0.39	0.54
Exeter V40	Trilogy	2,190	11,676.9	53	0.45	0.34	0.59
Exeter V40	Contemporary	5,666	34,056.4	144	0.42	0.36	0.50
Exeter V40	Muller PE cup	94	718.4	3	0.42	0.09	1.22
Exeter V40	Monoblock Acetabular Cup	123	1,205.9	5	0.41	0.13	0.97
Exeter V40	Osteolock	270	2,575.2	10	0.39	0.19	0.71
Exeter V40	R3 porous	297	543.1	2	0.37	0.04	1.33
Exeter V40	Reflection cemented	718	3,124.9	11	0.35	0.18	0.63
Exeter V40	CCB	380	1,486.8	5	0.34	0.11	0.78
Exeter V40	Bio-clad poly	122	634.0	2	0.32	0.04	1.14
Exeter V40	Reflection porous	466	2,502.1	7	0.28	0.11	0.58
Exeter V40	ZCA	71	378.2	1	0.26	0.01	1.47
Exeter V40	RM Pressfit cup	1,247	4,653.8	11	0.24	0.12	0.42

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Exeter V40	Fitmore	528	1,937.9	4	0.21	0.06	0.53
Exeter V40	CLS Expansion	88	818.9	1	0.12	0.00	0.68
Exeter V40	Delta-TT Cup	92	170.1	0	0.00	0.00	2.17
Exeter V40	ZCA all-poly cup	81	123.9	0	0.00	0.00	2.98
Exeter V40	Weber	53	449.5	0	0.00	0.00	0.82
Femoral Stem Press Fit	Delta-TT Cup	52	87.0	2	2.30	0.28	8.30
Femoral Stem Press Fit	Continuum TM	408	968.7	11	1.14	0.57	2.03
Femoral Stem Press Fit	Trident	59	126.9	1	0.79	0.02	4.39
Femoral Stem Press Fit	Trilogy	139	728.0	4	0.55	0.15	1.41
Friendly	Delta-TT Cup	55	186.3	2	1.07	0.13	3.88
Friendly	Delta-PF Cup	159	1,076.6	3	0.28	0.06	0.81
Furlong	Furlong	64	566.3	5	0.88	0.29	2.06
H-Max M	Delta-PF Cup	71	302.9	6	1.98	0.73	4.31
H-Max M	Delta-TT Cup	86	350.5	2	0.57	0.07	2.06
H-Max S	Delta-TT Cup	391	700.4	8	1.14	0.49	2.25
Lateral straight stem	Muller PE cup	152	1,290.7	9	0.70	0.32	1.32
Lateral straight stem	Weber	53	506.6	0	0.00	0.00	0.73
Mallory-Head	M2A	105	907.7	11	1.21	0.60	2.17
MS 30	Duraloc	55	661.3	6	0.91	0.33	1.97
MS 30	Contemporary	128	1,028.4	7	0.68	0.27	1.40
MS 30	Morscher	787	7,842.8	51	0.65	0.48	0.85
MS 30	Continuum TM	199	434.9	2	0.46	0.06	1.66
MS 30	Muller PE cup	462	3,906.8	15	0.38	0.21	0.63
MS 30	RM Pressfit cup	87	535.4	2	0.37	0.05	1.35
MS 30	Fitmore	1,497	8,018.1	27	0.34	0.22	0.49
MS 30	Trilogy	216	1,019.8	3	0.29	0.06	0.86
MS 30	ZCA all-poly cup	94	185.9	0	0.00	0.00	1.98
Muller	Trilogy	115	634.9	13	2.05	1.09	3.50
Muller	Trident	76	594.5	9	1.51	0.69	2.87
Muller	Duraloc	78	860.8	9	1.05	0.48	1.98
Muller	CLS Expansion	59	409.3	4	0.98	0.27	2.50
Muller	RM cup	1,013	9,159.3	71	0.78	0.61	0.98
Muller	Continuum TM	123	304.9	2	0.66	0.08	2.37
Muller	Morscher	70	747.3	4	0.54	0.15	1.37
Muller	Weber	377	3,051.2	12	0.39	0.20	0.69
Muller	Muller PE cup	1,693	14,530.0	57	0.39	0.30	0.51
Muller	ZCA all-poly cup	116	298.9	1	0.33	0.01	1.86
Muller	Fitmore	57	309.4	1	0.32	0.01	1.80
Muller	ZCA	138	667.5	2	0.30	0.04	1.08
Muller	RM Pressfit cup	277	1,418.3	3	0.21	0.04	0.62

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Omnifit	Trident	149	1,350.2	12	0.89	0.46	1.55
Polarstem uncemented	Reflection porous	334	892.9	12	1.34	0.69	2.35
Polarstem uncemented	R3 porous	503	690.0	7	1.01	0.41	2.09
Prodigy	Duraloc	113	1,267.8	16	1.26	0.72	2.05
SL monoblock	Muller PE cup	101	910.4	3	0.33	0.07	0.96
Spectron	Duraloc	1,153	11,665.4	138	1.18	0.99	1.40
Spectron	Muller PE cup	66	598.3	7	1.17	0.47	2.41
Spectron	Reflection cemented	2,945	25,725.1	252	0.98	0.86	1.11
Spectron	Morscher	210	2,315.5	21	0.91	0.56	1.39
Spectron	Reflection porous	2,755	20,599.5	151	0.73	0.62	0.86
Spectron	R3 porous	375	1,006.3	5	0.50	0.16	1.16
Spectron	Fitmore	78	827.3	4	0.48	0.13	1.24
Spectron	Mallory-Head	152	1,377.5	6	0.44	0.16	0.95
Spectron	Trident	78	692.4	3	0.43	0.09	1.27
Spectron	Biomex acet shell porous	68	827.6	1	0.12	0.00	0.67
S-Rom	ASR	130	661.4	87	13.15	10.54	16.23
S-Rom	Pinnacle	321	2,400.2	25	1.04	0.67	1.54
S-Rom	Ultima	78	989.4	8	0.81	0.35	1.59
Stemsys	Fixa Ti Por	378	612.2	6	0.98	0.36	2.13
Stemsys	Agilis Ti-por	179	227.2	1	0.44	0.01	2.45
Stemsys	DeltaMotion Cup	268	935.4	4	0.43	0.12	1.09
Stemsys	RM Pressfit cup	162	280.1	1	0.36	0.01	1.99
Stemsys	Delta-PF Cup	105	84.8	0	0.00	0.00	4.35
Summit	ASR	88	540.6	26	4.81	3.14	7.05
Summit	Pinnacle	1,460	6,577.6	62	0.94	0.72	1.21
Summit	Trilogy	135	757.7	5	0.66	0.21	1.54
Summit	Duraloc	101	883.7	5	0.57	0.18	1.32
Synergy Porous	BHR Acetabular Cup	114	722.1	13	1.80	0.96	3.08
Synergy Porous	R3 porous	1,060	2,448.2	25	1.02	0.66	1.51
Synergy Porous	Reflection porous	1,162	7,613.6	35	0.46	0.32	0.64
Synergy Porous	Delta-PF Cup	88	441.1	0	0.00	0.00	0.84
Trabecular Metal Stem	Continuum TM	298	653.3	13	1.99	1.06	3.40
Trabecular Metal Stem	Monoblock Acetabular Cup	74	543.9	3	0.55	0.11	1.61
Tri-Lock BPS	Pinnacle	62	195.3	3	1.54	0.32	4.49
TwinSys cemented	Selexys TPS	65	251.1	4	1.59	0.43	4.08
TwinSys cemented	RM Pressfit cup	1,098	3,621.1	21	0.58	0.36	0.89
TwinSys cemented	RM cup	148	1,005.6	4	0.40	0.11	1.02

Combination		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
TwinSys cemented	CCB	351	1,295.3	4	0.31	0.08	0.79
TwinSys cemented	Continuum TM	54	66.7	0	0.00	0.00	5.53
TwinSys uncemented	Selexys TPS	1,231	6,158.6	79	1.28	1.02	1.60
TwinSys uncemented	Continuum TM	118	340.8	3	0.88	0.18	2.57
TwinSys uncemented	Trilogy	209	1,080.7	8	0.74	0.32	1.46
TwinSys uncemented	RM Pressfit cup	3,735	15,116.5	90	0.60	0.48	0.73
TwinSys uncemented	RM cup	122	609.6	3	0.49	0.10	1.44
TwinSys uncemented	Delta-PF Cup	370	1,575.7	1	0.06	0.00	0.35
Versys	Trilogy	272	3,083.7	13	0.42	0.22	0.72
Versys cemented	ZCA	391	3,466.9	20	0.58	0.35	0.89
Versys cemented	Trilogy	237	2,170.4	7	0.32	0.13	0.66
Wagner cone stem	Fitmore	62	558.6	3	0.54	0.11	1.57
Zimmer Femoral Stem Press-Fit	Continuum TM	59	142.6	2	1.40	0.17	5.06

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

Size	Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	CC	721	5,405.9	43	0.80	0.58	1.07
<=28	CM	21	81.7	2	2.45	0.30	8.84
<=28	CP	10,108	75,732.7	532	0.70	0.64	0.76
<=28	MM	2,834	30,016.0	213	0.71	0.62	0.81
<=28	MP	43,233	328,054.3	2,264	0.69	0.66	0.72
32	CC	3,124	17,716.3	108	0.61	0.50	0.74
32	CP	5,698	18,406.4	94	0.51	0.41	0.62
32	MM	480	3,177.9	29	0.91	0.61	1.31
32	MP	17,530	57,975.4	356	0.61	0.55	0.68
36	CC	5,302	22,447.3	143	0.64	0.54	0.75
36	CM	443	2,051.6	16	0.78	0.45	1.27
36	CP	2,543	7,093.1	41	0.58	0.41	0.78
36	MM	1,002	7,151.6	93	1.30	1.05	1.59
36	MP	2,013	5,458.1	46	0.84	0.62	1.12
>36	CC	1,135	2,906.1	15	0.52	0.29	0.85
>36	CM	7	34.5	0	0.00	0.00	10.68
>36	CP	4	4.2	0	0.00	0.00	88.82
>36	MM	1,648	10,517.3	366	3.48	3.13	3.86
>36	MP	30	110.2	1	0.91	0.00	5.06

Summary Revision Rates vs Head Size

Size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=28	56,917	439,290.7	3,054	0.70	0.67	0.72
32	26,832	97,276.0	587	0.60	0.56	0.65
36	11,303	44,201.8	339	0.77	0.69	0.85
>36	2,824	13,572.3	382	2.81	2.54	3.11

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

Revision Comparison Standard vs Cross linked Polyethylene

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	10,283	48,478.2	309	0.64	0.57	0.71
CM	471	2,167.8	18	0.83	0.49	1.31
CP	18,356	101,239.4	667	0.66	0.61	0.71
PS	6,780	60,702.8	447	0.74	0.67	0.81
PX	11,576	40,536.6	220	0.54	0.47	0.62
MM	5,966	50,870.7	701	1.38	1.28	1.48
MP	62,818	391,682.4	2,667	0.68	0.66	0.71
PS	34,921	275,121.5	1,930	0.70	0.67	0.73
PX	27,894	116,532.4	737	0.63	0.59	0.68

PS= standard polyethylene PX = cross linked polyethylene

CP (PX) has a significantly lower revision rate compared to the PS combination and the MP (PS).

Revision vs Bearing Surfaces of Uncemented Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	8,127	38,863.7	262	0.67	0.59	0.76
CM	465	2,163.4	17	0.79	0.46	1.26
CP	11,926	60,478.0	402	0.66	0.60	0.73
MM	5,379	45,368.2	639	1.41	1.30	1.52
MP	11,865	60,207.8	498	0.83	0.76	0.90

The MM articulation has a significantly higher revision rate than all the others. CP has a significantly lower revision rate than MP.

Revision vs Bearing Surfaces of Fully Cemented Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CP	662	4,607.1	39	0.85	0.60	1.16
MM	9	56.1	3	5.35	1.10	15.63
MP	22,597	161,915.0	998	0.62	0.58	0.66

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

Revision vs Bearing Surfaces of Hybrid Prostheses

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	2,156	9,614.4	47	0.49	0.36	0.65
CM	4	3.4	1	29.84	0.76	166.26
CP	5,838	36,621.1	233	0.64	0.56	0.72
MM	561	5,428.4	60	1.11	0.84	1.42
MP	28,714	171,832.5	1,184	0.69	0.65	0.73

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

Summary for Revision vs Bearing Surfaces

Surfaces	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	10,283	48,478.2	309	0.64	0.57	0.71
CM	471	2,167.8	18	0.83	0.49	1.31
CP	18,356	101,239.4	667	0.66	0.61	0.71
MM	5,966	50,870.7	701	1.38	1.28	1.48
MP	62,818	391,682.4	2,667	0.68	0.66	0.71

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

Revision vs Monoblock Femoral Stems

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,297	12,979.5	57	0.44	0.33	0.57

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	14,909	101,132.4	1,078	1.07	1.00	1.13
55_64	25,143	163,761.8	1,410	0.86	0.82	0.91
65_74	33,509	208,252.6	1,339	0.64	0.61	0.68
GE75	26,754	143,589.4	648	0.45	0.42	0.49

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

Revision vs Acetabulum types

Acetabulum type	No. Ops.	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Uncemented No Liner	15,965	100,893.6	859	0.85	0.80	0.91
Fully Cemented	23,265	166,539.1	1,040	0.62	0.59	0.66
Uncemented Liner	58,658	326,947.5	2,463	0.75	0.72	0.78

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

Revision vs Age Bands vs Bearing Surfaces

Bearing Surface	Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CC	LT55	3,931	18,947	140	0.74	0.62	0.87
	55_64	4,233	20,462	110	0.54	0.44	0.65
	65_74	1,929	8,428	56	0.66	0.50	0.86
	GE75	190	639	3	0.47	0.10	1.37
CM	LT55	180	819	5	0.61	0.20	1.42
	55_64	210	978	10	1.02	0.49	1.88
	65_74	72	333	3	0.90	0.19	2.63
	GE75	9	36	0	0.00	0.00	10.10
CP	LT55	3,570	22,505	193	0.86	0.74	0.99
	55_64	6,484	37,116	246	0.66	0.58	0.75
	65_74	6,012	31,532	173	0.55	0.47	0.64
	GE75	2,290	10,084	55	0.55	0.41	0.71
MM	LT55	2,881	26,262	342	1.30	1.17	1.45
	55_64	2,369	19,608	295	1.50	1.34	1.69
	65_74	649	4,722	58	1.23	0.93	1.59
	GE75	67	277	6	2.16	0.79	4.71
MP	LT55	4,103	30,042	374	1.24	1.12	1.38
	55_64	11,411	81,122	727	0.90	0.83	0.96
	65_74	23,953	154,483	1,009	0.65	0.61	0.69
	GE75	23,351	126,033	557	0.44	0.41	0.48

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

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
F	53,414	327,875.9	2,137	0.65	0.62	0.68
M	46,901	288,860.3	2,338	0.81	0.78	0.84

Males have a significantly higher revision rate than females.

Revision vs Surgeon Annual Workload

Operations per Year	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT10	1,206	8,522.4	85	1.00	0.79	1.23
10_25	11,017	68,326.6	546	0.80	0.73	0.87
26_50	42,656	262,579.7	2,007	0.76	0.73	0.80
51_75	24,698	145,791.9	888	0.61	0.57	0.65
76_100	9,854	56,722.6	380	0.67	0.60	0.74
GE100	10,884	74,793.1	569	0.76	0.70	0.83

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

Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	3,709	28,223.0	214	0.76	0.66	0.87
Posterior	63,935	383,111.0	2,841	0.74	0.71	0.77
Lateral	26,583	168,478.8	1,112	0.66	0.62	0.70
Troch	119	737.2	11	1.49	0.74	2.67

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

Revision for Dislocation vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Anterior	3,709	28,223.0	40	0.14	0.10	0.19
Posterior	63,935	383,111.0	821	0.21	0.20	0.23
Lateral	26,583	168,478.8	159	0.09	0.08	0.11
Troch	119	737.2	1	0.14	0.00	0.76
Total	**94,346**	**580,550.1**	**1,021**	**0.18**	**0.17**	**0.19**

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

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	24,279	177,972.2	1,084	0.61	0.57	0.65
Uncemented	38,145	210,152.3	1,836	0.87	0.83	0.91
Hybrid	37,891	228,611.7	1,555	0.68	0.65	0.71

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

Revision by Arthroplasty Fixation vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55						
Cemented	672	5,907.7	107	1.81	1.48	2.19
Uncemented	10,939	69,360.9	675	0.97	0.90	1.05
Hybrid	3,298	25,863.9	296	1.14	1.02	1.28
55_64						
Cemented	2,415	21,587.5	228	1.06	0.92	1.20
Uncemented	13,932	79,969.3	718	0.90	0.83	0.97
Hybrid	8,796	62,205.1	464	0.75	0.68	0.82
65_74						
Cemented	8,585	70,899.3	458	0.65	0.59	0.71
Uncemented	9,709	46,583.0	337	0.72	0.65	0.80
Hybrid	15,215	90,770.3	544	0.60	0.55	0.65
>75						
Cemented	12,607	79,577.8	291	0.37	0.32	0.41
Uncemented	3,565	14,239.2	106	0.74	0.61	0.90
Hybrid	10,582	49,772.4	251	0.50	0.44	0.57

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

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

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

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

Revision vs ASA Status

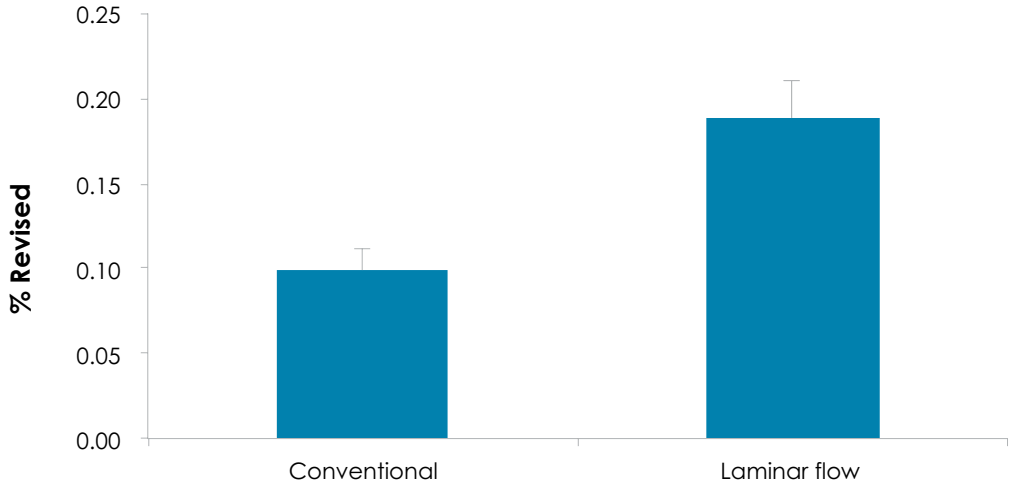
ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	11,246	50,445.4	428	0.85	0.77	0.93
2	39,498	167,045.4	1,161	0.70	0.66	0.74
3	15,450	59,512.1	403	0.68	0.61	0.75
4	562	1,697.8	18	1.06	0.63	1.68

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

Revision for Deep Infection within 6 months vs Theatre Environment

Theatre	Total Number	Number revised	%	Std Error
Conventional	57,961	57	0.098	0.013
Laminar flow	35,597	67	0.188	0.023

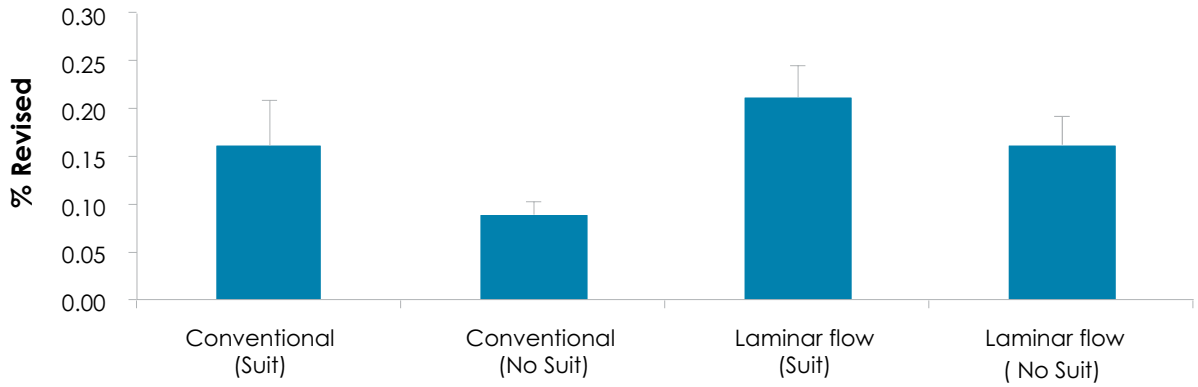
% Revision for Deep Infection Within 6 Months



There is a significant difference in revision rates (x2) for deep infection within 6 months of surgery between conventional and laminar flow theatres.

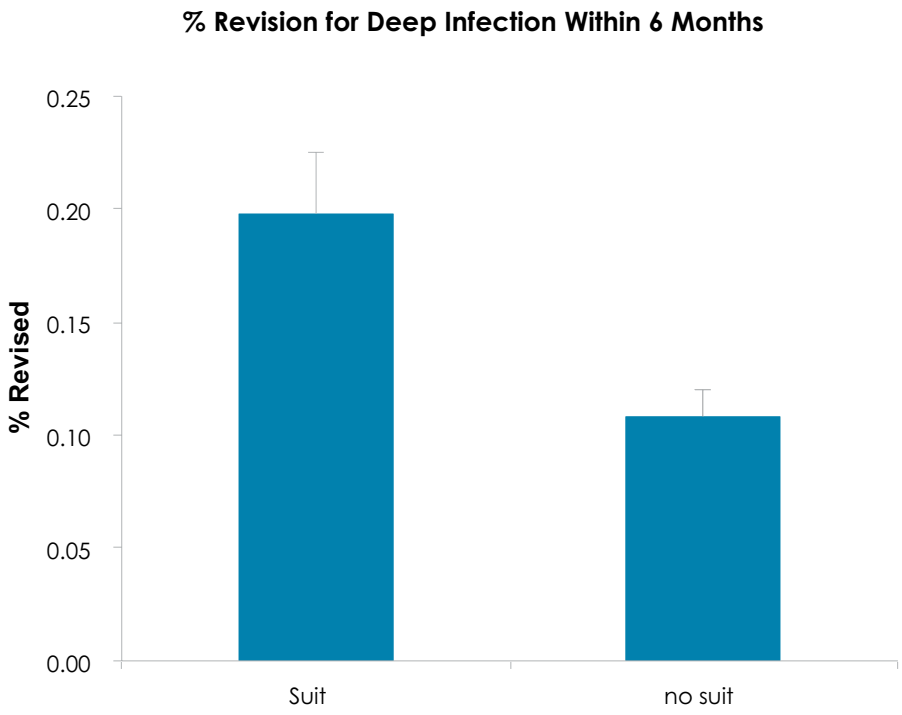
		Total Number	Number revised	%	Std Error
Conventional	Suit	7,444	12	0.161	0.046
	No suit	50,517	45	0.089	0.013
Laminar flow	Suit	18,355	39	0.213	0.034
	No suit	17,242	28	0.162	0.031

% Revision for Deep Infection Within 6 Months



There is a significant difference in revision rates (2.4x) for laminar flow/suit compared to conventional/no suit environments

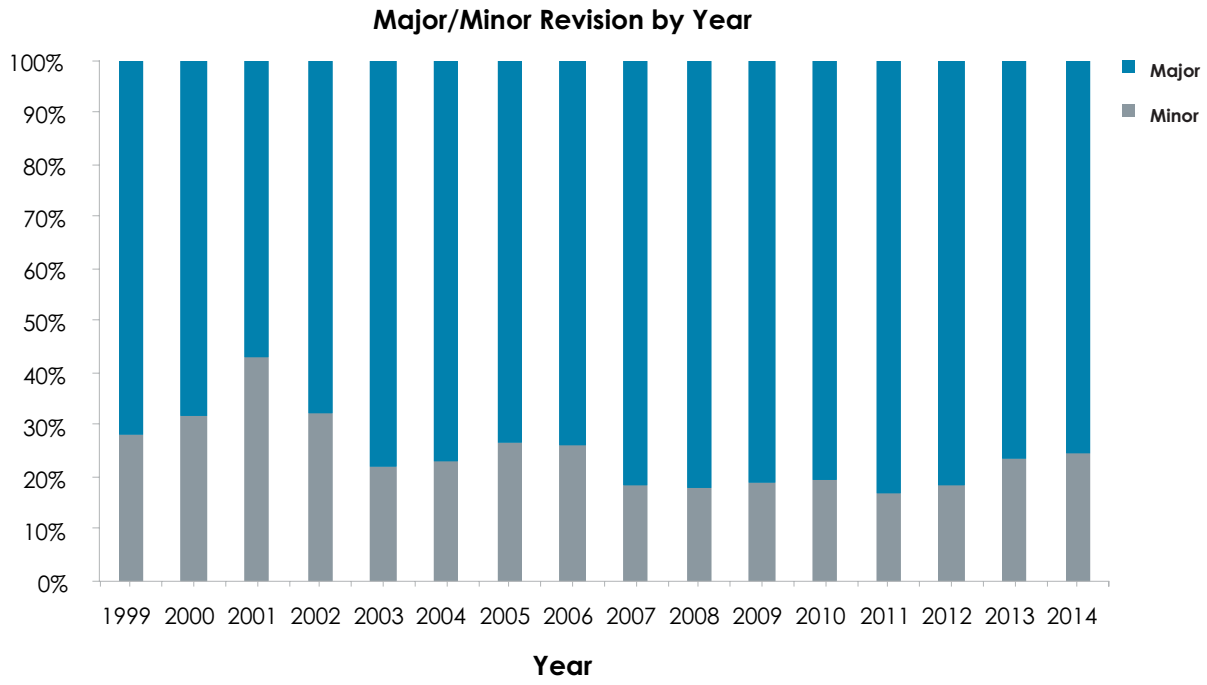
	Total Number	Number revised	%	Std Error
Suit	25,799	51	0.198	0.028
no suit	67,759	73	0.108	0.013



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

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

Comparison of Major vs Minor Revisions by Year



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

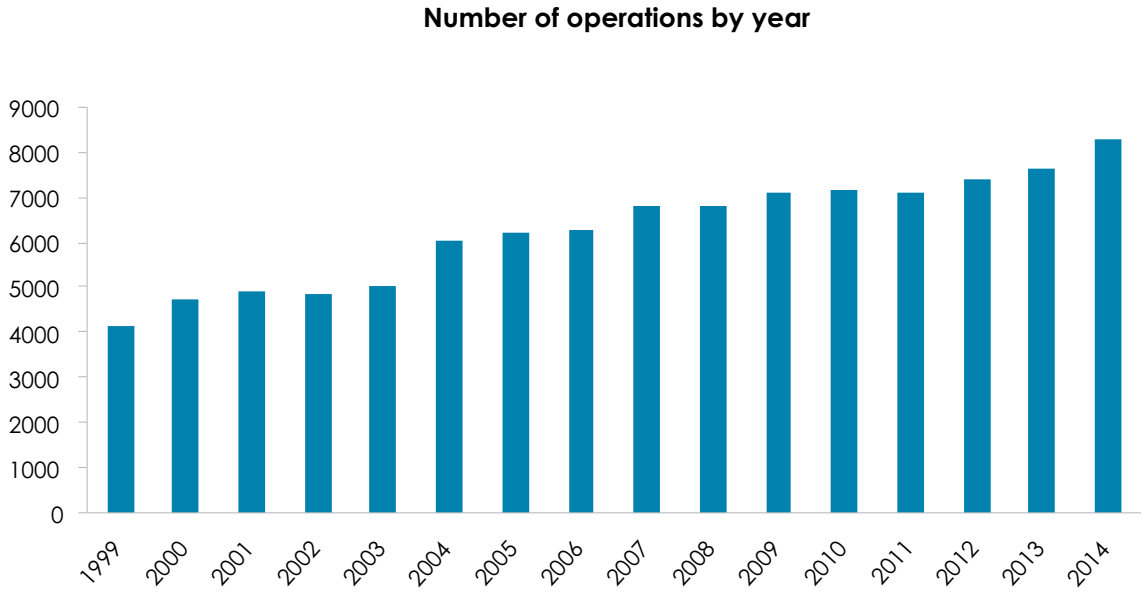
Re revisions for Major vs Minor revisions

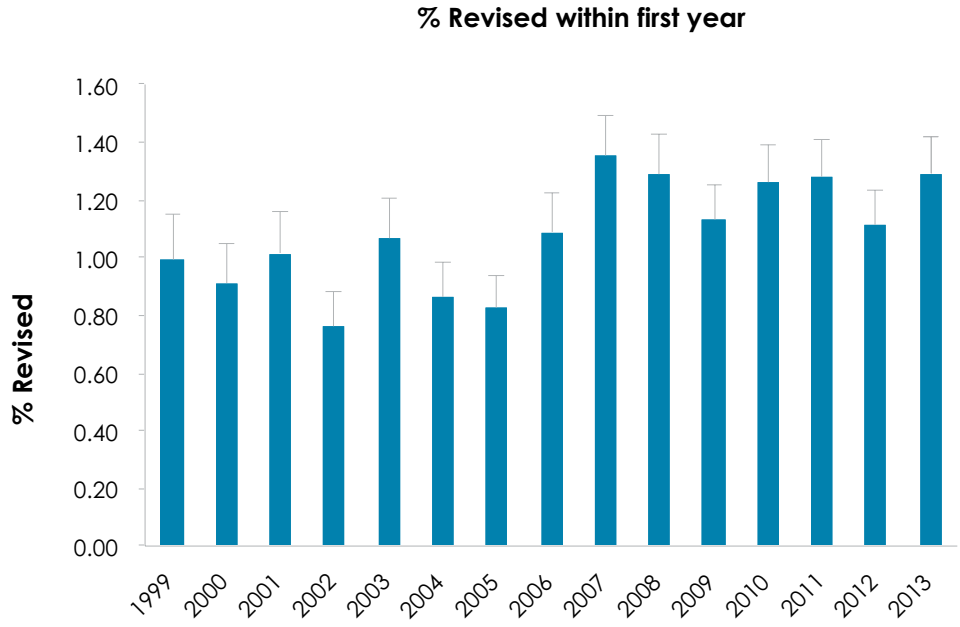
	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	962	3,877.1	159	4.10	3.49	4.79
Major	3,473	13,368.0	429	3.21	2.91	3.53

There is a significantly higher re-revision rate for minor compared to major revisions despite overlap of C.I.s (p=0.03).

Percentage of hips revised in the first year

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





Resurfacing Arthroplasty

All Patients

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1,518	8,099.0	104	1.28	1.05	1.56

There is a significantly higher revision rate compared to conventional hip arthroplasty (0.73/100 comp yrs.)

Resurfacing Prosthesis vs Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Adept	4	27.1	0	0	0	13.61
ASR	132	988.9	32	3.24	2.21	4.57
BHR	1,335	6,860.6	67	0.98	0.76	1.24
BMHR	28	110.3	1	0.91	0.02	5.05
Conserve Superfinish	3	16.6	0	0	0	22.23
Durom	4	42.3	0	0	0	8.73
Mitch TRH Resurfacing Head	12	53.2	4	7.52	2.05	19.25

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

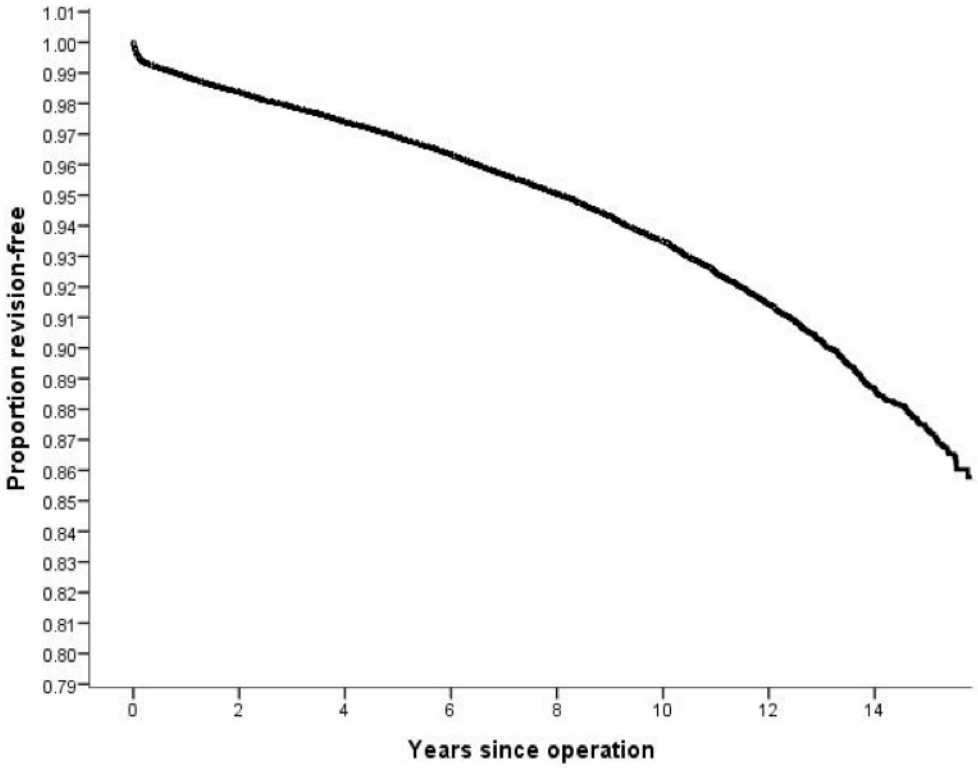
Head size vs Revision Rate

Hips resurfacing head size	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<=44	99	557.0	24	4.31	2.76	6.41
45-49	324	1,868.0	33	1.77	1.22	2.48
50-54	1,011	5,107.0	40	0.78	0.56	1.07
>=55	84	567.0	7	1.23	0.50	2.54
ALL	1,518	8,099.0	104	1.28	1.05	1.56

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

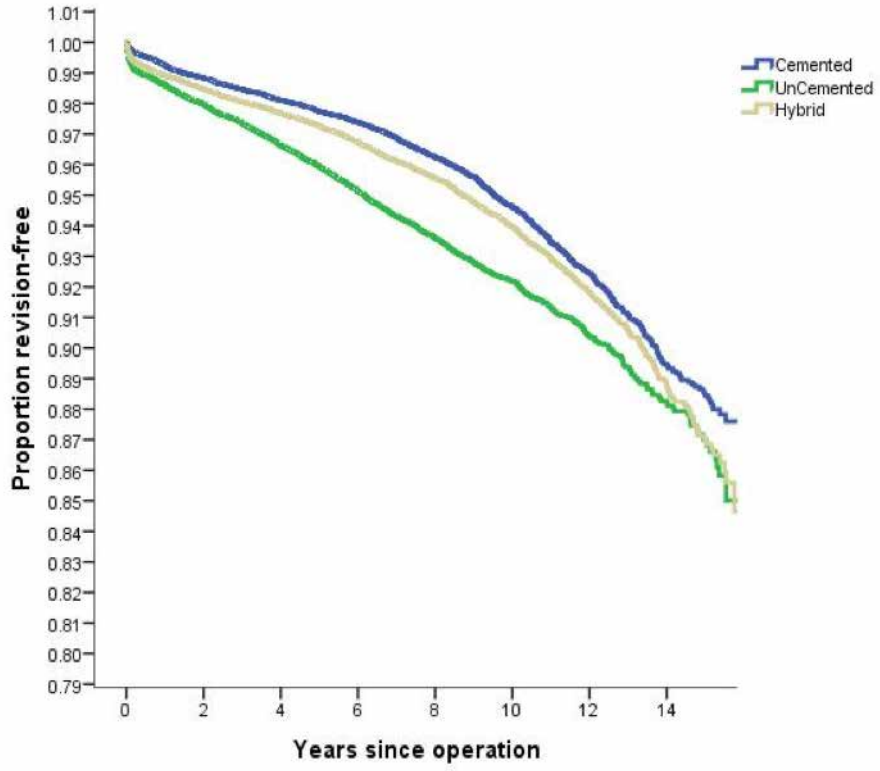
KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the years 1999 – 2014 with deceased patients censored at time of death.



Years	% Revision-free	No in each year
1	98.90	89,510
2	98.40	80,375
3	97.90	71,532
4	97.40	63,095
5	96.90	54,787
6	96.30	46,851
7	95.70	39,606
8	95.00	32,719
9	94.30	26,652
10	93.50	20,953
11	92.50	15,755
12	91.40	11,545
13	90.20	7,929
14	88.70	4,712
15	87.30	2,026

The KM analysis is to15 years rather than 16 as too few registered hips were revised in 2014.



Cemented

Years	% Revision-free	No in each year
1	99.20	22,305
2	98.80	20,761
3	98.50	19,090
4	98.10	17,430
5	97.70	15,859
6	97.40	14,307
7	96.90	12,696
8	96.20	10,979
9	95.60	9,289
10	94.60	7,490
11	93.50	5,748
12	92.40	4,357
13	91.10	3,079
14	89.50	1,883
15	88.40	899

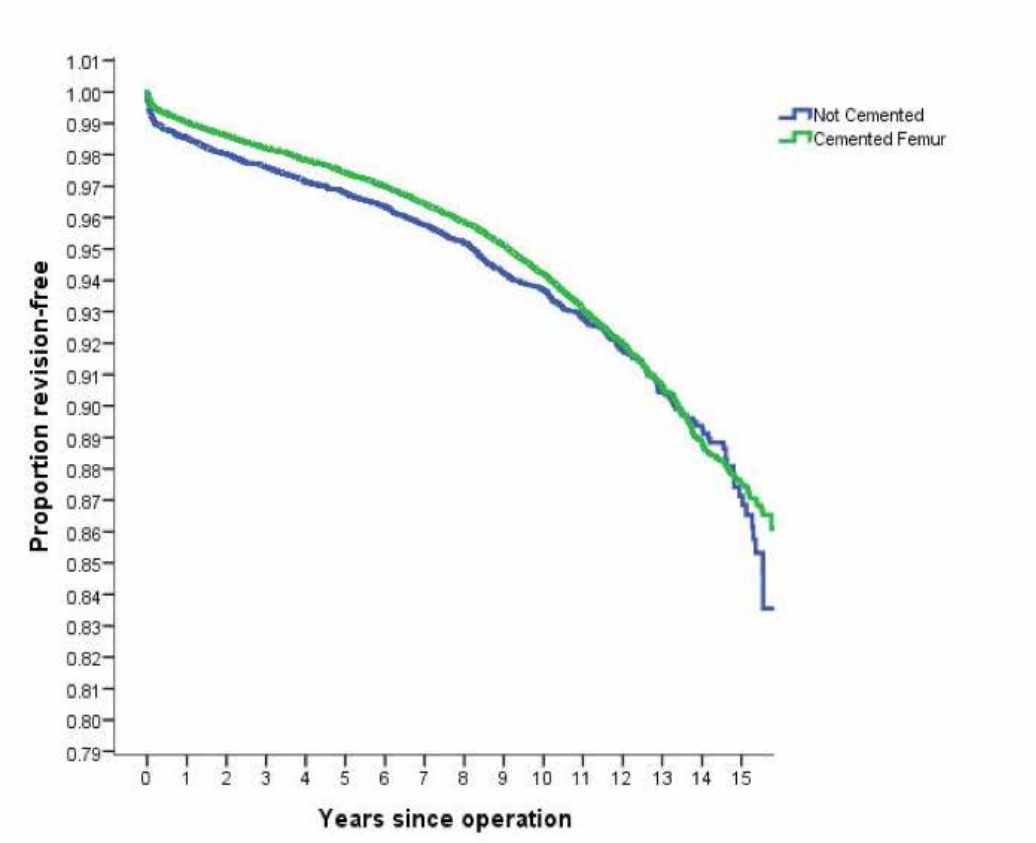
Uncemented

Years	% Revision-free	No in each year
1	98.60	33,739
2	98.00	29,892
3	97.40	26,280
4	96.60	22,680
5	95.90	18,816
6	95.10	15,161
7	94.30	12,110
8	93.60	9,506
9	92.80	7,360
10	92.20	5,596
11	91.40	4,143
12	90.40	2,920
13	89.40	1,984
14	88.30	1,238
15	87.00	492

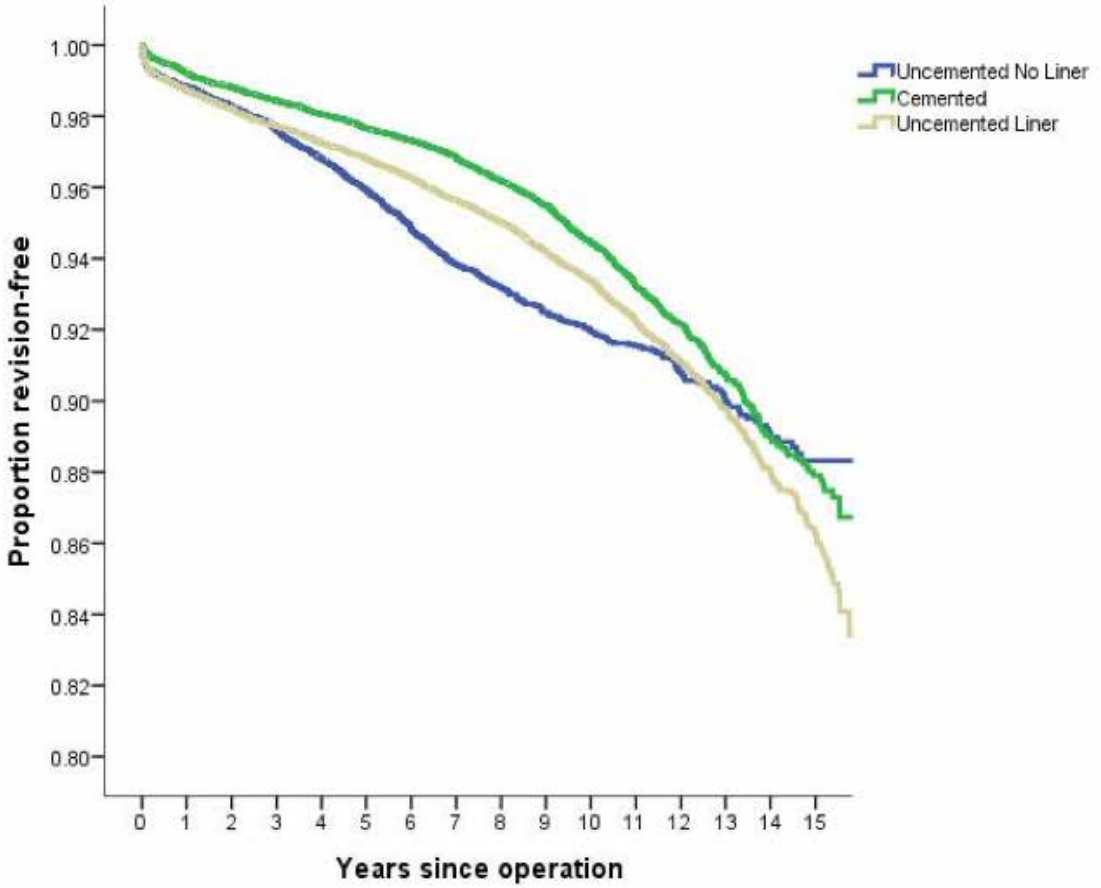
Hybrid

Years	% Revision-free	No in each year
1	98.90	33,466
2	98.50	29,724
3	98.00	26,162
4	97.70	22,985
5	97.30	20,112
6	96.70	17,383
7	96.10	14,800
8	95.50	12,234
9	94.80	10,052
10	94.00	7,867
11	93.00	5,871
12	91.80	4,283
13	90.60	2,886
14	88.80	1,679
15	87.00	647

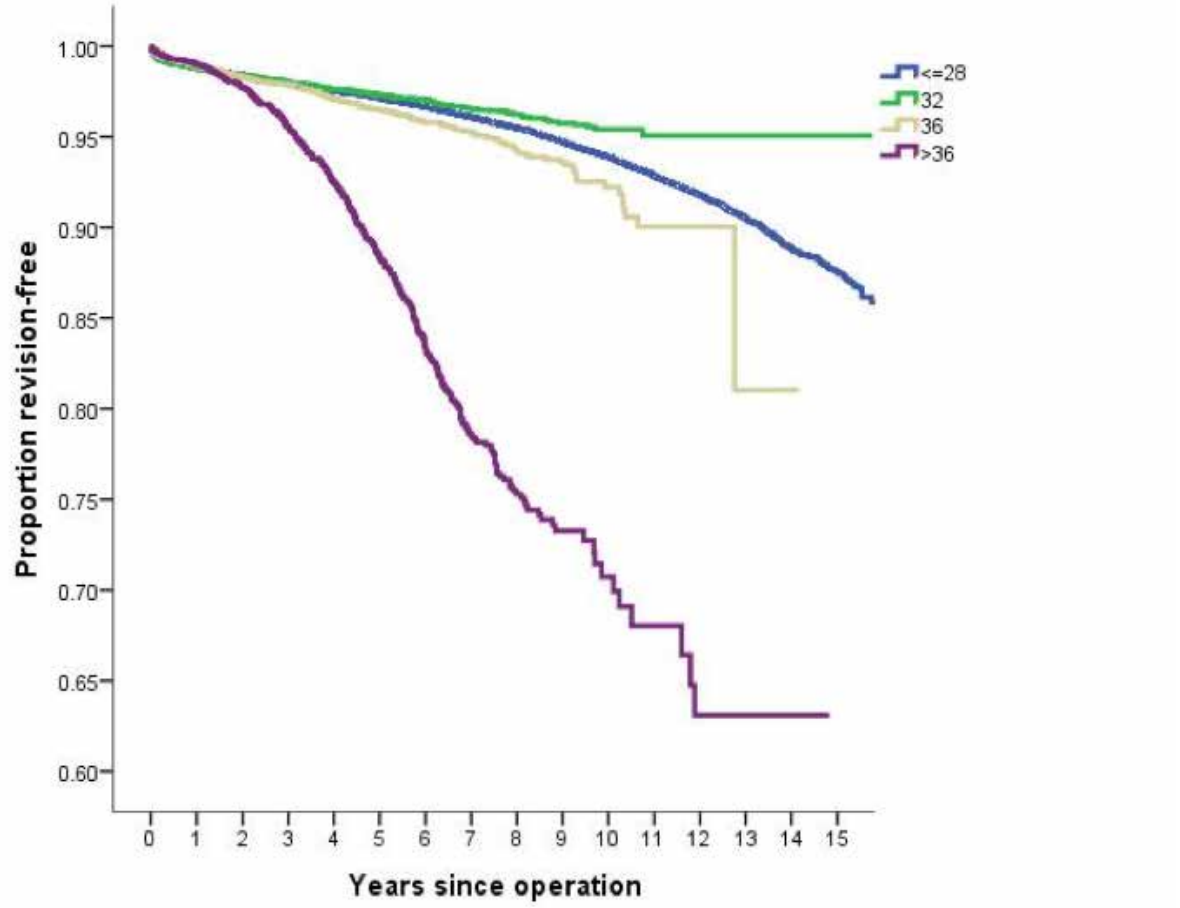
Survival cemented vs uncemented stems



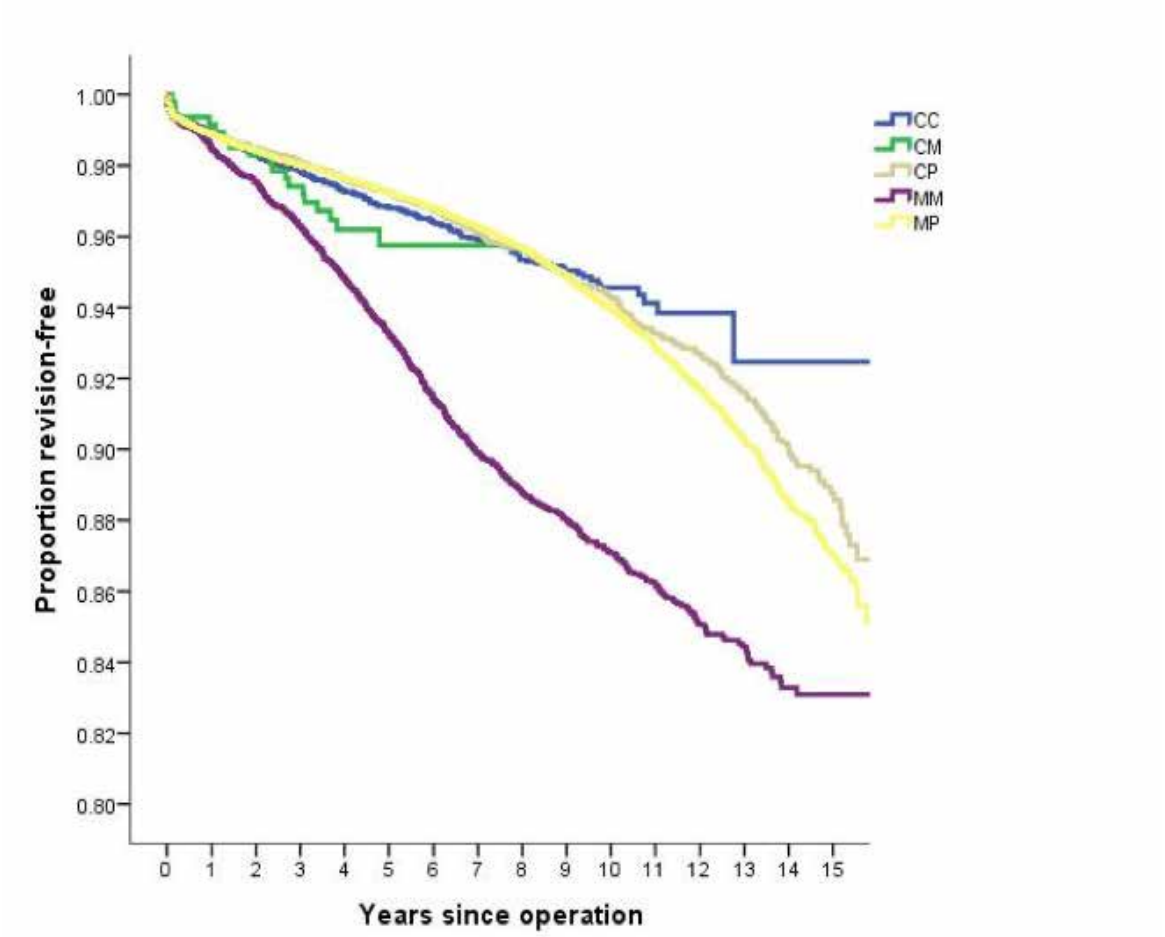
Survival vs Cemented vs Uncemented no Liner vs Uncemented with Liner



Survival versus Head Size

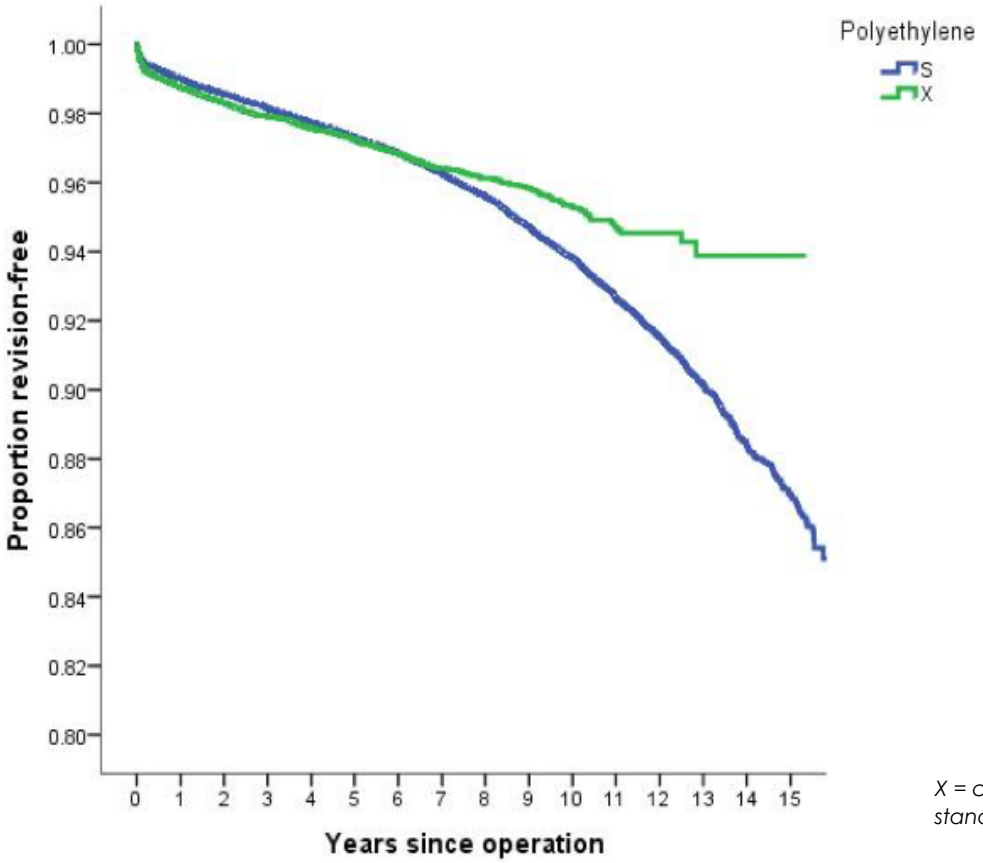


Survival vs Bearing Surface



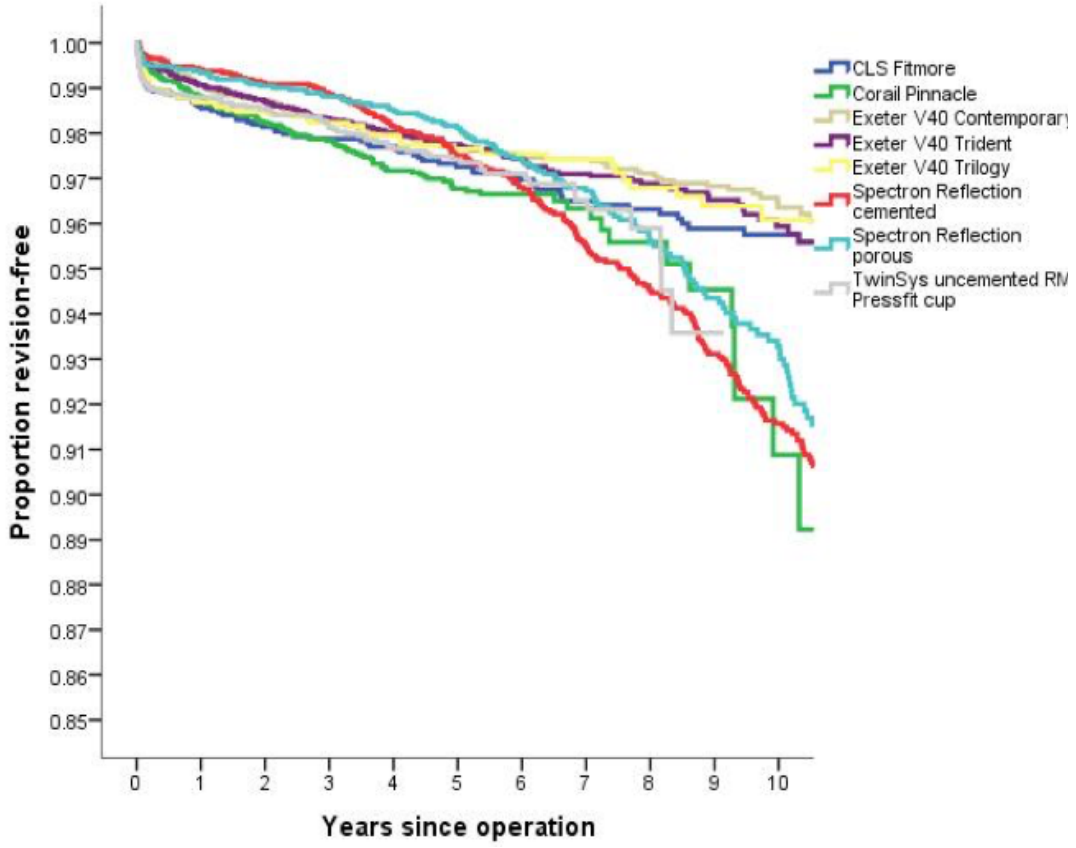
CC =ceramic/ceramic, CM = ceramic/metal, CP = ceramic/plastic, MM = metal/metal, MP = metal/plastic

Survival of Crosslinked vs Standard polyethylene

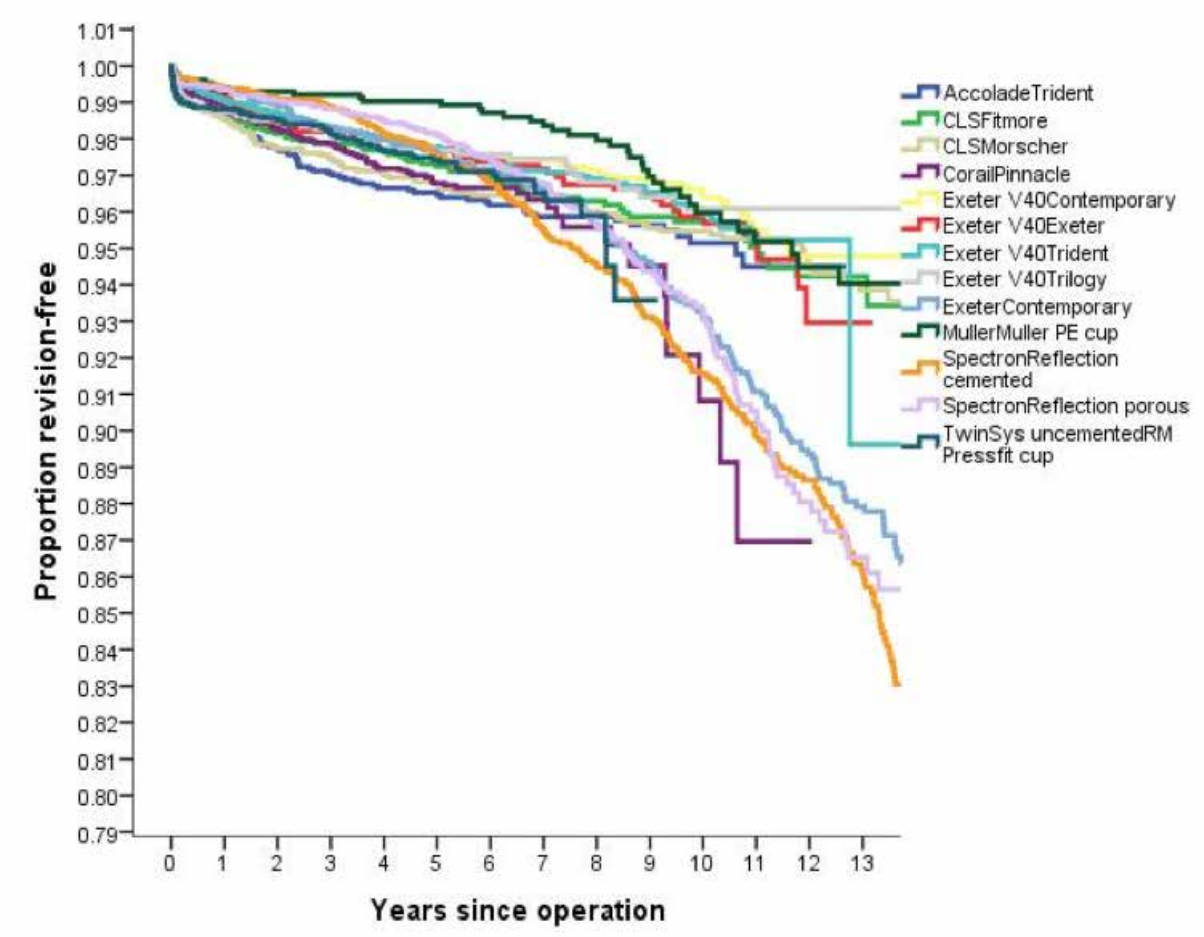


X = cross linked and S = standard polyethylene

Survival of combinations with > 2000 procedures

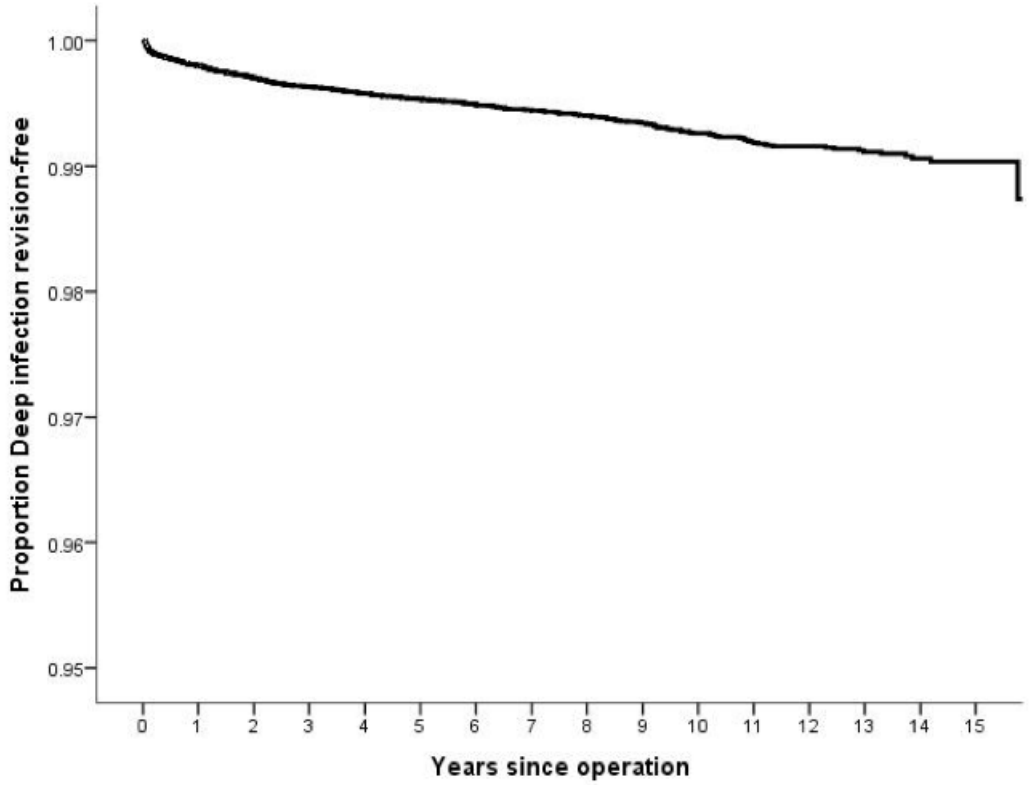


Survival of combinations with > 1500 procedures

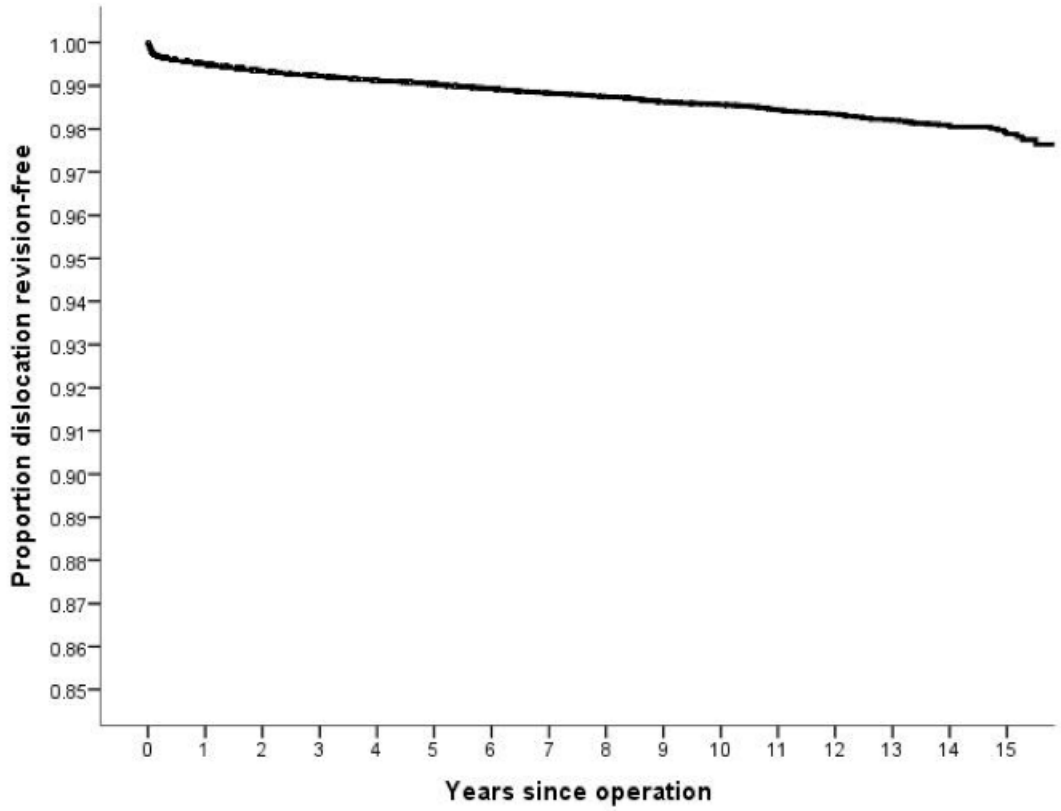


The following K M graphs are for the six main individual reasons for revision:

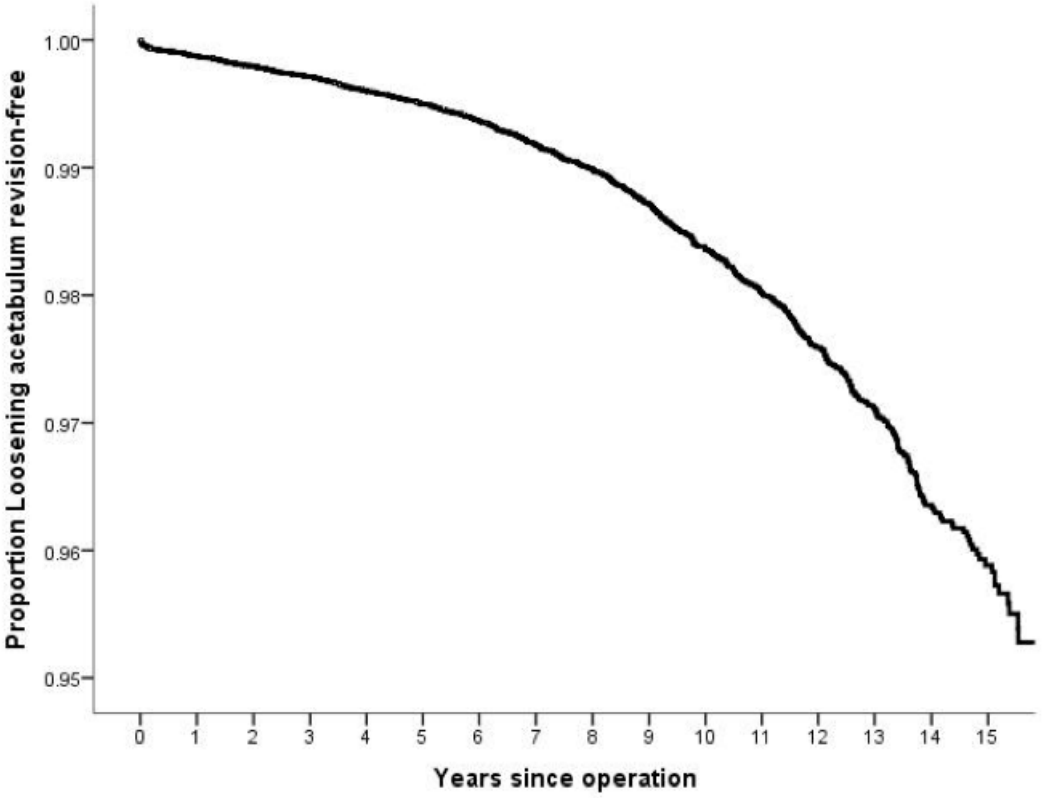
Deep infection



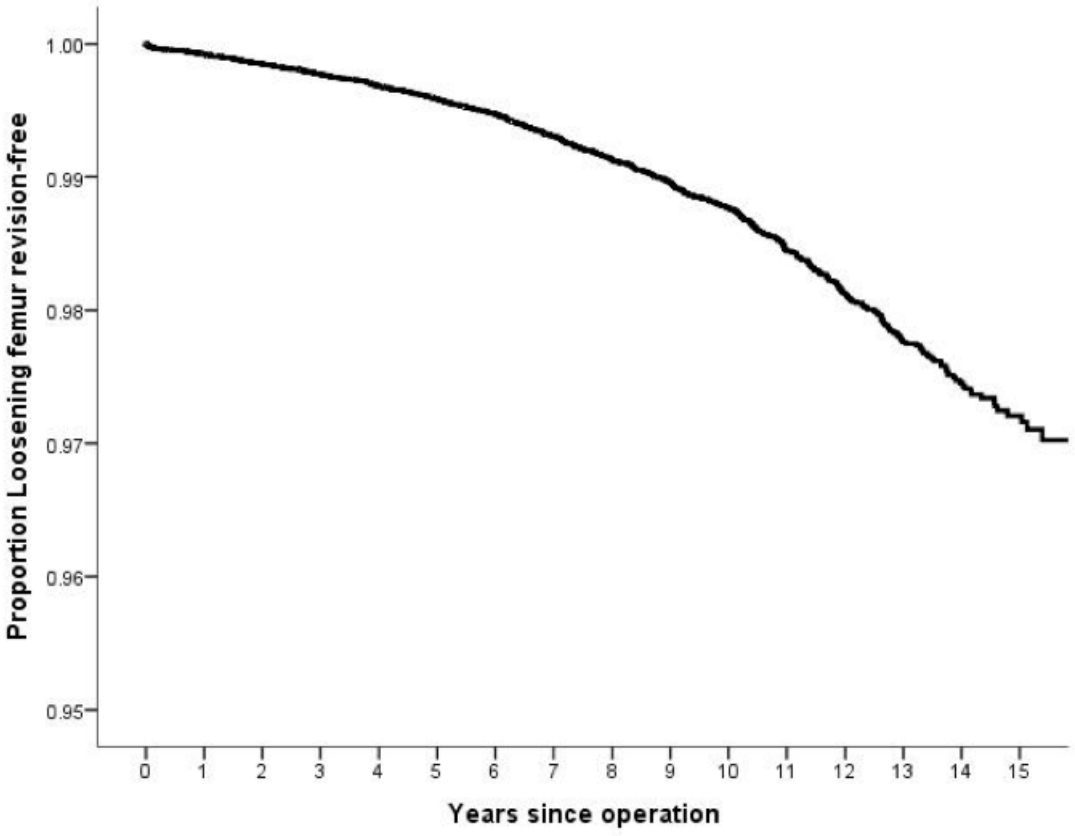
Dislocation



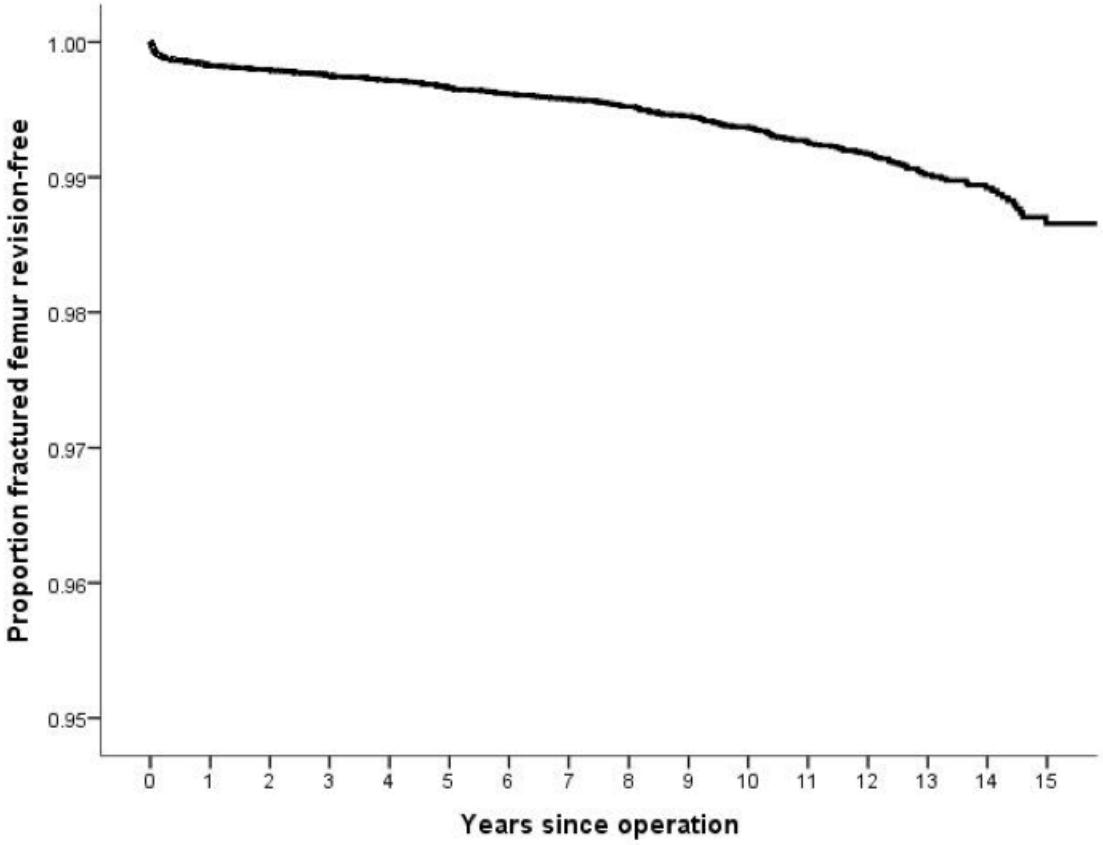
Loosening acetabular component



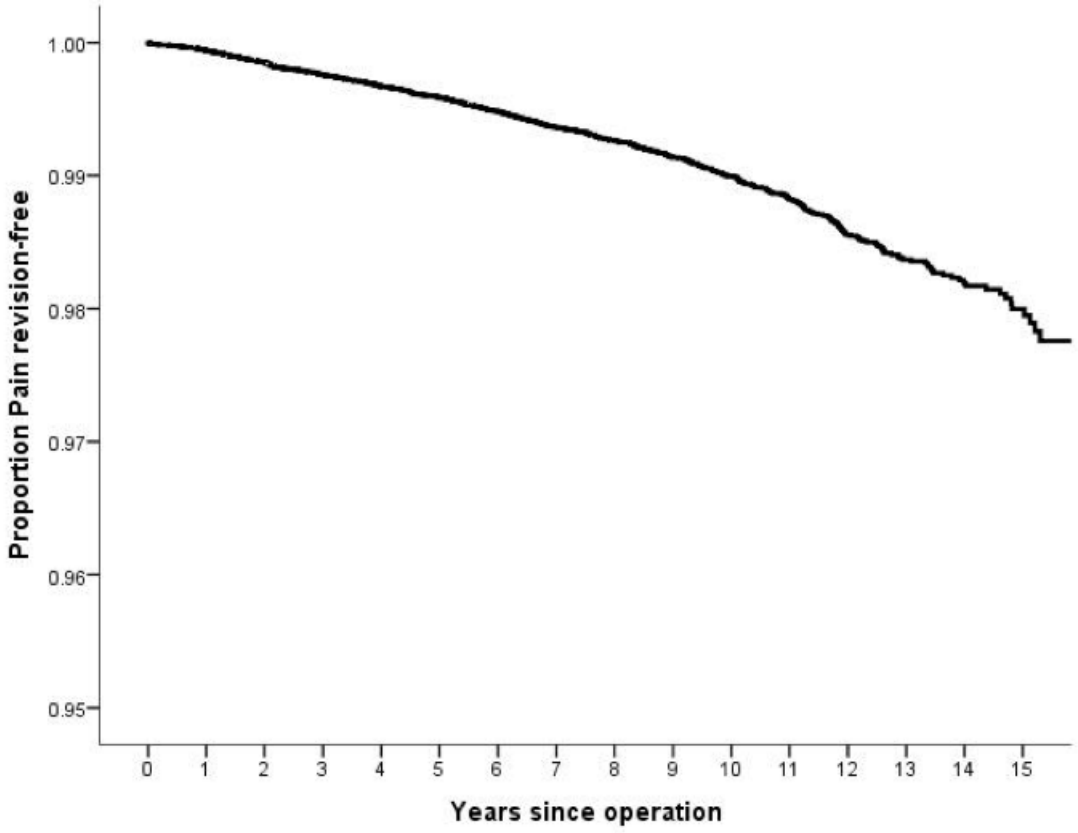
Loosening femoral component



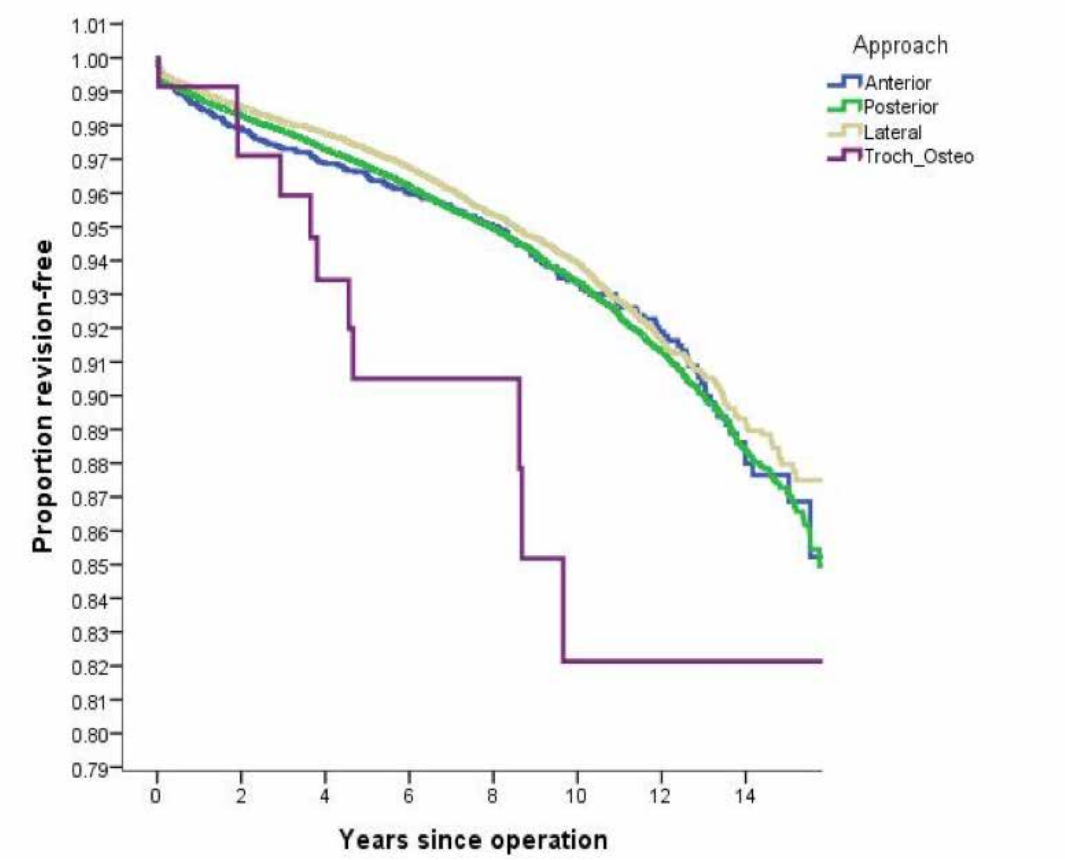
Fracture of femur



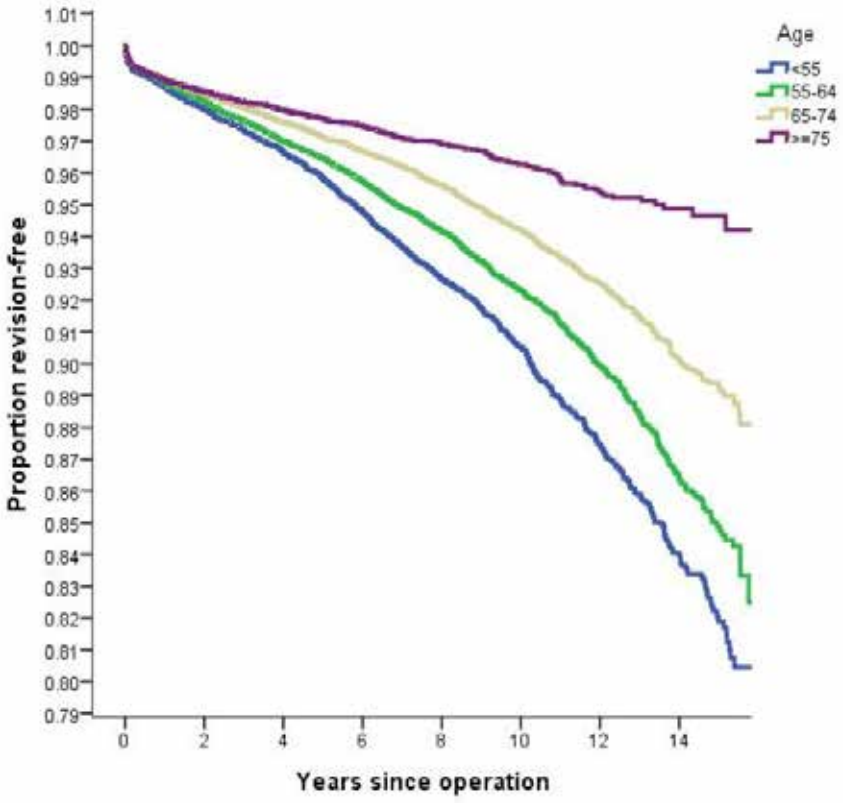
Pain



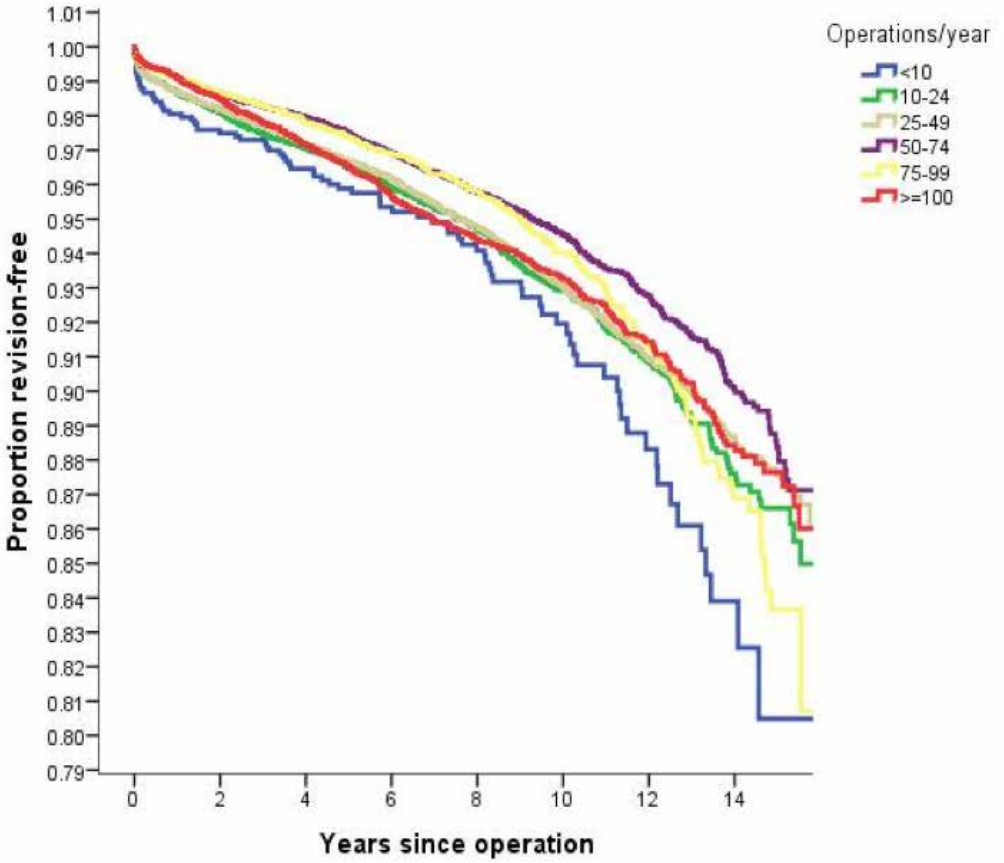
Survival for surgical approach



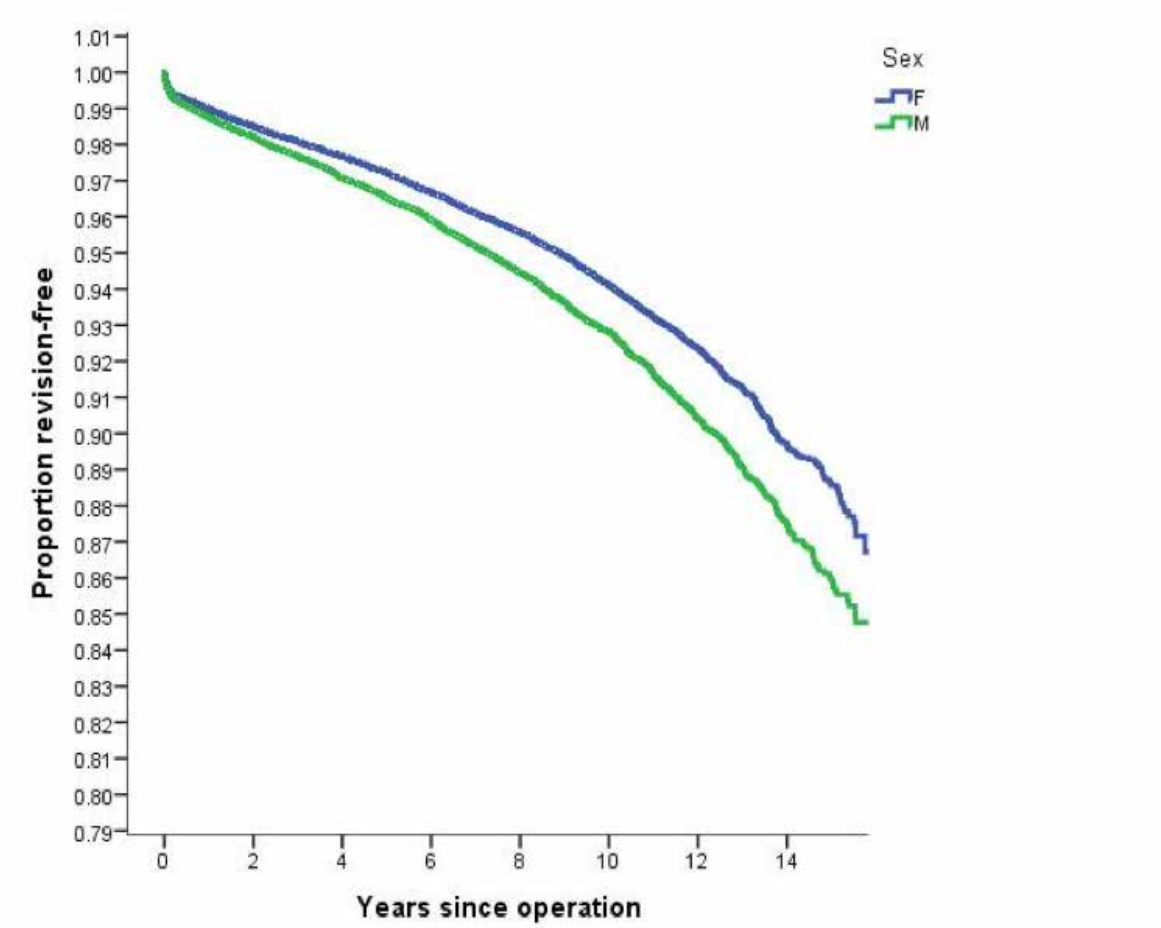
Survival for age bands



Survival for surgeon annual output



Survival male vs female



Re-revisions of conventional hips

Analysis was undertaken of hip re-revisions.

There were 592 registered conventional hip replacements that had been revised twice, 122 that had been revised three times, 32 that had been revised four times, five that had been revised five times and one that had been revised six times.

Second revision

Time between the first and second revisions averaged 748 days, with a range of 1 – 5,203 and a standard deviation of 940. This compares to an average of 1,764 days between the primary and first revision.

Reason for revision

Dislocation	184
Deep infection	165
Loosening femoral component	79
Loosening acetabulum component	68
Pain	66
Fracture femur	41

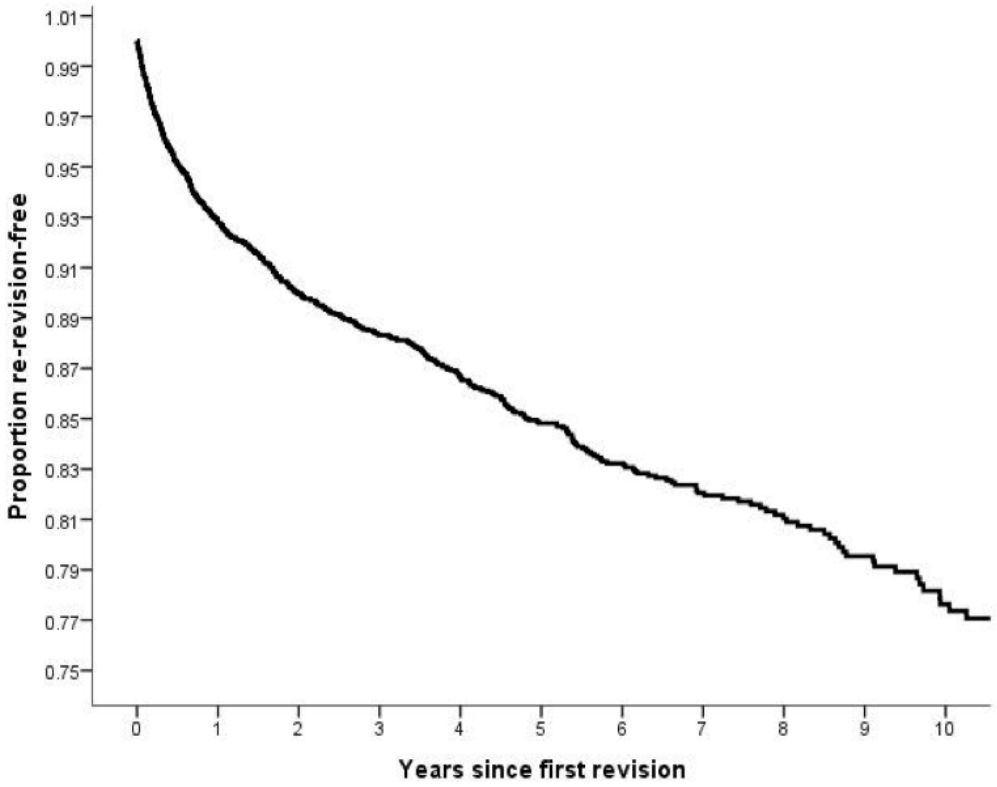
Revision

Change of head	386
Change of acetabulum	190
Change of liner	273
Change of femoral	160
Change of all	154

Re-revisions

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
4,470	17,440.1	592	3.39	3.13	3.68

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



Years	% re-revision free
1	92.80
2	90.00
3	88.30
4	86.70
5	84.80
6	83.20
7	82.10
8	81.00
9	79.50

Third revision

The average time between second and third revisions for the 122 arthroplasties was 606 days with a range of 1 – 4,451 and a standard deviation of 767.

Fourth revision

The average time between the third and fourth revisions for the 32 arthroplasties was 434 days, with a range of 7 – 3,111 and a standard deviation of 710 days.

Fifth revision

There were five registered, with an average time to revision of 277 days.

Sixth revision

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

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

Re- revisions of resurfacing hip replacements

There have been 21 re-revisions.

The average time between the first and second revisions was 581 days, with a range of 12 – 2,387 and a standard deviation of 5,738.

This compares with an average of 1,568 days between the primary resurfacing and the first revision.

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS, TEN YEARS AND 15 YEARS POST-SURGERY

Questionnaires at six months post-surgery

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

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

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

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

This groups each score into four categories:

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

For the sixteen year period, and as at July 2015, there were 28,152 primary hip questionnaire responses registered six months post-surgery. The mean hip score was 40.41 (standard deviation 7.67, range 48 – 2).

Scoring	> 41	15,989
Scoring	34 -41	7,640
Scoring	27 -33	2,689
Scoring	< 27	1,850

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 8,974 individual patients.

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

Questionnaires at ten years post-surgery

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

This dataset represents sequential Oxford hip scores for 5,736 individual patients.

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

Questionnaires at fifteen years post-surgery

All patients who had a six month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at 15 years post-surgery.

This dataset represents sequential Oxford hip scores for 680 individual patients.

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

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

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

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

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

Revision hip questionnaire responses

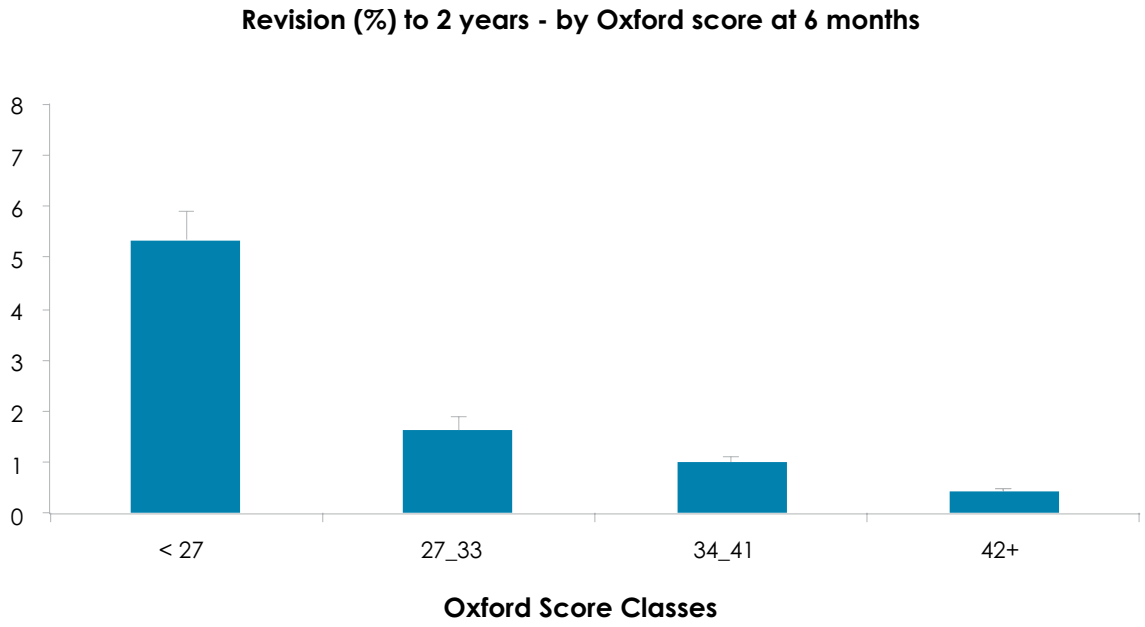
There were 7,412 revision hip responses with 65% achieving an excellent or good score. This group includes all revision hip procedures including revisions of primary arthroplasties performed prior to1999. The mean revision hip score was 35.65 (standard deviation 9.56, range 48 – 3).

OXFORD 12 SCORE AS A PREDICTOR OF HIP ARTHROPLASTY REVISION

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

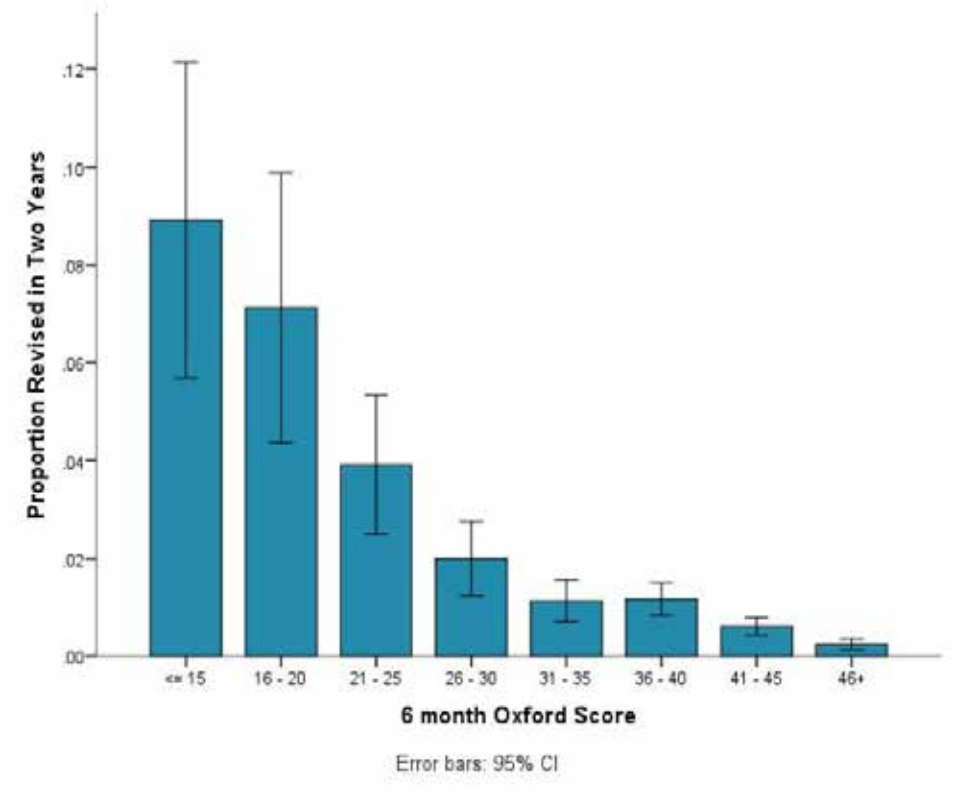


Revision risk versus Kalairajah groupings of Oxford scores within two years of the six month score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	1,552	83	5.35	0.57
27_33	2,224	36	1.62	0.27
34_41	6,433	64	0.99	0.12
42+	13,616	60	0.44	0.06

A person with a six month Oxford score >41 has a 0.44% risk of revision within two years compared to a 5.35% risk with a score of < 27.

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



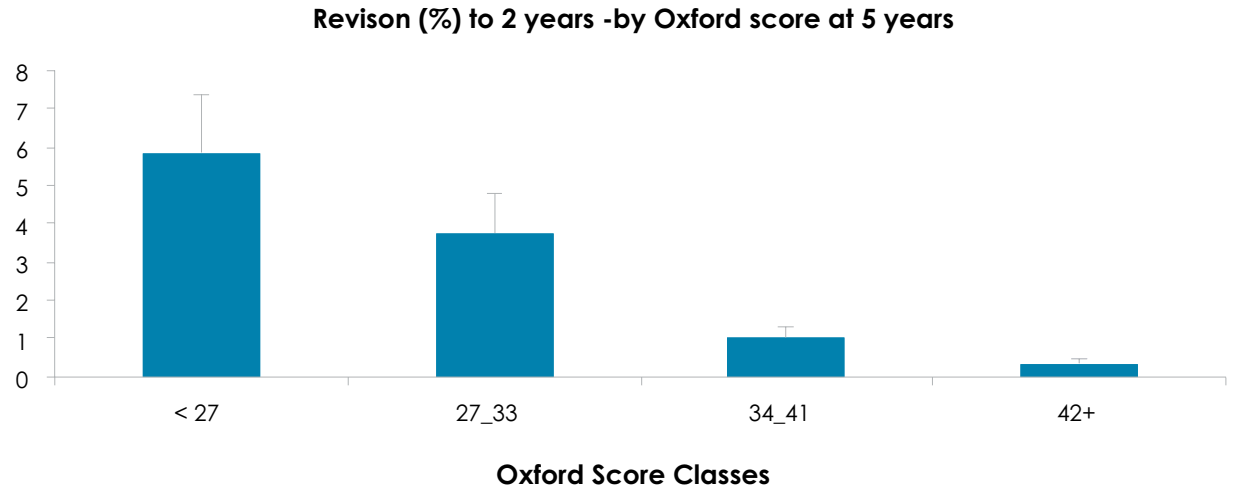
Revision risk versus groupings of Oxford scores within two years of the six month score date.

			Revision in 2 yrs		Total
			No	Yes	
Score 6 months	<= 15	Count	276	27	**303**
				8.9%	
	16 - 20	Count	313	24	**337**
				7.1%	
	21 - 25	Count	688	28	**716**
				3.9%	
	26 - 30	Count	1,276	26	**1302**
				2.0%	
	31 - 35	Count	2,281	26	**2307**
				1.1%	
	36 - 40	Count	3,984	47	**4031**
				1.2%	
	41 - 45	Count	7,507	46	**7553**
				0.6%	
	46+	Count	7,294	18	**7312**
				0.2%	
Total		**Count**	**23,619**	**242**	**23861**
				1.0%	

A person with a six month Oxford score >45 has a 0.20 % risk of revision within two years compared to an 8.90% (44.5x) risk with a score of <16.

Five year score and revision arthroplasty

As with the six month scores, plotting the patients' five year scores in the Kalairajah groupings against the proportion of hips revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 14.5 times the risk of a revision within two years compared to a person with a score >41.



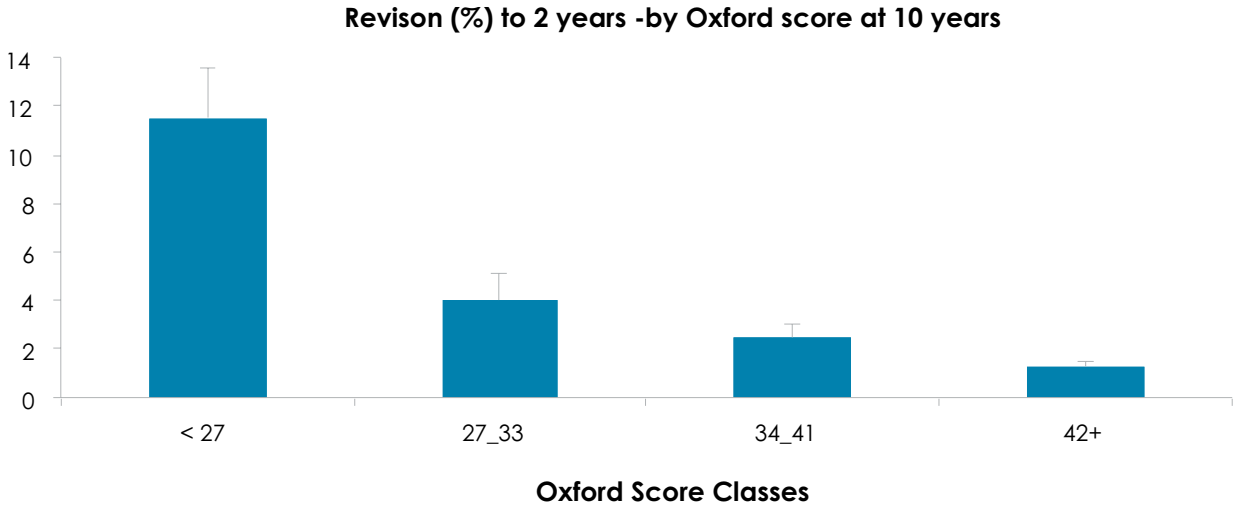
Revision risk versus Kalairajah groupings of Oxford scores within two years of the five year score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	264	16	6.06	1.47
27_33	385	13	3.38	0.92
34_41	1,139	12	1.05	0.30
42+	4,310	18	0.42	0.10

A person with a five year Oxford score >41 has a 0.42% risk of revision within two years compared to a 6.06% risk with a score <27.

Ten year score and revision arthroplasty

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

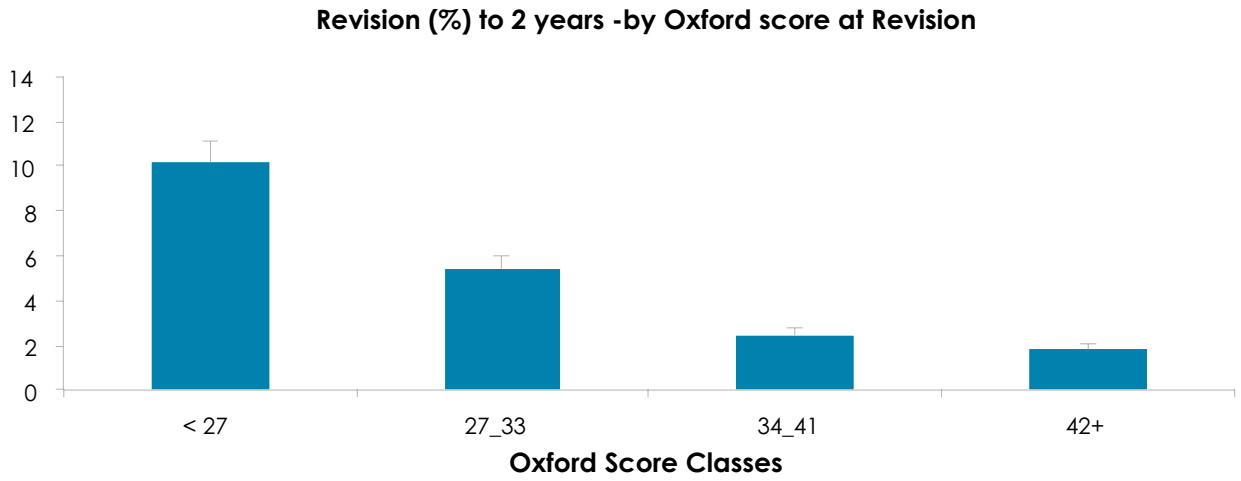


Revision risk versus Kalairajah groupings of Oxford scores within two years of the ten year score date.

Kalairajah Group	No in Group	No. revised	%	Std error
< 27	234	27	11.54	2.09
27_33	301	12	3.99	1.13
34_41	849	21	2.47	0.53
42+	2,805	36	1.28	0.21

A person with a 10 year Oxford score >41 has a 1.28% risk of revision within two years compared to an 11.54% risk with a score < 27.

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



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

Kalairajah Group	Revision to 2 yrs.	No. revised	%	Std error
< 27	1,075	109	10.14	0.92
27_33	1,081	58	5.37	0.69
34_41	1,958	48	2.45	0.35
42+	2,120	38	1.79	0.29

A person with a six month Oxford score >42 has a 1.79% risk of revision within two years compared to a 10.14% risk with a score < 27, which is is almost four times greater than for a primary hip.

KNEE ARTHROPLASTY

PRIMARY KNEE ARTHROPLASTY

The **sixteen-**year report analyses data for the period January The sixteen-year report analyses data for the period January 1999 – December 2014.There were 78,898 primary knee procedures registered, an additional 7,392 compared to last year's report representing a 4.3% increase over registrations in 2013 and 3 times the number registered in 1999.

The above total includes 356 patello-femoral prostheses with 64 registered in 2014 compared to 49 in 2013, a 30% increase.

1999	2,429
2000	3,014
2001	3,059
2002	2,896
2003	3,047
2004	4,103
2005	5,024
2006	5,157
2007	5,762
2008	5,604
2009	6,016
2010	6,089
2011	6,253
2012	6,346
2013	6,694
2014	7,392

Data Analysis

Age and sex distribution

The average age for a knee replacement was 68.29 years, with a range of 8.19 – 100.49 years.

All knee arthroplasty

	Female	Male
Number	40,783	38,115
Percentage	51.69	48.31
Mean age	68.63	67.92
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.83	9.36

Conventional knee arthroplasty

	Female	Male
Number	40,516	38,026
Percentage	51.59	48.41
Mean age	68.68	67.94
Maximum age	100.49	98.68
Minimum age	10.17	8.19
Standard dev.	9.80	9.35

Patello-femoral arthroplasty

	Female	Male
Number	267	89
Percentage	75.00	25.00
Mean age	60.19	59.36
Maximum age	87.75	83.70
Minimum age	31.15	31.20
Standard dev.	11.47	11.46

Body Mass Index

For the five-year period 2010 - 2014, there were 18,834 BMI registrations for primary knee replacements. The average was 31.18 (obese) with a range of 15 – 68.7 and a standard deviation of 6.01.

Previous operation

None	65,926
Menisectomy	8,134
Osteotomy	1,290
Ligament reconstruction	963
Internal fixation for juxtarticular fracture	609
Synovectomy	142

Diagnosis

Osteoarthritis	74,431
Rheumatoid arthritis	1,937
Post fracture	811
Other inflammatory	671
Post ligament disruption/reconstruction	531
Avascular necrosis	284
Tumour	76

Approach

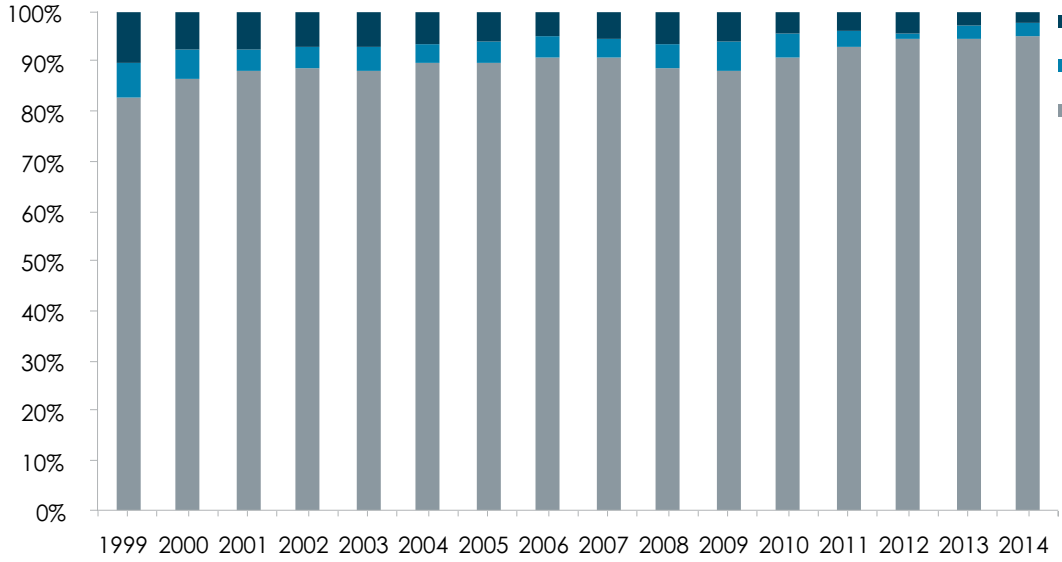
Medial parapatellar	71,279
Other	1,909
Lateral parapatellar	1,154
Image guided surgery	7,938
Minimally invasive surgery	156

Image guided surgery was added to the updated forms at the beginning of 2005 and in 2014 was used in 18% of primary arthroplasties.

Bone graft

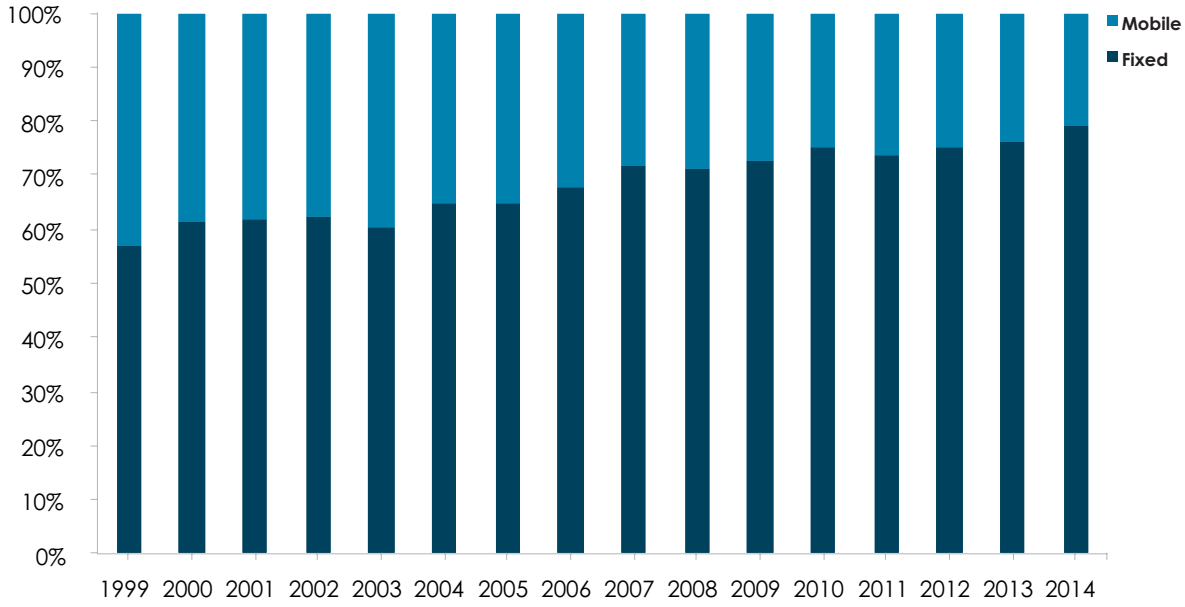
Femoral autograft	147
Femoral allograft	9
Femoral synthetic	6
Tibial autograft	84
Tibial allograft	19
Tibial synthetic	3

Comparison of proportions of cemented vs uncemented vs hybrid by year

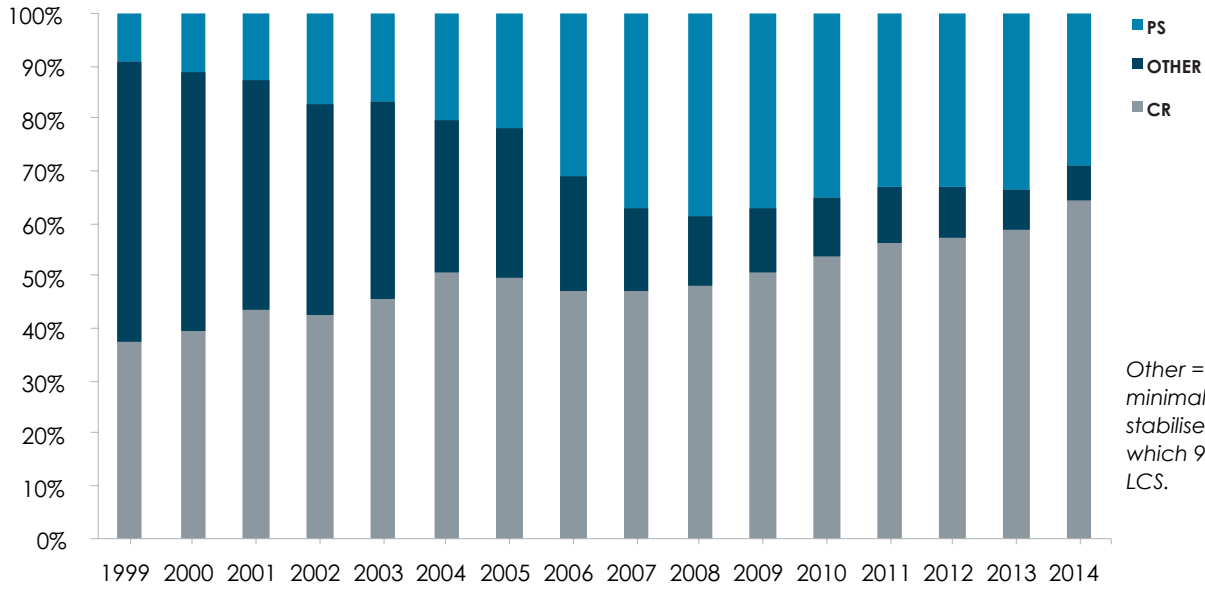


A hybrid knee has cemented tibia and uncemented femur.

Proportion of fixed vs mobile knees by year



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



Other = minimally stabilised of which 98% are LCS.

Cement

Femur cemented	72,007	91%
Antibiotic in cement	49,146	65%
Tibia cemented	74,989	95%
Antibiotic in cement	50,657	68%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	74,695	95%

A cephalosporin was used in 86% of arthroplasties.

Operating theatre

Conventional	43,561
Laminar flow	34,710
Space suits	25,741

In 2014, 50% of knee arthroplasties were performed in laminar flow theatres, up 1% from 2013 and space suits were used in 36%, down 1% from 2013

ASA Class

This was introduced with the updated forms at the beginning of 2005. For the ten-year period 2005 – 2014, there were 56,778 (94%) 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	6,550	12
2	36,185	63
3	13,796	24
4	247	1

Operative time (skin to skin in minutes)

Mean	83

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the ten-year period 2005 – 2014.

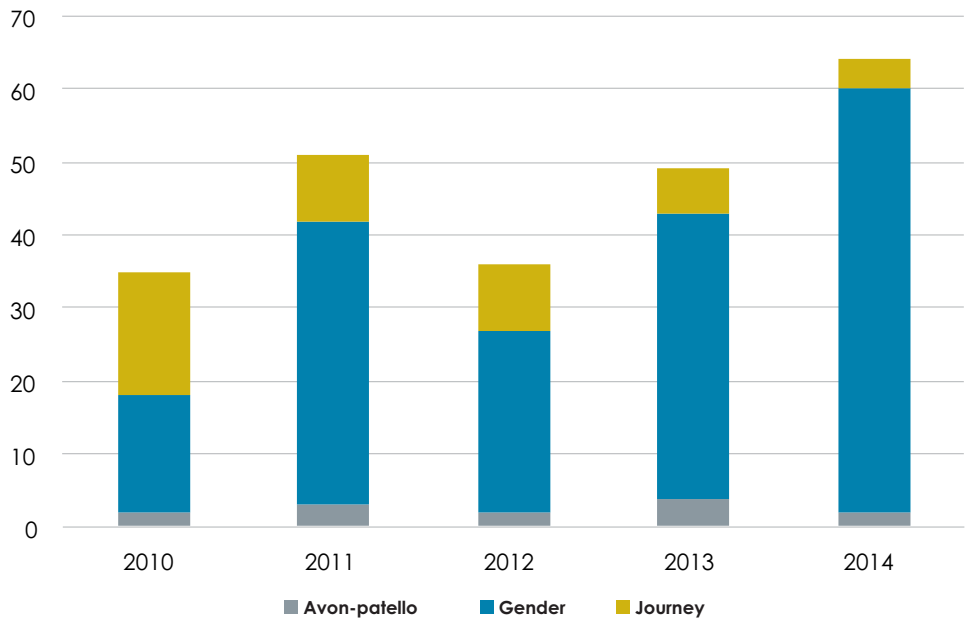
Consultant	52,773
Advanced trainee supervised	4,815
Basic trainee	1,283
Advanced trainee unsupervised	1,331

Prosthesis usage

Patello-femoral prostheses used in 2014

Gender	58
Journey	4
Avon patello	2

Patello - femoral prostheses used for 5 years 2010-2014



There are 356 patello-femoral procedures registered to 65 surgeons.

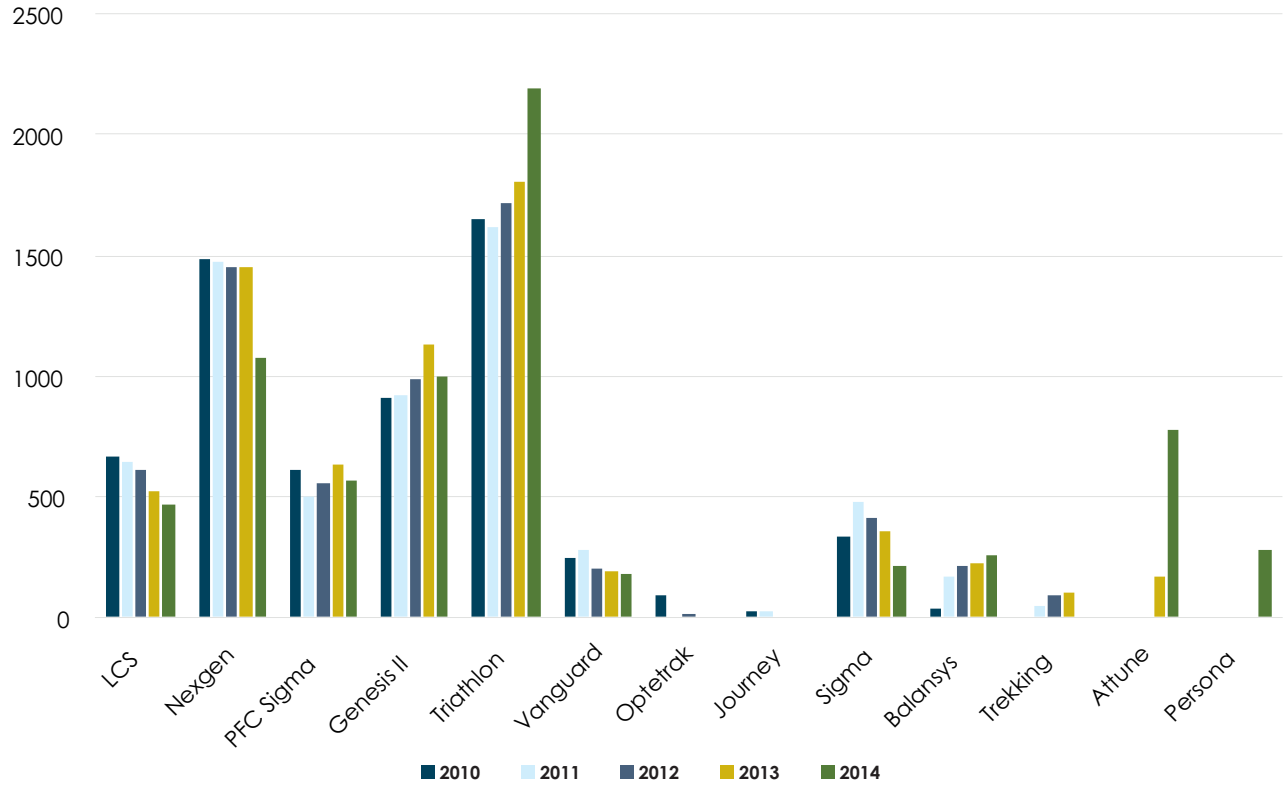
Conventional primary knees

Top 10 knee prostheses used in 2014

Triathlon	2,194
Nexgen	1,077
Genesis II	997
Attune	773
PFC Sigma	572
LCS	473
Persona	277
Balansys	260
Sigma	213
Vanguard	177

Persona has taken over Trekking from the 2013 list and Attune has climbed five places.

Most Used Knee Prostheses for 5 years (2010 – 2014)



Surgeon and hospital workload

Surgeons

In 2014, 223 surgeons performed 7,392 total knee replacements, an average of 33 procedures per surgeon.

51 surgeons performed less than 10 procedures and 58 performed more than 40.

Hospitals

In 2014 primary knee replacement was performed in 51 hospitals. 27 were public hospitals and 24 were private.

For 2014 the average number of total knee replacements per hospital was 145.

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 sixteen-year period from January 1999 to December 2014, there were 6,122 revision knee procedures registered. This is an additional 542 compared to last year's report.

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

Revision knees

	Female	Male
Number	2,940	3,182
Percentage	48.02	51.98
Mean age	69.94	69.27
Maximum age	95.80	98.39
Minimum age	10.57	15.49
Standard dev.	10.46	10.20

The percentage of revision knees to primary knees is 8%.

Body Mass Index

For the five-year period 2010 - 2014, there were 810 BMI registrations for revision knee replacements. The average BMI was 31.27(obese) with a range of 15 – 65 and a standard deviation of 6.19.

REVISION OF REGISTERED PRIMARY KNEE ARTHROPLASTIES

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

There were 2,242 revisions of the 78,542 primary conventional knee replacements (2.9%) and 30 revisions of the 356 patello-femoral prostheses (8.4%).

Conventional knee replacement analysis

Time to revision

Mean	1,260 days
Maximum	5,522 days
Minimum	1 day
Standard deviation	1,167 days

Reason for revision

Pain	672
Deep infection	579
Loosening tibial component	518
Patellar resurfacing	531
Loosening femoral component	259
Loosening patellar component	41
Fracture femur	34
Fracture tibia	32

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

Analysis by time of the 5 main reasons for revision

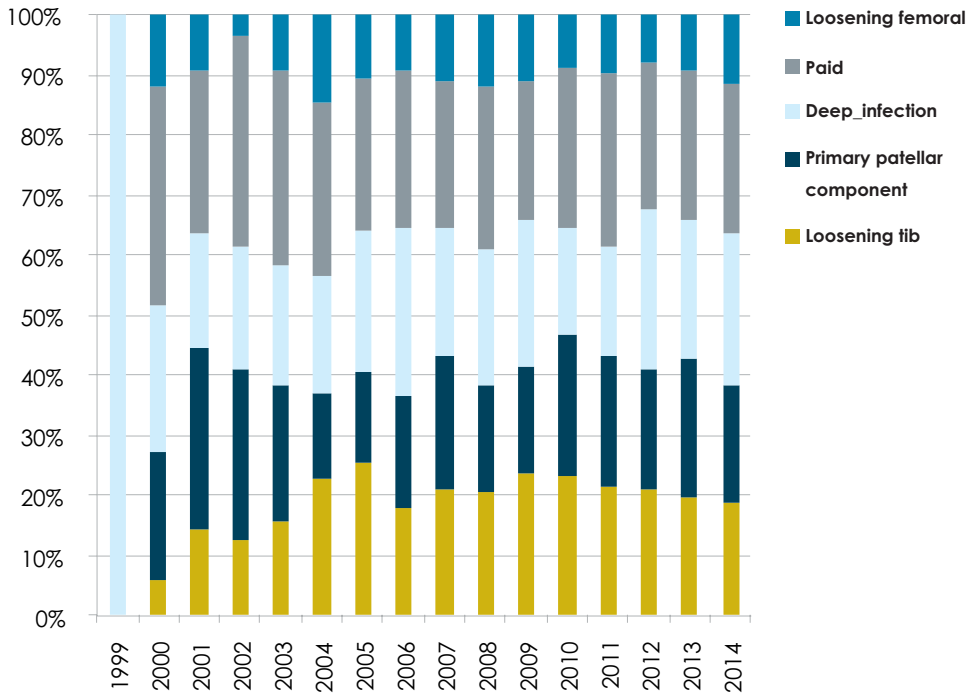
	Loosening tibial component		Primary patellar component		Deep infection		Pain		Loosening femoral	
Years	Count	%	Count	%	Count	%	Count	%	Count	%
0	34	6.60	82	15.40	226	39.00	106	15.80	14	5.40
1	59	11.40	167	31.50	118	20.30	194	28.90	30	11.60
2	72	13.90	90	16.90	68	11.70	111	16.50	23	8.90
3	66	12.70	62	11.70	54	9.30	71	10.60	22	8.50
4	57	11.00	38	7.20	26	4.50	49	7.30	34	13.10
5	45	8.70	18	3.40	22	3.80	32	4.80	20	7.70
6	47	9.10	14	2.60	21	3.60	20	3.00	24	9.30
7	35	6.80	13	2.40	15	2.60	19	2.80	21	8.10
8	22	4.20	8	1.50	7	1.20	15	2.20	16	6.20
9	31	6.00	9	1.70	8	1.40	11	1.60	17	6.60
10	15	2.90	13	2.40	6	1.00	19	2.80	10	3.90
11	17	3.30	11	2.10	5	0.90	8	1.20	15	5.80
12	10	1.90	4	0.80	1	0.20	9	1.30	6	2.30
13	3	0.60	1	0.20	1	0.20	3	0.40	4	1.50
14	5	1.00	1	0.20	0	0.00	5	0.70	3	1.20
15	0	0.00	0	0.00	1	0.20	0	0.00	0	0.00

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

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

	Loosening tibial component	Primary patellar component	Deep infection	Pain	Loosening femoral component
Years	**%**	**%**	**%**	**%**	**%**
1999	0.00	0.00	50.00	0.00	0.00
2000	6.50	22.60	25.80	38.70	12.90
2001	16.10	33.90	21.40	30.40	10.70
2002	16.70	38.30	26.70	46.70	5.00
2003	20.00	29.30	25.30	41.30	12.00
2004	26.20	16.70	22.60	33.30	16.70
2005	27.60	16.20	25.70	27.60	11.40
2006	19.30	20.20	30.30	28.40	10.10
2007	24.20	25.80	24.20	28.00	12.90
2008	22.70	20.00	25.40	29.70	13.50
2009	27.20	20.40	28.30	26.70	12.60
2010	26.10	26.60	19.70	30.00	9.90
2011	24.20	24.70	20.50	32.60	11.20
2012	23.10	22.20	29.50	26.90	9.00
2013	23.30	27.80	27.40	29.30	11.30
2014	21.70	22.10	29.00	27.90	13.40

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



Patello-Femoral Arthroplasty

Revision of patello-femoral knees

Of the 356 registered, 30 have been revised.

Time to revision

Average	1,508 days
Maximum	4,344 days
Minimum	108 days
Standard deviation	1,187 day

Reason for revision

Pain	11
Loosening patellar	2
Deep infection	2
Other	11

Patellar resurfacing

67 % of the 78,542 registered conventional primary knees did not have the patella resurfaced and 33% were resurfaced. Of the group that was not resurfaced, 529 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 Total Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
78,542	456,153.7	2,242	0.49	0.47	0.51

Revision Rate of Individual Knee Prostheses Sorted by Number of Arthroplasties

(Minimum of 50 arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Nexgen	16,950	98,020.8	521	0.53	0.49	0.58
Triathlon	13,669	50,502.9	212	0.42	0.37	0.48
LCS	13,372	102,086.9	525	0.51	0.47	0.56
Genesis II	11,085	59,809.3	297	0.50	0.44	0.56
PFC Sigma	9,485	59,877.7	234	0.39	0.34	0.44
Duracon	4,213	39,657.1	120	0.30	0.25	0.36
Vanguard	1,400	4,667.0	33	0.71	0.49	0.99
Sigma	958	2,248.6	16	0.71	0.41	1.16
Attune	946	532.6	3	0.56	0.12	1.65
Sigma CR150	920	2,604.8	14	0.54	0.29	0.90
Balansys	908	1,742.3	13	0.75	0.40	1.28
Scorpio	852	7,593.3	55	0.72	0.55	0.94
Maxim	822	7,938.2	41	0.52	0.37	0.70

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Optetrak	660	3,867.0	34	0.88	0.61	1.23
AGC	376	3,895.5	15	0.39	0.22	0.64
Trekking	362	604.8	3	0.50	0.10	1.45
Persona	295	123.4	3	2.43	0.50	7.11
MBK	256	2,877.0	16	0.56	0.32	0.90
Insall/Burstein	249	2,652.8	46	1.73	1.27	2.31
Journey	171	608.3	5	0.82	0.27	1.92
Advance	157	1,506.3	5	0.33	0.11	0.77
Legion	103	153.7	2	1.30	0.16	4.70
AMK	95	1,140.4	2	0.18	0.02	0.63
ROCC	66	443.6	5	1.13	0.37	2.63

There are 48 different types of knee prostheses in the Registry with 19 (40%) with less than 10 registrations.

Revision Rate of Individual Knee Prostheses Sorted by Revision Rate

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Persona	295	123.4	3	2.43	0.50	7.11
Insall/Burstein	249	2,652.8	46	1.73	1.27	2.31
Legion	103	153.7	2	1.30	0.16	4.70
ROCC	66	443.6	5	1.13	0.37	2.63
Optetrak	660	3,867.0	34	0.88	0.61	1.23
Journey	171	608.3	5	0.82	0.27	1.92
Balansys	908	1,742.3	13	0.75	0.40	1.28
Scorpio	852	7,593.3	55	0.72	0.55	0.94
Sigma	958	2,248.6	16	0.71	0.41	1.16
Vanguard	1,400	4,667.0	33	0.71	0.49	0.99
Attune	946	532.6	3	0.56	0.12	1.65
MBK	256	2,877.0	16	0.56	0.32	0.90
Sigma CR150	920	2,604.8	14	0.54	0.29	0.90
Nexgen	16,950	98,020.8	521	0.53	0.49	0.58
Maxim	822	7,938.2	41	0.52	0.37	0.70
LCS	13,372	102,086.9	525	0.51	0.47	0.56
Genesis II	11,085	59,809.3	297	0.50	0.44	0.56
Trekking	362	604.8	3	0.50	0.10	1.45
Triathlon	13,669	50,502.9	212	0.42	0.37	0.48
PFC Sigma	9,485	59,877.7	234	0.39	0.34	0.44
AGC	376	3,895.5	15	0.39	0.22	0.64
Advance	157	1,506.3	5	0.33	0.11	0.77
Duracon	4,213	39,657.1	120	0.30	0.25	0.36
AMK	95	1,140.4	2	0.18	0.02	0.63

The Insall/Burstein and Optetrak are the only knee prostheses that have significantly higher revision rates than the overall rate of 0.49/100 ocys @ the 95% confidence interval. Neither was registered in 2014.

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	71,283	406,726.3	1,922	0.47	0.45	0.49
Uncemented	3,150	20,895.5	172	0.82	0.70	0.96
Hybrid	41,09	28,531.9	148	0.52	0.44	0.61

The uncemented knees have a significantly higher revision rate than the other two variants.

Hybrid Knee: tibia cemented, femur uncemented

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

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

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Persona	293	122.5	3	2.45	0.50	7.16
Insall/Burstein	249	2,652.8	46	1.73	1.27	2.31
Legion	103	153.7	2	1.30	0.16	4.70
Optetrak	281	1,740.9	20	1.15	0.70	1.77
Journey	171	608.3	5	0.82	0.27	1.92
Balansys	908	1,742.3	13	0.75	0.40	1.28
Scorpio	852	7,593.3	55	0.72	0.55	0.94
Vanguard	1,387	4,616.6	32	0.69	0.47	0.98
Sigma	881	1,944.1	13	0.67	0.36	1.14
MBK	247	2,784.5	16	0.57	0.33	0.93
Attune	946	532.6	3	0.56	0.12	1.65
Sigma CR150	919	2,604.2	14	0.54	0.29	0.90
Maxim	822	7,938.2	41	0.52	0.37	0.70
Trekking	362	604.8	3	0.50	0.10	1.45
Genesis II	11,032	59,308.0	293	0.49	0.44	0.55
Nexgen	16,173	93,232.2	502	0.42	0.36	0.50
LCS	9,032	72,453.6	302	0.42	0.37	0.47
Triathlon	13,512	49,666.5	207	0.42	0.36	0.48
AGC	376	3,895.5	15	0.39	0.22	0.64
PFC Sigma	8,880	56,855.8	214	0.38	0.33	0.43
Advance	157	1,506.3	5	0.33	0.11	0.77
	3,432	31,921.8	98	0.31	0.25	0.37
AMK	95	1,140.4	2	0.18	0.02	0.63

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

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

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Sigma	77	304.5	3	0.99	0.20	2.88
PFC Sigma	598	2,980.8	20	0.67	0.41	1.04
Triathlon	155	825.7	5	0.61	0.20	1.41
Genesis II	51	495.9	3	0.61	0.12	1.77
LCS	1,960	14,439.3	73	0.51	0.40	0.64
Optetrak	379	2,126.1	14	0.49	0.21	0.97
Duracon	321	3,534.4	14	0.40	0.22	0.66
Nexgen	528	3,620.5	12	0.33	0.17	0.58

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

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

(Minimum of 50 primary registered arthroplasties)

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LCS	2,380	15,193.9	150	0.99	0.84	1.16
Nexgen	249	1,168.1	7	0.60	0.24	1.23
Duracon	460	4,200.9	8	0.19	0.08	0.38

The uncemented LCS prosthesis (179 implanted in 2014) has a significantly higher revision rate than the overall rate of 0.50/100 ocys at the 95% confidence.

Revision Rates for Fixed vs Mobile Bearing Knees

Prosthesis	Fixed/ Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
AGC	Fixed	376	3,895.5	15	0.39	0.22	0.64
AMK	Fixed	95	1,140.4	2	0.18	0.02	0.63
Balansys	Fixed	905	1,739.6	13	0.75	0.40	1.28
Duracon	Fixed	4,207	39,590.7	119	0.30	0.25	0.36
Genesis II	Fixed	11,083	59,808.4	297	0.50	0.44	0.56
Insall/Burstein	Fixed	249	2,652.8	46	1.73	1.27	2.31
Journey	Fixed	143	597.4	5	0.84	0.27	1.95
LCS	Mobile	13,372	102,086.9	525	0.51	0.47	0.56
Maxim	Fixed	822	7,938.2	41	0.52	0.37	0.70
MBK	Mobile	256	2,877.0	16	0.56	0.32	0.90
Trekking	Mobile	362	604.8	3	0.50	0.10	1.45
Persona	Fixed	295	123.4	3	2.43	0.50	7.11
Nexgen	Fixed	14,082	83,525.9	452	0.54	0.49	0.59
	Mobile	2,669	13,650.9	62	0.45	0.35	0.58
PFC Sigma	Fixed	5,464	37,576.9	150	0.40	0.34	0.47
	Mobile	3,419	21,562.0	82	0.38	0.30	0.47
Scorpio	Fixed	737	6,602.3	47	0.71	0.52	0.95

Prosthesis	Fixed/ Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
	Mobile	104	928.0	5	0.54	0.17	1.26
Sigma	Fixed	239	669.8	6	0.90	0.33	1.95
	Mobile	612	1,435.9	9	0.63	0.29	1.19
Sigma CR150	Fixed	172	559.7	5	0.89	0.29	2.08
	Mobile	734	2,031.4	9	0.44	0.20	0.84
Triathlon	Fixed	13,290	48,961.8	206	0.42	0.37	0.48
	Mobile	277	1,276.0	5	0.39	0.13	0.91
Attune	Fixed	470	221.5	1	0.45	0.01	2.52
	Mobile	475	310.6	2	0.64	0.08	2.33

Just the Insall/Burstein and the fixed version of the Scorpio have a significantly higher revision rate than the overall rate of 0.49/100 ocys at the 95% confidence.

Overall Revision Rates for Fixed vs Mobile Bearing Knees

Prosthe Fixed/Mobile	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Fixed	52,639	295,624.5	1,409	0.48	0.45	0.50
Mobile	22,290	146,796.6	718	0.49	0.45	0.53

For the second year in a row there is not a significantly higher revision rate for mobile bearing knees when compared to fixed bearing knees. It was not possible to determine fixed or mobile categories for all registered knees, which accounts for the 3,613 shortfall in the total number.

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

Prosthesis	CR/PS	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
AGC	PS	28	320.0	3	0.94	0.19	2.74
Insall/Burstein	PS	249	2,652.8	46	1.73	1.27	2.31
LCS	PS	67	241.1	0	0.00	0.00	1.53
Legion	PS	62	88.0	1	1.14	0.03	6.33
Sigma CR150	CR	920	2,604.8	14	0.54	0.29	0.90
Attune	CR	687	410.3	3	0.73	0.15	2.14
	PS	256	121.9	0	0.00	0.00	3.03
Balansys	CR	853	1,665.5	12	0.72	0.37	1.26
	PS	52	74.0	1	1.35	0.03	7.53
Genesis II	CR	5,879	38,053.9	146	0.38	0.32	0.45
	PS	5,198	21,707.1	151	0.70	0.59	0.82
Maxim	CR	657	6,277.4	30	0.48	0.32	0.68
	PS	165	1,660.8	11	0.66	0.33	1.19
Nexgen	CR	7,560	46,806.2	195	0.42	0.36	0.48
	PS	9,189	50,515.6	313	0.62	0.55	0.69
Optetrak	CR	436	2,539.3	15	0.59	0.33	0.97
	PS	224	1,327.6	19	1.43	0.86	2.23

Prosthesis	CR/PS	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Persona	CR	98	30.0	2	6.66	0.81	24.05
	PS	196	93.2	1	1.07	0.03	5.98
PFC Sigma	CR	7,530	47,079.3	159	0.34	0.29	0.39
	PS	1,888	12,465.7	73	0.59	0.46	0.74
Scorpio	CR	739	6,693.3	46	0.69	0.50	0.92
	PS	111	888.0	9	1.01	0.46	1.92
Sigma	CR	121	253.6	0	0.00	0.00	1.45
	PS	836	1,993.8	16	0.80	0.46	1.30
Trekking	CR	141	242.8	2	0.82	0.10	2.98
	PS	221	361.9	1	0.28	0.01	1.54
Triathlon	CR	11,324	40,366.1	168	0.42	0.36	0.48
	PS	2,340	10,127.5	44	0.43	0.32	0.58
Vanguard	CR	968	3,505.3	19	0.54	0.33	0.85
	PS	428	1,156.9	14	1.21	0.66	2.03

The Insall/Burstein, Nexgen PS, Genesis11 PS and the Optetrak PS have significantly higher revision rates than the overall rate of 0.49/100 ocys at the 95% confidence.

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

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
CR	37,913	196,528.0	811	0.41	0.38	0.44
MS	13,626	105,165.9	546	0.52	0.48	0.56
PS	21,513	105,817.6	703	0.66	0.62	0.72

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

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	71,283	406,726.3	1,922	0.47	0.45	0.49
Uncemented	3,150	20,895.5	172	0.82	0.70	0.96
Hybrid	4,109	28,531.9	148	0.52	0.44	0.61

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

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	6,658	39,918.3	394	0.99	0.89	1.09
55_64	21,576	126,838.3	803	0.63	0.59	0.68
65_74	29,870	175,005.7	759	0.43	0.40	0.47
>74	20,438	114,391.4	286	0.25	0.22	0.28

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

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	40,516	239,610.4	1,083	0.45	0.43	0.48
Male	38,026	216,543.4	1,159	0.54	0.50	0.57

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

Revision by Age Bands vs Arthroplasty Fixation

Cemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	5,596	32,284.9	295	0.91	0.81	1.02
55_64	19,199	110,028.1	680	0.62	0.57	0.67
65_74	27,475	158,707.6	690	0.43	0.40	0.47
>74	19,013	105,705.7	257	0.24	0.21	0.27

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

Uncemented	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	548	4,252.5	64	1.51	1.16	1.92
55_64	1,089	7,617.5	70	0.92	0.72	1.16
65_74	994	6,192.2	31	0.50	0.34	0.71
>74	519	2,833.4	7	0.25	0.10	0.51

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

Hybrid	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<55	514	3,381.0	35	1.04	0.72	1.44
55_64	1,288	9,192.7	53	0.58	0.43	0.75
65_74	1,401	10,105.9	38	0.38	0.27	0.52
>74	906	5,852.4	22	0.38	0.24	0.57

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

Revision vs Approach

Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Medial	70,875	407,845.2	1,976	0.48	0.46	0.51
Lateral	1,140	7,702.2	50	0.65	0.48	0.86
Other	1,824	12,097.5	47	0.39	0.29	0.52

There is no significant difference among the three approaches.

Revision vs Image Guidance

Image Guided	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
No	70,608	426,750.4	2,092	0.49	0.47	0.51
Yes	7,934	29,403.4	150	0.51	0.43	0.60

There is no significant difference between the two groups.

Revision vs Surgeon Annual Output

Operations per year	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	1,788	12,192.3	60	0.49	0.38	0.63
10_25	17,402	106,534.9	561	0.53	0.48	0.57
26_50	37,473	219,999.1	1,065	0.48	0.46	0.51
51_75	12,672	67,753.1	327	0.48	0.43	0.54
76_100	7,127	39,546.3	191	0.48	0.42	0.56
>100	2,068	10,053.6	38	0.38	0.27	0.52

There is no significant difference among the groups.

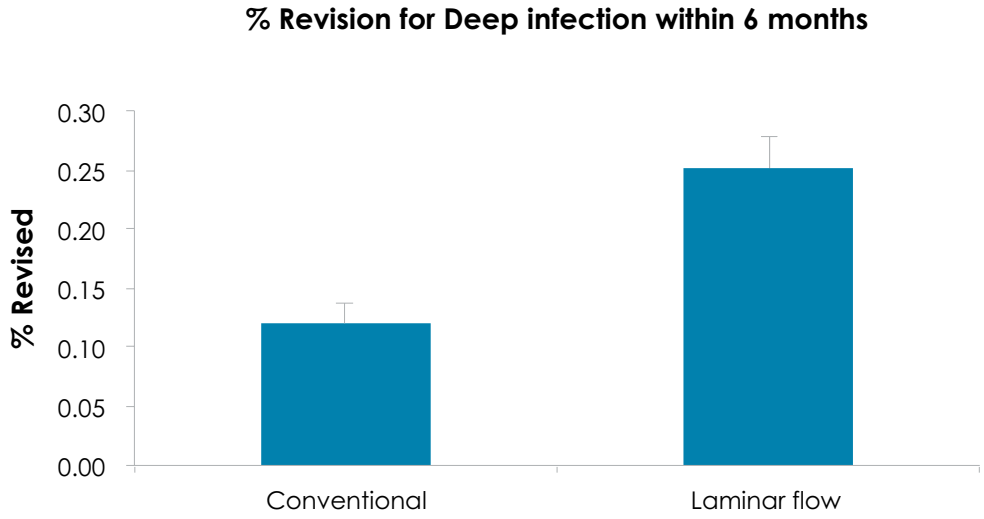
Revision vs ASA Status

ASA Class	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
1	6,459	27,637.8	151	0.55	0.46	0.64
2	36,001	151,911.8	791	0.52	0.49	0.56
3	13,760	55,885.5	312	0.56	0.50	0.62
4	247	909.7	6	0.66	0.24	1.44

There is no significant difference among the four classes.

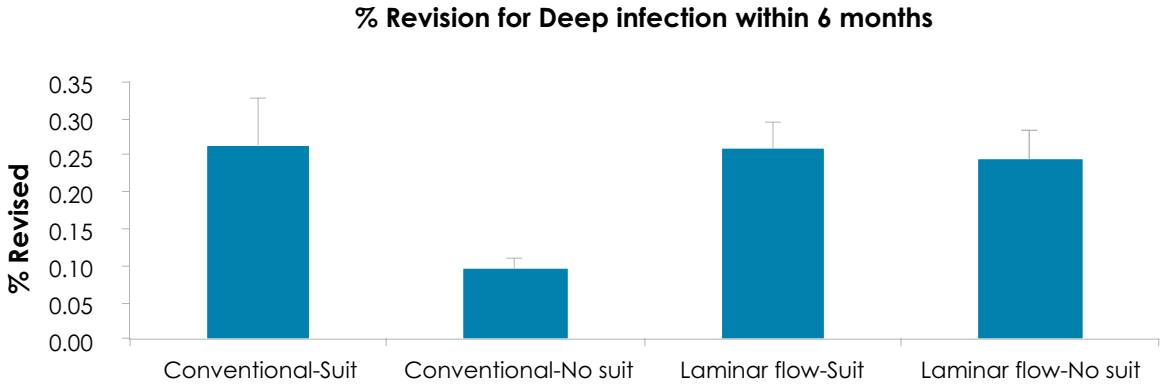
Revision for Deep Infection within 6months versus Theatre Environment

Theatre Environment	Total Number	Number Revised	%	Std Error
Conventional	41,133	49	0.119	0.017
Laminar	32,649	82	0.251	0.028



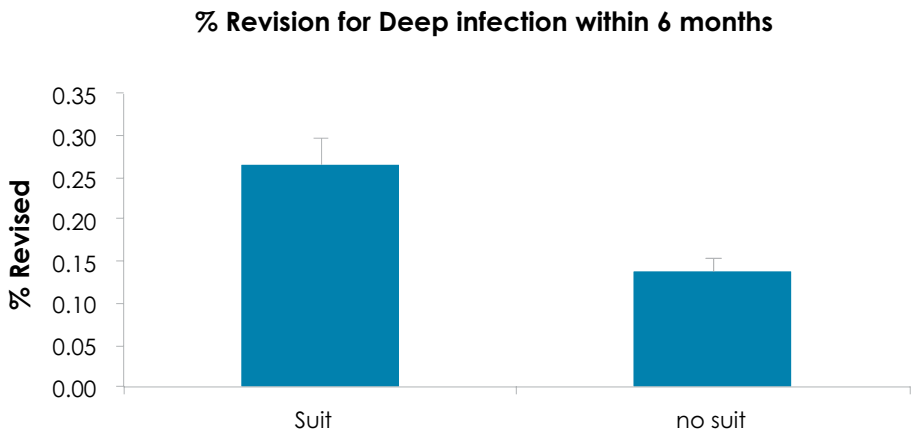
As with hip arthroplasty there is a significant difference in knee revision rates (2x) for deep infection within six months of surgery between conventional and laminar flow theatres.

Theatre Environment	Suit/No Suit	Total Number	Number	%	Std Error
Conventional	Suit	6,081	16	0.263	0.066
	no suit	35,052	33	0.094	0.016
Laminar flow	Suit	17,803	46	0.258	0.038
	no suit	14,846	36	0.243	0.040



There is a significant difference in the revision rates between conventional/no suit and the conventional/suit (2.8 x) and laminar /suit (2.7x) environments.

	Total Number	Number Revised	%	Std Error
Suit	24,170	64	0.265	0.033
no suit	50,321	69	0.137	0.017

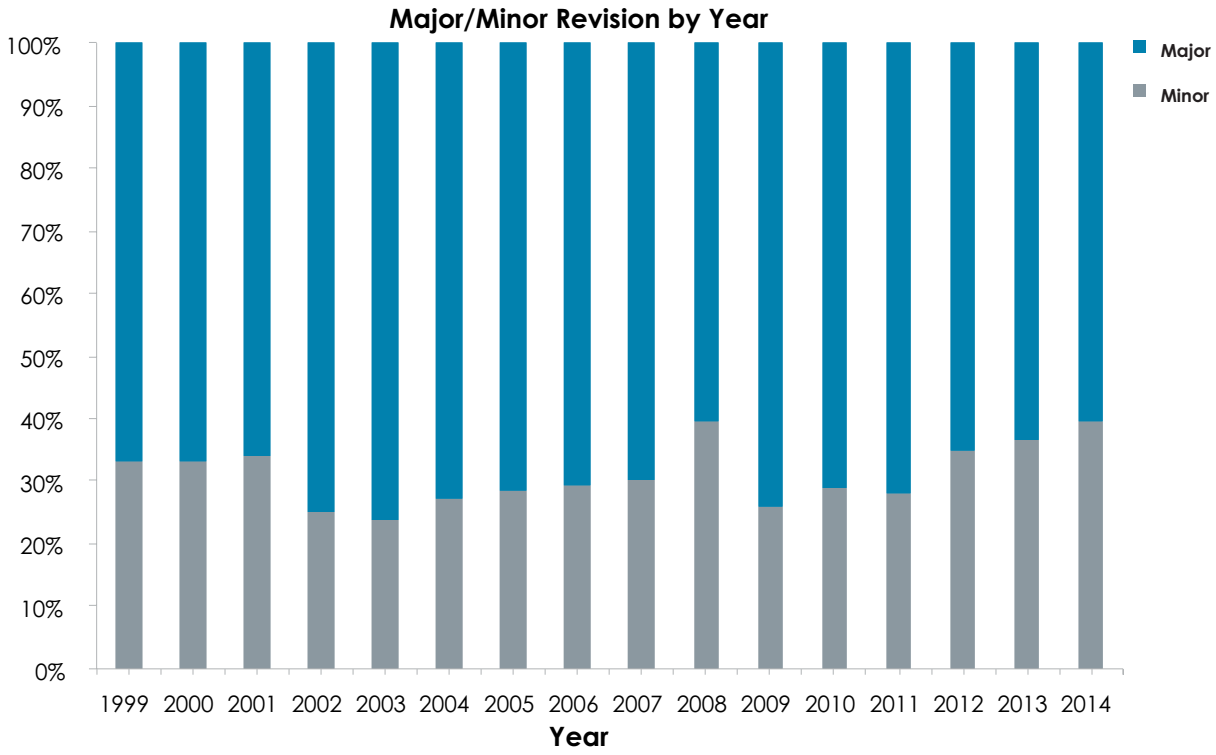


Furthermore there is a significant increase in revision rates (2 x) when suits are used in either conventional or laminar flow theatres.

From the above data it would seem that, similar to hip arthroplasty, the use of space suits significantly increases the risk of deep infection within the first 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.



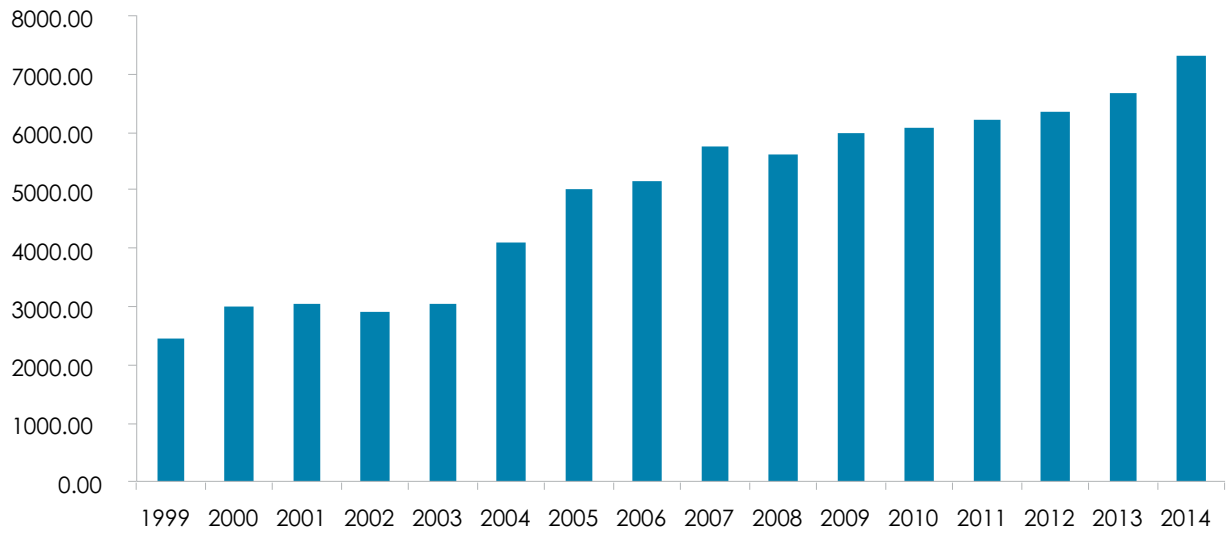
Re revisions for major vs minor knee revisions

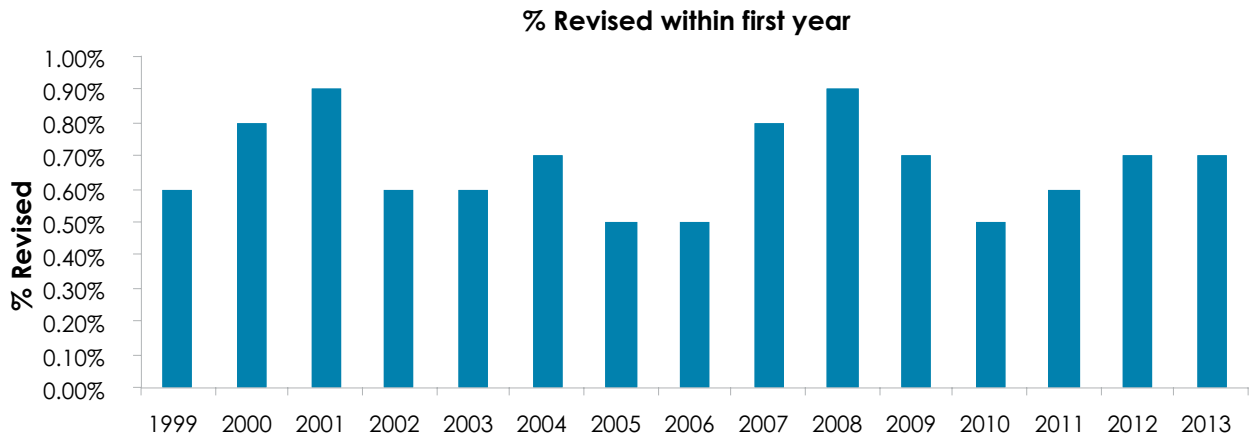
Major/Minor	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Minor	591	2,214.0	102	4.61	3.76	5.59
Major	1,236	5,324.0	158	2.97	2.52	3.47

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

Percentage of Knees Revised in the First Year

Number of operations by year





Patello-Femoral Arthroplasty

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
356	1,415.3	30	2.12	1.43	3.03

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

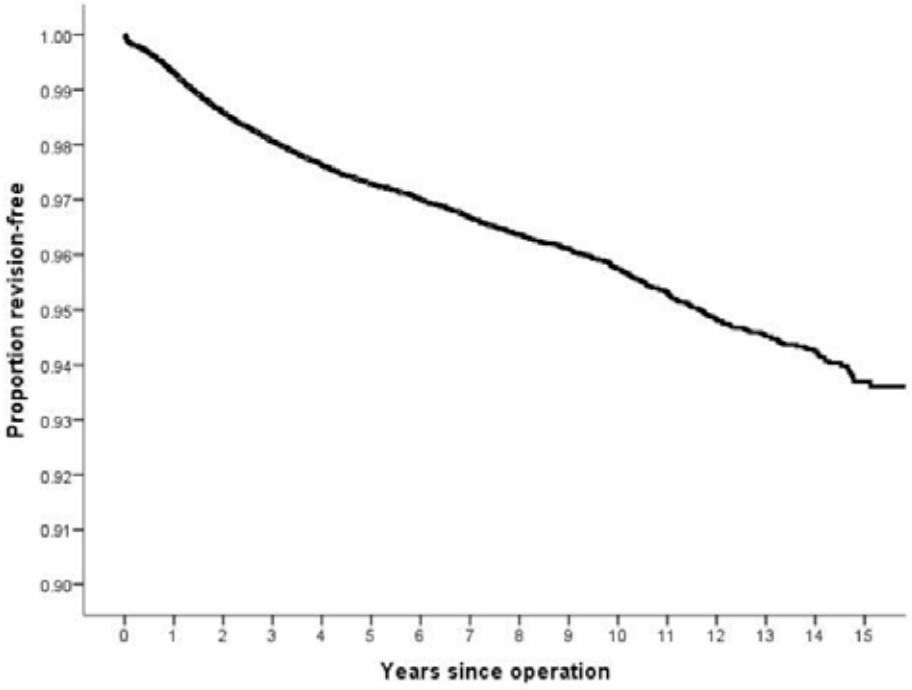
Revised to:

Total knee	26
Patello Femoral	2
Uniknee	2

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for years 1999 – 2014 with deceased patients censored at time of death.

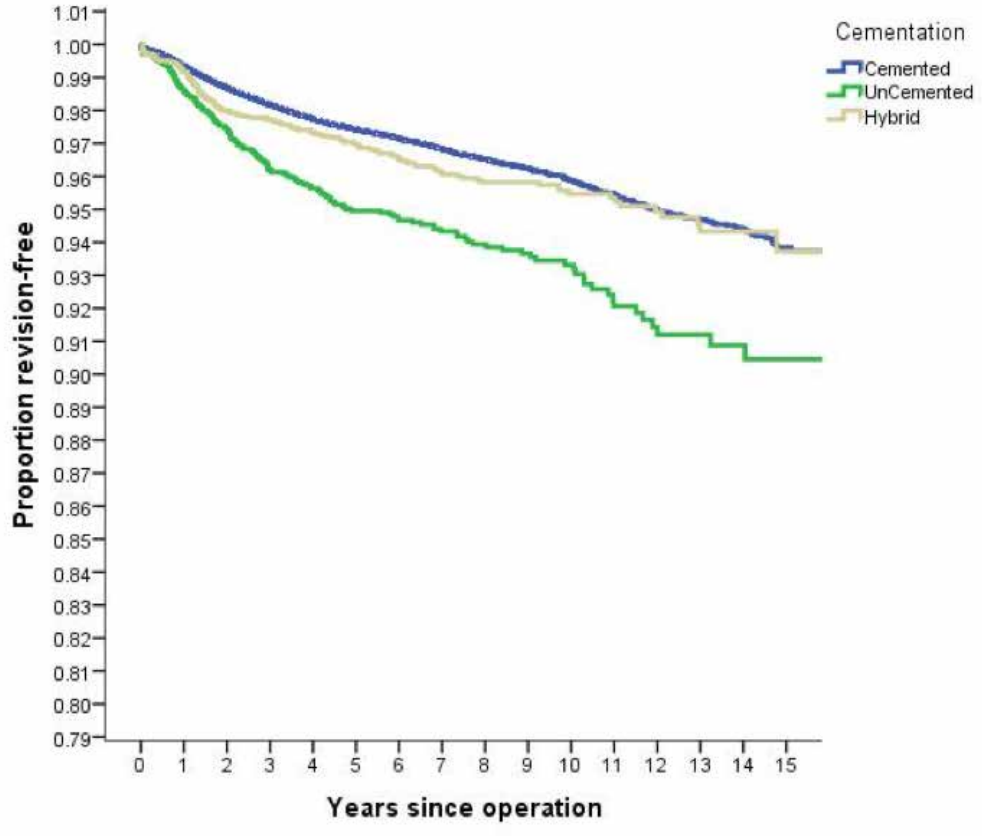
All Knees



Years	% Revision-free	No in each year
1	99.31%	70,069
2	98.59%	62,231
3	98.06%	54,835
4	97.63%	47,756
5	97.29%	40,941
6	97.00%	34,403
7	96.68%	28,442
8	96.36%	22,632
9	96.10%	17,627
10	95.74%	13,026
11	95.31%	9,549
12	94.84%	7,018
13	94.50%	4,879
14	94.24%	2,879
15	93.68%	1,166

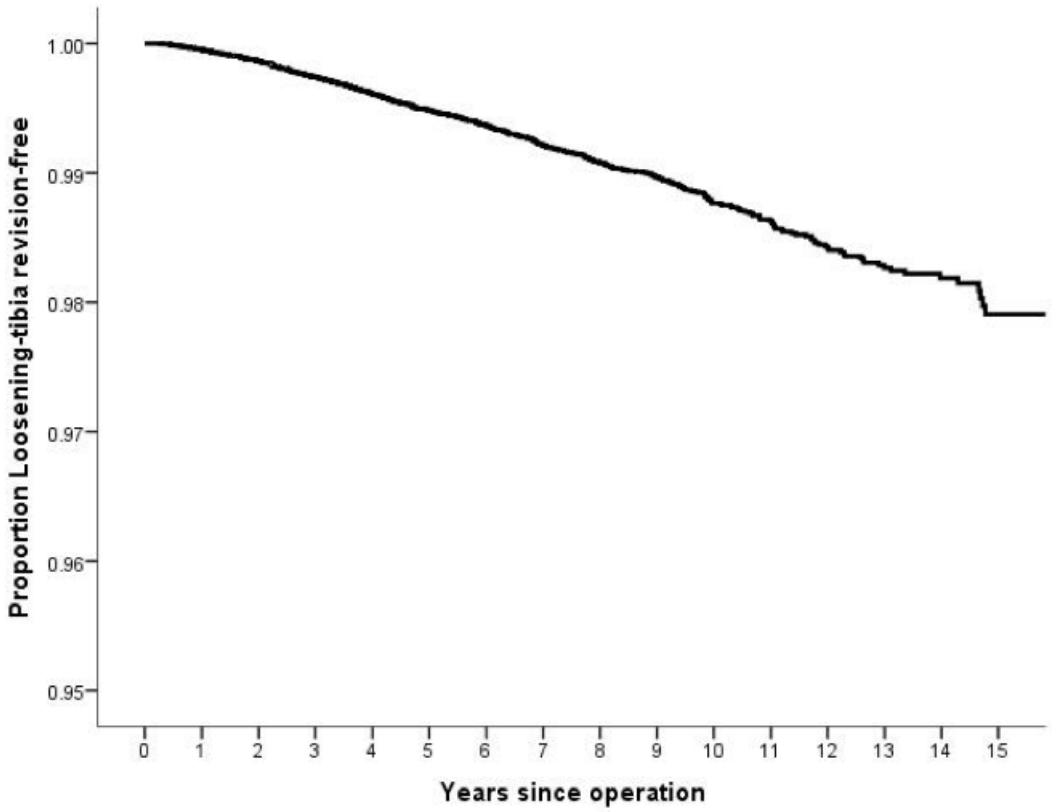
The KM analysis is to 15 years rather than 16 as too few registered knees were revised in 2014.

Cemented vs Uncemented vs Hybrid

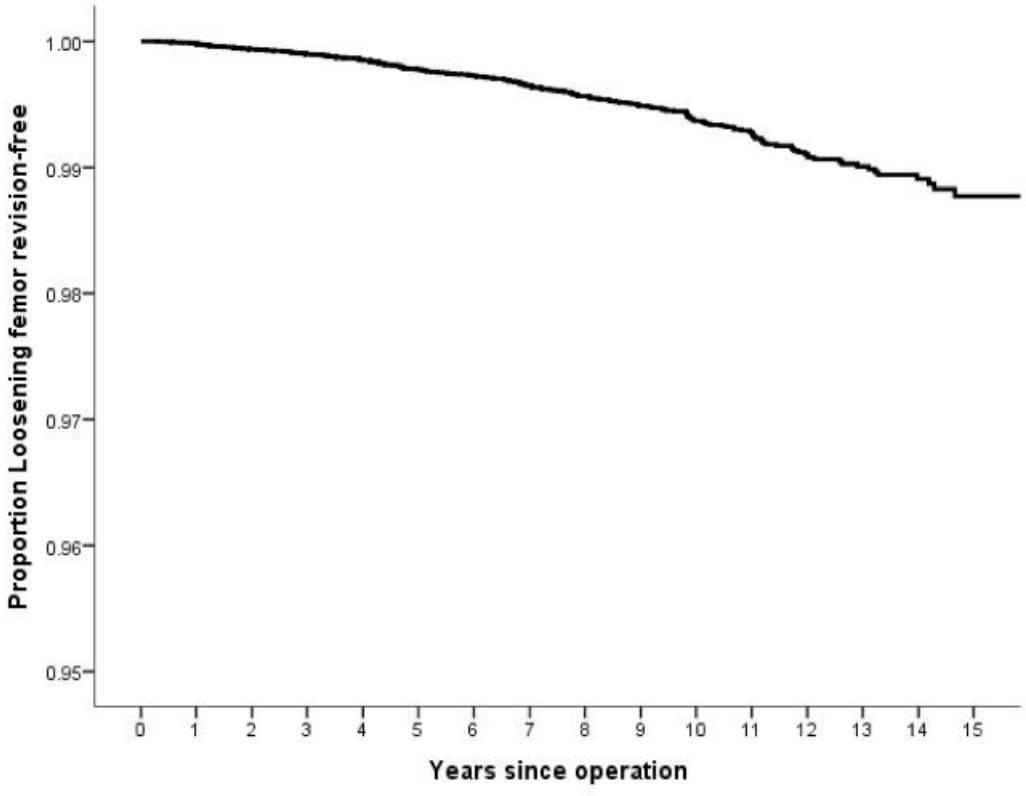


The following KM graphs are for the five main individual reasons for revision.

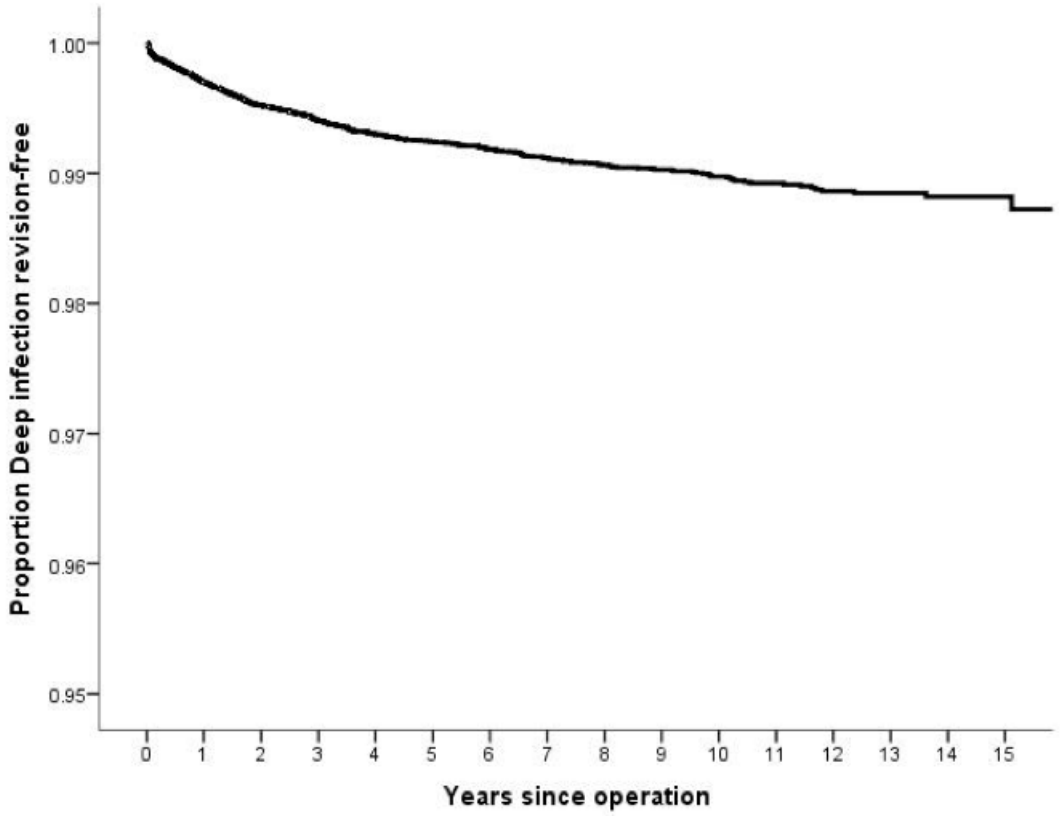
1. Tibial loosening



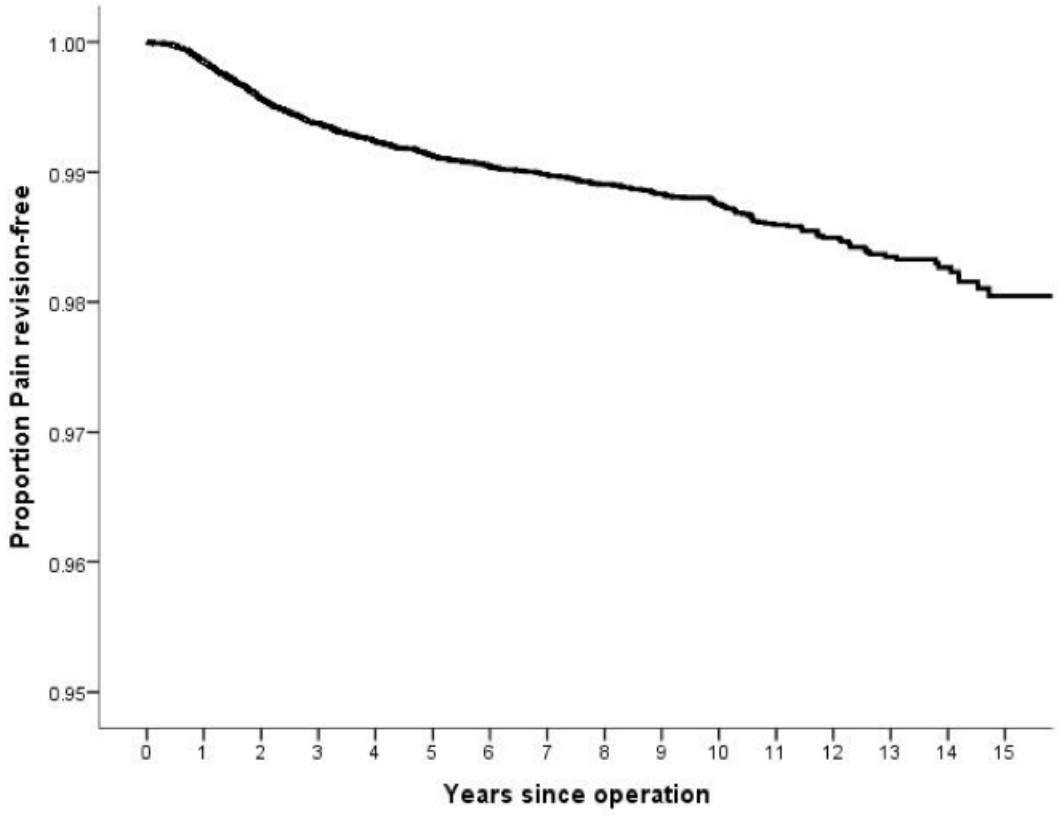
2. Femoral loosening



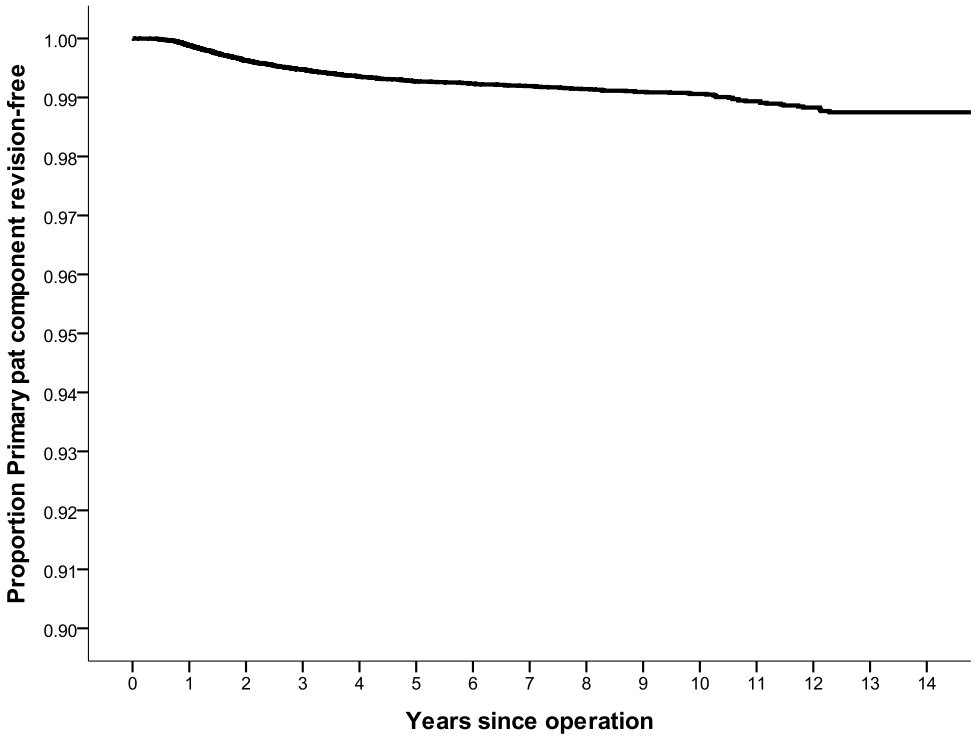
3. Deep infection



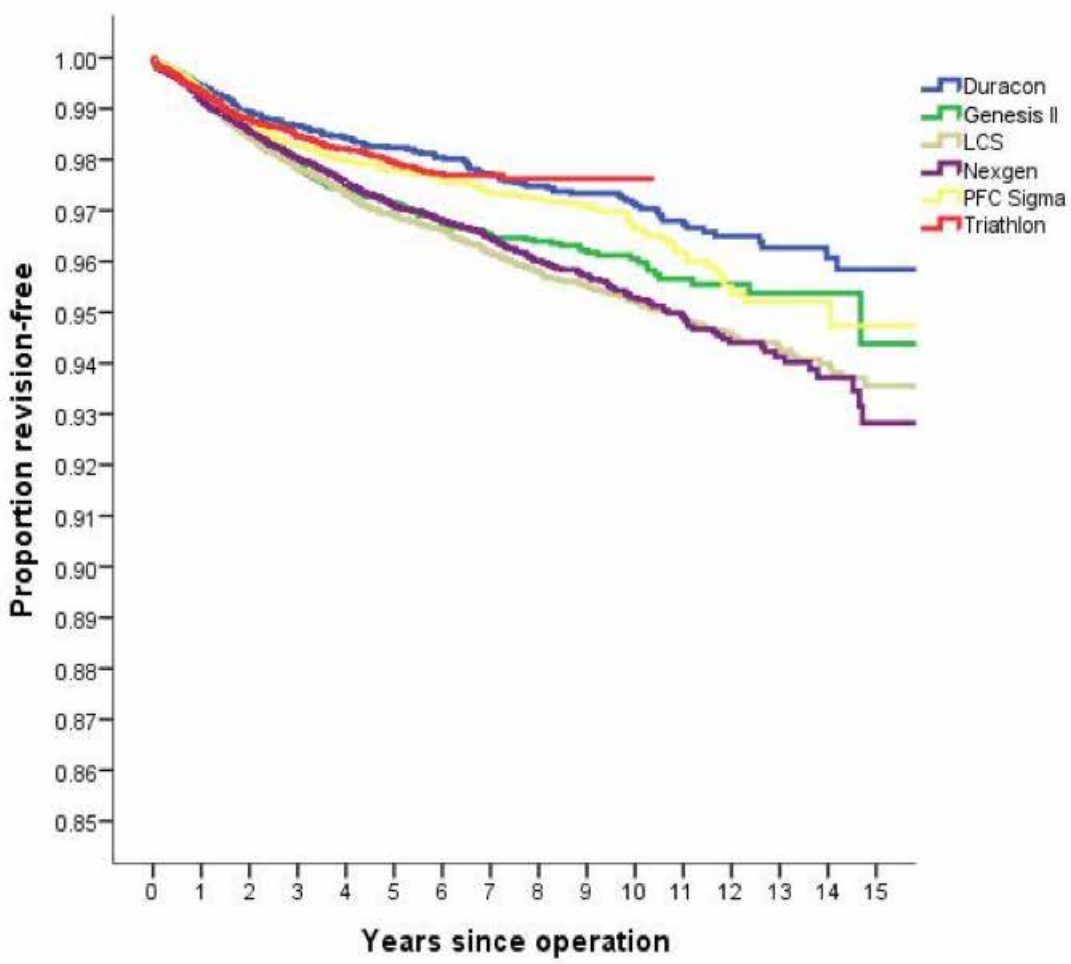
4. Pain



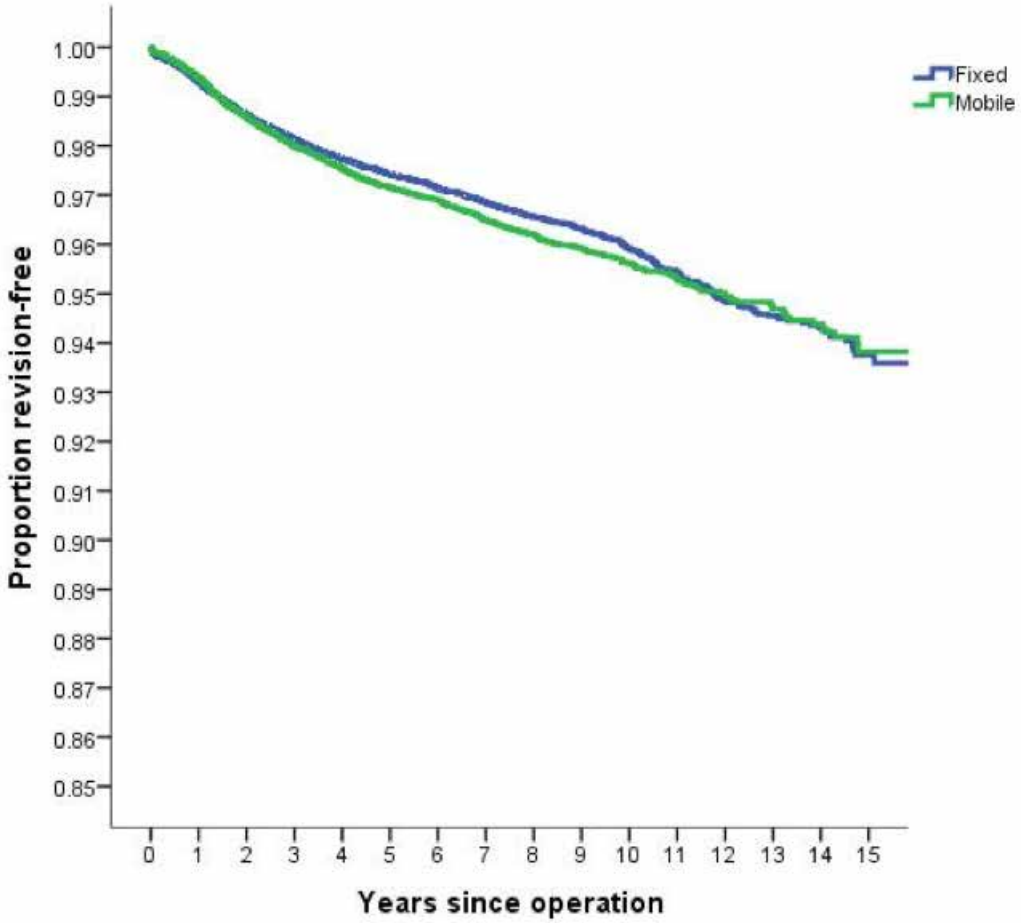
5. Patella



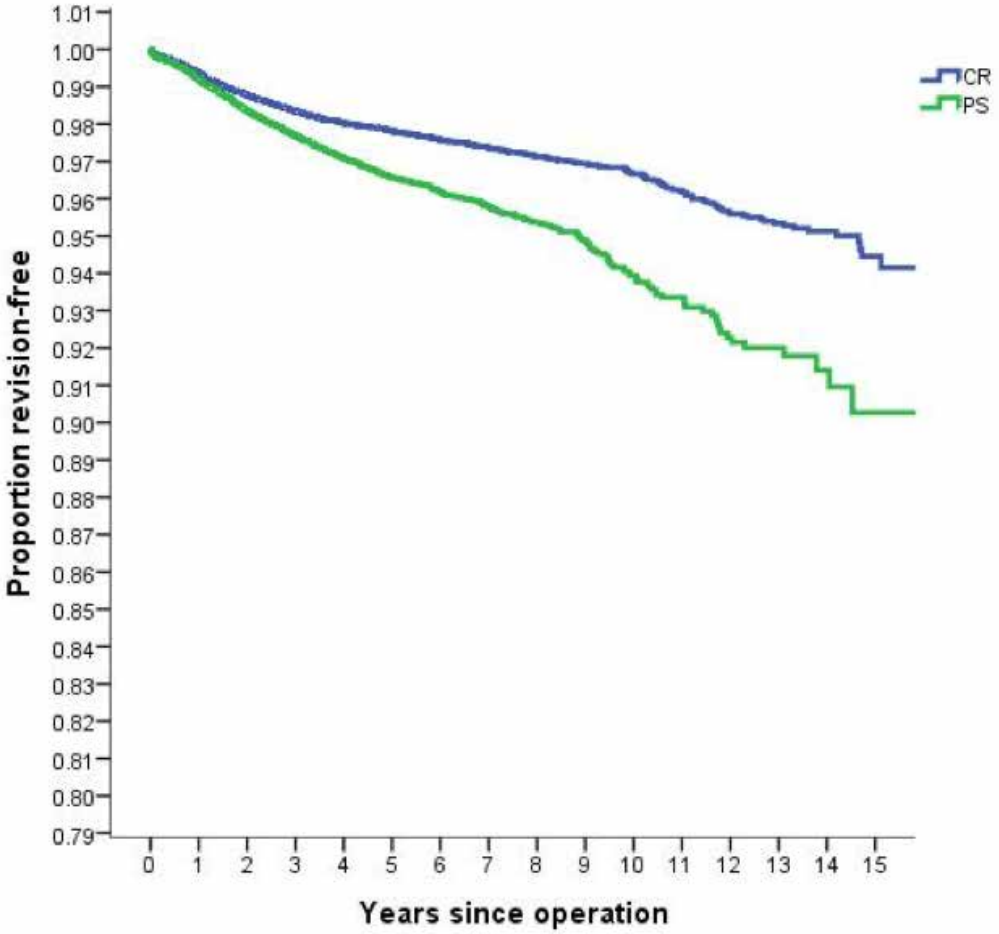
Survival Curve to 14 years for 6 knee prostheses



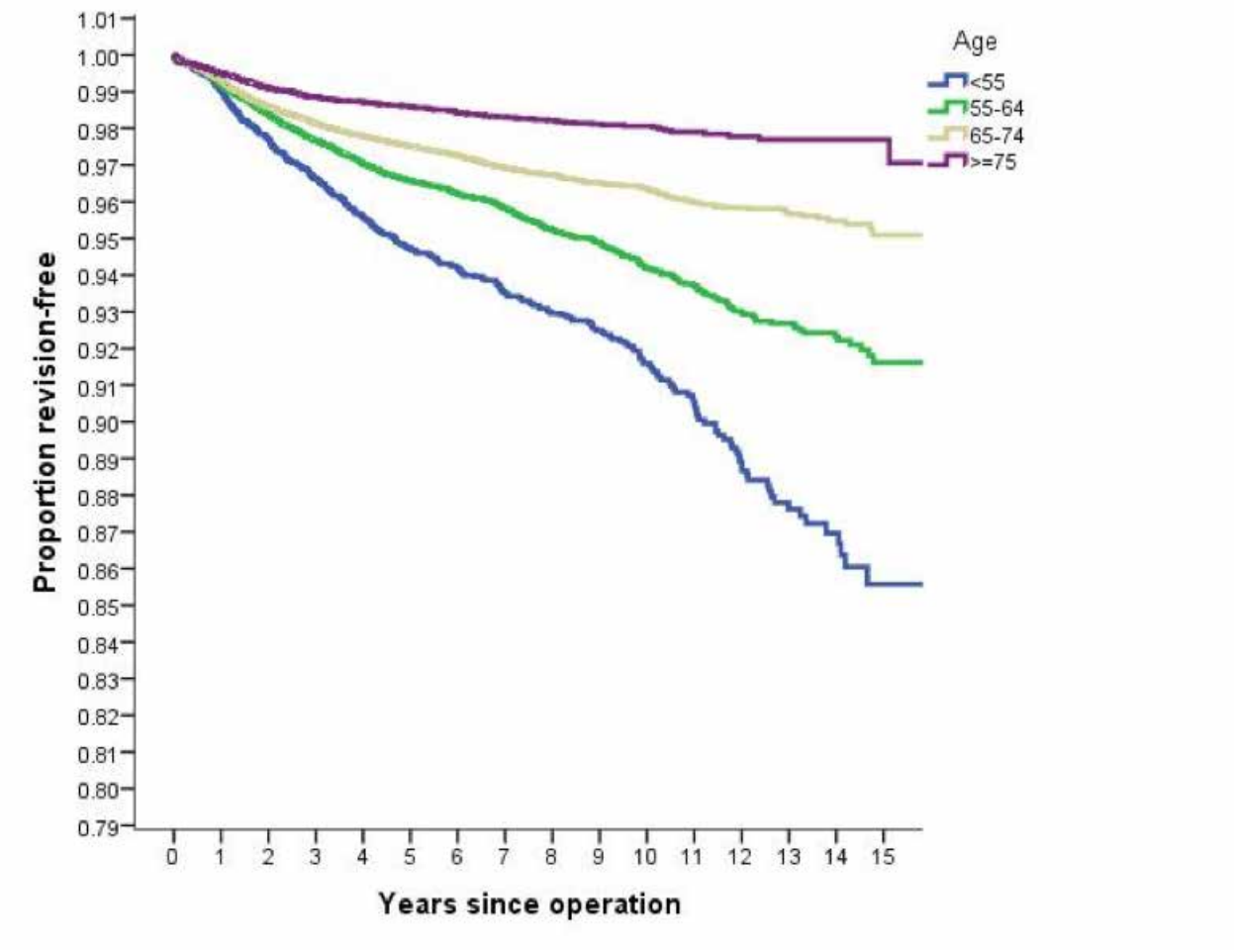
Fixed vs Mobile knees



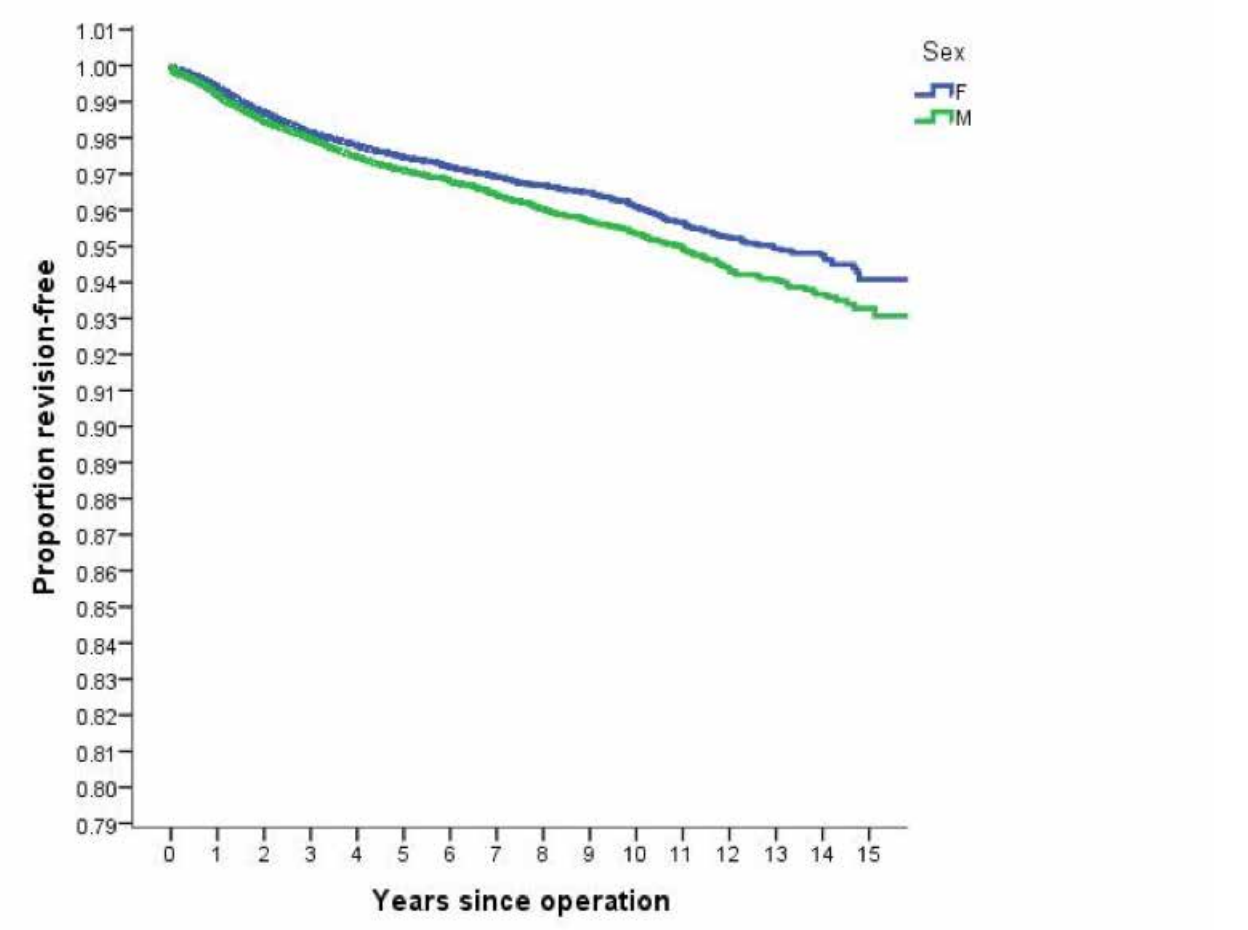
Posterior Stabilised vs Cruciate Retaining



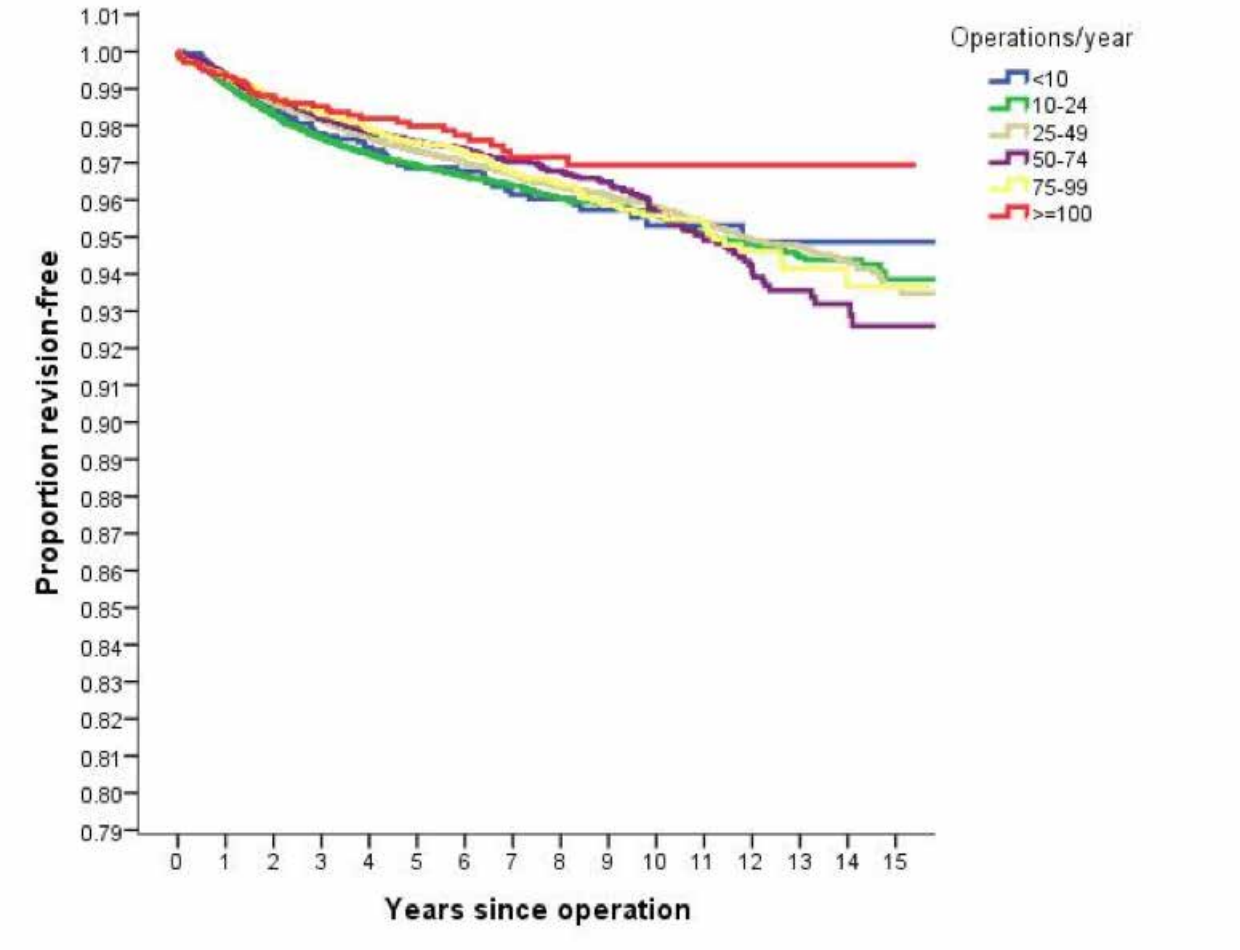
Survival for age bands



Survival for male vs female



Survival for for surgeon annual output



KNEE RE-REVISIONS

Analysis was undertaken of re-revisions. There were 314 registered primary knee revisions that had been revised twice, 56 that had been revised three times, 13 that had been revised four times, three that had been revised five times and one that had been revised six times.

Second revision

Time between the first and second revision for the 314 knee arthroplasties averaged 783 days, with a range of 2 – 4,654 and a standard deviation of 858 days. This compares to an average of 1,260 days between primary and first revision arthroplasty.

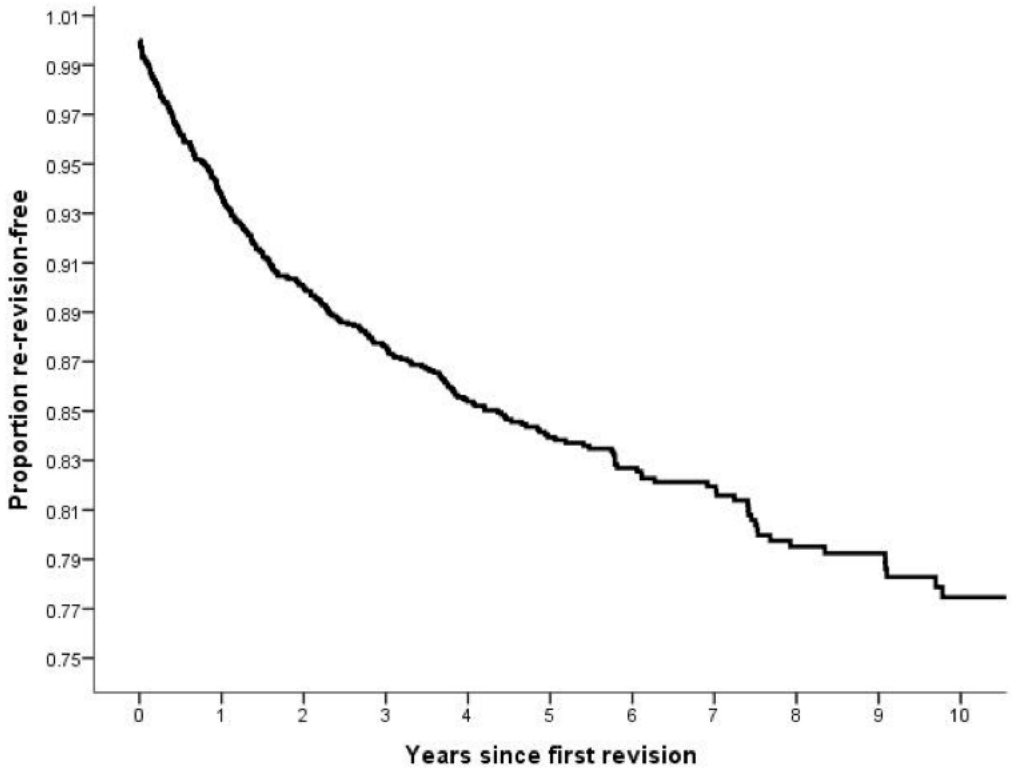
Reason for revision

Deep infection	148
Pain	69
Loosening tibial component	49
Loosening femoral component	39
Loosening patellar componen t	5
Fracture femur	1

Second Revisions

Number of primary revisions	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
2,242	9,365.7	314	3.35	2.99	3.74

Kaplan Meier survival curve for first revision knee arthroplasties



Years	Percentage re-revision free
1	93.60%
2	90.00%
3	87.60%
4	85.40%
5	83.90%
6	82.70%
7	81.90%
8	79.50%

Third revision

The average time between second and third revisions for the 56 knee arthroplasties was 658 days, with a range of 14 – 2,212 and a standard deviation of 580 days.

Fourth revision

The average time between third and fourth revisions for the 13 knee arthroplasties was 418 days, with a range of 23 – 1,454 and a standard deviation of 432 days.

Fifth revision

The average time between fourth and fifth revisions for the three knee arthroplasties was 631 days.

Sixth revision

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

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX MONTHS, FIVE YEARS, TEN YEARS AND 15 YEARS POST-SURGERY

Questionnaires at six months post-surgery

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

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

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

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

This groups each score into four categories:

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

For the sixteen-year period and as at July 2015, there were 23,777 primary knee questionnaire responses registered at six months post-surgery.

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

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

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

Questionnaires at five years post surgery

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

This dataset represents sequential Oxford knee scores for 8,788 individual patients.

At five years post-surgery, 83% of patients achieved an excellent or good score and had a mean of 40.25.

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 4,233 individual patients.

At ten years post-surgery, 81% of patients achieved an excellent or good score and had a mean of 39.83.

Questionnaires at fifteen tears 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 470 individual patients.

At fifteen years post-surgery, 79% of patients achieved an excellent or good score and had a mean of 39.02.

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

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

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

		6 mths %	5 yrs %	10 yrs %
1	Moderate or severe pain from the operated knee	13	8	8
2	Only able to walk around the house or unable to walk before pain becomes severe	5	4	4
3	Extreme difficulty or impossible to get in and out of a car or public transport	4	3	5
4	Extreme difficulty or impossible to kneel down and get up afterwards	41	38	42
5	Extreme difficulty or impossible to do the household shopping on your own	4	4	5
6	Extreme difficulty or impossible to wash and dry yourself	1	1	2
7	Pain interfering greatly or totally with your work	6	4	4
8	Very painful or unbearable to stand up from a chair after a meal	4	2	2
9	Most of the time or always feeling that the knee might suddenly "give way"	2	2	2
10	Limping most or every day	10	7	7
11	Extreme difficulty or impossible to walk down a flight of stairs	7	6	6
12	Pain from your knee in bed most or every nights	10	4	4

As noted in previous years there is little significant change, apart from reduction of night and severe pain, among the six month, five and ten year scores which means the six month score is indicative of the medium term outcome.

Revision knee questionnaire responses

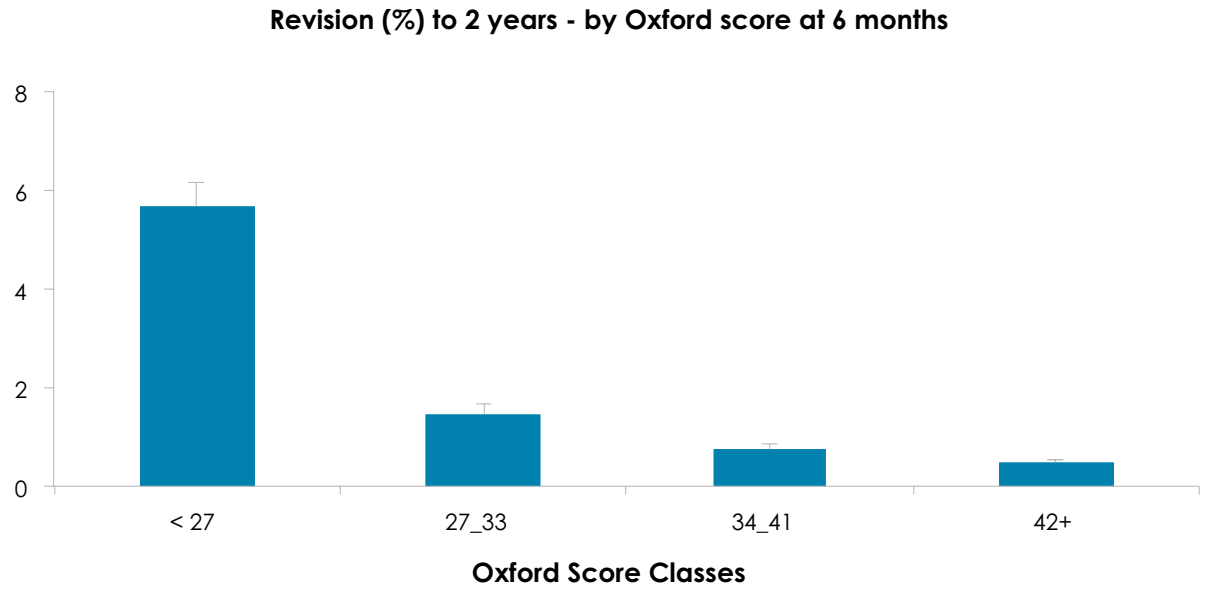
There were 3,314 revision hip responses with 54% achieving an excellent or good score. This group includes all revision knee procedures. The mean revision hip score was 33.11 (standard deviation 10.07, range 2 – 48).

OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

A statistically significant relationship has been confirmed between the Oxford scores at six months and five 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 12 times the risk of a revision within two years compared to a person with a score >41.

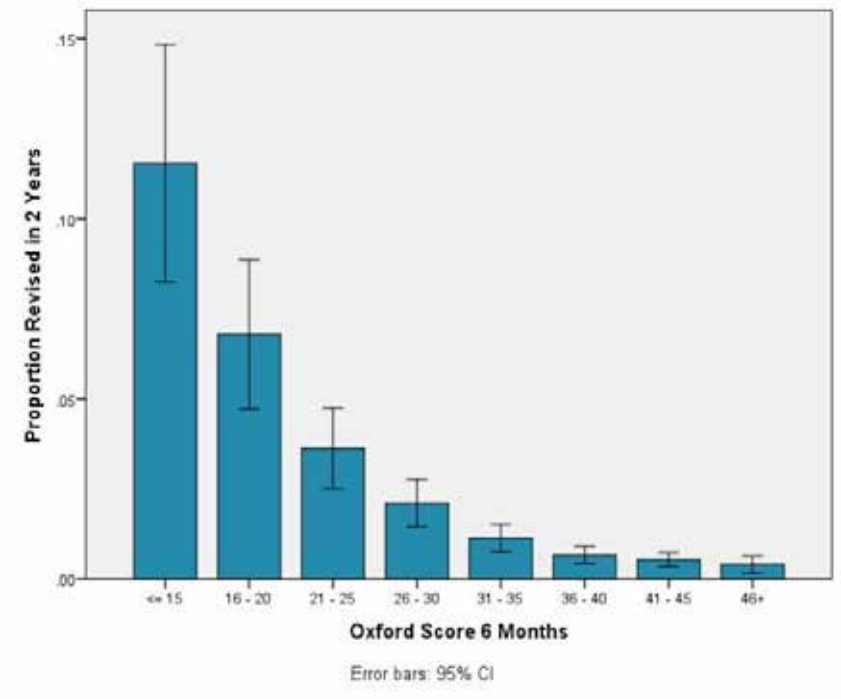


Revision risk versus Kalairajah groupings of Oxford scores within two years of the 6 month score date.

Kalairajah group	No in group	No. revised	%	Std error
< 27	2,311	131	5.67	0.48
27_33	3,088	45	1.46	0.22
34_41	6,970	52	0.75	0.10
42+	7,329	35	0.48	0.08

A person with an Oxford score >42 has a 0.48% risk of revision within two years compared to a 5.67% risk with a score of 27 or less.

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



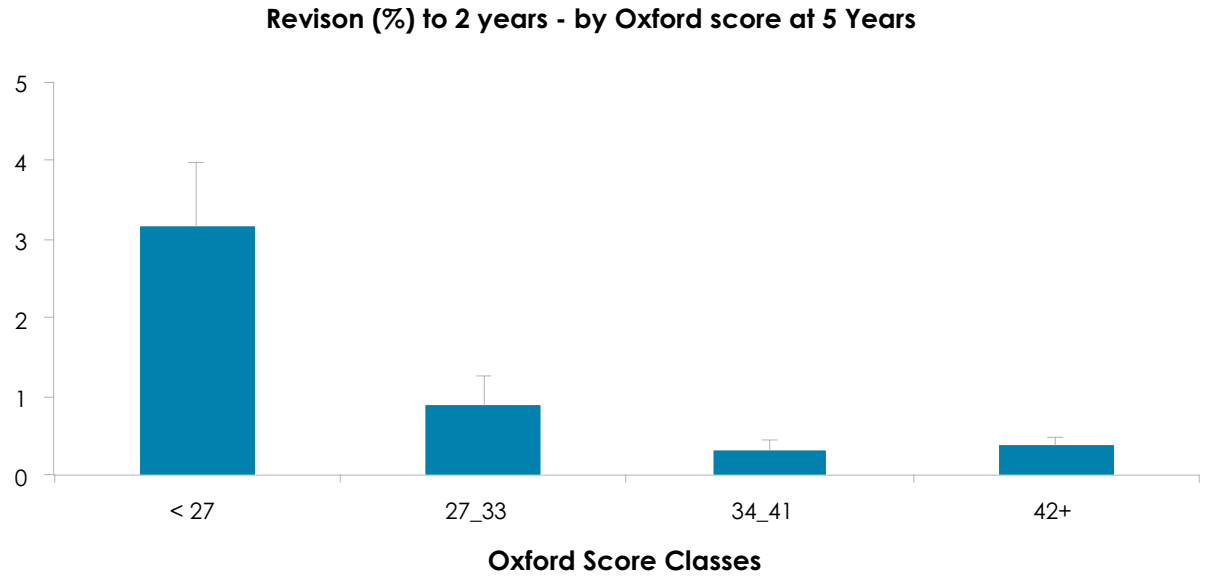
Revision risk versus groupings of Oxford scores within two years of the 6 month score date

			Revision in 2 yrs		Total
			No	Yes	
Score 6 months	<= 15	Count	322	42	**364**
				11.5%	
	16 - 20	Count	535	39	**574**
				6.8%	
	21 - 25	Count	1,033	39	**1,072**
				3.6%	
	26 - 30	Count	1,764	38	**1,802**
				2.1%	
	31 - 35	Count	2,884	33	**2,917**
				1.1%	
	36 - 40	Count	4,485	30	**4,515**
				0.7%	
	41 - 45	Count	5,712	31	**5,743**
				0.5%	
	46+	Count	2,700	11	**2,711**
				0.4%	
Total		**Count**	**19,435**	**263**	**19,698**
				1.3%	

A person with a 6 month Oxford score >45 has a 0.40 % risk of revision within two years compared to a 11.5% (29x) risk with a score of <16.

Five year score and revision arthroplasty

As with the six month scores, plotting the patients' five year scores in the Kalairajah groupings against the proportion of knees revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 10 times the risk of a revision within two years compared to a person with a score >33.



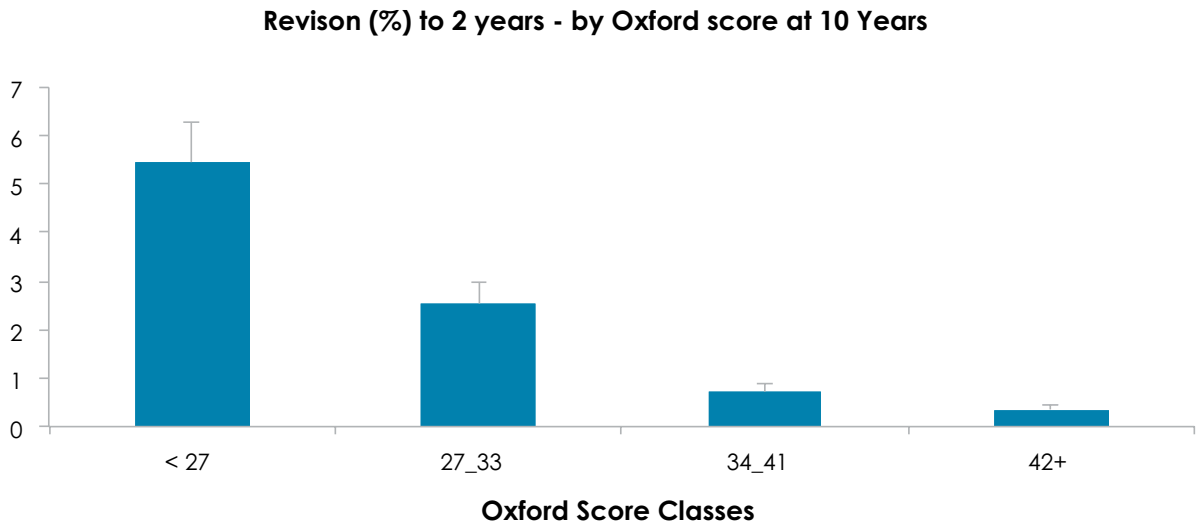
Revision risk versus Kalairajah groupings of Oxford scores within two years of the five year score date.

Kalairajah group	No in group	No. revised	%	Std error
< 27	444	14	3.15	0.83
27_33	574	5	0.87	0.39
34_41	1,563	5	0.32	0.14
42+	3,469	13	0.37	0.10

A person with an Oxford score >33 has a 0.32% risk of revision within two years compared to a 3.15% 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 22 times the risk of a revision within two years compared to a person with a score >41.

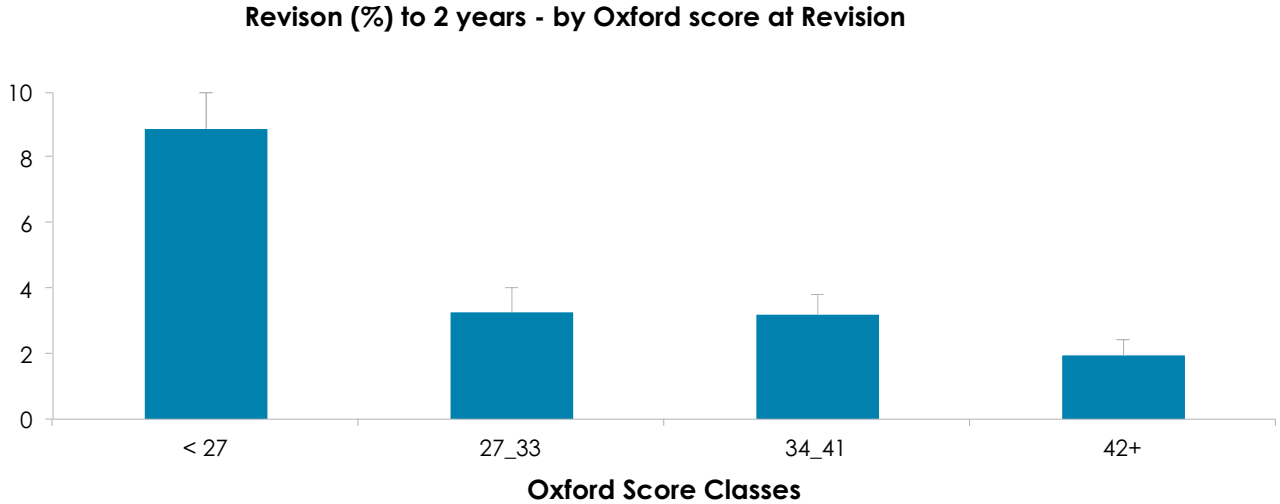


Kalairajah group	No in group	No. revised	%	Std error
< 27	231	14	6.06	1.57
27_33	292	7	2.40	0.90
34_41	703	5	0.71	0.32
42+	1,445	4	0.28	0.14

A person with an Oxford score >33 has a 0.32% risk of revision within two years compared to a 3.15% risk with a score of 27 or less.

Prediction of second revision from six month score following first revision

Plotting the patients six month scores following their first revision in the Kalairajah groupings against the proportion of knees revised for that same group again demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has a 4.5 times the risk of a revision within two years compared to a person with a score >41.



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

Kalairajah groups	No in group	No. revised	%	Std error
< 27	699	62	8.87	1.08
27_33	523	17	3.25	0.78
34_41	758	24	3.17	0.64
42+	629	12	1.91	0.55

A person with a six month Oxford score >42 has a 1.91% risk of revision within two years compared to an 8.87% risk with a score < 27.

UNICOMPARTMENTAL KNEE ARTHROPLASTY

PRIMARY UNICOMPARTMENTAL KNEE ARTHROPLASTY

The **fifteen**-year report analyses data for the period January 2000 – December 2014. There were 8,826 unicompartmental knee procedures registered, an additional 712 for 2014, and this represents a 1.9% reduction compared to 2013.

2000	340
2001	430
2002	533
2003	634
2004	634
2005	558
2006	584
2007	576
2008	540
2009	628
2010	602
2011	609
2012	720
2013	726
2014	712

Data Analysis

Age and sex distribution

The average age for a unicompartmental knee replacement was 66.28 years, with a range of 18.28 – 94.71 years.

	Female	Male
Number	4,115	4,711
Percentage	46.62	53.38
Mean age	66.15	66.40
Maximum age	94.71	93.42
Minimum age	18.28	31.62
Standard dev.	10.13	9.11

Body Mass Index

For the five year period 2010 - 2014, there were 2,439 BMI registrations for unicompartmental knee replacements. The average was 29.63 with a range of 17 – 59.50 and a standard deviation of 4.95.

Previous operation

None	7,065
Menisectomy	1,339
Ligament reconstruction	42
Osteotomy	28
Internal fixation	27
Synovectomy	4

Diagnosis

Osteoarthritis	8,633
Avascular necrosis	60
Post ligament disruption	40
Other inflammatory	22
Rheumatoid arthritis	17
Post fracture	14
Tumour	2

Approach

Medial	6,644
Minimally invasive surgery	2,173
Other	205
Lateral	186
Image guided surgery	58

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	6,608	75%
Antibiotic in cement	4,325	64%
Tibia cemented	6,832	77%
Antibiotic in cement	4,401	64%

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	8,499	96%

Operating theatre

Conventional	6,246
Laminar flow	2,486
Space suits	2,122

ASA Class

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

For the ten- year period 2005 – 2014, there were 5,929 (95%) unicompartmental knee procedures with the ASA class recorded.

Definitions

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

ASA	Number	Percentage
1	1,151	19
2	3,830	65
3	934	15
4	14	1

Operative time (skin to skin)

Mean	76 minutes

Surgeon grade

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

The following figures are for the ten-year period 2005 – 2014.

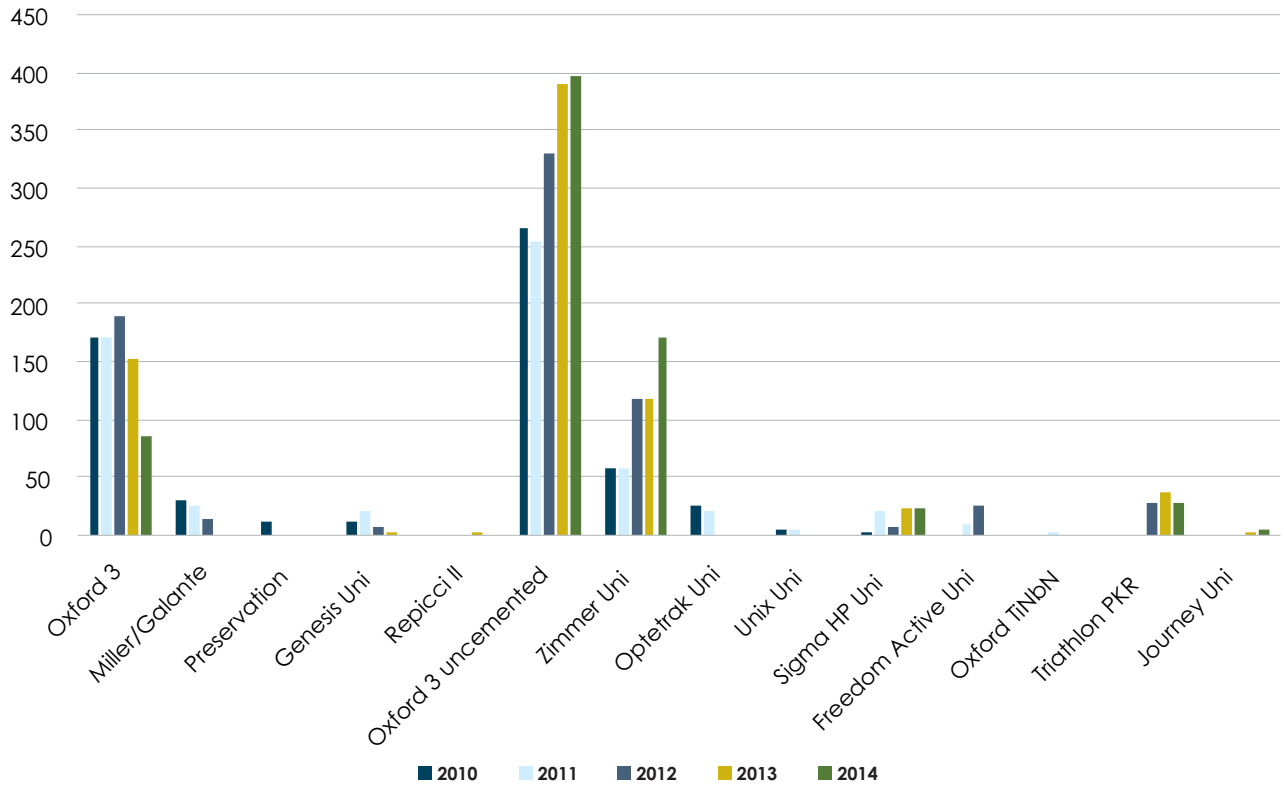
Consultant	5,940
Advanced trainee supervised	279
Advanced trainee unsupervised	14
Basic trainee	11

Prosthesis usage

Unicompartmental knee prostheses used in 2014

Oxford 3 uncemented	398
Zimmer Uni	172
Oxford 3	86
Triathlon PKR	28
Sigma HP Uni	24
Journey Uni	4

Most Used Unicompartmental Prostheses 2010 – 2014



Surgeon and hospital workload

Surgeons

In 2014, 74 surgeons (two fewer than 2013) performed 712 unicompartmental knee replacements, an average of just under 10 procedures per surgeon. 40 surgeons performed less than five procedures and 12 performed more than 15 procedures.

Hospitals

In 2014, unicompartmental knee replacements were performed in 34 hospitals; 18 were public and 16 were private.

For 2014, the average number of unicompartmental knee replacements per hospital was 21.

REVISION OF REGISTERED PRIMARY UNICOMPARTMENTAL ARTHROPLASTIES

This section analyses the data for revision of unicompartmental knee replacement over the fifteen-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 667 revisions of the 8,826 registered unicompartmental knee replacements (7.6%). A further 68 had a second revision, eight a third revision and one a fourth revision.

559 of the 667 (84%) were revised to total knee replacements and 108 (16%) were revised to further unicompartmental replacements.

Time to revision

Mean	1,588 days
Maximum	5,366 days
Minimum	10 days
Standard deviation	1,299 days

Reason for revision

Pain	226
Loosening tibial component	120
Loosening femoral component	92
Deep infection	25
Fracture tibia	22
Fracture femur	2

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

Analysis by time of the three main reasons for revision

	Loosening femoral		Loosening tibial		Pain	
Years	Count	Pain	Count	%	Count	%
0	12	13.00	26	21.70	36	15.90
1	19	20.70	33	27.50	58	25.70
2	9	9.80	10	8.30	32	14.20
3	15	16.30	8	6.70	13	5.80
4	5	5.40	9	7.50	22	9.70
5	6	6.50	5	4.20	13	5.80
6	3	3.30	10	8.30	10	4.40
7	7	7.60	7	5.80	13	5.80
8	5	5.40	2	1.70	8	3.50
9	3	3.30	6	5.00	8	3.50
10	3	3.30	2	1.70	7	3.10
11	1	1.10	2	1.70	3	1.30
12	4	4.30	0	0.00	3	1.30
13	0	0.00	0	0.00	0	0.00
14	0	0.00	0	0.00	0	0.00
Total	92	-	120	-	226	-

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 Primary Unicompartmental Knee Arthroplasties

No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
8,826	53,349.1	667	1.25	1.16	1.35

Revision Rate of Individual Unicompartmental Knee Prostheses Sorted Alphabetically

Prosthesis	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
EIUS Uni Knee	22	168.0	0	0.00	0.00	2.20
Freedom Active Uni	36	89.8	5	5.57	1.81	13.00
Genesis Uni	359	2,815.6	39	1.39	0.98	1.89
HLS Uni Evolution	1	0.5	1	193.25	4.89	1,076.74
Journey Uni	6	4.9	0	0.00	0.00	74.73
LCS Uni	6	55.7	2	3.59	0.44	12.98
Miller/Galante	710	6,164.2	61	0.99	0.76	1.27
Optetrak Unicondylar Cemented	101	505.0	7	1.39	0.56	2.86
Oxford 3	3,865	28,945.3	401	1.39	1.25	1.53
Oxford 3 uncemented	2,167	6,886.9	47	0.68	0.00	0.91
Oxford TiNbN coated	1	3.5	0	0.00	0.00	106.85
Oxinium Uni	33	203.3	11	5.41	2.70	9.68
Preservation	484	3,904.6	57	1.46	1.11	1.89
Repicci II	98	1,027.2	18	1.75	0.00	2.77
Sigma HP Uni	80	154.1	0	0.00	0.00	2.39
Triathlon PKR	139	308.5	4	1.30	0.35	3.32
Unix Uni	14	57.5	2	3.48	0.42	12.56
Zimmer Unicompartmental Knee	704	2,054.7	12	0.58	0.30	1.02

The Oxinium, the Freedom Active and the Oxford 3 unis all have significantly higher revision rates but, despite widely varying revision rates for the other prostheses, there are no significant differences because of the relatively small numbers and wide CIs. No Oxinium or Freedom Active unis were recorded for 2014.

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

Revision vs Arthroplasty Fixation

Fixation	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Cemented	6,584	46,007.0	612	1.33	1.23	1.44
Uncemented	1,970	6,400.3	43	0.67	0.49	0.90
Hybrid	272	941.9	12	1.27	0.66	2.23

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

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	1,072	6,578.5	109	1.66	1.36	2.00
55_64	3,046	18,648.6	298	1.60	1.42	1.79
65_74	2,964	18,354.3	184	1.00	0.86	1.16
GE75	1,744	9,767.7	76	0.78	0.61	0.97

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

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	4,115	25,260.2	339	1.34	1.20	1.49
Male	4,711	28,089.0	328	1.17	1.04	1.30

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

Revision vs Surgeon Annual Workload

Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	4,040	26,836.9	390	1.45	1.31	1.60
>=10	4,784	26,504.8	276	1.04	0.92	1.17

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

Revision vs Surgical Approach

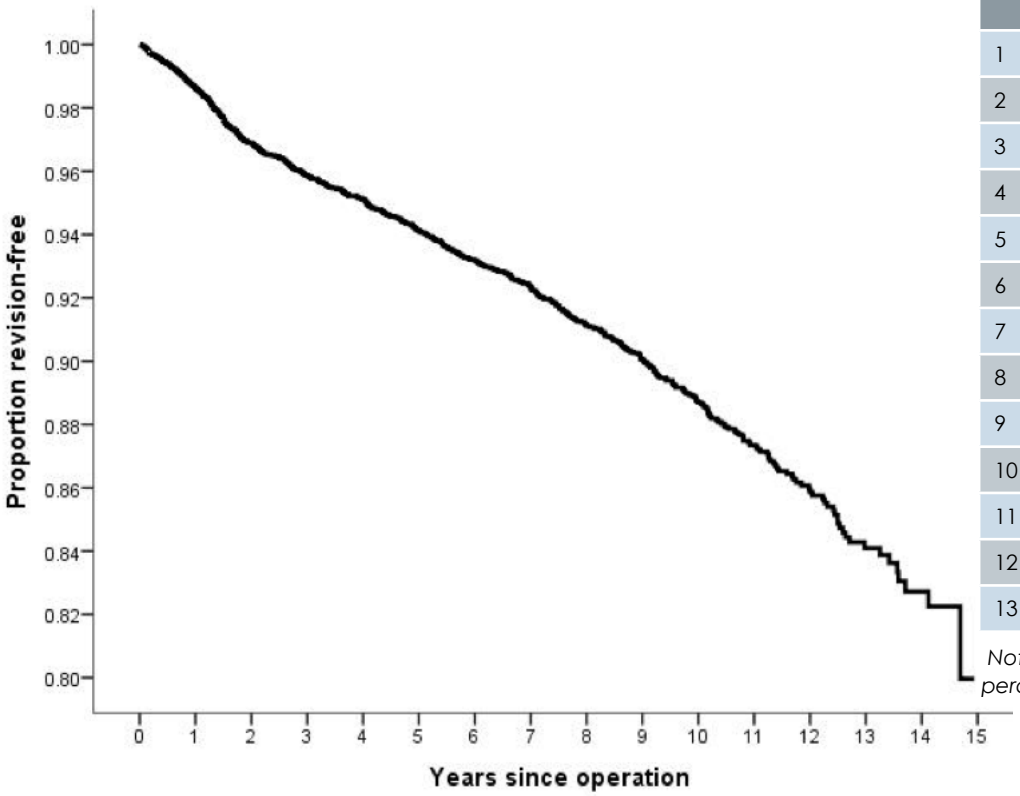
Approach	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Standard parapatellar	6,653	41,996.4	557	1.33	1.22	1.44
Minimally Invasive	2,173	11,352.8	110	0.97	0.80	1.17

The minimally invasive technique has a significantly lower revision rate.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 15 years from 2000 to 2014, with deceased patients censored at time of death.

Unicompartmental Knees



Years	% Revision-free	Number
1	98.60%	7,960
2	96.90%	7,090
3	95.90%	6,217
4	95.10%	5,512
5	94.10%	4,803
6	93.20%	4,116
7	92.40%	3,533
8	91.10%	2,925
9	90.10%	2,357
10	88.70%	1,831
11	87.40%	1,304
12	86.00%	825
13	84.10%	449

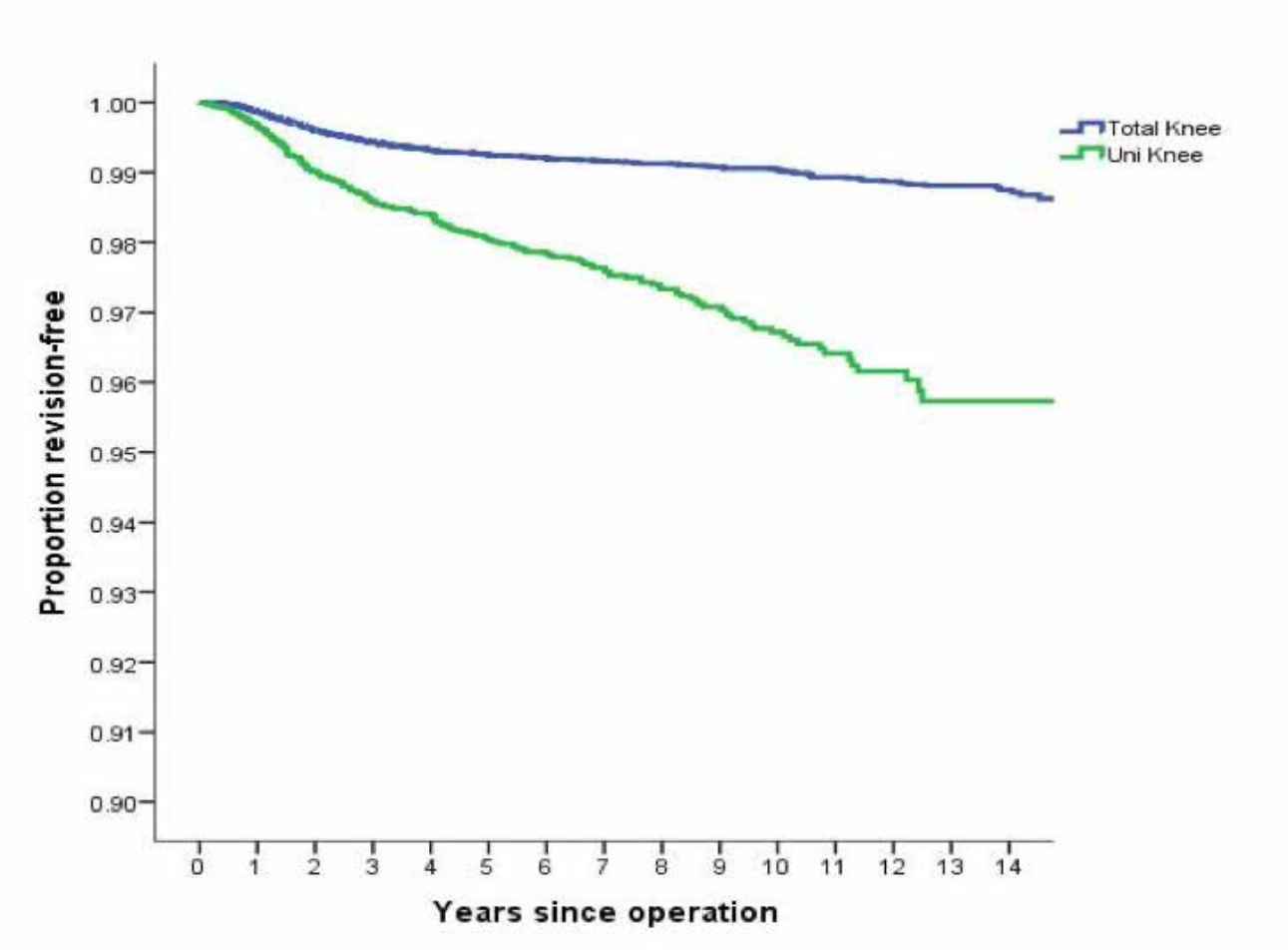
Note: Numbers too few for accurate percentage survival beyond 13 years.

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	559	2,677.1	46	1.72	1.26	2.29
Revised to Uni	108	435.7	22	5.05	3.16	7.65

When compared to the primary total knee arthroplasty revision rate of 0.49 at the 95% confidence interval there is a significantly increased revision rate (3.5x) when a unicompartmental arthroplasty is converted to a total knee arthroplasty. This statistic is even more significant following revision of a unicompartmental to a further unicompartmental arthroplasty. Further evidence is that the average six month Oxford score following conversion of a unicompartmental to total arthroplasty is similar to that for a revised primary total knee arthroplasty.

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



Total vs UniKnees	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total Knees	78,542.00	456,153.7	544	0.12	0.11	0.13
Uni Knees	8,826.00	53,349.1	189	0.35	0.31	0.41

There is a significantly better survivorship (3x) for total knees revised for pain alone than for uni-knees revised to total knees for pain alone. However, overall for both groups the survival at 12 years is still very good and this may reflect that there is no indication for further revision even if pain persists.

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

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

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

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

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

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

For the fifteen year period and as at July 2015, there were 6,002 unicompartmental knee questionnaire responses registered at six months post-surgery. The mean unicompartmental knee score was 39.47 (standard deviation 7.34, range 3 – 48).

Scoring	> 41	2,974
Scoring	34 -41	1,950
Scoring	27 -33	677
Scoring	< 27	401

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

Questionnaires at five years post surgery

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

This dataset represents sequential Oxford knee scores for 2,317 individual patients.

At five years post-surgery, 88 % of patients had achieved an excellent or good score and had a mean of 41.48.

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 953 individual patients.

At ten years post-surgery, 83% of patients achieved an excellent or good score and had a mean of 40.41.

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

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

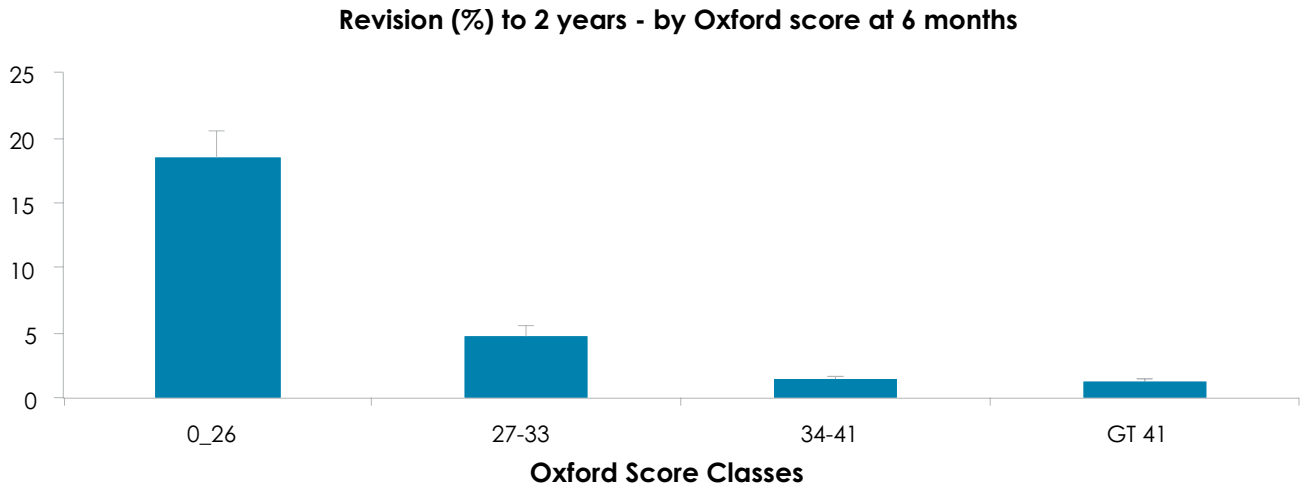
Percentage scoring 0 or 1 for each question out of the group at six months, five years and ten years post- surgery.

		6m%	5y%	10y%
1	Moderate or severe pain from the operated knee	10	8	10
2	Only able to walk around the house or unable to walk before pain becomes severe	3	2	3
3	Extreme difficulty or impossible to get in and out of a car or public transport	2	1	2
4	Extreme difficulty or impossible to kneel down and get up afterwards	30	27	30
5	Extreme difficulty or impossible to do the household shopping on your own	2	2	3
6	Extreme difficulty or impossible to wash and dry yourself	0.5	0.4	0.7
7	Pain interfering greatly or totally with your work	3	3	4
8	Very painful or unbearable to stand up from a chair after a meal	3	2	2
9	Most of the time or always feeling that the knee might suddenly "give way"	2	1	3
10	Limping most or every day	7	5	5
11	Extreme difficulty or impossible to walk down a flight of stairs	3	3	5
12	Pain from your knee in bed most or every nights	7	4	6

OXFORD 12 SCORE AS A PREDICTOR OF KNEE ARTHROPLASTY REVISION

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

Plotting the patients' six month scores in the Kalairajah groupings against the proportion of knees revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score. A patient with a score below 27 has 14 times the risk of a revision within two years compared to a person with a score of 34-41.



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

Kalairajah group	Revision to 2 yrs	No. revised	%	Std error
0_26	337	62	18.40	2.11
27-33	558	26	4.66	0.89
34-41	1,552	22	1.42	0.30
GT 41	2,307	30	1.30	0.24

A person with an Oxford score >41 has a 1.30% risk of revision within two years compared to an 18.40% risk with a score of < 27.

ANKLE ARTHROPLASTY

PRIMARY ANKLE ARTHROPLASTY

The **fifteen**-year report analyses data for the period January 2000 – December 2014. There were 1,160 primary ankle procedures registered, an additional 102 compared to last year's report, which represents a 10.7% reduction compared to 2013.

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

Data Analysis

Age and sex distribution

The average age for an ankle replacement was 65.52 years, with a range of 32.32 – 95.52 years.

	Female	Male
Number	444	716
Percentage	38.28	61.72
Mean age	63.26	66.93
Maximum age	95.52	90.26
Minimum age	32.32	34.15
Standard dev.	9.70	8.51

Body Mass Index

For the five-year period 2010 - 2014, there were 280 BMI registrations for primary ankle replacements. The average was 28.29 with a range of 17 – 43 and a standard deviation of 4.29.

Previous operation

None	908
Internal fixation for juxtarticular fracture	117
Arthrodesis	39
Osteotomy	21

Diagnosis

Osteoarthritis	858
Post trauma	196
Rheumatoid arthritis	107
Other inflammatory	18
Avascular necrosis	4

Approach

Anterior	1,008
Anterolateral	34
Other	13

Bone graft

Tibia autograft	39
Tibia allograft	3
Tibia synthetic	1
Talus autograft	9
Talus allograft	3

Cement

TTibia cemented	12
Antibiotic in cement	7
Talus cemented	7
Antibiotic in cement	4

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	1,116 (96%)

Operating theatre

Conventional	590
Laminar flow	557
Space suits	211

ASA Class

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

For the ten-year period 2005 -2014, there were 901 (89%) primary ankle procedures with the ASA class recorded.

Definitions

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

ASA	Number
1	173
2	561
3	164
4	3

Operative time (skin to skin)

Mean	121 minutes

Surgeon grade

The updated forms introduced in 2005 have separated advanced trainee into supervised and unsupervised. The following figures are for the ten-year period 2005 -2014.

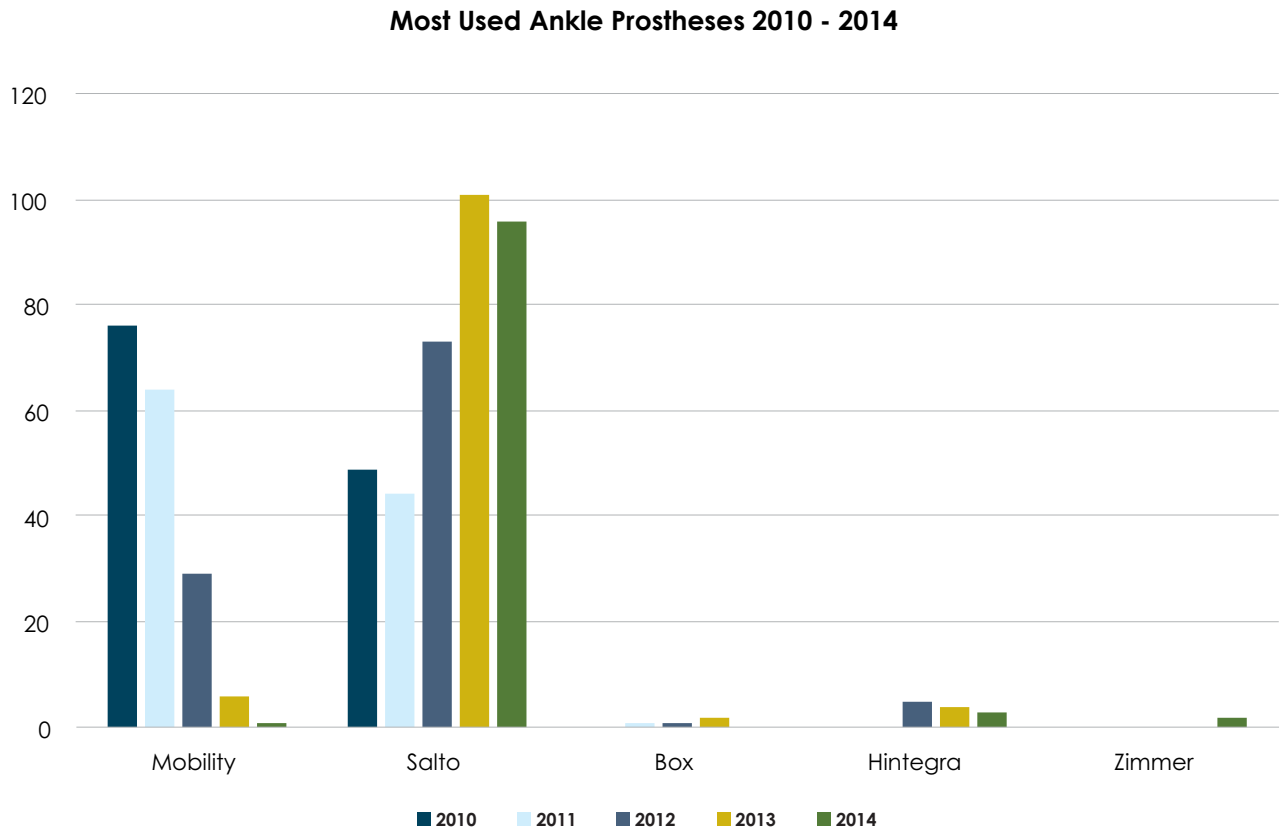
Consultant	1,008
Advanced trainee supervised	6

Prosthesis usage

Ankle prostheses used in 2014

Salto	96
Hintegra	3
Zimmer	2
Mobility	1

The Zimmer appears for the first time and the Box prosthesis was not registered in 2014.



Surgeon and hospital workload

Surgeons

In 2014, 18 surgeons performed 102 primary ankle procedures, an average of six procedures per surgeon. One surgeon performed more than 15 procedures and two performed one procedure.

Hospitals

In 2014, primary ankle replacement was performed in 27 hospitals. 13 were public and 14 were private.

	Female	Male
Number	60	101
Percentage	37.27	62.73
Mean	64.13	65.46
Maximum age	81.68	83.06
Minimum age	42.13	34.55
Standard dev.	9.49	8.45

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 fifteen year period from January 2000– December 2014, there were 161 revision ankle procedures registered.

The average age for an ankle revision was 65.02 years, with a range of 34.55 – 83.06.

REVISION OF REGISTERED PRIMARY ANKLE ARTHROPLASTIES

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

There were 120 revisions of the primary total ankle procedures of 1,160 (10.34%).

The big increase in the number of revision procedures in 2014 was due to the Registry receiving 51 back-dated revision forms.

Time to revision

Mean	1,438 days
Maximum	4,814 days
Minimum	21 days
Standard deviation	1,144 days

Reason for revision

Pain	54
Loosening talar component	39
Loosening tibial component	128
Deep infection	14

Ankle re-revisions

There were 12 registered primary ankle procedures that were revised twice and two procedures that were revised three times.

Analysis by time of the 3 main reasons for revision

	Loosening talar component		Pain		Loosening tibial	
Years	**Count**	**%**	**Count**	**%**	**Count**	**%**
0	3	7.7	4	7.4	1	3.6
1	3	7.7	14	25.9	7	25.0
2	7	17.9	9	16.7	3	10.7
3	6	15.4	8	14.8	3	10.7
4	6	15.4	8	14.8	3	10.7
5	4	10.3	3	5.6	1	3.6
6	2	5.1	3	5.6	2	7.1
7	1	2.6	2	3.7	1	3.6
8	1	2.6	1	1.9	2	7.1
9	3	7.7	1	1.9	2	7.1
10	1	2.6	1	1.9	1	3.6
11	1	2.6	0	0.0	1	3.6
12	0	0.0	0	0.0	1	3.6
13	1	2.6	0	0.0	0	0.0
Total	**39**	**100.00%**	**54**	**100.00%**	**28**	**100.00%**

Statistical note

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

i) Observed component years

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

ii) Rate/100 component years

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

Statistical significance

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

All Primary Ankle Arthroplasties

No. Ops.	Observed comp. Yrs	Number Revised	Rate/100-component-years	Exact 95% confidence interval	
1,160	5,642.4	120	2.13	1.76	2.54

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	1,091.4	32	2.93	2.01	4.14
Box	6	19.8	1	5.06	0.00	28.20
Hintegra	12	21.2	0	0.00	0.00	17.41
Mobility	450	2,319.7	52	2.24	1.67	2.94
Ramses	11	77.7	5	6.43	2.09	15.01
Salto	513	1,716.0	19	1.11	0.67	1.73
STAR	47	395.9	11	2.78	1.39	4.97
Zimmer Trabecular Metal Ankle	2	0.6	0	0.00	0.00	570.92

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

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	444.00	2,188.3	48	2.19	1.62	2.91
Males	716.00	3,454.1	72	2.08	1.63	2.63

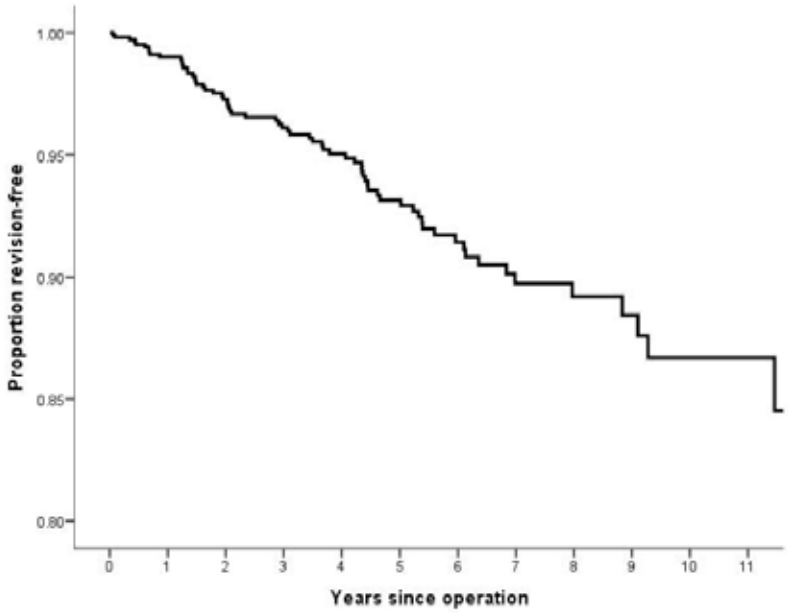
Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	136	654.8	25	3.82	2.47	5.64
55_64	402	2,089.0	51	2.44	1.82	3.21
65_74	445	2,145.8	39	1.82	1.29	2.48
GE74	177	752.9	5	0.66	0.22	1.55

The higher two age bands have significantly lower revision rates than the lower two and the >74 a significantly lower revision rate than the 65-74 age band.

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 15 years from 2000 to 2014, with deceased patients censored at time of death.



Years	% Revision-free	No in each year N
1	98.40	1,037
2	96.30	891
3	94.20	757
4	92.20	656
5	90.20	514
6	88.60	390
7	86.20	278
8	85.10	210
9	83.10	152

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

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

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

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

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

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

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

For the fifteen year period and as at July 2015, there were 859 primary ankle questionnaire responses registered at six months post-surgery. The mean primary ankle score was 32.60 (standard deviation 9.48, range 2 – 48).

Scoring	> 41	207
Scoring	34 -41	287
Scoring	27 -33	163
Scoring	< 27	202

At six months post-surgery, 58% had an excellent or good score.

Questionnaires at five years post surgery

All patients who had a six-month registered questionnaire, and who had not had revision surgery were sent a further questionnaire at five years post-surgery. There were 287 primary ankle questionnaire responses registered at five years post-surgery.

At five years post-surgery, 69% achieved an excellent or good score. The average score was 36.85.

Analysis of the individual questions

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

Percentage scoring 0 or 1 for each question at six-months

		%
1	Moderate or severe pain from the operated ankle	22
2	Only able to walk around the house or unable to walk before the pain becomes severe	6
3	Extreme difficulty or impossible to walk on uneven ground	14
4	Most of the time or always have to use an orthotic	22
5	Pain greatly or totally interferes with usual work	15
6	Limping most or every day	32
7	Extreme difficulty or impossible to climb a flight of stairs	6
8	Pain from your ankle in bed most or every night(s)	7
9	Pain from your ankle greatly or totally interferes with usual recreational activities	21
10	Have swelling of your foot most or all of the time	30
11	Very painful or unbearable to stand up from a chair after a meal	6
12	Sudden severe pain from your ankle most or every day	5

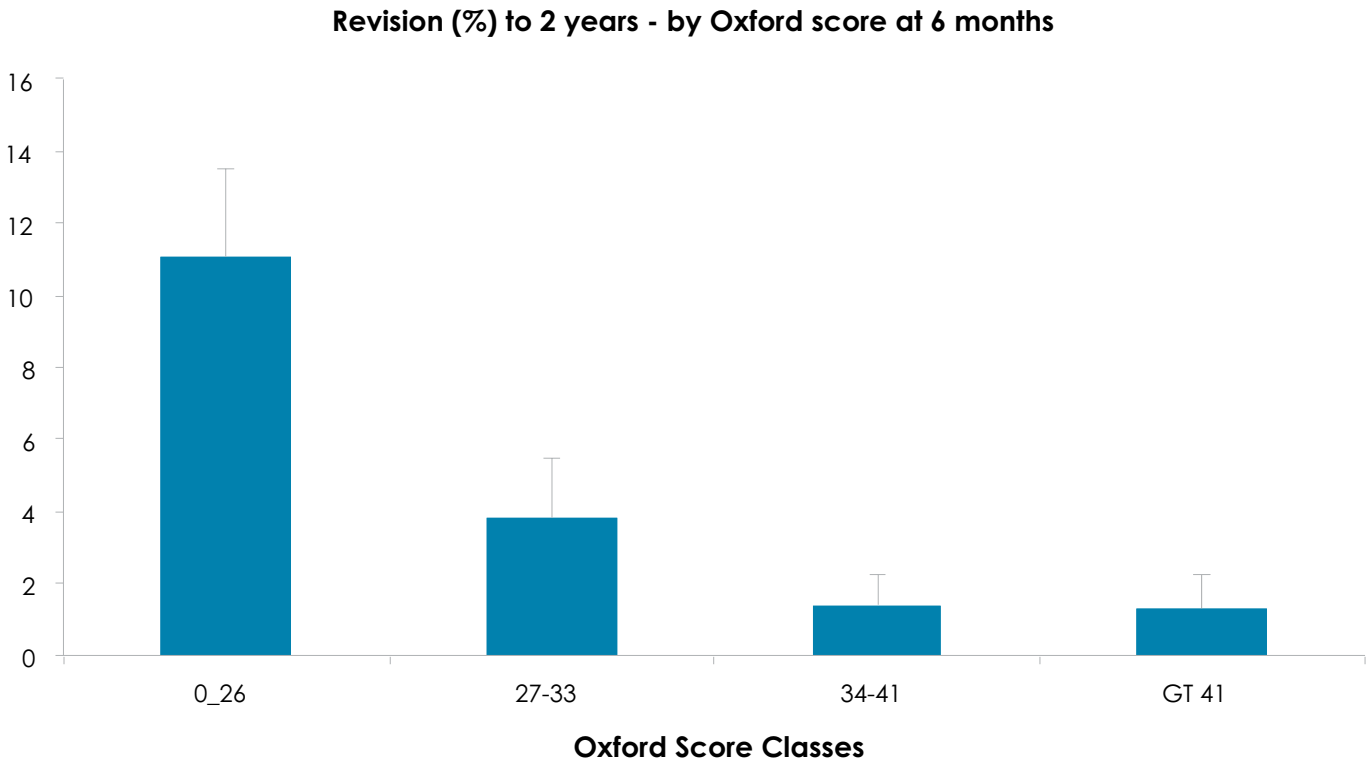
Revision ankle questionnaire responses

There were 59 revision ankle responses with 29% achieving an excellent or good score. This group includes all revision ankle responses. The mean revision ankle score was 28.12 (standard deviation 10.33, range 8 – 48).

OXFORD 12 SCORE AS A PREDICTOR OF ANKLE ARTHROPLASTY REVISION

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

Plotting the patients' six month scores in the Kalairajah groupings against the proportion of ankles 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 8.4 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	Revision to 2 yrs	No. revised	%	Std error
0_26	163	18	11.04	2.45
27-33	132	5	3.79	1.66
34-41	213	3	1.41	0.81
GT 41	153	2	1.31	0.92

A person with an Oxford score >41 has a 1.31% risk of revision within two years compared to an 11.04% risk with a score of < 27.

SHOULDER ARTHROPLASTY

PRIMARY SHOULDER ARTHROPLASTY

The **fifteen**-year report analyses data for the period January 2000 – December 2014. There were 6,331 primary shoulder procedures registered, an additional 801 compared to last year's report, which represents a 7.2% increase over 2013 registrations and a 657% increase over the 15 years.

2000	122
2001	162
2002	193
2003	225
2004	280
2005	293
2006	366
2007	400
2008	457
2009	514
2010	494
2011	579
2012	698
2013	747
2014	801

Of the 6,331 shoulder registrations, 1,586 are hemi shoulder replacements, 2,409 are conventional total shoulder replacements, 2,009 are reverse shoulder replacements, 208 are partial resurfacing shoulder replacements, 118 are total resurfacing replacements and one is a humeral sphere.

Data Analysis

Age and sex distribution

The average age for all patients with a shoulder arthroplasty was 70.88 years, with a range of 15.63 – 99.36 years.

All shoulder arthroplasty

	Female	Male
Number	4,028	2,303
Percentage	63.62	36.38
Mean age	72.48	68.08
Maximum age	97.71	99.36
Minimum age	15.63	21.83
Standard dev.	9.62	10.29

Hemiarthroplasty

	Female	Male
Number	1,050	536
Percentage	66.20	33.80
Mean age	71.66	65.80
Maximum age	97.71	99.36
Minimum age	15.63	25.83
Standard dev.	11.01	12.15

Conventional total shoulder arthroplasty

	Female	Male
Number	1,531	878
Percentage	63.55	36.44
Mean age	70.78	67.20
Maximum age	94.62	89.11
Minimum age	26.64	29.38
Standard dev.	8.81	8.48

Reverse shoulder arthroplasty

	Female	Male
Number	1,297	712
Percentage	64.56	35.44
Mean age	76.05	73.31
Maximum age	96.82	92.65
Minimum age	40.70	48.96
Standard dev.	7.35	7.39

Partial resurfacing arthroplasty

	Female	Male
Number	74	134
Percentage	35.58	64.42
Mean age	58.60	55.87
Maximum age	87.06	86.12
Minimum age	20.70	21.83
Standard dev.	14.39	11.18

Total resurfacing arthroplasty

	Female	Male
Number	75	43
Percentage	63.56	36.44
Mean age	71.00	66.05
Maximum age	86.79	80.55
Minimum age	47.24	45.16
Standard dev.	8.16	8.38

Humeral sphere

One female patient aged 50.11 years.

Previous operation

None	5,344
Internal fixation for juxtarticular fracture	160
Previous stabilisation	119
Osteotomy	4

Diagnosis

Osteoarthritis	3,402
Cuff tear arthropathy	1,255
Acute fracture prox. humerus	658
Rheumatoid arthritis	510
Post old trauma	375
Avascular necrosis	194
Post recurrent dislocation	80
Other inflammatory	60

Approach

Deltopectoral	5,583
Deltoid split	161
Other	21

Bone graft

Humeral autograft	98
Humeral allograft	20
Humeral synthetic	3
Glenoid autograft	71
Glenoid allograft	11

Cement

Humerus cemented	1,483
Antibiotic in cement	910
Glenoid cemented	1,632
Antibiotic in cement	1,144

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	5,928	(94%)

Operating theatre

Conventional	3,830
Laminar flow	2,480
Space suits	1,110

ASA Class

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

For the ten-year period 2005 – 2014 there were 5,088 (95%) shoulder procedures with the ASA class recorded.

Definitions

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

ASA	Number	Percentage
1	457	9
2	2,815	55
3	1,751	35
4	65	1

Operative time (skin to skin in minutes)

	Mean
Hemi	110
Total Sh.	128
Partial R.	94
Total R.	126
Reverse	118

Surgeon grade

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

The following figures are for the ten-year period 2005 – 2014.

Consultant	5,101
Advanced trainee supervised	259
Advanced trainee unsupervised	13
Basic trainee	1

Top 10 shoulder prostheses 2014

SMR	320
Delta Xtend Reverse	155
Aequalis	93
Aequalis Reversed	62
Global AP	58
Global Unite	24
Global	20
Epoca	18
Comprehensive	15
Bigliani/Flatow	11

The Comprehensive is a new addition to the list and has replaced the Global Cap Resurfacing from the 2013 list.

Surgeon and hospital workload

Surgeons

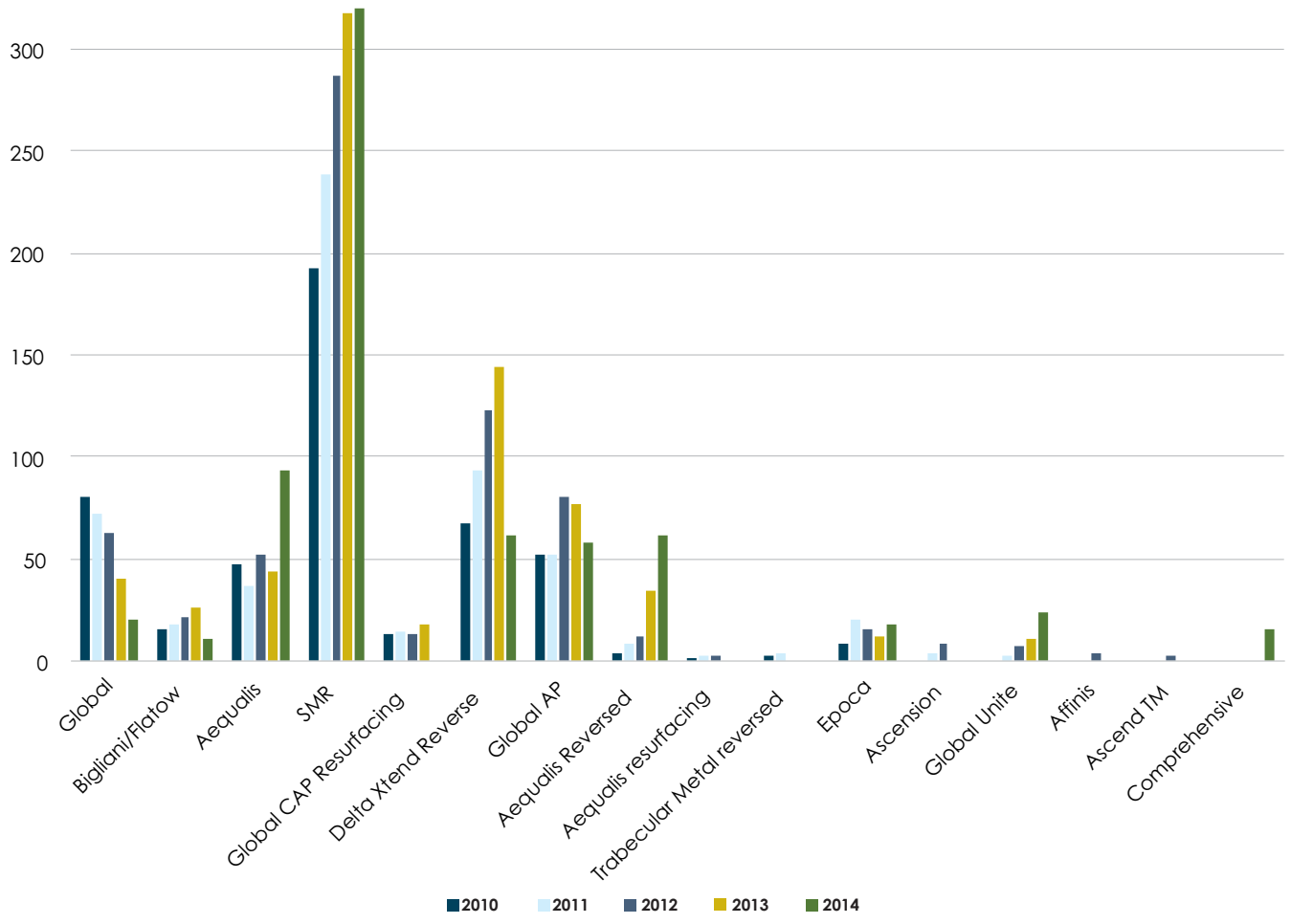
In 2014, 79 surgeons performed 801 shoulder procedures, an average of 10 procedures per surgeon. 12 surgeons performed more than 20 procedures and 15 surgeons performed one procedure.

Hospitals

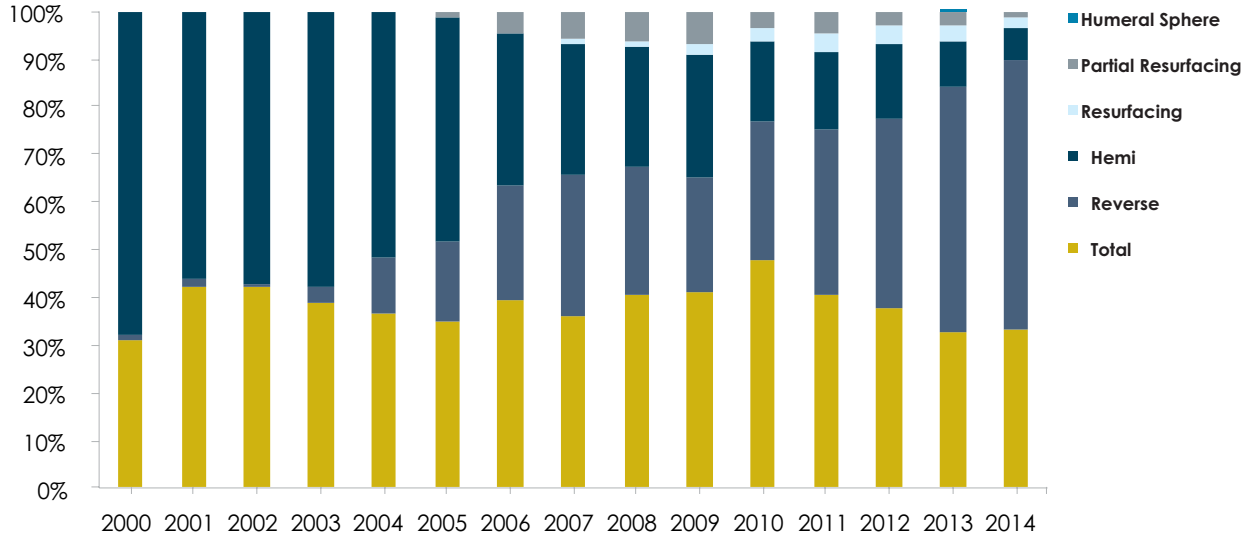
In 2014 shoulder replacement was performed in 47 hospitals. 26 were public and 21 were private.

The average number of shoulder replacements per hospital for 2014 was 14.

Most used shoulder prostheses 2010 - 2014



Percentages of the different types of shoulder prostheses used by year



The Reverse shoulder prostheses continue to dominate and in 2014 accounted for 56% of shoulder arthroplasties.

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 **fifteen-** year period January 2000 – December 2014, there were 502 revision shoulder procedures registered.

The average age for a shoulder revision was 68.46 years with a range of 24.05 – 89.95 years.

	Female	Male
Number	279	223
Percentage	55.58	44.42
Mean	70.03	66.49
Maximum age	89.95	88.46
Minimum age	33.20	24.05
Standard dev.	10.86	10.62

REVISION OF REGISTERED PRIMARY SHOULDER ARTHROPLASTIES

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

There were 308 revisions of the primary group of 6,331(4.9%). There were 33 procedures that had been revised twice and four that had been revised three times.

Time to revision

Mean	917 days
Maximum	4,530 days
Minimum	0 days
Standard deviation	894 days

Reason for revision

Pain	70
Dislocation/instability anterior	58
Sub acromial cuff impingement	55
Loosening glenoid	40
Deep infection	21
Loosening humeral	12
Instability posterior	10
Sub acromial tuberosity impingement.	5
Fracture humerus	3
Loosening both	2

Analysis by time for the 6 main reasons for revision

	Loosening glenoid		Dislocation		Deep infection		Pain		Sub acromial Cuff		Loosening Humeral	
Years	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
0	10	25.00	34	58.62	7	33.33	17	24.29	11	20.00	2	16.67
1	9	22.50	10	17.24	8	38.10	19	27.14	15	27.27	1	8.33
2	4	10.00	3	5.17	3	14.29	11	15.71	11	20.00	1	8.33
3	2	5.00	2	3.45	2	9.52	6	8.57	3	5.45	3	25.00
4	1	2.50	3	5.17	1	4.76	5	7.14	3	5.45	1	8.33
5	4	10.00	4	6.90	0	0.00	1	1.43	4	7.27	3	25.00
6	3	7.50	0	0.00	0	0.00	4	5.71	2	3.64	0	0.00
7	0	0.00	0	0.00	0	0.00	2	2.86	2	3.64	0	0.00
8	1	2.50	1	1.72	0	0.00	2	2.86	0	0.00	0	0.00
9	4	10.00	0	0.00	0	0.00	2	2.86	2	3.64	0	0.00
10	2	5.00	0	0.00	0	0.00	1	1.43	2	3.64	1	8.33
11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
12	0	0.37	1	1.72	0	0.00	0	0.00	0	0.00	0	0.00
Total	**40**	**-**	**58**	**-**	**21**	**-**	**70**	**-**	**55**	**-**	**12**	**-**

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	
6,331	29,121.5	308	1.06	0.94	1.18

Revision rate of Shoulder Prostheses vs Arthroplasty Type

Operation Type	No. Ops.	Observed	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total	2,409	11,775.9	118	1.00	0.83	1.20
Reverse	2,009	6,062.8	58	0.96	0.72	1.23
Hemi	1,586	10,016.5	110	1.10	0.90	1.32
Resurfacing	118	339.2	1	0.29	0.01	1.64
Partial resurfacing	208	926.0	21	2.27	1.40	3.47
Humeral Sphere	1	1.1	0	0.00	0.00	344.59

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

Revision Rate of Individual Shoulder Prostheses Sorted on Alphabetical Order

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Conventional Total	Aequalis	352	1,541.0	12	0.78	0.40	1.36
	Affinis	3	7.6	0	0.00	0.00	48.50
	Anatomical	35	374.9	0	0.00	0.00	0.98
	Arthrex Eclipse	1	3.1	0	0.00	0.00	117.47
	Ascend TM	2	3.6	0	0.00	0.00	101.31
	Bi-Angular	8	72.3	0	0.00	0.00	5.10
	Bigliani/Flatow	263	1,859.0	7	0.38	0.15	0.78
	Cofield 2	21	210.1	0	0.00	0.00	1.76
	Comprehensive	6	2.2	0	0.00	0.00	168.21
	Delta Xtend Reverse	2	3.6	0	0.00	0.00	103.09
	Epoca Humeral stem	4	17.6	0	0.00	0.00	20.93
	Global	509	3,097.1	14	0.45	0.25	0.76
	Global AP	330	938.4	2	0.21	0.03	0.77
	Global Unite	13	2.5	0	0.00	0.00	144.72
	Humeral stem	1	2.3	0	0.00	0.00	157.40
	Neer 3	2	24.4	0	0.00	0.00	15.11
	Neer II	12	139.7	0	0.00	0.00	2.64
	Osteonics humeral component	49	426.5	6	1.41	0.52	3.06
	Sidus	1	0.3	0	0.00	0.00	1,132.24

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
	Simpliciti TM	8	9.0	0	0.00	0.00	41.03
	SMR	782	3,008.1	77	2.56	2.02	3.20
	Univers 3D	5	32.5	0	0.00	0.00	11.35
Reverse	Aequalis	45	19.8	1	5.06	0.13	28.17
	Aequalis Reversed	73	201.0	1	0.50	0.01	2.77
	Aequalis Reversed Fracture	19	24.0	0	0.00	0.00	15.36
	Affinis	3	6.6	0	0.00	0.00	56.21
	Comprehensive	12	5.0	0	0.00	0.00	73.83
	Delta	55	422.9	2	0.47	0.06	1.71
	Delta Xtend Reverse	733	1,946.6	25	1.28	0.83	1.90
	SMR	1,049	3,392.9	29	0.85	0.57	1.23
	Trabecular Metal Reverse	19	40.5	0	0.00	0.00	9.12
	Vaios	1	3.7	0	0.00	0.00	99.73
Hemi	Aequalis	152	837.3	9	1.07	0.49	2.04
	Aequalis Reversed	1	2.4	0	0.00	0.00	153.46
	Affinis	5	4.0	0	0.00	0.00	91.47
	Anatomical	19	208.3	0	0.00	0.00	1.77
	Arthrex Eclipse	2	12.2	0	0.00	0.00	30.24
	Ascend TM	1	2.6	0	0.00	0.00	143.49
	Bi-Angular	19	192.9	2	1.04	0.13	3.75
	Bigliani/Flatow	137	1,072.8	13	1.21	0.65	2.07
	Bio-modular	1	7.1	1	14.00	0.35	78.03
	Cofield 2	50	501.6	0	0.00	0.00	0.74
	Delta	1	8.3	0	0.00	0.00	44.57
	Delta Xtend Reverse	17	50.4	3	5.95	1.23	17.39
	Global	721	4,926.5	47	0.95	0.70	1.27
	Global AP	66	199.9	2	1.00	0.12	3.61
	Global Unite	31	40.2	2	4.98	0.60	17.98
	MRS Humeral	4	14.9	0	0.00	0.00	24.69
	Neer II	24	208.5	0	0.00	0.00	1.77
	Osteonics humeral component	43	364.0	2	0.55	0.07	1.98
	Randelli	1	8.2	0	0.00	0.00	44.82
	SMR	289	1,345.2	29	2.16	1.44	3.10
	Trabecular Metal Reverse	1	5.2	0	0.00	0.00	70.51
	Univers 3D	1	3.8	0	0.00	0.00	96.59

Prothesis		No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total Resurfacing	Aequalis Resurfacing Head	10	35.8	0	0.00	0.00	10.31
	Epoca Head	62	150.4	0	0.00	0.00	2.45
	Global CAP Resurfacing	44	145.6	1	0.69	0.02	3.83
	SMR Resurfacing	2	7.3	0	0.00	0.00	50.39
Partial resurfacing	Aequalis Resurfacing Head	1	3.0	0	0.00	0.00	121.06
	Arthrex Eclipse	3	7.9	2	25.22	3.05	91.09
	Ascension	20	47.1	1	2.12	0.05	11.82
	Copeland Resurfacing	19	107.4	2	1.86	0.23	6.73
	Custom Global Cap	1	3.4	0	0.00	0.00	108.14
	Epoca Head	16	39.2	1	2.55	0.06	14.20
	Global CAP Resurfacing	92	496.4	9	1.81	0.83	3.44
	Global Humeral Head	1	2.2	0	0.00	0.00	164.92
	Hemicap Resurfacing	6	34.9	0	0.00	0.00	10.56
	SMR Resurfacing	43	159.4	4	2.51	0.68	6.42
	SMR Resurfacing CTA	6	24.9	2	8.03	0.97	28.99

There are widely varying revision rates, most of which do not reach statistical significance. The stand out is SMR Conventional which has a markedly higher revision rate than the other main Conventional prostheses. Eighty-eight were implanted in 2014.

Revision vs Glenoid Fixation
(Conventional Total arthroplasties only)

	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Uncemented	838	3,298.4	74	2.24	1.76	2.82
Cemented	1,571	8,477.5	44	0.52	0.38	0.70

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

Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	409	2,198.7	45	2.05	1.49	2.74
55_64	1,169	5,729.8	91	1.59	1.27	1.94
65_74	2,375	10,977.5	108	0.98	0.81	1.19
GE74	2,378	10,215.5	64	0.63	0.48	0.80

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

Revision vs Prosthesis Group vs Age Bands

Prosthesis	Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Total	LT55	124	594.2	15	2.52	1.41	4.16
	55_64	572	2,662.8	38	1.43	1.01	1.96
	65_74	1,051	5,218.0	46	0.88	0.65	1.18
	GE75	662	3,300.9	19	0.58	0.35	0.90
Reverse	LT55	14	33.4	2	5.98	0.72	21.62
	55_64	194	618.8	10	1.62	0.77	2.97
	65_74	732	2,125.2	24	1.13	0.72	1.68
	GE74	1,069	3,285.3	22	0.67	0.42	1.01
Hemi	LT55	180	1,171.2	16	1.37	0.78	2.22
	55_64	308	2,040.1	39	1.91	1.36	2.61
	65_74	492	3,303.6	32	0.97	0.66	1.37
	GE74	606	3,501.4	23	0.66	0.42	0.99
Resurfacing	LT55	5	14.1	1	7.09	0.18	39.51
	55_64	28	100.3	0	0.00	0.00	3.68
	65_74	56	150.2	0	0.00	0.00	2.45
	GE74	29	74.5	0	0.00	0.00	4.95
Partial resurfacing	LT55	85	384.6	11	2.86	1.43	5.12
	55_64	67	307.6	4	1.30	0.35	3.33
	65_74	44	180.3	6	3.33	1.22	7.24
	GE74	12	53.3	0	0.00	0.00	6.92

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Female	4,028	18,806.2	177	0.94	0.81	1.09
Male	2,303	10,315.3	131	1.27	1.06	1.51

There is no significant difference between the two groups.

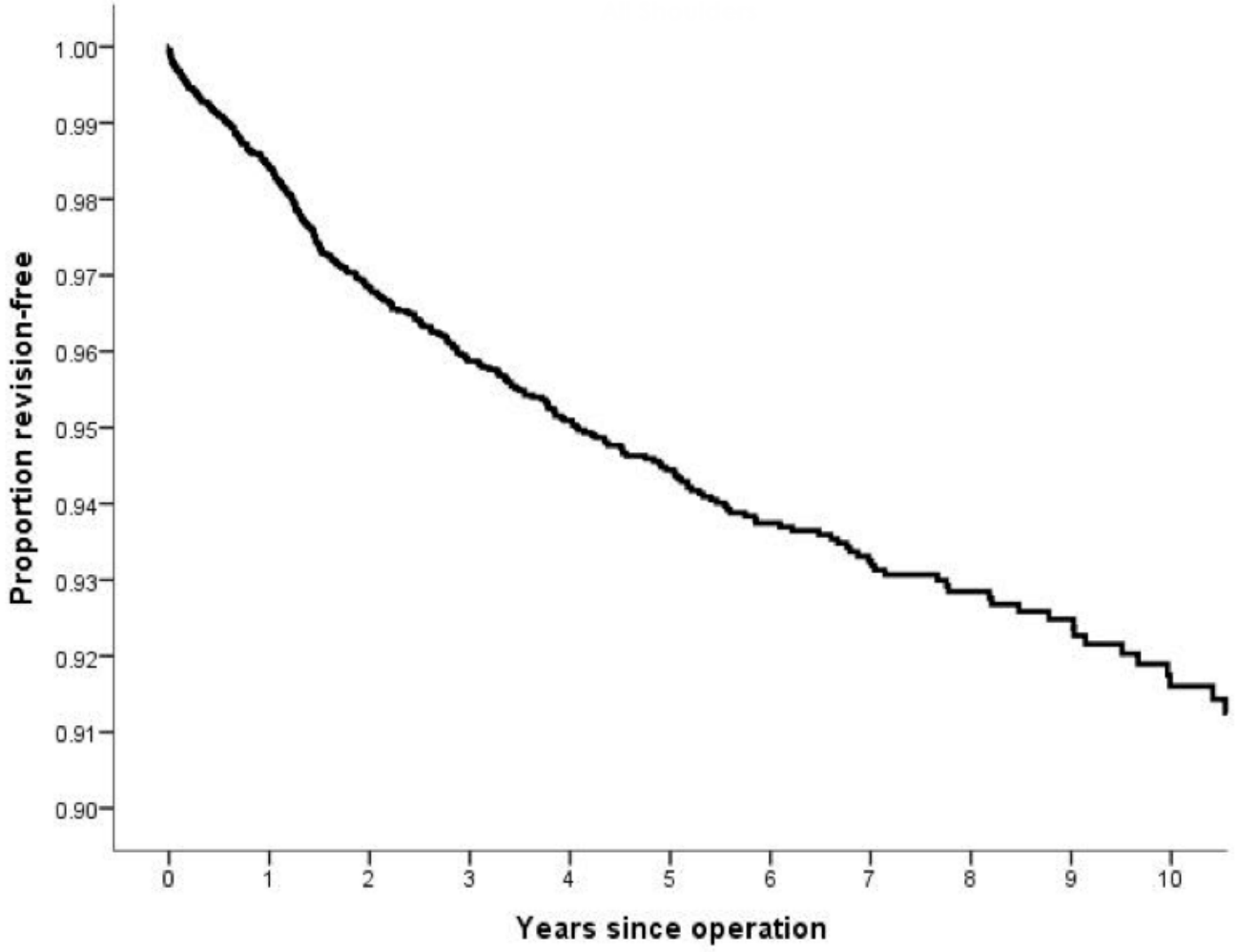
Revision vs Surgeon Annual Workload

Consultant Number of ops/yr	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
<10	2,759	12,886.5	148	1.15	0.97	1.35
>=10	3,572	16,235.0	160	0.99	0.84	1.15

There is no significant difference between the two groups.

KAPLAN MEIER CURVES

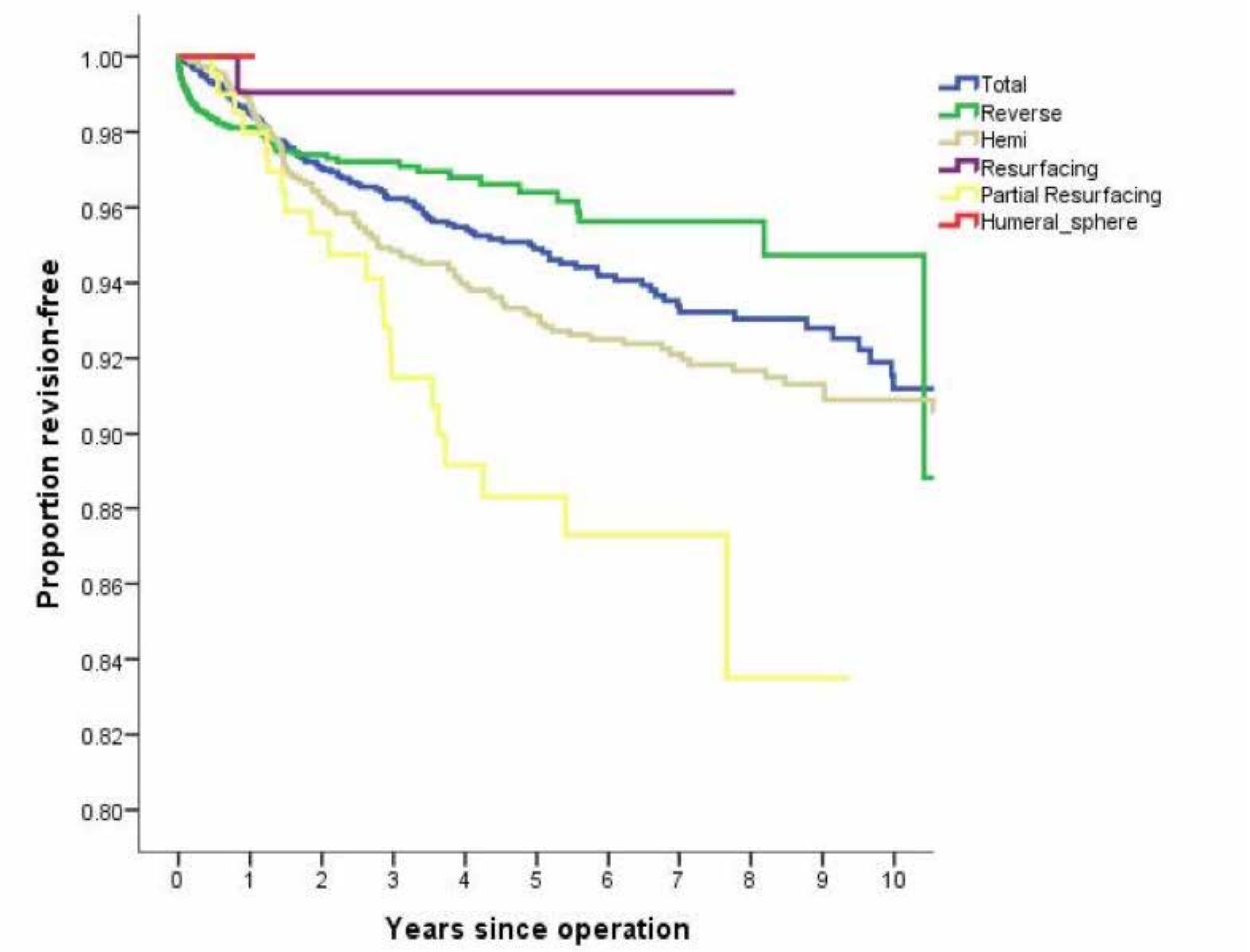
The following Kaplan Meier survival analyses are for the 15 years from 2000 to 2014, with deceased patients censored at time of death.



Years	% Revision-free	N
1	98.40%	5,364
2	96.80%	4,482
3	95.90%	3,690
4	95.10%	3,046
5	94.40%	2,509
6	93.70%	2,031
7	93.20%	1,546
8	92.80%	1,252
9	92.50%	899
10	91.60%	626

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

Survival curves for different shoulder categories



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

Questionnaires at six months post-surgery

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

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

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

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

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

For the fifteen-year period and as at July 2015, there were 4,225 shoulder questionnaire responses registered at six months post-surgery.

The mean shoulder score was 36.35 (standard deviation 9.52, range 2 – 48)

Scoring	> 41	1,565
Scoring	34 - 41	1,331
Scoring	27 - 33	641
Scoring	<27	688

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 1,226 individual patients.

At five years post-surgery, 78% of these patients achieved an excellent or good score and had a mean of 39.60.

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 245 individual patients.

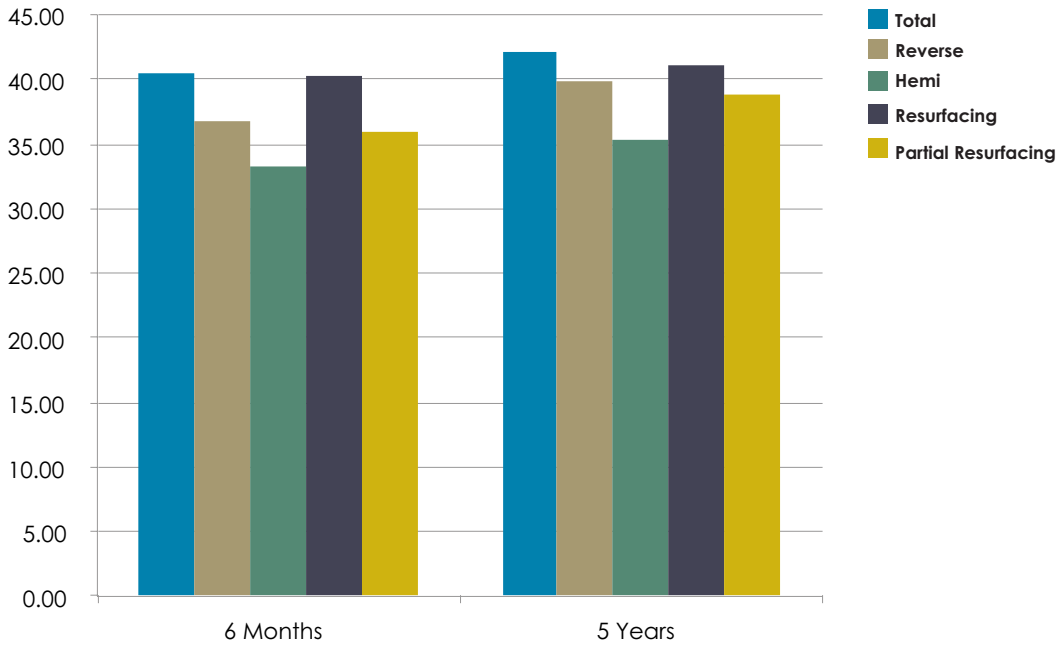
At ten years post-surgery, 73% of these patients achieved an excellent or good score and had a mean of 38.40.

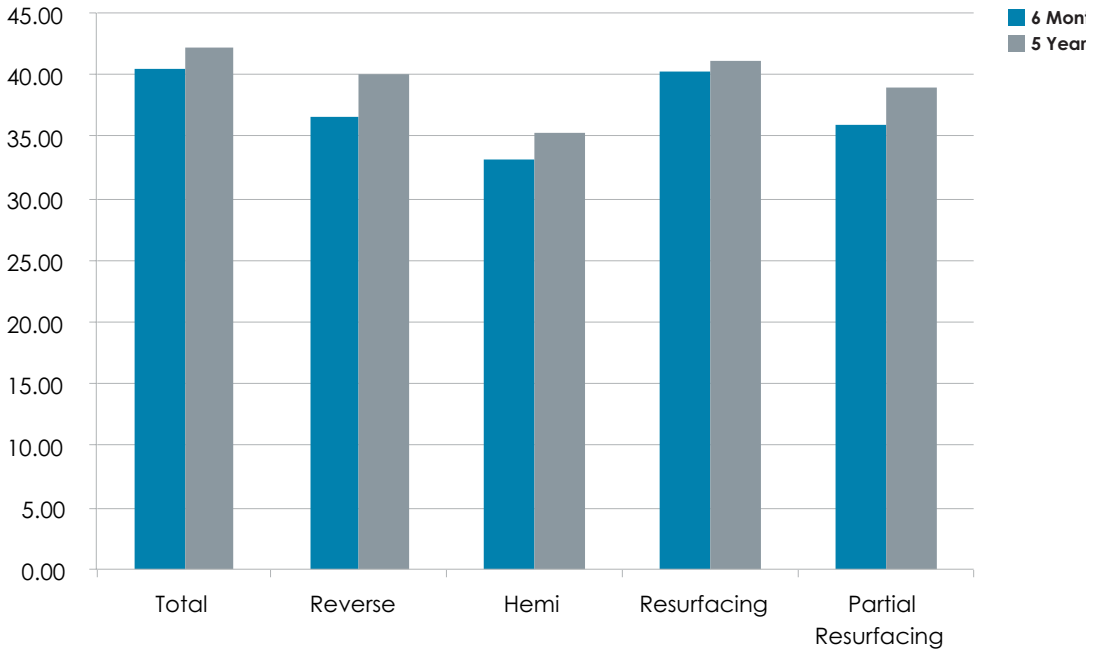
Six month and Five Year Oxford Scores for the different arthroplasty types

Prosthesis type	Time Post-Surgery	Mean Score	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Conventional Total	6 Months	40.54	0.35	39.86	41.22
	5 Years	42.11	0.35	41.43	42.80
Reverse	6 Months	36.67	0.54	35.62	37.72
	5 Years	39.95	0.54	38.89	41.01
Hemi	6 Months	33.16	0.44	32.29	34.03
	5 Years	35.37	0.45	34.50	36.25
Resurfacing	6 Months	40.33	2.79	34.85	45.82
	5 Years	41.11	2.82	35.59	46.64
Partial Resurfacing	6 Months	35.90	1.53	32.90	38.90
	5 Years	38.90	1.54	35.87	41.93

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

Comparison of 6 month and 5 year scores for different arthroplasty types





Analysis of the individual questions

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

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

		6mth %	5yr %
1	The worst pain from the shoulder is severe or unbearable	18	12
2	Usually have moderate or severe pain from the operated shoulder	22	14
3	Extreme difficulty or impossible to get in and out of a car or public transport	3	2
4	Extreme difficulty or impossible to use a knife and fork at the same time	5	2
5	Extreme difficulty or impossible to do the household shopping on your own	7	7
6	Extreme difficulty or impossible to carry a tray containing a plate of food across a room	9	8
7	Extreme difficulty or impossible to brush or comb hair with the operated arm	19	12
8	Extreme difficulty or impossible to dress yourself because of your operated shoulder	7	4
9	Extreme difficulty or impossible to hang clothes in a wardrobe using operated arm	18	14
10	Extreme difficulty or impossible to wash and dry under both arms	10	6
11	Pain from operated shoulder greatly or totally interfering with usual work	14	12
12	Pain from shoulder in bed most or every night(s)	16	12

Revision shoulder questionnaire responses

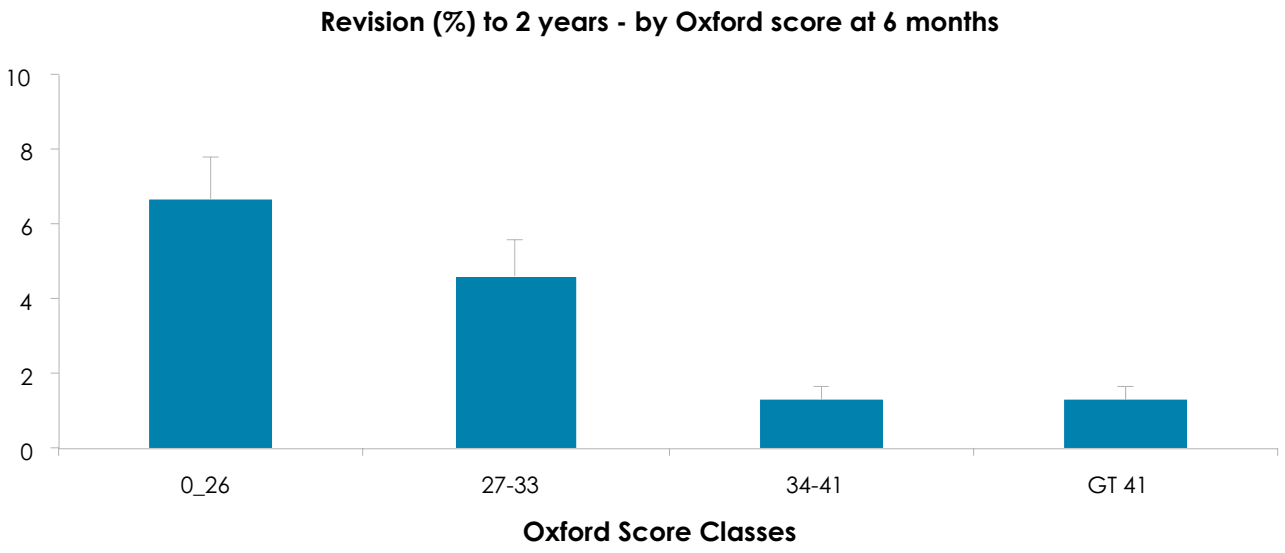
There were 297 revision shoulder responses with 47% achieving an excellent or good score. This group includes all revision shoulder responses. The mean revision shoulder score was 31.11 (standard deviation 10.51, range 3 – 48).

OXFORD 12 SCORE AS A PREDICTOR OF SHOULDER ARTHROPLASTY REVISION

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

Six month score and revision arthroplasty

Plotting the patients' six month scores in the Kalairajah groupings against the proportion of shoulders revised for that same group demonstrates that there is an incremental increase in risk during the next two years related to the Oxford score, although it is not as clear cut as for the hips and knees. A patient with a score below 27 has 5 times the risk of a revision within two years compared to a person with a score of 34-41 or >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	482	32	6.64	1.13
27-33	455	21	4.62	0.98
34-41	918	12	1.31	0.37
GT 41	1,073	14	1.30	0.35

A person with an Oxford score >41 has a 1.30% risk of revision within two years compared to a 6.64% risk with a score <27.

ELBOW ARTHROPLASTY

PRIMARY ELBOW ARTHROPLASTY

The **fifteen**-year report analyses data for the period January 2000 – December 2014. There were 435 primary elbow procedures registered, an additional 26 compared to 2013.

2000	17
2001	29
2002	32
2003	23
2004	28
2005	30
2006	31
2007	36
2008	40
2009	34
2010	30
2011	33
2012	24
2013	22
2014	26

Data Analysis

Age and sex distribution

The average age for an elbow replacement was 66.86 years, with range of 15.16 – 92.41 years.

	Female	Male
Number	334	101
Percentage	76.78	23.22
Mean age	67.20	65.73
Maximum age	92.41	91.73
Minimum age	36.38	15.16
Standard dev.	11.91	13.57

Previous operation

None	367
Internal fixation for juxtarticular fracture	20
Synovectomy+-removal radial head	14
Debridement	12
Osteotomy	2
Ligament reconstruction	1
Interposition arthroplasty	1

Diagnosis

RRheumatoid arthritis	237
Post fracture	123
Osteoarthritis	58
Other inflammatory	8
Post dislocation	7
Post ligament disruption	4

Approach

Posterior	272
Medial	86
Lateral	28

Bone graft

Humeral autograft	32
Humeral allograft	3
Humeral synthetic	1
Ulnar autograft	2

Cement

Humerus cemented	404	
Antibiotic in cement	298	(74%)
Ulna cemented	382	
Antibiotic in cement	277	(73%)
Radius cemented	22	
Antibiotic in cement	21	(96%)

Systemic antibiotic prophylaxis

Patient number receiving at least one systemic antibiotic	404	(93%)

Operating theatre

Conventional	298
Laminar flow	133
Space suits	64

ASA Class

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

For the ten-year period 2005 – 2014, there were 283 (92%) primary elbow procedures with the ASA class recorded.

Definitions

ASA class 1: A healthy patient

ASA class 2: A patient with mild systemic disease

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

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

ASA	Number
1	8
2	128
3	140
4	7

Operative time (skin to skin)

Mean	140 minutes

Surgeon grade

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

The following figures are for the ten- year period 2005 – 2014.

Consultant	300
Advanced trainee supervised	7
Advanced trainee unsupervised	3

Surgeon and hospital workload

In 2014, 16 surgeons performed 26 primary elbow procedures. Three surgeons performed two operations and 11 surgeons performed one operation each.

Hospitals

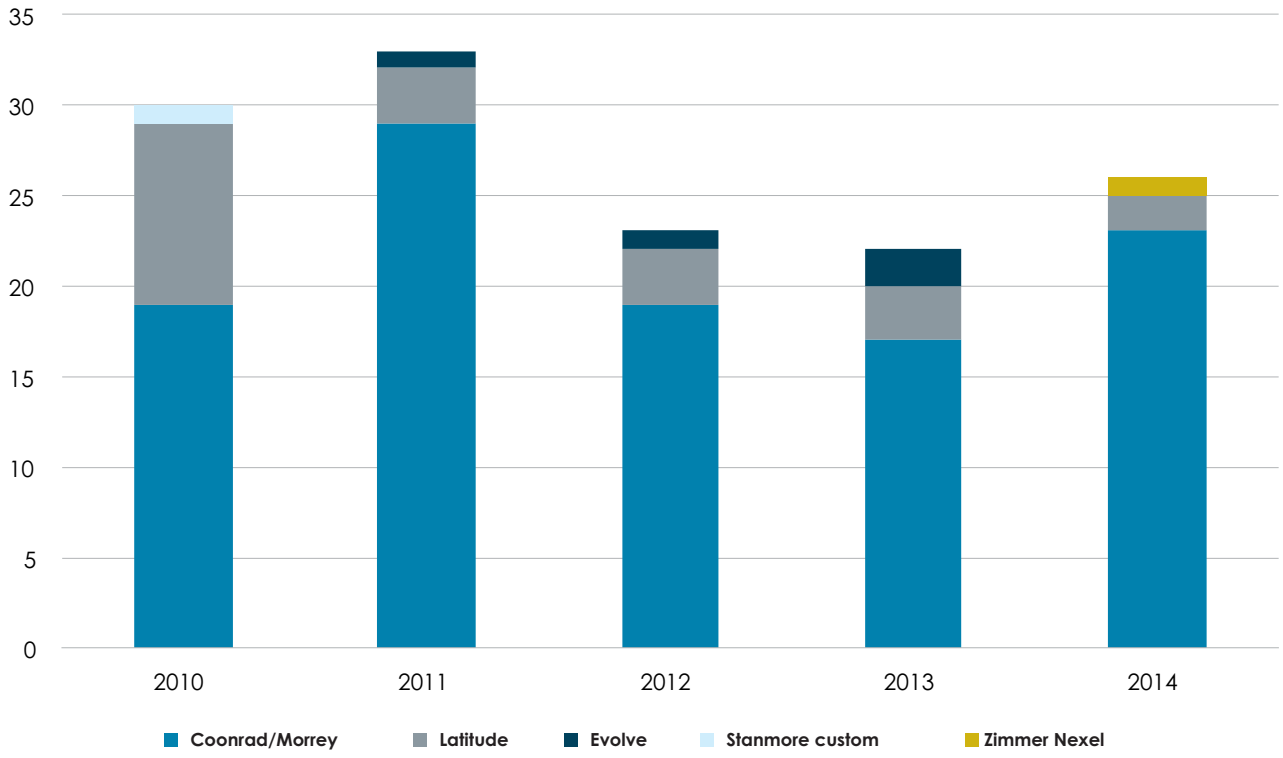
In 2014, primary elbow replacement was performed in 45 hospitals, of which 10 were public and 4 were private.

Prosthesis usage

Elbow prostheses used in 2014

Coonrad/Morrey	23
Latitude	2
Zimmer Nexel	1

Most Used Elbow Prostheses 2010 – 2014



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 fifteen-year period January 2000 – December 2014, there were 78 revision elbow procedures registered.

The average age for a revision elbow replacement was 65.76 years, with a range of 30.97 – 88.95 years.

	Female	Male
Number	56	22
Percentage	71.79	28.21
Mean	66.16	64.73
Maximum age	88.95	84.17
Minimum age	42.23	30.97
Standard dev.	9.42	12.36

REVISION OF REGISTERED PRIMARY ELBOW ARTHROPLASTIES

This section analyses data for revisions of primary elbow procedures for the fifteen-year period January 2000 – December 2014.

There were 28 revisions of the primary group of 435 (6.4%).

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

Time to revision

Mean	1,231 days
Maximum	3,988 days
Minimum	62 days
Standard deviation	1,039 days

Reason for revision

LLoosening humeral component	9
Deep infection	7
Loosening ulnar component	6
Pain	3
Fracture humerus	3
Loosening radial head component	2
Dislocation	2
Fracture ulna	1

Analysis by time for the 3 main reasons for revision

	Loosening humeral		Loosening Ulna		Deep infection	
Years	Count	%	Count	%	Count	%
0	0	0.00	0	0.00	0	0.00
1	2	22.20	0	0.00	4	57.10
2	3	33.30	3	50.00	1	14.30
3	2	22.20	2	33.30	0	0.00
4	1	11.10	0	0.00	0	0.00
5	0	0.00	0	0.00	0	0.00
6	0	0.00	0	0.00	1	14.30
7	0	0.00	0	0.00	0	0.00
8	0	0.00	0	0.00	1	14.30
9	0	0.00	0	0.00	0	0.00
10	0	0.00	1	16.70	0	0.00
11	1	11.10	0	0.00	0	0.00
Total	9	-	6	-	7	-

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	
435	2,523.7	28	1.11	0.74	1.60

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	124.5	5	4.01	1.30	9.37
Coonrad/Morrey	317	1,864.3	13	0.70	0.37	1.19
Evolve Stem	10	43.9	0	0.00	0.00	8.40
Kudo	18	139.8	3	2.15	0.44	6.27
Latitude	71	339.8	7	2.06	0.83	4.24
Sorbie Questor	1	6.8	0	0.00	0.00	54.09
Stanmore custom implant	1	4.4	0	0.00	1.00	83.22
Zimmer Nexel	1	0.1	0	0.00	2.00	2,749.72

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

Revision vs Gender

Gender	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
Females	334	2,070.8	19	0.92	0.55	1.43
Males	101	452.9	9	1.99	0.91	3.77

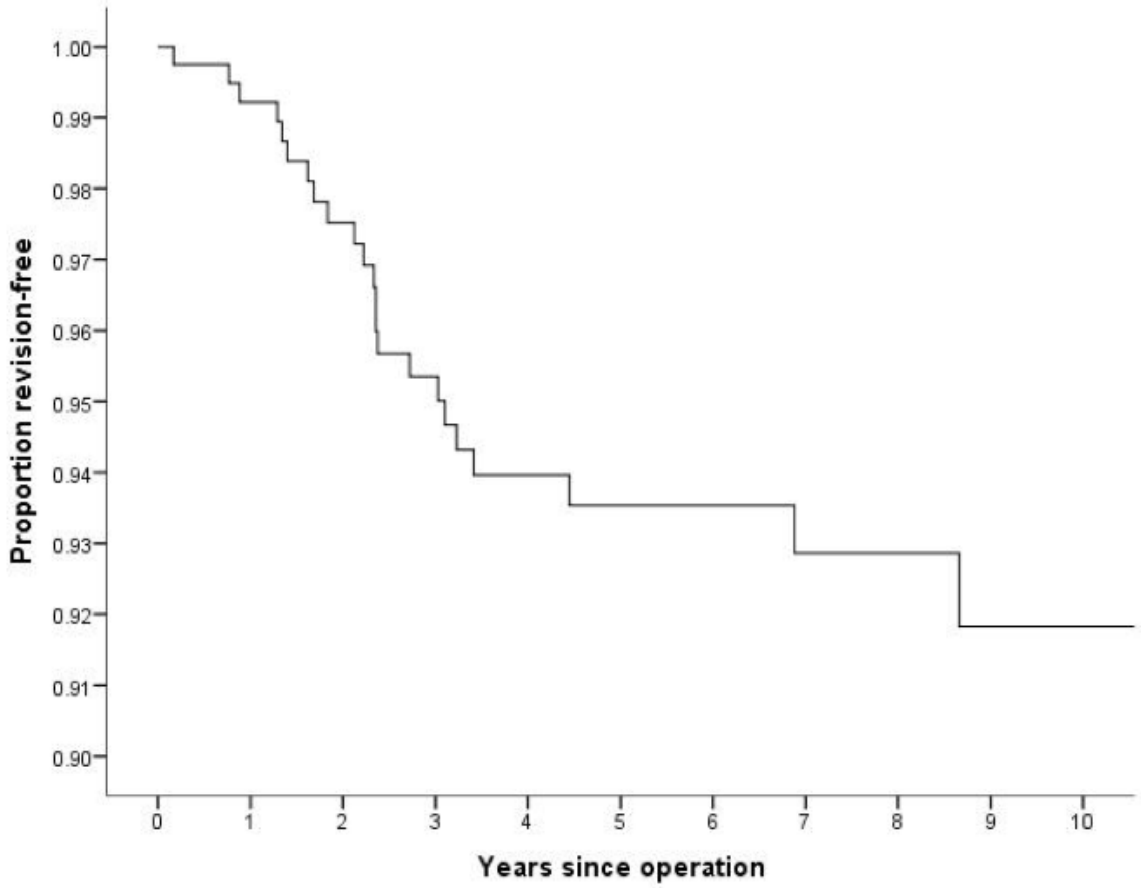
Revision vs Age Bands

Age Bands	No. Ops	Observed comp. Yrs	Number Revised	Rate/100 component-years	Exact 95% confidence interval	
LT55	77	536.0	5	0.93	0.30	2.18
55_64	113	734.1	10	1.36	0.65	2.51
65_74	119	660.6	9	1.36	0.62	2.59
GE74	126	593.0	4	0.67	0.18	1.73

KAPLAN MEIER CURVES

The following Kaplan Meier survival analyses are for the 15 years from 2000 to 2014, with deceased patients censored at time of death.

Elbows



Years	% Revision-free	N
1	99.30%	396
2	97.40%	356
3	95.40%	317
4	94.10%	290
5	93.40%	240

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

PATIENT BASED QUESTIONNAIRE OUTCOMES AT SIX-MONTHS POST SURGERY

Questionnaires at six months post surgery

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

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

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

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

This groups each score into four categories:

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

For the fifteen-year period and as at July 2015, there were 294 primary elbow responses registered at six months post-surgery.

The mean primary elbow score was 37.05 (standard deviation 9.72, range 7 – 48).

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

At six months post-surgery, 69% had an excellent or good score.

Questionnaires at five-year post-surgery

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

At five years post-surgery, there were 84 registered responses. Of those, 88% achieved an excellent or good score.

Analysis of the individual questions

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

Percentage scoring 0 or 1 for each question at six months post- surgery

		6mth
1	The worst pain from the elbow is severe or unbearable	12
2	Extreme difficulty or impossible to dress yourself because of your operated elbow	5
3	Extreme difficulty or impossible to lift a teacup safely with your operated arm	7
4	Extreme difficulty or impossible to get your hand to your mouth	4
5	Extreme difficulty or impossible to carry the household shopping with your operated arm	18
6	Extreme difficulty or impossible to carry a tray containing a plate of food across a room	12
7	Extreme difficulty or impossible to brush or comb hair with the affected arm	14
8	Usually have moderate or severe pain from the operated elbow	13
9	Extreme difficulty or impossible to hang clothes in a wardrobe using operated arm	9
10	Extreme difficulty or impossible to wash and dry under both arms	9
11	Pain from operated elbow greatly or totally interfering with usual work or hobbies	13
12	Pain from elbow in bed most or every night(s)	7

Revision elbow questionnaire responses

There were 43 revision elbow responses with 56% achieving an excellent or good score. This group includes all revision elbow responses. The mean revision elbow score was 33.21 (standard deviation 11.24, range 8 – 48).

LUMBAR DISC REPLACEMENT

PRIMARY LUMBAR DISC REPLACEMENT

This report analyses data for the **thirteen**-year period January 2002 – December 2014.There were 151 lumbar disc replacements registered, an additional two compared to last year's report.

Data Analysis

The average age for a lumbar disc replacement was 40.31 years, with a range of 24.07 – 62.19 years.

	Female	Male
Number	72	79
Percentage	47.68	52.32
Mean age	40.42	40.19
Maximum age	62.19	60.71
Minimum age	24.07	27.19
Standard dev.	8.60	7.32

Disc replacement levels

L3/4	20
L4/5	103
L5/S1	32

Fusion levels

L3/4	2
L4/5	12
L5/S1	57

Previous operation

Discectomy	29
L3/4	0
L4/5	14
L5/S1	191

Diagnosis

Degenerative disc disease

L3/4	11
L4/5	61
L5/S1	83
Other	4

Annular tear MRI scan

L3/4	13
L4/5	67
L5/S1	26
Other	1

Discogenic pain on discography

L3/4	20
L4/5	85
L5/S1	63
Other	1

Approach

Retroperitoneal midline	137
Retroperitoneal lateral	3
Transperitoneal	2
Other- mini open horizontal	2

Intraoperative complications

Damage to major veins	13
Subsidence	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	123

Operating theatre

Conventional	85
Laminar flow	65
Spacesuits	2

Operative time (skin to skin)

Mean	138 minutes

Surgeon grade

Consultant	151

REVISION OF REGISTERED PRIMARY LUMBAR DISC REPLACEMENTS

This section analyses data for revisions of primary lumbar disc replacements for the 12-year period.

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

There were two revisions of the primary group of 151 lumbar disc replacements and one re-revision.

Time to revision

Mean	457 days
Maximum	672 days
Minimum	242 days

Reason for revision

Pain	2
Loss of spinal alignment	1

Oswestry Disability Index

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

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

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

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

Pre operative scores

Modified Roland and Morris	119
Mean	15
Maximum	66
Minimum	1
Standard deviation	7
Oswestry Disability Index	44
Mean	57
Maximum	82
Minimum	30
Standard deviation	13

Post operative score

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

CERVICAL DISC REPLACEMENT

This report analyses data for the eleven-year period January 2004 – December 2014. There were 268 primary cervical disc replacements, an increase of 44 from the previous year.

Data Analysis

The average age for a cervical disc replacement was 44.26 years, with a range of 24.92 – 65.79 years.

	Female	Male
Number	112	156
Percentage	41.79	58.21
Mean age	45.67	43.24
Maximum age	65.79	63.00
Minimum age	27.73	24.92
Standard dev.	8.10	7.80

Disc replacement levels

C3/4	9
C4/5	21
C5/6	148
C6/7	121
C7T1	3
Other	3

Previous operation

Foraminotomy	8
Adjacent level fusion	15
Adjacent level disc arthroplasty	2
Other	12

Diagnosis

Acute disc prolapse	193
Chronic spondylosis	21
Neck pain	13
Other	29

Approach

Anterior right	169
Anterior left	44
Other	1

Intra operative complications

Equipment failure	1
Removal of implant	1
Tear jugular vein	1

Systemic antibiotic prophylaxis

Patient number receiving systemic antibiotic prophylaxis	214

Operating theatre

Conventional	147
Laminar flow	118
Spacesuits	1

Operative time (skin to skin)

Mean	121 minutes

Surgeon grade

Consultant	267
Advanced trainee supervised	1

Revision Cervical disc replacement

There was no change from the previous year, with one revision cervical disc replacement registered.

Neck Disability Index Scoring

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

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

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

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

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

Example: 16 (total scored)/45(total possible score) x 100 = 35.5%

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

Pre-operative score

Neck Disability Index	136
Mean	45

Post-operative score

Neck Disability Index	128
Mean	22

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

Questionnaire on the perceptions of patients about shoulder surgery

Jill Dawson, Ray Fitzpatrick, Andrew Carr. J Bone Joint Surg B. 1996 July; 78(4) 593-600

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

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Hips		
	Stems	Cups
Stryker	Accolade	Trident
	Accolade II	Tritanium
	Exeter V40	Contemporary
	ABG II	Exeter X3 rimfit
	Securfit	Exeter
DePuy	Elite plus	Charnley
	Summit	Duraloc
	Charnley	Pinnacle
	corail	
	C-stem	
	Trilock	
	Proxima	
	Silent	
	S-rom	
	ASR	
Zimmer	TM	Fitek
	ML Taper	Fitmore
	Avenir Muller	Morscher
	CLS	ZCA
	CPT	Trilogy
	MS30	Continum
	Versys	
	Muller	
Smith & Nephew	Spectron	
	Basis	Reflection cemented
	Polar uncemented	Reflection porus
	Synergy Porus	Polar cemented
	Anthology Porus	Polar uncemented
	Empirion Porus	EP uncemented
	Echelon Porus	R3 porus
	SL PLus	BHR porus
	BHR resurfacing	
	CPCS	

Mathys	Twinsys cemented	Selexys
	TwinSys uncemented	RM
	CCA	CCB
	CCB	
Biomet	Bi metric	Exceed Ring lock
Lima	H Max S stem	Delta TT
	H Max C stem	Delta PF
Knees		
Stryker	Duracon	
	Scorpio	
	Triathlon	
	Avon PF	
Biomet	AGC	
	Maxim	
	Vanguard	
DePuy	LCS	
	PFC Sigma	
	LSC PFJ	
	PFC	
	S-Rom Nollies	
	Attune	
Global Ortho	MBK	
S&N	Genesis II	
	Genesis Oxinium	
	Journey	
	Journey II	
	Legion	
Zimmer	Insall Bernstein	
	Nexgen	
Persona		
Orthotec	Optetrak	

	Themis
Mathys	Balansys
Unicompartmental Knees	
Stryker	Eius
	Unix
	Triathlon PKR
Biomet	Oxford cemented
	Oxford cementless
	Repecci II
Zimmer	Miller Galanti
	Zimmer Uni - Zuc
DePuy	Preservation
	Sigma partial
S&N	Genesis Uni
	Oxinium Uni
Shoulders	
DePuy	Global
	Delta
Lima	SMR
Orthotec	Hemicap resurfacing
Rem Systems	Aequalis
Zimmer	Bigliani/Flatow
	Neer
Biomet	Copeland Resurfacing

Ankles	
DePuy	Agility
	Mobility
Orthotec	Ramses
REM Systems	Salto
Stryker	Star
Elbows	
Zimmer	Coonrad/Morrey
DePuy	Acclaim
Biomet	Kudo
	Discovery Elbow
REM Systems	Latitude

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

NEW ZEALAND JOINT REGISTRY
Primary Replacement Hip
Free Phone 0800-274-989 **Total Hip Arthroplasty ❑** **Resurfacing Arthroplasty ❑**
31.05.2010

Date: .....

Patient Name:

Address:

Consultant: .....

BMI:.....

[If different from patient label]

Side:..... **

Hospital: .....

Town/City

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

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

DIAGNOSIS

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

APPROACH ❑ **Image guided surgery** ❑ **Minimally invasive surgery**

❑ **Anterior** ❑ **Posterior** ❑ **Lateral** ❑ **Trochanteric osteotomy**

FEMUR

Please do not fold

ACETABULUM

Please do not fold

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - ACETABULUM

❑ Allograft
❑ Autograft ❑ Synthetic

FEMORAL HEAD

Please do not fold

bar-coded label

AUGMENTS

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

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

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Revision Hip Joint

Free Phone 0800-274-989
07.04.2005

Date: .....

Side:..... **

Patient Name:

Address:

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

Tick Appropriate Boxes

REASON FOR REVISION

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

Date Index Operation: .....

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

REVISION

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

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery

❑ Anterior ❑ Posterior ❑ Lateral ❑ Trochanteric osteotomy

FEMUR

Please do not fold

bar-coded label

ACETABULUM

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

❑ Allograft ❑ Synthetic
❑ Autograft

BONE GRAFT - ACETABULUM

❑ Allograft ❑ Synthetic
❑ Autograft

FEMORAL HEAD

Please do not fold

bar-coded label

AUGMENTS

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

❑ Adv Trainee Supervised

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

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

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

NEW ZEALAND JOINT REGISTRY
Primary Replacement Knee
Free Phone 0800-274-989 ❑ Total Knee Arthroplasty ❑ Unicompartmental ❑ Patellofemoral
31.05.2010

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

Patient Name:

Address:

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

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

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

DIAGNOSIS

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

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

FEMUR

Please do not fold
bar-coded label

TIBIA

Please do not fold
bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - FEMUR

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - TIBIA

❑ Allograft
❑ Autograft ❑ Synthetic

PATELLA

Please do not fold
bar-coded label

AUGMENTS

Please do not fold
bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Revision Knee Joint

Free Phone 0800-274-989

07.04.2005

Date: .....

Side:..... **

Patient Name:

Address:

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

Hospital: .....

Town/City:.....

Tick Appropriate Boxes

REASON FOR REVISION

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

Date Index Operation: .....

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

REVISION

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

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery

❑ Medial parapatellar ❑ Lateral parapatellar ❑ Other

FEMUR

Please do not fold

bar-coded label

TIBIA

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT – FEMUR

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

BONE GRAFT – TIBIA

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

PATELLA

Please do not fold

bar-coded label

AUGMENTS

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Primary Replacement Shoulder

0800-274-989 ❑ **Total shoulder Arthroplasty** ❑ **Hemiarthroplasty** ❑ **Reverse Shoulder**
06.05.2009

Date: .....

Side:..... **

Patient Name:

Address:

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

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

- ❑ None
- ❑ Internal fixation for juxtarticular fracture
- ❑ Previous stabilisation
- ❑ Osteotomy
- ❑ Arthrodesis
- ❑ Other: Name: .....

DIAGNOSIS

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

APPROACH

❑ **Deltopectoral** ❑ **Other : specify**

HUMERUS

Please do not fold

bar-coded label

GLENOID

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

❑ **Allograft**
❑ **Autograft** ❑ **Synthetic**

BONE GRAFT - GLENOID

❑ **Allograft**
❑ **Autograft** ❑ **Synthetic**

HUMERAL HEAD

Please do not fold

bar-coded label

AUGMENTS

Please do not fold

bar-coded label

STICK ALL LABELS ON REVERSE SIDE

CEMENT

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

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

OPERATING THEATRE

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

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Revision Shoulder

Free Phone 0800-274-989
07.04.2005

Date: .....

Side:..... **

Tick Appropriate Boxes

Patient Name:

Address:

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

REASON FOR REVISION

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

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

REVISION

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

APPROACH

- ❑ Deltopectoral
- ❑ Other: specify

HUMERUS

Please do not fold bar-coded labels

GLENOID

Please do not fold bar-coded labels

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

- ❑ Allograft
- ❑ Synthetic
- ❑ Autograft

BONE GRAFT - GLENOID

- ❑ Allograft
- ❑ Synthetic
- ❑ Autograft

HUMERAL HEAD

Please do not fold bar-coded labels

AUGMENTS

Please do not fold bar-coded labels

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

- ❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

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

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

PRIMARY OPERATING SURGEON

- ❑ Adv Trainee Unsupervised
- ❑ Consultant
- ❑ Adv Trainee Supervised Year.....
- ❑ Basic Trainee

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

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

NEW ZEALAND JOINT REGISTRY
Primary Replacement Ankle

Free Phone 0800-274-989
31.05.2010

Date: .....

BMI:.....

Side:..... **

Patient Name:

Address:

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

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

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

DIAGNOSIS

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

.....

APPROACH

❑ Anterior ❑ Anterio-lateral ❑ Other

TIBIA

Please do not fold

bar-coded label

TALUS

Please do not fold

bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

BONE GRAFT - TALUS

- ❑ Allograft
- ❑ Autograft ❑ Synthetic

AUGMENTS

Please do not fold

bar-coded label

FUSION DISTAL TFJ

STICK ALL LABELS ON REVERSE SIDE

CEMENT

❑ Tibia ❑ Talus ❑ Antibiotic Brand:

.....

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Revision Ankle Joint

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

Date: .....

Side:..... **

Patient Name:

Address:

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

Tick Appropriate Boxes

REASON FOR REVISION

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

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

REVISION

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

APPROACH

❑ Anterior ❑ Anterio-lateral ❑ Posterior

TIBIA

Please do not fold bar-coded label

TALUS

Please do not fold bar-coded label

STICK ALL LABELS ON REVERSE SIDE

BONE GRAFT - TIBIA

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - TALUS

❑ Allograft
❑ Autograft ❑ Synthetic

AUGUMENTS

Please do not fold bar-coded label

FUSION DISTAL TFJ

Yes ❑ No ❑

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Primary Replacement Elbow

Free Phone 0800-274-989
07.04.2005

Date: .....

Patient Name:

Address:

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

Side:..... **

Tick Appropriate Boxes

PREVIOUS OPERATION ON INDEX JOINT

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

DIAGNOSIS

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

APPROACH

❑ Medial ❑ Lateral ❑ Posterior

HUMERUS

Please do not fold bar-coded label

ULNA

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

BONE GRAFT - ULNA

- ❑ Allograft
- ❑ Autograft
- ❑ Synthetic

RADIAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Revision Elbow Joint

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

Date: .....

Patient Name:

Address:

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

Side:..... **

Tick Appropriate Boxes

REASON FOR REVISION

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

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

REVISION

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

APPROACH

❑ Medial ❑ Lateral ❑ Posterior

HUMERUS

Please do not fold bar-coded label

ULNA

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

BONE GRAFT - HUMERUS

❑ Allograft
❑ Autograft ❑ Synthetic

BONE GRAFT - ULNA

❑ Allograft
❑ Autograft ❑ Synthetic

RADIAL HEAD

Please do not fold bar-coded label

AUGMENTS

Please do not fold bar-coded label

STICK EXTRA LABELS ON REVERSE SIDE

CEMENT

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

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**

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

OPERATING THEATRE

❑ Conventional ❑ Laminar flow or similar ❑ Space suits

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

PRIMARY OPERATING SURGEON

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

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

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

NEW ZEALAND JOINT REGISTRY
Primary Cervical Disc Replacement

Free Phone 0800-274-989 **14.08.2008**

Date: .....

Patient Name:

Address:

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

Tick Appropriate Boxes

ACC Q ACC Claim No: .....

LEVELS OF DISC REPLACEMENT

PRE OP PATIENT SCORE (NECK DISABILITY INDEX)

.....

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

PREVIOUS OPERATION

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

DIAGNOSIS

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

APPROACH

- ❑ Anterior Right
- ❑ Anterior Left
- ❑ Other .....

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS

.....

.....

SYSTEMIC ANTIBIOTIC PROPHYLAXIS

- ❑ Yes
- ❑ No

OPERATIVE THEATRE

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

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

PRIMARY OPERATING SURGEON

- ❑ Consultant
- ❑ Adv Trainee Unsupervised
- ❑ Adv Trainee Supervised
- Year .....
- ❑ Basic Trainee

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

NEW ZEALAND JOINT REGISTRY
Revision Cervical Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: .....

Patient Name:

Address:

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

LEVEL OF REVISION
.....

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

Town/City: .....

Tick Appropriate Boxes

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

REASON FOR REVISION

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

Date Index Operation: .....

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

REVISION

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

APPROACH ❑ Image guided surgery ❑ Minimally invasive surgery

- ❑ Anterior
- ❑ Posterior
- ❑ Lateral
- ❑ Trochanteric

Osteotomy

IMPLANTS

Please do not fold **bar-coded label**	**Please do not fold** **bar-coded label**

STICK EXTRA LABELS ON REVERSE SIDE

Please do not fold **bar-coded label**	**Please do not fold** **bar-coded label**

STICK EXTRA LABELS ON REVERSE SIDE

SYSTEMIC ANTIBIOTIC PROPHYLAXIS
Name .....

OPERATING THEATRE

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

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

PRIMARY OPERATING SURGEON

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

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

NEW ZEALAND JOINT REGISTRY
Primary Lumbar Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: .....

Patient Name:

Address:

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

Town/City.....

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

DISC REPLACEMENT Levels **FUSION Levels** **PRE OP PATIENT SCORE**
Modified Roland and Morris

❑ **L3/4** ❑ **L3/4** **Total number of "Yes" responses**.....

❑ **L4/5** ❑ **L4/5** ***Oswestry Score***

❑ **L5/S1** ❑ **L5/S1** **Percentage score**

Other .....

PREVIOUS OPERATION

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

❑ **Other** ..... ❑ **L3/4** ❑ **L4/5** ❑ **L5/S1**

DIAGNOSIS

1. Degenerative Disc disease ❑ **L3/4** ❑ **L4/5** ❑ **L5/S1** ❑ **Other** .....
(plain x-ray changes present)

2. Annular tear MRI scan ❑ **L3/4** ❑ **L4/5** ❑ **L5/S1** ❑ **Other** .....
(normal plain x-ray)

3. Discogenic pain on discography ❑ **L3/4** ❑ **L4/5** ❑ **L5/S1** ❑ **Other** .....

APPROACH

❑ **Retroperitoneal midline abdominal wall incision** ❑ **Transperitoneal**
❑ **Retroperitoneal lateral abdominal wall incision** ❑ **Other** .....

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS

.....

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Yes ❑ **No** ❑

OPERATIVE THEATRE

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

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

PRIMARY OPERATING SURGEON

❑ **Consultant** ❑ **Adv Trainee** **Year**..... ❑ **Basic Trainee**

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

NEW ZEALAND JOINT REGISTRY
Revision Lumbar Disc Replacement

Free Phone 0800-274-989
14.08.2008

Date: ..... Patient Name: Address:

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

Tick Appropriate Boxes **ACC** ❑ **Q** **ACC Claim No:** .....

REASON FOR REVISION

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

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

REVISION

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

APPROACH

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

NEW DISC REPLACEMENT Levels	**NEW FUSION Levels**
❑ **L3/4**	❑ **L3/4**
❑ **L4/5**	❑ **L4/5**
❑ **L5/S1**	❑ **L5/S1**

Other .....

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

IMPLANTS

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

Affix Supplier Label

Affix Supplier Label

STICK EXTRA LABELS ON REVERSE SIDE

INTRAOPERATIVE COMPLICATIONS

.....

.....

❑ **SYSTEMIC ANTIBIOTIC PROPHYLAXIS**
Yes ❑ **No** ❑

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

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

PRIMARY OPERATING SURGEON
❑ **Consultant** ❑ **Adv Trainee** **Year**..... ❑ **Basic Trainee**

TOTAL HIP REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually had from your operated on hip?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on hip becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to put on a pair of socks, stockings or tights?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on hip interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on hip?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you had any sudden, severe pain - 'shooting', 'stabbing' or 'spasms' - from the affected operated on hip?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

10 Have you been limping when walking, because of your operated on hip?
- 4 Rarely/never
- 3 Sometimes or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on hip in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

□ I wish to receive a progress report on the study.

NB: If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

REVISION HIP REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually had from your operated on hip?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on hip becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to put on a pair of socks, stockings or tights?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on hip?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on hip interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on hip?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you had any sudden, severe pain - 'shooting', 'stabbing' or 'spasms' - from the affected operated on hip?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

10 Have you been limping when walking, because of your operated on hip?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on hip in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

TOTAL KNEE REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:** .....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on knee?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on knee becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Could you kneel down and get up again afterwards on your operated knee?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on knee interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on knee?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you felt that your operated on knee might suddenly “give way” or let you down?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

10 Have you been limping when walking, because of your operated on knee?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Could you walk down one flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on knee in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

REVISION KNEE REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on knee?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on knee becomes severe? (with or without a stick)
- 4 No pain/more than 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk because of severe pain

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Could you kneel down and get up again afterwards?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Have you had any trouble with washing and drying yourself (all over) because of your operated on knee?
- 4 No trouble at all
- 3 Very little trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

7 How much has pain from your operated on knee interfered with your usual work (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

8 After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your operated on knee?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

9 Have you felt that your operated on knee might suddenly "give way" or let you down?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

10 Have you been limping when walking, because of your operated on knee?
- 4 Rarely/never
- 3 Sometimes, or just at first
- 2 Often, not just at first
- 1 Most of the time
- 0 All of the time

11 Could you walk down one flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

12 Have you been troubled by pain from your operated on knee in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

Additional Information

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

TOTAL ANKLE REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:**.....

Patient Address: ..... **Operating Surgeon:**.....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please **circle the number** which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on ankle?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on ankle becomes severe?
- 4 No pain up to 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk at all because of severe pain

3 Have you been able to walk on uneven ground?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 Extreme difficulty
- 0 No impossible

4 Have you had to use an orthotic (shoe insert), heel lift, or special shoes?
- 4 Never
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 Always

5 How much has pain from your ankle interfered with your usual work (including housework and hobbies)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

6 Have you been limping when walking because of your operated on ankle?
- 4 No days
- 3 Only one or two days
- 2 Some days
- 1 Most days
- 0 Every day

7 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 Impossible

8 Have you been troubled by pain from your operated on ankle in bed at night?
- 4 No nights
- 3 Only one or two nights
- 2 Some nights
- 1 Most nights
- 0 Every night

9 How much has pain from your operated on ankle interfered with your usual recreational activities?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

10 Have you had swelling of your foot?
- 4 None at all
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 All the time

11 After a meal (sat at a table) how painful has it been for you to stand up from a chair because of your operated on ankle?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

12 Have you had any sudden severe pain – shooting, stabbing or spasms from your operated on ankle?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone

REVISION ANKLE REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:**.....

Patient Address: ..... **Operating Surgeon:** .....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the pain you usually have from your operated on ankle?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

2 For how long have you been able to walk before the pain from your operated on ankle becomes severe?
- 4 No pain up to 30 minutes
- 3 16 to 30 minutes
- 2 5 to 15 minutes
- 1 Around the house only
- 0 Unable to walk at all because of severe pain.

3 Have you been able to walk on uneven ground?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 Extreme difficulty
- 0 No impossible.

4 Have you had to use an orthotic (shoe insert), heel lift, or special shoes?
- 4 Never
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 Always

5 How much has pain from your ankle interfered with your usual work (including housework and hobbies)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

6 Have you been limping when walking because of your operated on ankle?
- 4 No days
- 3 Only one or two days
- 2 Some days
- 1 Most days
- 0 Every day

7 Have you been able to climb a flight of stairs?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 Impossible

8 Have you been troubled by pain from your operated on ankle in bed at night?
- 4 No nights
- 3 Only one or two nights
- 2 Some nights
- 1 Most nights
- 0 Every night

9 How much has pain from your operated on ankle interfered with your usual recreational activities?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you had swelling of your foot?
- 4 None at all
- 3 Occasionally
- 2 Often
- 1 Most of the time
- 0 All the time

13 After a meal (sat at a table) how painful has it been for you to stand up from a chair because of your operated on ankle?
- 4 Not at all painful
- 3 Slightly painful
- 2 Moderately painful
- 1 Very painful
- 0 Unbearable

12 Have you had any sudden severe pain – shooting, stabbing or spasms from your operated on ankle?
- 4 No days
- 3 Only 1 or 2 days
- 2 Some days
- 1 Most days
- 0 Every day

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed, try to answer the question from the joint replacement aspect alone.

TOTAL SHOULDER REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....
Patient Address: ..... **Operating Surgeon:**.....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please **circle the number** which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm?** **Left** **Right**

Please circle the SIDE on which you had your surgery performed **Left** **Right**

1 How would you describe the ***worst*** pain you have had from your operated on shoulder?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 How would you describe the pain you ***usually*** have from your operated on shoulder?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to use a knife and fork at the same time?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 Have you had any trouble dressing yourself because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

10 Have you been able to wash and dry yourself under both arms?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

11 How much has pain from your operated on shoulder interfered with your usual work hobbies or recreational activities (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on shoulder in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

REVISION SHOULDER REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....
Patient Address: ..... **Operating urgeon:**.....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm?** **Left** **Right**

Please circle the SIDE on which you had your surgery performed **Left** **Right**

1 How would you describe the ***worst*** pain you have had from your operated on shoulder?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 How would you describe the pain you ***usually*** have from your operated on shoulder?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

3 Have you had any trouble getting in and out of a car or using public transport because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to use a knife and fork at the same time?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you do the household shopping on your own?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 Have you had any trouble dressing yourself because of your operated on shoulder?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

10 Have you been able to wash and dry yourself under both arms?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

11 How much has pain from your operated on shoulder interfered with your usual work hobbies or recreational activities (including housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on shoulder in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

Patient Name: ..... **Date of Birth:**.....
Patient Address: ..... **Operating Surgeon:** .....
..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm? Left Right**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the ***worst*** pain you have had from your operated on elbow?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 Have you had any trouble dressing yourself because of your operated on elbow?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

3 Can you lift a teacup safely with your operated on arm?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to get your hand to your mouth?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you carry the household shopping with your operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the affected arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 How would you describe the pain you ***usually*** have from your operated on elbow?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

14 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

15 How much has pain from your operated on elbow interfered with your usual work hobbies or recreational activities (including hobbies and housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on elbow in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.

REVISION ELBOW REPLACEMENT - QUESTIONNAIRE

Patient Name: ..... **Date of Birth:** .....

Patient Address: ..... **Operating Surgeon:** .....

..... **Date of Surgery:**.....

We would like you to score yourself on the following 12 questions. Each question is scored from 4 to 0, from least to most difficulty or severity: 4 being the least difficult/severe and 0 being the most difficult/severe. Please circle the number which best describes yourself **OVER THE LAST 4 WEEKS** **Which is your dominant arm? Left Right**

Please circle the SIDE on which you had your surgery performed Left Right

1 How would you describe the ***worst*** pain you have had from your operated on elbow?
- 4 None
- 3 Mild
- 2 Moderate
- 1 Severe
- 0 Unbearable

2 Have you had any trouble dressing yourself because of your operated on elbow?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

3 Can you lift a teacup safely with your operated on arm?
- 4 No trouble at all
- 3 A little bit of trouble
- 2 Moderate trouble
- 1 Extreme difficulty
- 0 Impossible to do

4 Have you been able to get your hand to your mouth?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

5 Could you carry the household shopping with your operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

6 Could you carry a tray containing a plate of food across a room?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

7 Could you brush/comb your hair with the affected arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, Impossible

8 How would you describe the pain you ***usually*** have from your operated on elbow?
- 4 None
- 3 Very mild
- 2 Mild
- 1 Moderate
- 0 Severe

9 Could you hang your clothes up in a wardrobe – using the operated on arm?
- 4 Yes, easily
- 3 With little difficulty
- 2 With moderate difficulty
- 1 With extreme difficulty
- 0 No, impossible

16 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

17 How much has pain from your operated on elbow interfered with your usual work hobbies or recreational activities (including hobbies and housework)?
- 4 Not at all
- 3 A little bit
- 2 Moderately
- 1 Greatly
- 0 Totally

12 Have you been troubled by pain from your operated on elbow in bed at night?
- 4 No nights
- 3 Only 1 or 2 nights
- 2 Some nights
- 1 Most nights
- 0 Every night

:.....

□ I wish to receive a progress report on the study. **NB:** If there are reasons other than the operation which would stop you doing one of the tasks listed; try to answer the question from the joint replacement aspect alone.