National Joint Registry
www.njrcentre.org.uk

National Joint Registry
for England and Wales

6th Annual Report
2009

ISSN1753-9374

Prepared by

The NJR Centre, Hemel Hempstead

David Emsley

Claire Newell

Martin Pickford

Martin Royall

Mike Swanson

M&M Communications

Royal College of Surgeons Clinical Effectiveness Unit

Susan Charman

Lynn Copley

Jan van der Meulen

Healthcare Quality Improvement Partnership

Yvonne Tse

Elaine Young

This document is available in PDF format for download from the NJR website at **www.njrcentre.org.uk**

Contents

Part 1 tables

Part 1 figures

Part 2 tables

Part 2 figures

Part 3 tables

Part 3 figures

Chairman's introduction

Bill Darling C.B.E. D.L. F.R.Pharm.S

Last year in my introduction to the Annual Report I said that the National Joint Registry (NJR) was entering a new phase of its work. As well as continuing to maintain a compliance rate of more than 90% and improving the consent rate, the emphasis was moving on to improving the quality and use of data.

During the year, there has been a dramatic increase in the number of requests for data for research and other studies and a new protocol is being developed which will clarify and facilitate the process.

The NJR Steering Committee has approved a strategic plan that focuses on the objectives of the Register for the next two years. Its key aims include:

- continuing to work to improve the quality, availability and timeliness of information to stakeholders
- promoting and facilitating high quality research
- extending the benefits of the NJR by including other joint replacement procedures such as ankles, shoulders, elbows and wrists, and by including procedures in Northern Ireland
- improving stakeholder engagement
- raising awareness of the benefits of the NJR.

An additional development for next year will be our participation in the national Patient Reported Outcome Measures (PROMs) study. This will provide an opportunity for the NJR to analyse patient outcomes on a scale that was not previously possible. Agreement is in place with the Department of Health for the national PROMs data to be linked with the NJR data.

The Steering Committee has re-established the NJR's Editorial Board under the chairmanship of Martyn Porter. The Board will ensure the timely preparation of the Annual Report, widen the range of topics covered and make information more readily available to stakeholders.

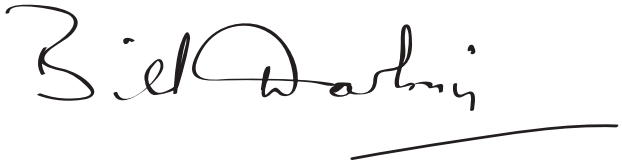
Following the Annual Meeting of the British Hip Society in February 2008 the Steering Committee approved the development of NJR Clinician Feedback. This service provides a number of reports which enable surgeons to assess their clinical practice and compare it with their colleagues at a local, sector and national level. The prototype was demonstrated at the meeting and the system went live in November 2008. The number of reports will increase as different types of data become available. Similar services for implant manufacturers and hospital and trust management are under consideration.

The Steering Committee has continued to work with the British Orthopaedic Association (BOA), Royal College of Surgeons, industry and the NJR Regional Clinical Co-ordinators' Network to develop and refine an agreed methodology and process for the identification and management of potentially outlying surgeons and prostheses. As a result of outlier analysis by the NJR, the Medicines and Healthcare products Regulatory Agency (MHRA) issued a device alert for an implant which has subsequently been withdrawn by the manufacturer. We can now quickly inform hospitals of potential problems, which significantly reduces the period between identification of an issue and patient review.

I believe we have demonstrated that the Register is a tool for excellence and that it will enable continuing improvement in best practice and patient care.

I again record my thanks to Professor Paul Gregg, Steering Committee Vice-Chairman, for his support and enthusiasm during the year. I should also like to thank Martyn Porter, in particular, for his tireless work as Chair of the Editorial Board and all other members of the Steering Committee for their generous contribution.

From 1st April 2008, the NJR has operated under the auspices of the Healthcare Quality Improvement Partnership (HQIP). I should like to record my thanks to its staff, in particular Elaine Young whose commitment to progressing the project has been enormous. I also thank the Regional Clinical Co-ordinators for their significant contribution and, last but not least, the NJR contractor, Northgate Information Solutions (UK) Ltd.



Bill Darling
Chairman, NJR Steering Committee

Vice-Chairman's foreword

Professor P J Gregg

As Vice-Chairman of the NJR Steering Committee, I am delighted to introduce our 6th Annual Report.

I am very pleased, as our Chairman has noted, that the Register's underlying compliance and consent rates have increased over the last financial year. It is now essential that our attentions are turned to checking and, where necessary, improving the quality of the data.

It is also gratifying to note the dramatic increase in the number of requests for data for research and other studies, which indicates that a significant number of health professionals believe the data we hold is of real value.

I believe the strategic plan for the next two years, as detailed in the Chairman's introduction, will lead to significant improvements and development of the NJR. It is gratifying to note that this work is fully funded.

In my foreword to last year's Annual Report, I indicated that I was particularly pleased the NJR had been able to establish a working relationship with the Department of Health's National Patient Reported Outcome Measures study. This study commenced in April 2009 and we will shortly be turning our attention to linking PROMs and NJR data with a view to assessing patient reported outcomes for different types of prosthesis, surgical technique and age group.

A significant amount of work has been carried out to refine and develop the methodology for the identification of 'potential outlier' data for prosthesis survival by prosthesis type and surgeon. It is vitally important to ensure absolute robustness and fairness in this process. Further work remains to be done, in particular, around mandating registration of joint replacements with the NJR.

As stated in the 5th Annual Report, I still believe it is important to develop a workable system for the assessment of case complexity. The contribution of the British Hip Society and the British Association for Surgery of the Knee would be much appreciated in relation to this work.

One of the particularly interesting findings in the 6th Annual Report is that three year survivorship, for all age groups including the younger age group, is highest for cemented hip prostheses. At a time when the use of cement is declining in hip replacement surgery, perhaps we should all reflect on this. It would be particularly interesting to see later survivorship data in relation to the use of cement.

I am very pleased that we have been able to re-establish the NJR's Editorial Board, as outlined by our Chairman. I would like to add my thanks to Martyn Porter for his extremely hard work as Editorial Board Chair.

Once again I wish to record my thanks to the Chair of the NJR Steering Committee for all his hard work both within and outside the Committee, and for his continued enthusiasm and determination to see the further development of a National Joint Registry during these difficult times.

I wish to reinforce Bill Darling's thanks to the HQIP staff, in particular Elaine Young, whose contribution to the NJR project has been very significant. My thanks are also extended to the NJR Steering Committee, Regional Clinical Co-ordinators and Northgate Information Solutions (UK) Ltd, in particular their Regional Co-ordinators, for all their hard work and valuable contributions.

Finally, thank you to all the orthopaedic surgeons for entering their data. Hopefully, the increasing feedback to surgeons will be found to be extremely useful and encourage them to continue entering their data.

Professor P J Gregg
Vice-Chairman, NJR Steering Committee

executive summary

Part 1: Annual progress

The 6th Annual Report of the National Joint Registry for England and Wales is the public report for the period 1st April 2008 to 31st March 2009 (Part 1). The report also includes sections on joint replacement activity for the period 1st January to 31st December 2008 (Part 2) and a survivorship analysis of hip and knee joint replacement surgery using data from 1st April 2003 to 30th November 2008 (Part 3).

Collection of data on hip and knee replacement operations for the NJR began on 1st April 2003 with the aim of providing information to all those involved in the management and delivery of joint replacement surgery and to patients. The over-riding purpose of providing this information is to improve the outcomes of care for patients and patient safety.

The NJR is managed by Northgate Information Solutions (UK) Ltd under a contract with the Healthcare Quality Improvement Partnership (HQIP) which took over responsibility for the overall management of the NJR from the Department of Health (DH) on 1st April 2008. The NJR Steering Committee, as an advisory non-departmental public body, continues to oversee the work of the NJR.

The NJR is funded through a levy raised on the sale of hip and knee replacement implants.

Part 1 of the report provides information about data quality and completeness, an overview of where operations have been undertaken and highlights of progress and plans.

The financial year 2008/09 saw:

- the highest ever number of submissions of hip and knee joint replacement operations in a single year, at 160,027. This represents 92.5% of all operations carried out in England and Wales in both the NHS and independent healthcare sector. It takes overall compliance with reporting to the NJR (from 1st April 2003 to 31st March 2009) to 78%
- the highest annual rate of records submitted with patient consent, at 87.5%; this means that of all records submitted to the NJR, 78% have patient consent
- the highest annual rate of records submitted with both patient consent and an NHS number, at 92.9%[1]; the overall rate of linkable records in the NJR is now 77.4%
- the total number of records submitted to the NJR (from 1st April 2003 to 31st March 2009) rising to 742,706, of which:
  - 64.8% took place in NHS hospitals
  - 26.6% took place in independent hospitals
  - 4.7% took place in NHS treatment centres
  - 3.9% took place in independent sector treatment centres (ISTCs).

Achievements for the year included:

- the launch in November 2008 of NJR Clinician Feedback, a secure online service that enables surgeons to assess their clinical practice and compare it to that of their colleagues at hospital, regional (strategic health authority), sector (NHS or independent) and national levels
- the first occasion on which an implant was withdrawn from sale by a supplier using information provided by the NJR's outlier analysis. Following a device alert issued by the Medicines and Healthcare products Regulatory Agency (MHRA), the NJR was able very quickly to identify patients who had received the implant and inform the relevant hospitals
- a review of the outlier methodology. Following implementation on NJR Clinician Feedback, it became clear that the method was difficult to understand and interpret. As previously agreed by the NJR Steering Committee, the statistical method used for the identification of outlying data will remain under continuous review and development

[1] This rate also includes those NHS numbers that were traced using the National Strategic Tracing Service (NSTS) after submission to the NJR.

- re-establishment of the NJR Editorial Board under the chairmanship of Martyn Porter, a consultant orthopaedic surgeon at Wrightington Hospital. The Editorial Board's role is to oversee the production of the Annual Report and, as an interim measure, to consider all research requests until a dedicated research infrastructure is established
- the planned commencement, on 1st April 2009, of a national Patient Reported Outcomes Measures study (PROMs) study which will include, among other operations, elective hip and knee joint replacement surgery. Working with the DH, the NJR Steering Committee has secured agreement that the data collected by the PROMs study will be linked to NJR data and be available for analysis by the NJR
- first steps of the strategic plan for the period 2009 to 2011, which will include:
  - a major programme to assess the quality of data held on the Register and projects to improve the quality of data submissions in the future. The NJR Steering Committee will continue to promote the case for making the NJR a mandatory data collection
  - implementation of a research protocol and infrastructure for handling the increasing requests for data, including re-establishment of the Research Committee
  - improved access to information for all stakeholders, including the development of services similar to NJR Clinician Feedback for suppliers and hospital and trust managers, as well as providing better information to patients
  - extending the NJR to include ankle, shoulder, elbow and wrist joint replacement surgery and collecting data from Northern Ireland
- agreement to undertake a number of studies throughout the year ahead, looking at data quality, re-revisions, hydroxyapatite (HA) coating, thromboprophylaxis and fractured neck of femur.

Part 2: Clinical activity 2008

Part 2 of the National Joint Registry (NJR) 6th Annual Report summarises the data and findings for hip and knee procedures carried out between 1st January 2008 and 31st December 2008 in England and Wales and entered into the NJR by 28th February 2009.

During 2008, 408 hospitals and treatment centres were active and, of these, 386 (95%) submitted at least one operative procedure to the NJR. The compliance rate for the calendar year 2008 was similar to the previous year (86%). This compares with 92.5% compliance for the financial year 2008/09.

On average, 185 hip replacements and 197 knee replacements were submitted per orthopaedic unit, although there was considerable variation around this mean.

The NJR recorded 71,367 hip procedures, which represents an increase of 3.6% compared to last year. Revision operations represented 9.2% of all hip procedures.

Of the 64,722 primary hip replacement operations undertaken in 2008, 38% were cemented total hip replacements (THRs), 33% cementless THRs and 14% hybrid THRs. Of the remainder, 8% were resurfacing and 7% were large head metal on metal procedures.

Despite the evidence of superior short term results for cemented THRs, there is an increasing trend away from fixation with cement. In 2004, 53% were cemented procedures, compared to 38% during 2008; there has been a corresponding increase in cementless operations from 21% in 2004 to 33% in 2008.

Patient demographics in terms of age and sex distribution have not changed substantially in 2008 compared to previous years. However, patients' health at the time of surgery appears to have deteriorated over the years, as indicated by the fact that 37% of patients were recorded as being fit and healthy prior to surgery in 2003 (ASA grade1)[2], compared to only 18% in 2008. Over the same time period, patients' body mass index (BMI)[3] increased from 27.8 to 28.3.

Patients' age and gender significantly influenced the fixation and type of replacement operation carried out. Male patients under 55 proportionally had more resurfacings compared with female patients over the age of 65, for whom cemented fixation predominated.

In 2008, 124 different brands of acetabular cups, 12 different brands of resurfacing cups and 137 different brands of femoral stems were recorded as being used in primary and revision procedures.

The Orthopaedic Data Evaluation Panel (ODEP)[4] ratings of prostheses used have been studied again. The full 10A benchmark rating was achieved in 76% of cemented stems, 77% of cementless stems, 49% of cemented cups, 11% of cementless cups and 19% of resurfacing cups. Some of the lower figures represent newer designs which have fewer than 10 years' clinical follow up.

Of the cemented hip stem brands, the Exeter V40 was the market leader, having approximately 60% of market share, and of cemented cups the Contemporary was the market leader.

With cementless brands, the Corail stem achieved 46% of the market, while the Pinnacle socket was market leader for uncemented fixation. For resurfacing, the Birmingham hip resurfacing maintained the market lead, albeit at a reduced level compared to previous years because of increasing competition.

Of the 6,581 hip revision procedures, 86% were carried out as a single operation; the remainder were either a single operation to remove the prosthesis or two separate operations (two stage revision).

The number of knee replacement procedures entered into the NJR during 2008 was 75,629 which represents an increase of 4.3% compared to 2007. Of these, 5% were revision operations.

[2] American Society of Anaesthesiology system for grading the overall physical condition of the patient, as follows: P1 – Fit and healthy; P2 – Mild disease, not incapacitating; P3 – Incapacitating systemic disease; P4 – Life threatening disease; P5 – Not expected to survive 24 hours.
[3] BMI: 20-25 normal, 25-30 overweight, 30-40 obese, > 40 morbidly obese.
[4] Orthopaedic Data Evaluation Panel of NHS Supply Chain. See ODEP ratings in Glossary.

Of the 71,527 primary knee replacements in 2008, 91% were of the total condylar type, 8% unicondylar and just over 1% patello-femoral replacements. Cement fixation was used in the vast majority of total knee replacements; in comparison with hips, this trend has not changed substantially over the last five years.

However, similar to hips, there was a relationship between type of replacement and fixation as a function of sex and age, with younger patients proportionally receiving more unicondylar replacements. Also similar to hip replacements were the trends in terms of patients' ASA grades and BMI.

The ODEP classification does not include knee replacements.

The PFC Sigma was the market leader for condylar type knee replacements and the Oxford for unicondylar designs.

In total 3,987 revision knee procedures were carried out in 2008, of which 74% were single stage revisions and the remainder were staged.

Part 3: Implant survivorship 2003 to 2008

Part 3 of the 6th Annual Report describes the clinical outcomes of hip and knee replacement surgery, represented by survivorship analysis up to a maximum period of five years. The results were analysed according to method of fixation, implant brand, age, gender and bearing surface. Where appropriate, regression analysis was used to estimate risk factors for revision, adjusted for case mix differences.

The analysis was carried out on a subset of all patients entered on the NJR database, which was linked to Hospital Episode Statistics (HES). As such, it describes almost exclusively NHS activity; the reasons for this are outlined further in the body of this Report.

Out of 557,661 hip and knee replacements entered on to the NJR between April 2003 and November 2008, 324,404 were linked to the HES database and identified as being primary procedures. Of these, 157,232 were primary hip replacements and 2,464 were first hip revisions. The corresponding figures for knees were 167,172 primary knee replacements and 3,061 first knee revisions.

The most important difference for this Annual Report is that the revisions were identified not only on the HES database but also as subsequent registrations on the NJR database. Out of the 2,464 first hip revisions, 944 were identified in HES and NJR, 1,188 only in HES and 332 only in the NJR. These numbers emphasise the importance of using both databases in order to pick up as many as possible of the revisions that actually occur. The linkage between the two databases facilitates the debate on data quality.

Corresponding figures for the 3,061 first knee revisions were 1,220 in HES and NJR, 1,466 only in HES and 375 only in the NJR.

Using these methods has increased the number of hip revisions identified by almost 200% and the number of knee revisions by 300%. The corresponding three year revision rates were approximately 65% higher for hips and 100% higher for knees compared to last year's report.

The overall revision rates (with 95% confidence intervals) following primary hip replacement were 1% (0.9% - 1%) at one year, 2% (1.9% - 2.1%) at three years and 2.8% (2.7% - 3%) at five years.

The three year revision rates were 1.3% with a cemented hip prosthesis (1.2% - 1.4%), 1.9% with hybrid prosthesis (1.7% - 2.1%), 2.8% with cementless prosthesis (2.6% - 3.0%) and 4.5% with hip resurfacing (4% - 5%).

With the exception of hip resurfacing, elderly patients had lower revision rates following primary hip replacement than younger patients. Women had lower revision rates than men. For resurfacings, these trends were reversed and revision rates were higher for elderly patients and women.

Revision rates following primary hip replacement were found to vary according to brand. No adjustments have been made for other 'case mix' variables in these analyses.

For cemented stems, the most commonly used cemented stem, the Exeter V40, had a revision rate of 1.3% at three years. The revision rates of the other cemented stems ranged from 1.0% to 2.2%.

For uncemented stems, the Corail, the most commonly used uncemented stem had a revision rate of 2.6% at three years. The revision rates of the other cementless stems ranged from 1.9% to 3.8%.

For cemented cups, the Contemporary, which was used most frequently, had a three year revision rate of 1.3%. The revision rates of the other cemented cups ranged from 0.4% to 2.2%.

For uncemented cups, the Pinnacle, which was used most frequently, had a three year revision rate of 2.2%. The revision rates of the other uncemented cups ranged from 1.1% to 2.8%.

A number of these prostheses were implanted in relatively small numbers and, despite the differences in revision rates and hazard ratios, the 95% confidence intervals sometimes overlapped, indicating that not all these differences were statistically significant. Therefore, care needs to be taken when interpreting this data.

In comparison, there was only weak evidence that the revision rate following primary hip replacement (excluding resurfacing procedures) varied according to the bearing surface.

The overall revision rate following primary knee replacement was 0.7% (95% confidence interval 0.6% - 0.7%) at one year, 2.5% (2.4% - 2.6%) at three years and 3.7% (3.5% - 3.9%) at five years.

The three year revision rates were 2.1% with cemented knee replacement (2.0% - 2.2%), 2.4% with cementless knee replacement (2.1% - 2.9%) and 2.9% with hybrid prosthesis (2.2% - 3.9%).

The three year revision rate for unicondylar replacement was 7.2% (6.6% - 7.9%) and 8.3% for patello-femoral replacement (6.6% - 10.5%). The three year revision rate for unicondylar replacement has significantly increased from previous NJR reports as a result of the change in methodology and greater capture of revision operations. It is possible that other data quality issues may have distorted this figure and caution should be exercised when interpreting the results at this stage of the NJR.

Revision rates following primary knee replacements were lower in elderly patients. Compared to women, men had higher revision rates for cemented and hybrid prostheses but lower revision rates for unicondylar and patello-femoral replacements. Unicondylar knee replacements or patello-femoral replacements increased the risk of revision most strongly in women.

Once again, revision rates varied according to brand. Of the total condylar brands, the most commonly used, the PFC Sigma, had a three year revision rate of 1.7%. Of the other condylar brands, the revision rates ranged from 0.4% to 8.0%.

Of the unicondylar replacements, the Oxford was used most frequently. It had a three year revision rate of 6.9%. Only two other unicondylar replacements were used in any volume. The MG Uni had a revision rate of 4.5% and the Preservation had a revision rate of 12%.

The Avon was the most frequently used patello-femoral joint. It had a three year revision rate of 6.9%.

The NJR is work in progress and methods for data management and analysis are continuously being updated. The most important change this year lies in the methods used to identify revisions.

The results describe NHS activity carried out in the NHS and independent sector. The analysis does not include privately funded surgery carried out in independent hospitals and, because of lack of availability of Patient Episode Database for Wales (PEDW) data, neither does it presently describe practice in Wales.

part 1
annual progress

1.1 introduction

1.1.1 Annual Report

This report is the 6th Annual Report of the National Joint Registry (NJR) for England and Wales. The NJR collects data on hip and knee joint replacement surgery in England and Wales from both the NHS and independent sector. The information published in this report is of use to patients, clinicians, the orthopaedic implant industry and hospital and trust management. The data is collected in order to provide a broad range of stakeholders with information that will lead to an improvement in the outcomes of joint replacement surgery and in patient safety.

The report is divided into three main parts:

- **part 1** - a general outline of the NJR's work for the financial year 1st April 2008 to 31st March 2009; providing summary statistics of the data recorded during the year, summarising major developments and outlining proposed work for the financial year 2009/10
- **part 2** - a description of joint replacement activity as reported to the NJR in the calendar year 1st January to 31st December 2008
- **part 3** - an analysis of survivorship of hip and knee replacement surgery using data submitted to the NJR from 1st April 2003 to 30th November 2008, including data from the Hospital Episodes Statistics (HES) service.

1.1.2 The National Joint Registry

The National Joint Registry (NJR) was established in October 2002 and began collecting and studying data on hip and knee replacement operations in April 2003. The aim of the Registry is to provide information to all those involved in the management and delivery of joint replacement surgery with regard to surgical and implant performance and clinical best practice. This includes the regulatory authorities such as the Medicines and Healthcare products Regulatory Agency (MHRA) and the Care Quality Commission (CQC). Central to the provision of this information is the aim of improving patient outcomes and patient safety.

In order to achieve its aims, the NJR requires a continuous supply of high quality and accurate data with maximum coverage. It is only with good quality data that the long term monitoring of the effectiveness of hip and knee joint replacement surgery can be achieved. By 31st March 2009, the NJR held information on approximately 743,000 individual operations undertaken in England and Wales. Data quality is important because it affects the level and quality of monitoring and analyses that can be undertaken.

1.1.3 Management and funding

The NJR has been managed by Northgate Information Solutions (UK) Ltd since April 2006, under a contract with the Healthcare Quality Improvement Partnership (HQIP)[5], and is funded through a levy raised on the sale of hip and knee replacement implants.

From 1st April 2008, the responsibility for the management of the NJR transferred from the Department of Health (DH) to HQIP and is now included within the National Clinical Audit and Patient Outcomes Programme. The NJR Steering Committee continues to oversee the strategic direction and running of the Registry. The NJR Steering Committee is an advisory non-departmental public body; the current list of members and their declarations of interest can be found in Appendix 1 and on the NJR website.

[5] For more information about HQIP, visit the website at **www.hqip.org.uk**

part 1

1.2 data completeness and quality

1.2.1 Key indicators

The completeness and quality of data submitted to the NJR Centre is measured using three key indicators:

- compliance - the rate, expressed as a percentage, of operation records submitted to the NJR compared with the number of operations actually carried out
- consent - the number of records submitted, for which the patient has agreed to their personal data[6] being stored on the NJR database
- linkability - the number of records submitted with consent and with the patient's NHS number. The NHS number is required to link all primary and revision operations relating to a single patient.[7]

Performance against the key indicators has continued to improve year on year, although this does require the provision of continual support to orthopaedic units to either maintain or improve performance levels. Detailed figures and trends are shown below.

1.2.2 Performance against key indicators

Progress against the three measures of compliance, consent and linkability for the financial year 2008/09 was as set out below.

Compliance

All NHS trusts and NHS foundation trusts are expected to submit details of all hip and knee joint replacement operations to the NJR; the data collection is mandatory for all independent hospitals and independent sector treatment centres (ISTCs). Compliance is measured by comparing the number of submitted records to the number of levies raised through the sale of implants. For NHS organisations, compliance can also be measured by comparing submission to the NJR with records submitted to HES and its Welsh equivalent, the Patient Episode Database Wales (PEDW).

Figure 1.1 shows the total compliance rates achieved over the last five years. The figures are derived from a comparison of the number of procedures reported to the NJR with the number of levies raised through implant sales. The compliance rate has shown a steady upwards trend since 2004, although the rate of 92.5% for 2008/09 is a slight drop from that reported in the previous year (95.6%).

This drop is most likely due to large variations in the quarterly rates recorded in 2007/08; one quarter showed 120% compliance, which may have resulted in the reporting of a slightly inflated compliance rate last year. The drop may also have been compounded by a significant increase in the number of implant purchases reported in March 2009, which was not matched by a corresponding increase in the amount of reported procedures. In 2008/09 the quarterly compliance rates have been more consistent and show a quarter on quarter increase throughout the year. The overall compliance rate from 1st April 2003 to 31st March 2009 is 78.0%.

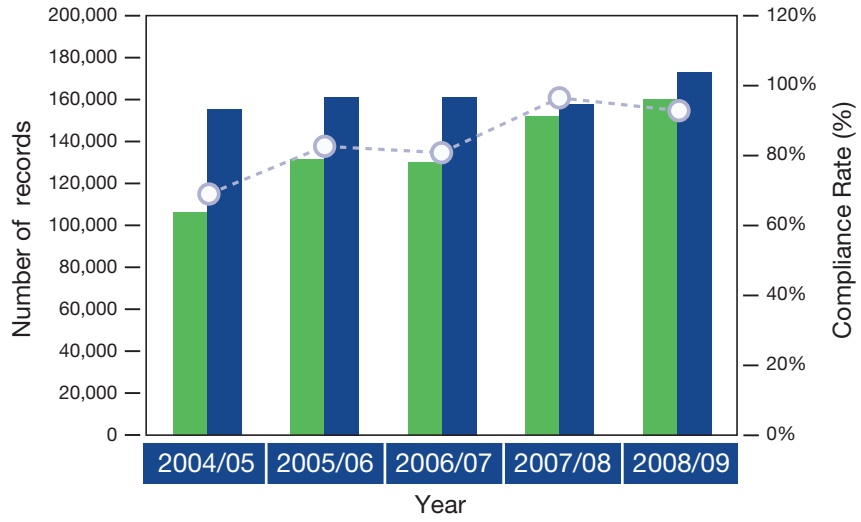


Figure 1.1

NJR Compliance: 2004 – 2009, based on levies from implant sales.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009 and levy submissions to NJR by implant suppliers and manufacturers.[8]

Number of operations
Levy
Compliance (%)

[6] Personal data includes NHS number, surname, date of birth and postcode.
[7] NJR data is submitted for NHS number tracing; the linkability figure includes NHS numbers that were traced subsequent to the operation details being submitted to the NJR.
[8] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

The NJR publishes figures for each hospital via its NJR StatsOnline service on its website. Patients, clinicians and managers are able to view the contribution being made by their hospital to the NJR and, ultimately, to improving patient outcomes and safety. Compliance varies widely, with some orthopaedic units failing to submit any records. Table 1.1 shows the hospitals which undertake elective hip and knee joint replacement surgery but did not submit any data to the NJR for the year 1st April 2008 to 31st March 2009.

Table 1.1 List of non-returning units, 2008/09.

Trust	Hospital
Barking, Havering and Redbridge Hospitals NHS Trust	Queens Hospital*
Bromley Hospitals NHS Trust	Orpington Treatment Centre Princess Royal University Hospital
Dartford and Gravesham NHS Trust	Darent Valley Hospital
Guy's and St Thomas' NHS Foundation Trust	Guy's Hospital* Guy's Nuffield House St Thomas' Hospital
Homerton University Hospital NHS Foundation Trust	Homerton University Hospital
Leeds Teaching Hospitals NHS Trust	Leeds General Infirmary Chapel Allerton Hospital
Mid Essex Hospital Services NHS Trust	Broomfield Hospital*
Orthopaedics and Spine Specialist Hospital	Orthopaedics and Spine Specialist Hospital
Salford Royal NHS Foundation Trust	Hope Hospital
University College London Hospitals NHS Foundation Trust	University College Hospital*
University Hospital of South Manchester NHS Foundation Trust	Wythenshawe Hospital*

**These hospitals began submitting data in May 2009*

Consent

The NJR requires consent from patients in order to be able to store their personal details including their NHS number. Without patient consent, any patient will be lost to the follow up system, which means it is not possible to link any previous or subsequent operations to the same patient. Low rates of consent would result in the NJR failing to meet its aims. Consent rates for each hospital are published via NJR StatsOnline.

The NJR has three ways of recording consent: 'Yes', 'No' and 'Not recorded'. Support has been granted under Section 251 of the NHS Act 2006 enabling the NJR to record details of patients where 'Not recorded' is indicated. It is possible that this exemption will be withdrawn in 2009, therefore it is essential to reduce the total number of submissions with consent 'Not recorded'. The total of such records was 14,400 last year alone. Patients, when asked, rarely refuse consent and the failure to record it is usually the result of inadequate processes within the hospital and the consent form not being available to the person entering the data.

Figure 1.2 shows the steady increase in the recording of patient consent over the five years of the NJR. Consent for 2008/09 was 87.5%, an increase from 2007/08 (84.4%). The consent rate for all operations submitted to the NJR from 1st April 2003 to 31st March 2009 is 78.0%.

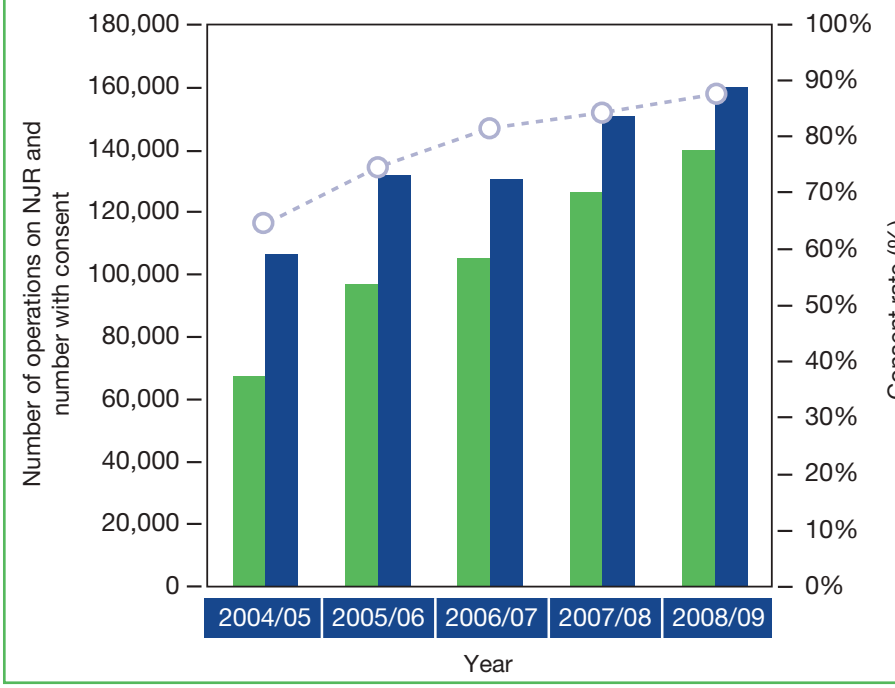


Figure 1.2

NJR Consent: annual analysis of total records received and those with patient consent, 2004 – 2009.

Source: Operations entered on NJR 1st April 2004 - 31st March 2009.[9]

Linkability

The ability to link all operations relating to an individual patient is essential to the monitoring of the performance of implants and surgery. The linkability rate refers to the percentage of operations submitted that have both positive patient consent and an NHS number recorded. Low rates of linkability adversely affect the NJR's ability to monitor surgical and implant performance.

The percentage of linkable records submitted to the NJR from 2004/05 to 2008/09 is shown in Figure 1.3. The linkability rate for 2008/09 was 92.9% compared to 90.1% for 2007/08. The overall linkability rate for the NJR database is 77.4%.

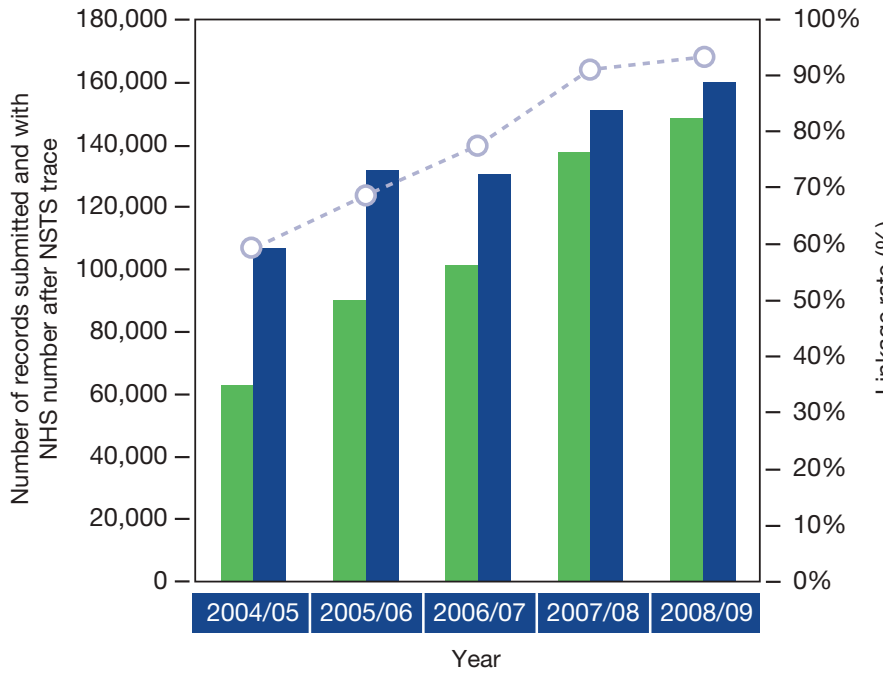


Figure 1.3

NJR Linkability: analysis of total records received and those for which NHS numbers have been traced, 2004 – 2009.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009.[9]

[9] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

part 1

1.3 key figures

1.3.1 Operation totals

The total number of procedures reported to the NJR between 1st April 2003 and 31st March 2009 is 742,706. The year in view saw the largest number of submissions for any year (160,027).

Figure 1.4 shows the total number of operations recorded on the NJR in England and Wales each year from 2004/05 to 2008/09. For the third year in a row, the number of knee replacement operations (82,419) exceeds the number of hip replacement operations (77,608).

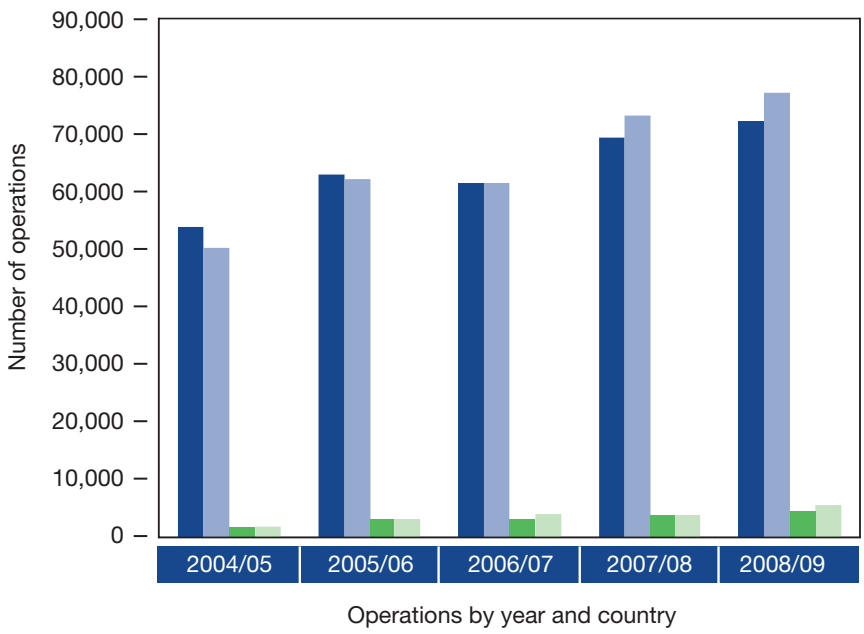


Figure 1.4

Total hip and knee joint replacement operations entered on the NJR, 2003/04 – 2007/08, recorded by country in which the operation took place.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009.[10]

Operation types

The NJR has records for three different types of hip and knee joint replacement procedures:

- primary – the first time a joint is replaced
- revision – an operation that involves the removal and replacement of one or more components of a joint replacement
- re-operation other than revision – an operation following either a primary or revision operation that does not require any joint implants to be removed or replaced, for example a wound debridement (wash out)[11] .

Figure 1.5 shows the number of operations reported by type from 1st April 2004 to 31st March 2009. Primary operations continue to represent the most reported procedures (92.2%). The difference in the number of knee primary operations and hip primary operations has continued to increase in favour of the former (1.9% more as a proportion in 2005/06, compared to 4.8% in 2008/09).

[10] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

[11] Re-operation information was not collected in the first version of the NJR's Minimum Dataset (MDSv1), from 1st April 2003 to 31st March 2004. It was included in MDSv2, from 1st April 2004, but removed from MDSv3 which came into use on 1st December 2007. However, some units are continuing to use MDSv2, which is why some re-operations continue to be reported. The figures are included for completeness only.

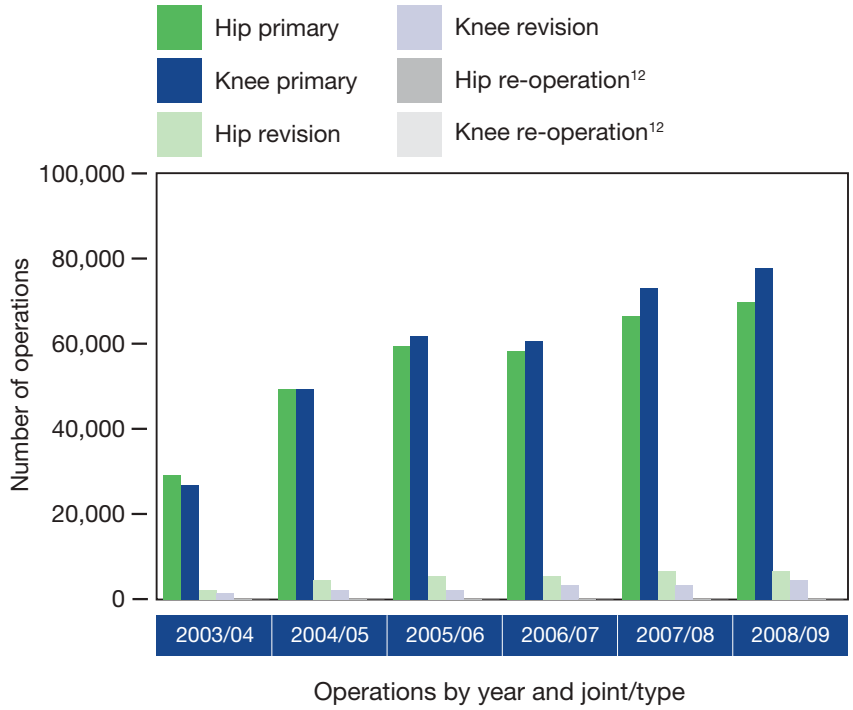


Figure 1.5

Type: hip and knee joint replacement operations entered on the NJR, 2003/04 – 2008/09, recorded by type of operation.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009.[13]

Where the operations took place

Of the 742,706 operations submitted to the NJR since it started to collect data, 94.9% were carried out in England and 5.1% in Wales. In 2008/09, 149,400 (93.4%) operations were carried out in England, compared to 10,627 (6.6%) in Wales.

There are four types of organisations in England carrying out hip and knee joint replacement surgery:

- NHS hospital
- NHS treatment centre
- independent hospital
- independent sector treatment centre (ISTC).

There are no NHS treatment centres or ISTCs in Wales.

Overall, for the period 1st April 2003 to 31st March 2009, 480,743 (64.8%) of submitted operations took place in NHS hospitals in England and Wales, 197,877 (26.6%) in independent hospitals, 35,053 (4.7%) in NHS treatment centres and 29,030 (3.9%) in ISTCs. The proportion of operations by provider type is shown in Figure 1.6.

[12] NJR data is submitted for NHS number tracing; the linkability figure includes NHS numbers that were traced subsequent to the operation details being submitted to the NJR.
[13] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

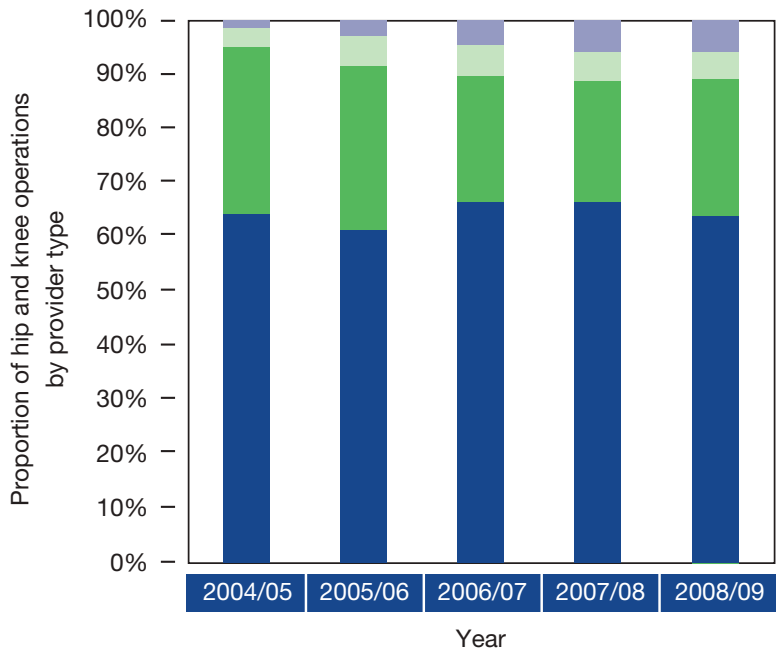


Figure 1.6

Proportion of reported operations by provider type entered on the NJR, 2004/05 – 2008/09.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009.[14]

The proportion of procedures undertaken in NHS treatment centres and ISTCs has remained similar to that reported last year, while there has been an increase of 2.6% in the proportion of procedures in independent hospitals compared to a 2.4% decrease in NHS hospitals.

Figure 1.7 shows the proportion of hip replacement operations reported to the NJR by provider type.

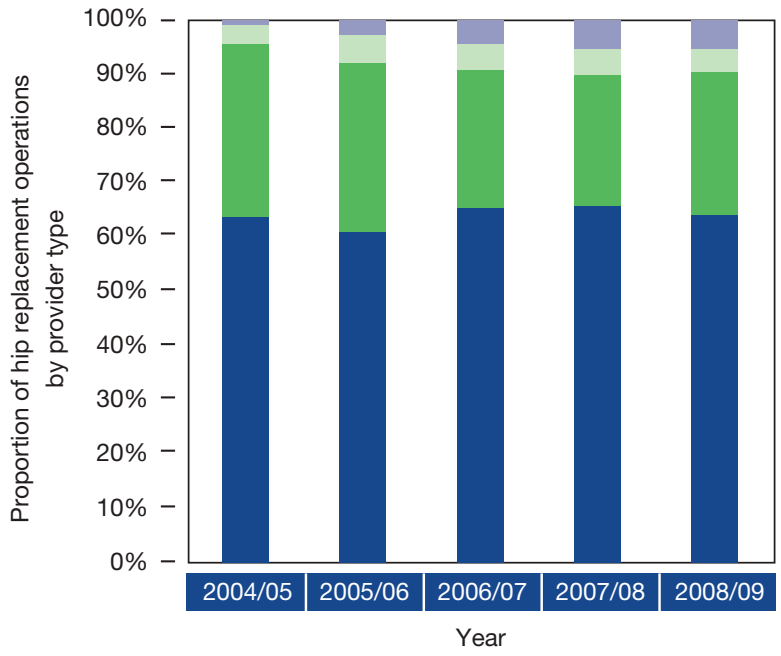


Figure 1.7

Proportion of hip replacement operations by provider type.

Source: Operations entered on NJR 1st April 2004 – 31st March 2009.[14]

[14] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

The proportion of hip replacement operations undertaken in NHS treatment centres and ISTCs has remained similar to that reported last year, although there has been a slight increase in the proportion of operations carried out in independent hospitals (2.1%). The proportion of hip operations undertaken in NHS hospitals has decreased slightly from that reported last year (1.8%).

Figure 1.8 shows the proportion of knee replacement operations reported to the NJR by provider type.

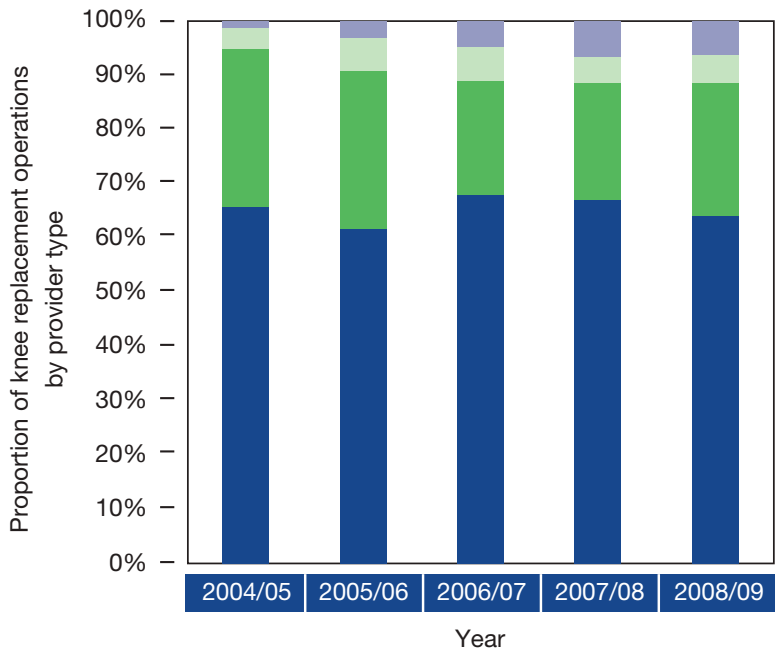


Figure 1.8

Proportion of knee replacement operations by provider type.

Source: Operations entered on NJR 1st April 2004 – 31st March 2005.[15]

The proportion of knee replacement operations undertaken by the four major provider types reported this year has seen changes similar to those reported for hip operations. The proportion of knee operations undertaken by NHS treatment centres and ISTCs has remained similar to that reported last year, with a reported increase of 3% in independent hospitals compared to a 3% decrease in NHS hospitals in England and Wales.

[15] The supporting data for Figures 1.1 to 1.8 are to be found on the NJR Annual Report website.

part 1

1.4 progress and plans

1.4.1 NJR Clinician Feedback

Following feedback from the Annual Meeting of the British Hip Society in February 2008, a set of requirements for NJR Clinician Feedback was prepared for, and approved by, the NJR Steering Committee. The service was demonstrated at the British Orthopaedic Association (BOA) Annual Congress in September 2008 and launched in November 2008. It enables surgeons to assess and compare their clinical practice at a hospital, regional, sector (NHS or independent) and national level. It is a secure, web-based service accessed via the internet.

The service is provided for surgeons only and provides them with a view of their early results. The relatively low numbers reported for each surgeon, along with inconsistent compliance rates and case mix variables, can skew the results and could lead to incorrect conclusions being drawn about a surgeon's overall practice. For this reason alone, the figures have not been made publicly available.

The service consists of a number of different reports, most of which can be filtered to adjust for case mix. Figures 1.9 and 1.10 give two sample screen shots.

Figure 1.9

NJR Clinician Feedback: primary procedure hip report.

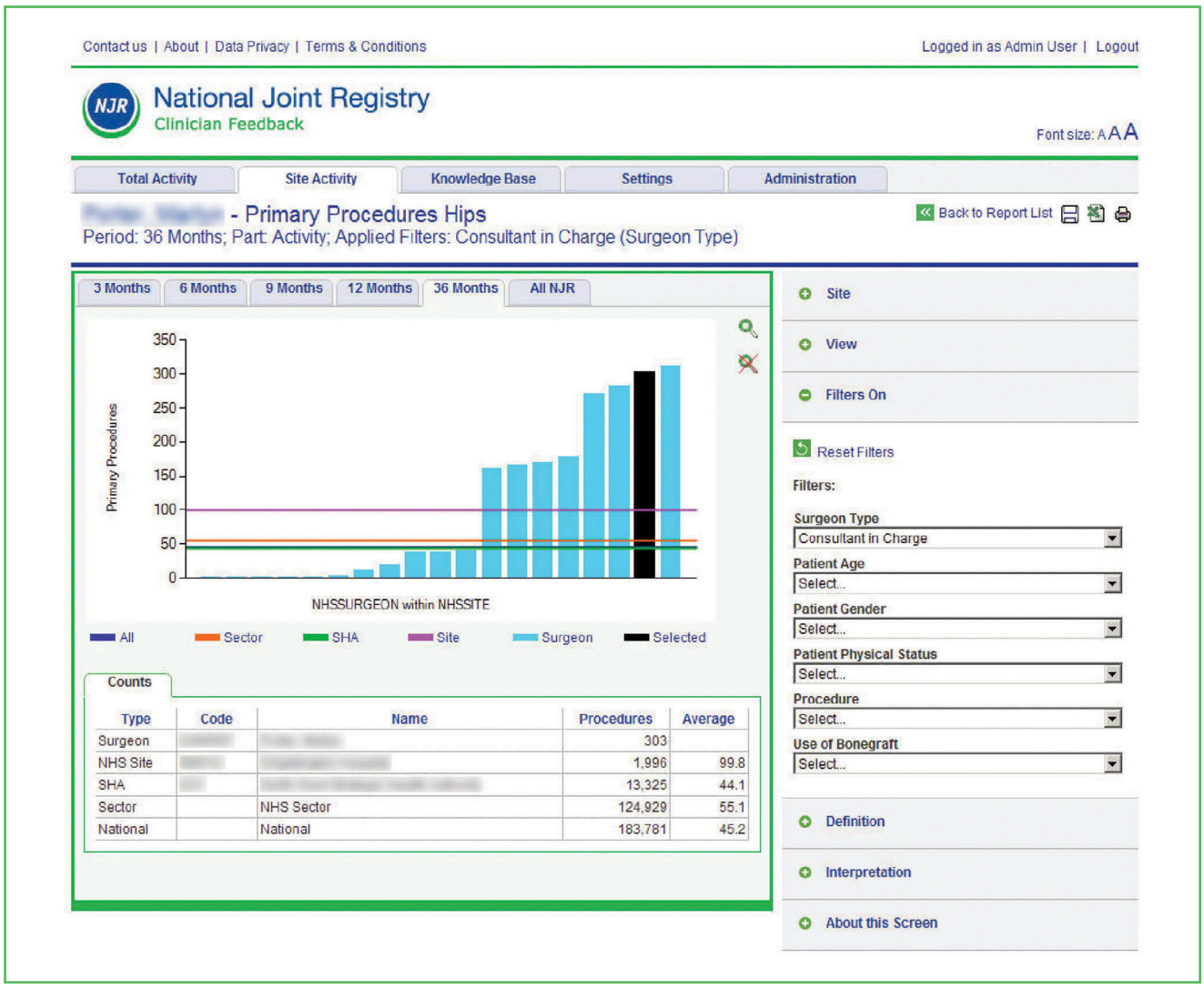


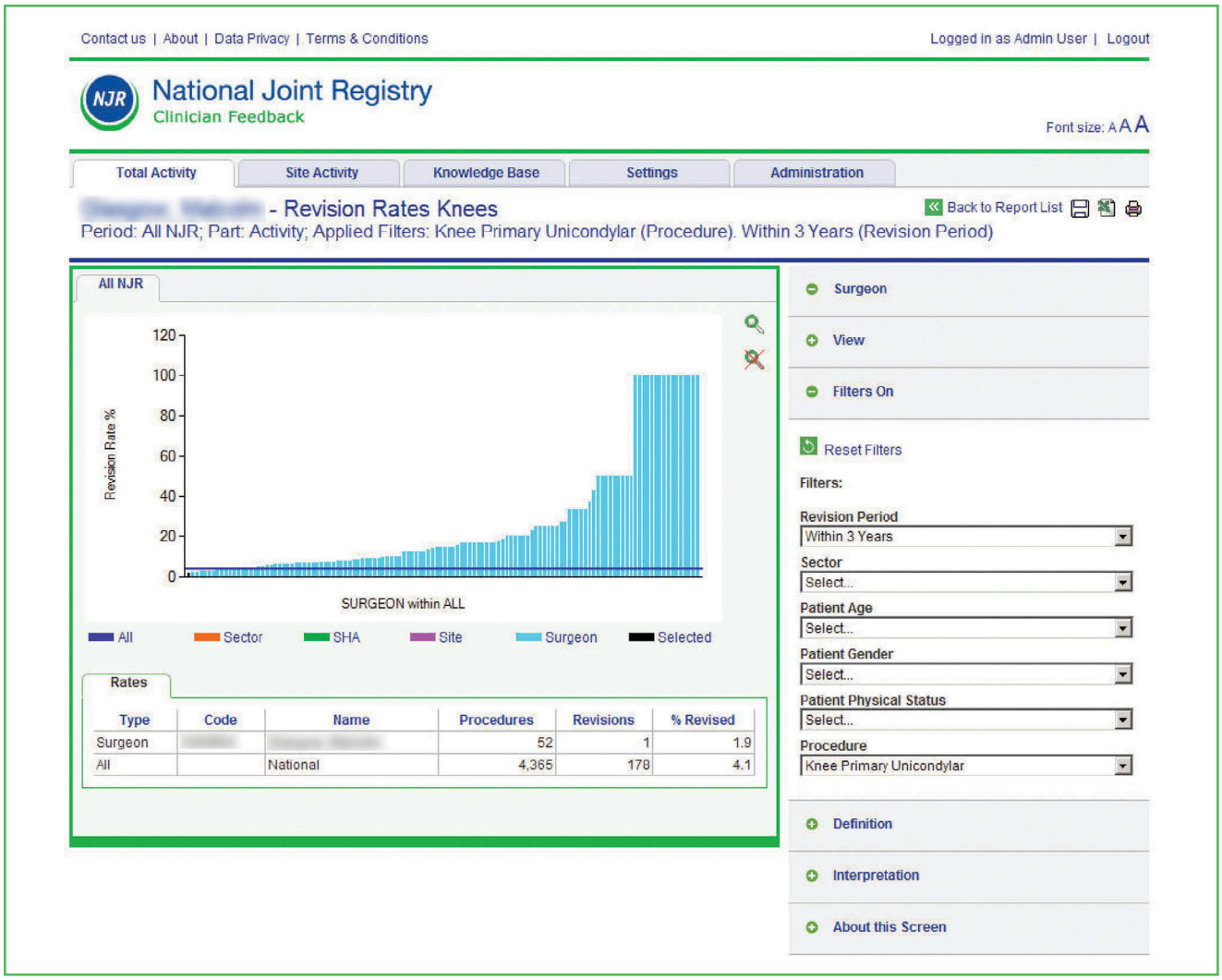
Figure 1.9 shows the number of primary hip procedures undertaken by a consultant in the last 36 months in an NHS hospital. The report shows all the surgeons registered in that hospital, with the surgeon's own figures represented by the black bar. Also shown are the averages for all surgeons at hospital, strategic health authority, NHS and national level. The reports can be filtered by case mix variables and, while the filters are shown in the screen shot, none have been applied. All reports include the actual figures.

Figure 1.10 shows the most recent report to be added to the service; the revision rate report. This example shows a three year revision rate for primary unicondylar knee. The procedures considered are those that have been in the database for a minimum of three years. The total of revisions includes those for which the revising surgeon was not the same as the primary procedure surgeon. The report accounts for where the primary procedure took place, which means it provides more accurate information than some other published sources.

This figure shows the effect of low numbers; the high revision rates shown are due to a low number of procedures being submitted. This particular report could be run at a hospital level or comparing orthopaedic units within a strategic health authority region, which may be more meaningful to patients.

Figure 1.10

NJR Clinician Feedback: three year revision rate report for primary unicondylar knee.



It is intended to continue to increase the number and type of reports available through the NJR Clinician Feedback service and to include data from HES and PEDW. This would enable additional reports to be included, such as incidences of dislocation, venous thromboembolic events, mortality and length of stay.

1.4.2 Investigating outlier data - implants

The MHRA issued a device alert on an individual implant which has subsequently been withdrawn from sale by the manufacturer. This is the first time that the withdrawal of a product has been precipitated by the use of NJR data. Having identified a potential problem, the NJR was able to provide the MHRA with the data necessary for its joint investigation with the manufacturer.

Once the decision to issue a device alert had been made, the NJR was very quickly able to identify those patients who had received the implant, where the procedure had been reported to the NJR, and inform the appropriate hospitals. This action significantly reduces the period between the identification of a problem and the clinical review of the patient.

1.4.3 Investigating outlier data - surgeons

Similar to the handling of potentially outlying implant data, there are two distinct parts to the process for surgeons: identifying outlying data in the first instance and investigating to establish whether or not there is outlying performance.

When setting up the process for identifying outlying data, the NJR Steering Committee agreed that the statistical method would be subject to continuous review. Following implementation of the agreed method through the 'patient time incidence rate report' on NJR Clinician Feedback, it quickly became clear that a detailed knowledge and understanding of statistical methods was required to interpret the report. As a result, the Steering Committee decided that the existing method should be reviewed and the report on NJR Clinician Feedback was disabled. Once the review has been completed, the revised method will be published and the report reinstated.

The process for investigating outlier data was agreed by the Steering Committee, following wide consultation, and promulgated via the BOA and other professional societies.

1.4.4 Establishment of the NJR Editorial Board

The NJR Steering Committee agreed to the re-establishment of the NJR Editorial Board to oversee the production of the Annual Report. With the amount of data now available and the limited amount of time available for analysis, it is essential that clinical and epidemiological expertise is involved as early as possible. This includes agreeing and specifying the work at the outset and reviewing the outputs as soon as they are available. The Editorial Board is chaired by Mr Martyn Porter.

1.4.5 Patient Reported Outcome Measures (PROMs)

The Department of Health has contracted for a national PROMs study for four surgical treatments: hip replacement, knee replacement, varicose veins and groin hernia. The NJR Steering Committee was involved with the Department at an early stage, offering support and developing an understanding of how the NJR might benefit from working closely with the study. As a result of that involvement, it has been agreed that the NJR will be able to access data from PROMs to link it into the NJR database.

While recognising that a single, six month follow up does not meet the NJR's wish for a longer term study, it nevertheless represents a significant step towards providing more detailed information on the outcomes of knee and hip replacement surgery from the patient's perspective. In recognising the value of patient outcomes based studies, the NJR Steering Committee has agreed to part fund the national study. One of the aims of the NJR's strategic plan (section 1.4.6) is to use the national PROMs data to undertake its own, longer term PROMs study, with patients being followed up at defined points over a number of years[16].

[16] For patients, more information about the national PROMs study can be found on the NHS Choices website at **www.nhs.uk** and, for service providers, more information is available at **www.northgate-proms.co.uk**

The contract for the national PROMs study was let in three parts. The first and second parts (data collection and data aggregation) were awarded to Northgate Information Solutions (UK) Ltd and the third part (data analysis) was awarded to Market and Opinion Research International Ltd (MORI). The data analysis will be completed by the Royal College of Surgeons Clinical Effectiveness Unit which partnered with MORI during the bidding process.

1.4.6 Strategic plan

During the year in view the NJR Steering Committee began the development and implementation of a strategic plan for the next two years (2009 to 2011), which focuses on the following broad areas outlined below.

- **Data quality and improvement**. In order to achieve its aims and objectives and meet the needs of its many stakeholders, the NJR requires good quality data. A programme to assess and monitor the quality of submitted data is under consideration. Its function would need to include providing a clear statement about data quality and regular data quality reports to orthopaedic units. Seeking agreement to make the NJR a mandatory data collection for all NHS trusts and NHS foundation trusts is a key element of this programme.
- **Research and studies**. The number of requests for information and data from the NJR has increased significantly over the last year. A protocol is being developed for handling research requests and facilitating and streamlining the process by which data is made available for studies, whether they are funded by the NJR or third parties. The strategic plan identifies the need for a supporting infrastructure to manage the research protocol. It recommends re-establishment of the NJR Research Committee to consider all requests and advise the Steering Committee on the direction and priorities for NJR research.
- **Improved information**. With six years of data now recorded, it is recognised that the NJR should make information more readily available to stakeholders on a more frequent basis, rather than relying on traditional means of communication such as the Annual Report and newsletters. Services similar to NJR Clinician Feedback, aimed at implant manufacturers and suppliers, hospital management and service commissioners, are being considered. So, too, are proposals to publish information and data currently included in the Annual Report more frequently on the NJR website. In order to provide more information to patients about joint replacement surgery in England and Wales, the NJR has begun collaboration with NHS Choices.
- **Extending the NJR**. In order to extend the scope of the NJR with regard to the types of joint replacement covered, preliminary work commenced in early February 2009 to enable the collection of data about ankle joint replacement surgery. It is hoped that elbow and shoulder joint replacement surgery will also be included in the data collection within the next 12 months. Initial meetings have taken place to pave the way for the inclusion of data from Northern Ireland.

1.4.7 Specialist studies

A number of different studies on specialist topics are planned for the year ahead, as outlined below.

- **Data quality**. Initially, three approaches are being pursued.
  - First, a 'capture-recapture analysis' to estimate the completeness of follow up. This type of analysis allows us to estimate how many revisions may have been missed in the HES and NJR databases. Initial results from this analysis indicate that the revision rates continue to be underestimated by at least 15%.
  - Secondly, a large study will examine the records held by the NJR compared to the forms filled in, and the patients' notes for primary hip and knee replacements. Similarly, the records of patients undergoing revision hip and knee replacements according to the NJR and HES will be compared for accuracy.
  - Thirdly, the patients' physical status (ASA scores 1 to 5) as reported to the NJR will be compared with HES information on co-morbid conditions, based on admissions in the year preceding the hip or knee replacement. Subsequent checks against medical records are planned, especially for patients for whom contradictory information is held by the HES and NJR.

- **Re-revisions.** An investigation to establish how many patients have a revision after the first revision of their hip or knee replacement. It will cover the re-revision rate, mortality, operative procedures and brands of implant.
- **Hydroxyapatite (HA) coating.** A study of the impact of HA coating on revision rates after hip replacement using a cementless prosthesis. It will consider patient characteristics and the procedures used during the operation.
- **Thromboprophylaxis.** This treatment is intended to prevent venous thromboembolic events (VTEs), such as deep vein thrombosis and pulmonary embolism, following joint replacement surgery. It can involve a combination of chemical and physical methods such as thrombo embolus deterrent (TED) stockings. The study will look at the methods of thromboprophylaxis and their impact on mortality, VTE and bleeding.
- **Fractured neck of femur.** An examination of the outcomes of total hip replacement in patients who have suffered a fracture to the neck of the femur. Revision rates, mortality and length of stay will be considered in relation to patient characteristics, procedures and types of implant used.

1.4.8 Governance and support

The NJR is involved with a large and diverse number of stakeholders, all of whom benefit from its work. A comprehensive list of these stakeholders can be found on the NJR website.

Steering Committee

The NJR Steering Committee met four times during 2008/09; the minutes of its meetings are published on the NJR website. Its current members were appointed by the Appointments Commission on behalf of the Secretary of State for Health following a formal recruitment process. For a current list of NJR Steering Committee members and their declarations of interest, see Appendix 1 or visit the NJR website.

Regional Clinical Co-ordinators' Network

The NJR Regional Clinical Co-ordinators' (RCCs) Network consists of 23 consultant orthopaedic surgeons who act as local 'champions' for the service and support the work of the Steering Committee and Regional Co-ordinators. The RCC Network Chair is Mr Peter Howard. Further information about the Network and its members can be found on the NJR website.

Regional Co-ordinators

The NJR Centre has six Regional Co-ordinators and it plans to recruit a further two. Their role is to provide on-site support to hospitals. Contact details for the Regional Co-ordinators and information about their areas of responsibility are available on the NJR website.

Information and communication

The NJR has continued to communicate regularly with all stakeholders. A review of its communications strategy is planned for the year ahead. While publications have included the 5th Annual Report, Joint Approach newsletters, patient information leaflets and material on the website, it is recognised that more information needs to be provided to different audiences and in formats that are appropriate and easily understood.

Representatives of the NJR Centre have attended various conferences and events, including the British Orthopaedic Association (BOA) Annual Congress and the annual meetings of the British Hip Society, British Association of Surgery of the Knee and Society of Orthopaedic and Trauma Nursing. NJR staff have continued to hold regional workshops and training in hospitals.

part 1

1.5 finance

1.5.1 Income and expenditure 2008/09

The NJR is self financing, funded by a levy raised on the sale of hip and knee implants to NHS and independent healthcare providers in England and Wales. The rate of the levy is set by the Health Minister and is subject to a Memorandum of Understanding between the DH, Welsh Assembly Government, Independent Healthcare Advisory Services and the Association of British Healthcare Industries (ABHI) Orthopaedics Special Interest Section.

Income to the NJR for the financial year 2008/09 was £4,150,811; expenditure for the same period was £1,672,484.

In previous years the NJR was administered by the DH. From 2008/09, responsibility for handling the levy income passed to HQIP for use in the development of the NJR and its broader effectiveness. Reported levy income for the period includes funding transferred from the DH in relation to surplus levy income from previous years. Therefore the funds that are available, which were not used in 2008/09 for the management of the NJR, have been fully profiled for use in subsequent years against the new NJR strategic plan.

Members of the NJR Steering Committee and RCC Network are volunteers and do not receive payment for their work. However, they are reimbursed for travel and subsistence expenses incurred while attending meetings. The total expenditure for members' expenses during 2008/09 was £11,767 (April to December 2008) and £5,075 (January to March 2009, not yet charged to account).

The levy was set at £20 per joint from 1st April to 30th November 2008 and, due to a change in the rate of VAT, was adjusted to £19.57 from 1st December 2008 to 31st March 2009.

part 1

1.6 appendices

Appendix 1
NJR Steering Committee, 2008/09

A1.1 NJR Steering Committee – composition

As an advisory non-departmental public body, the NJR Steering Committee comprises:

• chair	1
• orthopaedic surgeons	3
• patient group representatives	2
• implant manufacturer/supplier industry representatives	2
• public health/epidemiology representatives	1
• NHS organisation management representatives	1
• independent healthcare provider representatives	1
• practitioner with special interest in orthopaedic care, who is a GP, nurse or allied health professional (physiotherapist or occupational therapist).	1

A1.2 Membership from 1st October 2009

Members are appointed, as posts become vacant.

Mr William Darling	Chairman (from October 2002)
Professor Paul Gregg	Orthopaedic surgeon Vice Chairman (from January 2007)
Mr Michael Borroff	Orthopaedic device industry (from October 2002)
Mrs Patricia Cassidy	Independent healthcare sector (from April 2007)
Miss Mary Cowern	Patient group - Arthritis Care (from October 2006)
Mrs Patricia Durkin	Patient representative (from March 2007)
Professor Alex MacGregor	Public health and epidemiology (from October 2002)
Miss Carolyn Naisby	Practitioner with special interest in orthopaedics (from July 2006)
Mr Martyn Porter	Orthopaedic surgeon (from January 2003)
Mr Dean Sleigh	Orthopaedic device industry (from April 2008)
Mr Keith Tucker	Orthopaedic surgeon (from May 2007)
Mr Andrew Woodhead	NHS trust management (from January 2007)

A1.3 Observers

The following have regularly attended NJR Steering Committee meetings as observers:

Mr Peter Howard	NJR Regional Clinical Co-ordinators' Network
Dr Christopher Brittain	MHRA
Mr Andy Smallwood	NHS Purchasing and Supply Agency, now NHS Supply Chain
Ms Elaine Young	National Development Lead, HQIP
Mr Robin Burgess	Chief Executive, HQIP

A1.4 Members' declarations of interest

Mr William Darling	Managing Director, J, M and W Darling Ltd Managing Director, Galen Pharmacy Ltd Chair, South Tyneside Standards Committee
Professor Paul Gregg	Consultant Orthopaedic Surgeon, South Tees Hospitals NHS Trust (orthopaedic unit receives research/audit funding from DePuy International Ltd, Stryker UK and Smith & Nephew plc) Orthopaedic Advisor for Ramsay Healthcare
Mr Michael Borroff	Chair, ABHI Orthopaedics Special Interest Section Employed by DePuy International Ltd, manufacturer of orthopaedic prostheses
Mrs Patricia Cassidy	Chief Executive, Hospitals, Nuffield Health
Miss Mary Cowern	None
Mrs Patricia Durkin	Consultancy fee paid work and share holder, CHKS Healthcare
Professor Alex MacGregor	Professor of Chronic Disease Epidemiology, University of East Anglia Consultant Rheumatologist, Norfolk and Norwich University Hospital NHS Trust
Miss Carolyn Naisby	Consultant Physiotherapist, City Hospitals Sunderland NHS Foundation Trust
Mr Martyn Porter	Consultant Orthopaedic Surgeon, Wrightington, Wigan and Leigh NHS Trust (orthopaedic unit has received financial support from DePuy International for clinical and RSA studies for Elite Plus femoral stem and C-stem). Has acted as a consultant to DePuy International in relation to the development of a hip femoral stem (C-stem AMT) and received royalties on this hip stem
Mr Dean Sleigh	National Business Development Manager, Biomet UK Council member, ABHI
Mr Keith Tucker	Consultant Orthopaedic Surgeon, Norfolk and Norwich University Hospital NHS Trust (various sources of financial support for research undertaken by orthopaedic department) Royalties received from Johnson & Johnson Orthopaedic more than five years ago for contribution to design of hip prostheses (royalties paid to orthopaedic charity)
Mr Andrew Woodhead	Chief Executive, Newham University Hospital NHS Trust

Appendix 2
NJR Regional Clinical Co-ordinators, 2008/09

Chair Mr Peter Howard	**South East Coast Strategic Health Authority** Mr Hagen Jähnich/Helmut Zahn (shared position) Mr Guy Selmon
South West Strategic Health Authority Mr Nick Fiddian Mr Evert Smith	**East Midlands Strategic Health Authority** Mr Colin Esler, Vice Chair Mr Peter Howard, Chair
West Midlands Strategic Health Authority Mr David Dunlop Mr Ian D M dos Remedios	**London Strategic Health Authority** Vacancy (Mr Mark Rowntree retired February 2008) Mr Gareth Scott
North West Strategic Health Authority Mr Glyn Thomas	**Yorkshire and Humberside Strategic Health Authority** Mr John Mitchell Mr Ian Stockley
North East Strategic Health Authority Mr John Anderson Professor Andrew McCaskie	**North Wales** Mr Glynne Andrew
East of England Strategic Health Authority Mr Godfrey Charnley Mr Matthew Porteous	**South East Wales** *Vacant* (Mr Robin Rice resigned June 2007)
South Central Strategic Health Authority Mr John Britton	

NJR website

The following information is available on the NJR website.

NJR 6th Annual Report Part 1 – Annual progress

NJR 6th Annual Report Part 2 – Clinical activity 2008

NJR 6th Annual Report Part 3 – Implant survivorship 2003 to 2008

NJR 6th Annual Report Part 1 – Annual progress - Welsh language

NJR 6th Annual Report – Supporting data for figures for part 1[17]

NJR 6th Annual Report – NJR Steering Committee Terms of Reference

NJR 6th Annual Report – NJR Regional Clinical Co-ordinators, Terms of Reference

NJR 6th Annual Report – Prostheses data

NJR Centre contact details

National Joint Registry
Northgate Information Solutions (UK) Ltd
Peoplebuilding 2
Peoplebuilding Estate
Maylands Avenue
Hemel Hempstead
Hertfordshire
HP2 4NW

Telephone: 0845 345 9991
Fax: 0845 345 9992
Email: health_servicedesk@northgate-is.com
Website: www.njrcentre.org.uk

[17] The supporting figures for the tables in Part 1 will be published only on the NJR website.

part 2 clinical activity 2008

2.1 introduction

This section summarises the number of hip and knee replacement procedures undertaken in England and Wales between 1st January 2008 and 31st December 2008 and entered into the National Joint Registry (NJR) by 28th February 2009. The information is summarised according to the type of hospital or treatment centre, procedure type and patient characteristics.

2.1.1 Hospitals and treatment centres participating in the NJR

During 2008, 408 orthopaedic units were open and of these 386 (95%) submitted at least one hip or knee procedure into the NJR (Table 2.1). The compliance rate of 86% (determined from the number of leviable components) was lower than the 95% unit participation rate, indicating that not all procedures at the participating units were recorded.

On average, 185 hip replacements and 197 knee replacements were recorded per orthopaedic unit over the year, although the numbers varied from one to more than 1,458 procedures (Table 2.2). Compared with previous years, there was an overall reduction in the number of units reporting fewer than 99 procedures in a year and an increase in units reporting between 100 and 299 procedures in a year (Figure 2.1), suggesting a greater degree of activity in joint replacement units.

Table 2.1 Total number of hospitals and treatment centres in England and Wales able to participate in the NJR and the proportion actually participating in 2008.

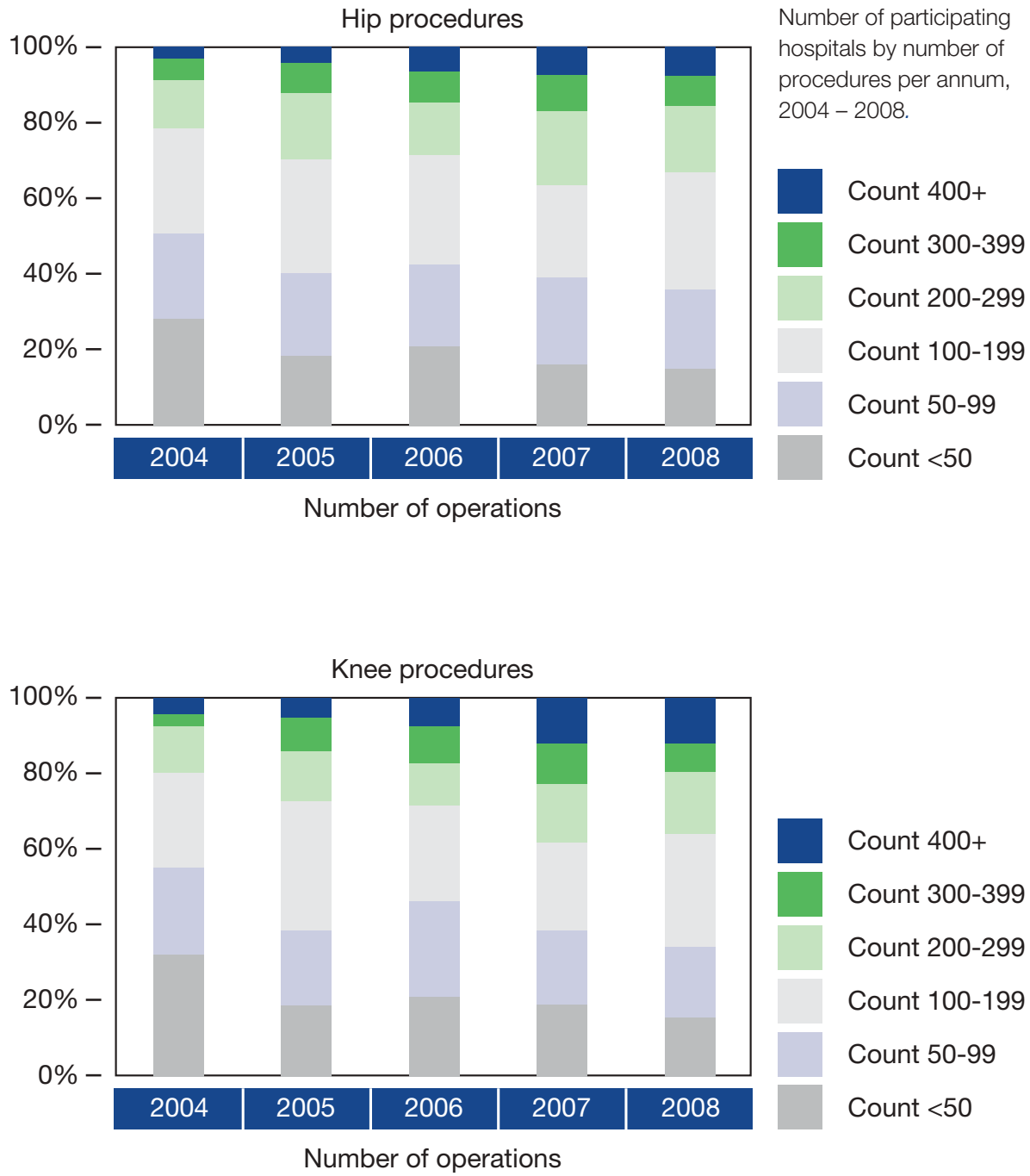
	Total number of units	Number of units submitting	Proportion participating
Total	**408**	**386**	**95%**
NHS hospitals	**222**	**201**	**91%**
England	205	184	90%
Wales	17	17	100%
Independent hospitals	**163**	**163**	**100%**
England	158	158	100%
Wales	5	5	100%
Independent sector treatment centres	**11**	**11**	**100%**
England	11	11	100%
Wales	0	0	-
NHS treatment centres	**12**	**11**	**92%**
England	12	11	92%
Wales	0	0	-

Table 2.2 Number of participating hospitals according to number of procedures performed during 2008.

	Total number of hospitals	< 50	50 - 99	100 - 199	200 - 299	300 - 399	400+	Average number per unit	Min	Max
All operations										
Hospitals entering hip replacements	386	58	79	121	68	31	29	185	1	1,382
Hospitals entering knee replacements	383	61	71	114	61	32	44	197	1	1,458
Primary operations										
Hospitals entering primary hip replacements	386	64	88	119	73	24	18	168	1	1,146
Hospitals entering primary knee replacements	381	67	70	110	62	38	34	188	1	1,416

Figure 2.1

Number of participating hospitals by number of procedures per annum, 2004 – 2008.



part 2

2.2 hip replacement procedures, 2008

The total number of hip procedures entered into the NJR during 2008 was 71,367, an increase of 3.6% over 2007. Of these, 64,722 were primary and 6,581 were revision procedures.

Table 2.3 shows that the physical status of 94% of patients at independent hospitals and ISTCs, compared with 82% at NHS units, was graded as fit and healthy or with mild disease according to the ASA[18] system.

Nearly all procedures (97%) undertaken at ISTCs were primary procedures. The percentage of primary hip resurfacings undertaken in independent hospitals (11%) is nearly double that of NHS hospitals (6%), as shown in Figure 2.2. NHS treatment centres do more cementless hip primary procedures (46%) than any other provider.

Revision procedures account for a higher percentage of total procedures undertaken at NHS hospitals (12%) than at any other type of provider (9% overall). NHS hospitals perform 81% of all hip revision procedures.

[18] American Society of Anaesthesiology system for grading the overall physical condition of the patient, as follows: P1 – Fit and healthy; P2 – Mild disease, not incapacitating; P3 – Incapacitating systemic disease; P4 – Life threatening disease; P5 – Not expected to survive 24 hours.

Table 2.3 Patient characteristics and procedure details according to type of provider for hip procedures in 2008.

	NHS hospital		Independent hospital		NHS treatment centre		Independent treatment centre		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**45,141**		**19,117**		**3,250**		**3,859**		**71,367**	
Patient physical status										
P1 - Fit and healthy	6,385	14%	5,167	27%	666	20%	269	7%	12,487	17%
P2 - Mild disease, not incapacitating	30,527	68%	12,740	67%	2,180	67%	3,315	86%	48,762	68%
P3 - Incapacitating systemic disease	7,877	17%	1,173	6%	390	12%	275	7%	9,715	14%
P4 - Life threatening disease	342	1%	31	<1%	14	<1%	0	0%	387	1%
P5 - Not expected to survive 24 hours	10	<1%	6	<1%	0	0%	0	0%	16	<1%
Procedure type										
Primary procedure	**39,750**	**88%**	**18,206**	**95%**	**3,007**	**93%**	**3,759**	**97%**	**64,722**	**91%**
Primary resurfacing	2,769	6%	2,075	11%	238	7%	116	3%	5,198	7%
Hybrid total hip	6,499	14%	2,539	13%	321	10%	543	14%	9,902	14%
Total hip replacement not using cement	14,832	33%	7,101	37%	1,508	46%	1,451	38%	24,892	35%
Total hip replacement using cement	15,650	35%	6,491	34%	940	29%	1,649	43%	24,730	35%
Revision procedure	**5,391**	**12%**	**911**	**5%**	**243**	**7%**	**100**	**3%**	**6,645**	**9%**
Hip excision arthroplasty	66	<1%	6	<1%	0	0%	1	<1%	73	<1%
Hip re-operation other than revision	60	<1%	2	<1%	1	<1%	1	<1%	64	<1%
Hip single stage revision	4,516	10%	811	4%	215	7%	92	2%	5,634	8%
Hip stage 1 of 2-stage revision	330	1%	38	<1%	11	<1%	2	<1%	381	1%
Hip stage 2 of 2-stage revision	419	1%	54	<1%	16	<1%	4	<1%	493	1%
Bilateral or unilateral										
Bilateral	126	<1%	242	1%	18	1%	32	1%	418	1%
Unilateral	45,015	100%	18,875	99%	3,232	99%	3,827	99%	70,949	99%
Funding										
Independent	695	2%	11,020	58%	8	<1%	156	4%	11,879	17%
NHS	42,500	94%	7,394	39%	3,139	97%	3,697	96%	56,730	79%
Not selected	1,946	4%	703	4%	103	3%	6	<1%	2,758	4%

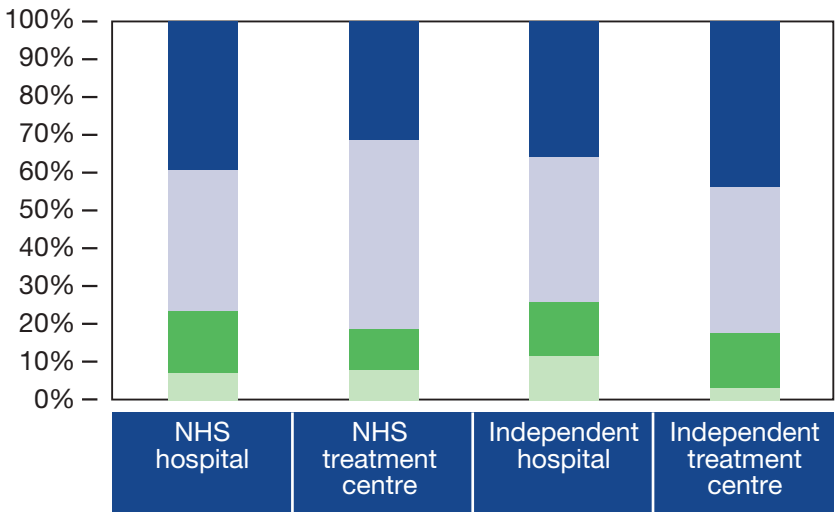


Figure 2.2

Primary hip procedures by provider type.

2.2.1 Hip primary replacement procedures, 2008

Of the 64,722 primary hip replacement procedures undertaken in 2008, 38% were cemented total hip replacements (THRs), 33% were cementless THRs, 8% were hip resurfacing procedures and 7% were large head metal on metal total hip procedures (Figure 2.3). Please note that Figure 2.3 shows separately the procedures using large heads with resurfacing cups, which are not specifically analysed elsewhere.

Compared with previous years, there has been a reduction in the percentage use of cemented THR procedures and corresponding increase in the use of cementless interventions. Cemented procedures dropped from 53% in 2004 to 38% in 2008, while cementless surgeries rose from 21% in 2004 to 33% in 2008. Large diameter metal on metal articulation accounted for 15% of all primary hip procedures.

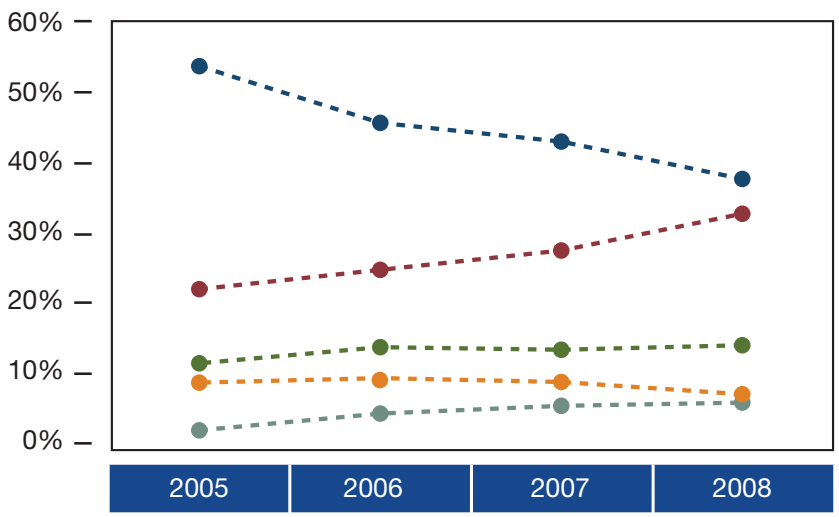


Figure 2.3

Type of primary hip replacement procedures undertaken between 2005 and 2008.

2.2.1.1 Patient characteristics

Age and gender were included for those patients who gave consent for their personal identifiers to be entered into the NJR and where no response to the consent request was recorded (a total of 91% of records). The average age was 66.7 years, compared with 68.1 in 2004. Approximately 60% of the patients were female (Table 2.4). On average, female patients were older than male patients at the time of their primary hip replacement (68.4 years and 65.8 years respectively, Table 2.5). Patients undergoing a resurfacing procedure were the youngest, at an average age of 54.9 years (Figure 2.4).

According to the ASA system, 18% of patients undergoing a primary hip replacement in 2008 were graded as 'fit and healthy' prior to surgery, compared to 37% in 2003. Figure 2.5 shows the changes in ASA grade over six years. Patient BMI[19] has increased over the past five years from 27.8 to 28.3, as shown in Figure 2.6. This is equivalent to a weight increase of 1.45kg (3.2 pounds) for a person of average height. The single largest indication recorded for surgery was osteoarthritis, recorded in 93% of procedures (Table 2.4).

[19] BMI: 20-25 normal, 25-30 overweight, 30-40 obese, > 40 morbidly obese.

Table 2.4 Patient characteristics for primary hip replacement procedures in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Primary resurfacing arthroplasty of joint		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total hip primaries	**24,730**	**38%**	**24,892**	**38%**	**9,902**	**15%**	**5,198**	**8%**	**64,722**	
Total hip primaries with patient data	**22,591**		**22,902**		**8,990**		**4,678**		**59,161**	**91%**
Average age	72.93		65.73		69.55		54.85		66.66	
SD[20]	9.4		11.1		10.8		9.2		13.1	
Interquartile range	67.7 - 79.3		59.6 - 73.2		63.2 - 77.0		49.2 - 61.3		61.3 -76.4	
Gender										
Female	14,954	66%	13,151	57%	5,588	62%	1,530	33%	35,223	60%
Male	7,637	34%	9,751	43%	3,402	38%	3,148	67%	23,938	40%
Patient physical status										
P1 – Fit and healthy	3,075	12%	4,945	20%	1,417	14%	2,264	44%	11,701	18%
P2 – Mild disease, not incapacitating	17,568	71%	17,204	69%	7,032	71%	2,784	54%	44,588	69%
P3 – Incapacitating systemic disease	3,931	16%	2,650	11%	1,399	14%	145	3%	8,125	13%
P4 – Life threatening disease	151	1%	89	<1%	51	1%	3	<1%	294	<1%
P5 – Not expected to survive 24 hours	5	<1%	4	<1%	3	<1%	2	<1%	14	<1%
BMI										
Average	28.0		28.6		28.4		28.4		28.3	
SD[20]	5.0		5.2		5.2		4.6		5.1	
Indications for surgery										
Osteoarthritis	23,092	93%	23,129	93%	8,964	91%	4,913	95%	60,098	93%
Avascular necrosis	453	2%	608	2%	303	3%	78	2%	1,442	2%
Fractured neck of femur	397	2%	290	1%	205	2%	3	<1%	895	1%
Congenital dislocation	156	1%	478	2%	176	2%	145	3%	955	1%
Other inflammatory arthropathy	313	1%	310	1%	127	1%	35	1%	785	1%
Failed hemiarthroplasty	65	<1%	53	<1%	53	1%	2	<1%	173	<1%
Previous arthrodesis	28	<1%	31	<1%	18	<1%	5	<1%	82	<1%
Infection	32	<1%	22	<1%	15	<1%	3	<1%	72	<1%
Trauma chronic	482	2%	487	2%	261	3%	86	2%	1,316	2%
Previous hip surgery, non trauma related	34	<1%	94	0%	31	<1%	10	<1%	169	<1%
Other	535	2%	568	2%	255	3%	141	3%	1,499	2%

[20] Standard deviation of average.

Table 2.5 Age and gender for primary hip replacement in 2008.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Primary resurfacing arthroplasty of joint		Total
	No.	%	No.	%	No.	%	No.	%	No.
Average age by gender									
Female	**14,954**		**13,151**		**5,588**		**1,530**		**35,223**
Average	73.6		66.2		70.1		53.8		68.4
SD[21]	9.3		11		10.7		9.3		12.4
Interquartile range	68.4 - 79.9		59.8 - 73.7		63.8 - 77.7		48.3 - 60.2		62.5 - 77.4
Male	**7,637**		**9,751**		**3,402**		**3,148**		**23,938**
Average	71.7		65.1		68.6		55.4		65.8
SD[21]	9.54		11.1		10.8		9.16		12.24
Interquartile range	66.5 - 78.0		59.2 - 72.7		62.1 - 75.9		49.7 - 61.8		59.7 - 74.7
Age group by gender									
Female									
< 45 years	126	1%	492	4%	124	2%	237	15%	979
45 - 54 years	420	3%	1,321	10%	327	6%	557	36%	2,625
55 - 64 years	1,883	13%	3,986	30%	1,154	21%	601	39%	7,624
65 - 74 years	5,464	37%	4,561	35%	2,027	36%	129	8%	12,181
75 - 84 years	5,702	38%	2,386	18%	1,644	29%	6	<1%	9,738
> 85 years	1,359	9%	405	3%	312	6%	0	0%	2,076
Male									
< 45 years	104	1%	503	5%	102	3%	419	13%	1,128
45 - 54 years	315	4%	1,054	11%	249	7%	1,002	32%	2,620
55 - 64 years	1,171	15%	3,025	31%	775	23%	1,328	42%	6,299
65 - 74 years	3,029	40%	3,447	35%	1,299	38%	374	12%	8,149
75 - 84 years	2,585	34%	1,516	16%	846	25%	22	1%	4,969
> 85 years	433	6%	206	2%	131	4%	3	<1%	773

[21] Standard deviation of average.

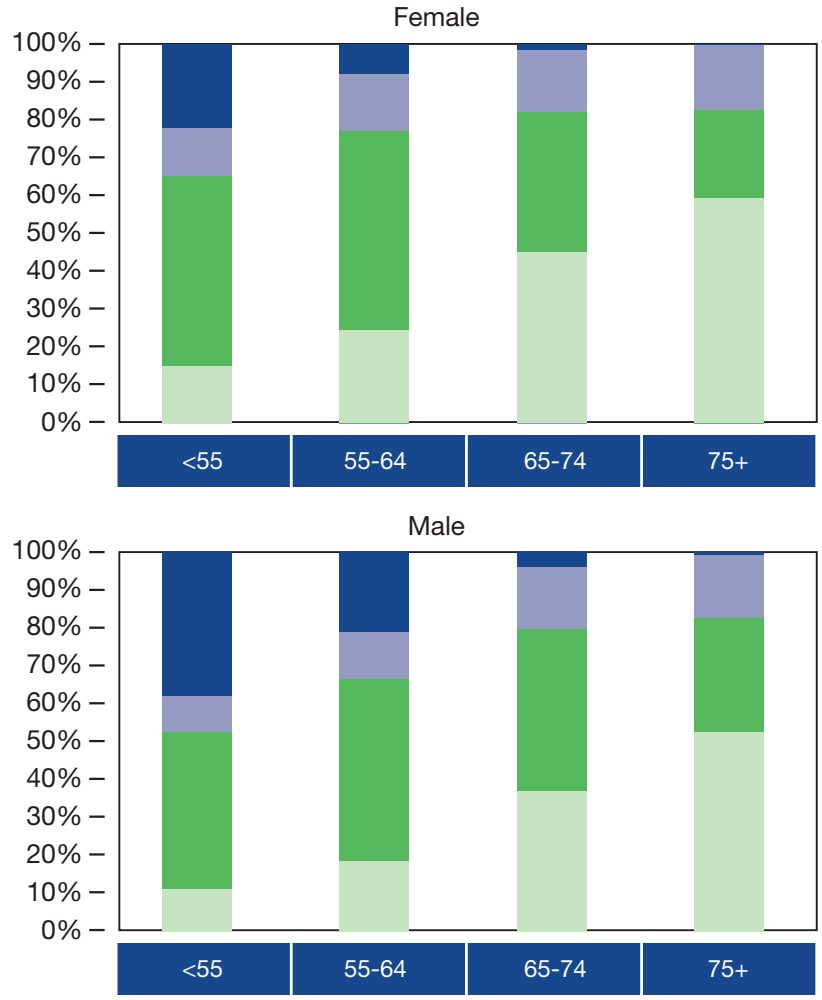


Figure 2.4

Age and gender for primary hip replacement patients in 2008.

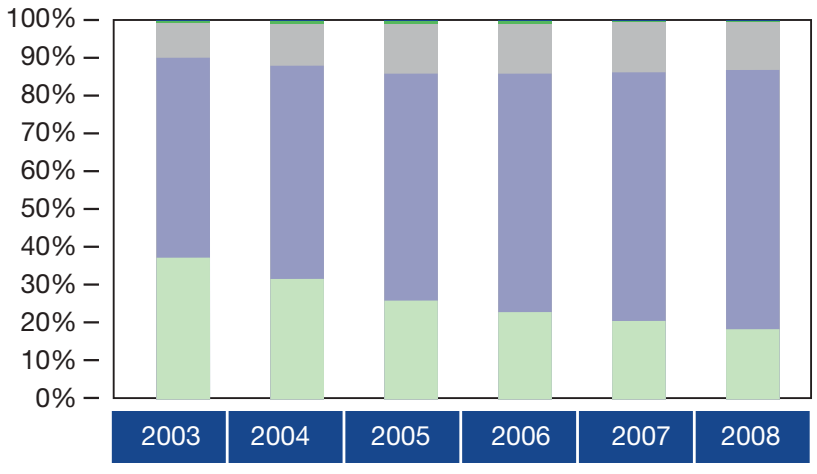


Figure 2.5

ASA grades for primary hip replacement patients undertaken between 2003 and 2008.

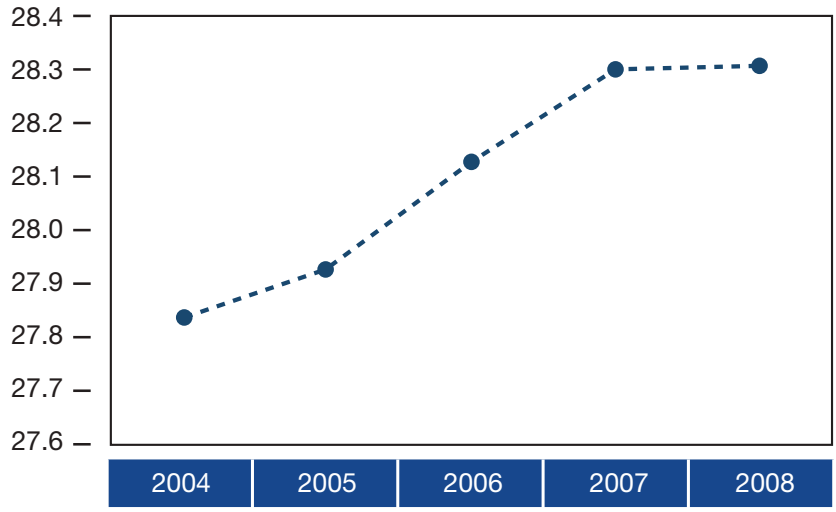


Figure 2.6

Body mass index for primary hip replacement patients undertaken between 2004 and 2008.[22]

2.2.1.2 Surgical techniques

The surgical techniques used in procedures undertaken in 2008 are summarised in Table 2.6. Patients were mainly positioned laterally. The lateral position was used more frequently in hybrid and resurfacing procedures than in cemented and cementless procedures. As would be expected, the most frequently used incision approach was posterior for cementless, hybrid and resurfacing procedures and lateral for cemented procedures. Compared with previous years, there has been a slight increase in the use of a posterior approach. The use of a lateral patient position increased from 83% in 2004 to 90% in 2008, while the use of a posterior approach increased from 39% in 2004 to 54% in 2008.

The reduction in the use of cemented stems from 77% in 2004 to 55% in 2008 and the use of cemented cups, from 56% to 44%, is consistent with the reduction seen in the overall number of cemented procedures (Figure 2.3). The relative usage of different types of bone cement is shown in Figure 2.7. Use of minimally invasive surgery (MIS) was greatest in cementless procedures, although it was used in less than 5% of all procedures (Table 2.6).

[22] BMI: 20-25 normal, 25-30 overweight, 30-40 obese, > 40 morbidly obese.

Table 2.6 Characteristics of surgical practice for primary hip replacement procedures in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Primary resurfacing arthroplasty of joint		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**24,730**		**24,892**		**9,902**		**5,198**		**64,722**	
Patient position										
Lateral	21,265	86%	22,341	90%	9,396	95%	5,083	98%	58,085	90%
Supine	3,465	14%	2,551	10%	506	5%	115	2%	6,637	10%
Incision										
Antero/antero-lateral	711	3%	797	3%	239	2%	65	1%	1,812	3%
Lateral (inc. Hardinge)	11,274	46%	8,628	35%	2,956	30%	926	18%	23,784	37%
Posterior	10,802	44%	13,970	56%	6,240	63%	4,046	78%	35,058	54%
Trochanteric osteotomy	335	1%	37	<1%	9	<1%	19	<1%	400	1%
Other	1,608	7%	1,460	6%	458	5%	142	3%	3,668	6%
Minimally invasive surgery										
Yes	727	3%	2,322	9%	353	4%	114	2%	3,516	5%
No	23,338	94%	21,941	88%	9,352	94%	4,871	94%	59,502	92%
Not selected	665	3%	629	3%	197	2%	213	4%	1,704	3%
Image guided surgery										
Yes	52	<1%	182	1%	23	<1%	91	2%	348	1%
No	23,826	96%	23,993	96%	9,641	97%	4,871	94%	62,331	96%
Not selected	852	3%	717	3%	238	2%	236	5%	2,043	3%
Femoral bone graft used										
Yes	142	1%	216	1%	53	1%	37	1%	448	1%
No	24,588	99%	24,676	99%	9,849	99%	5,161	99%	64,274	99%
Acetabular bone graft used										
Yes	653	3%	973	4%	636	6%	155	3%	2,417	4%
No	24,077	97%	23,919	96%	9,266	94%	5,043	97%	62,305	96%

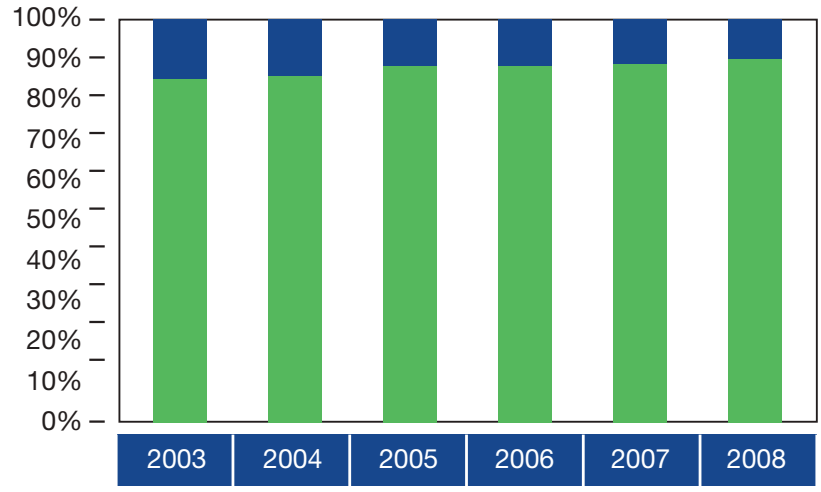


Figure 2.7

Bone cement types for primary hip replacement procedures undertaken between 2003 and 2008.

2.2.1.3 Thromboprophylaxis

The most frequently prescribed chemical method of thromboprophylaxis for hip replacement patients was low molecular weight heparin (LMWH), at 72%, and the most used mechanical method was thromboembolus deterrent (TED) stockings (62%), see Table 2.7. There has been an increase in the use of LMWH, from 64% in 2007 to 72% in 2008. Similarly, there has been an increase in the prescription of intermittent calf compression, from 26% in 2007 to 30% in 2008. The number of procedures for which both chemical and mechanical methods were prescribed rose from 63% in 2007 to 74% in 2008. The use of aspirin decreased by 2% from 2007.

Table 2.7 Thromboprophylaxis regime for primary hip replacement patients, prescribed at time of operation.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Primary resurfacing arthroplasty of joint		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**24,730**		**24,892**		**9,902**		**5,198**		**64,722**	
Aspirin	5,376	22%	4,328	17%	2,530	26%	1,371	26%	13,605	21%
Low molecular weight heparin	18,328	74%	18,485	74%	6,691	68%	3,248	62%	46,752	72%
Pentasaccharide	157	1%	140	1%	81	1%	59	1%	437	1%
Warfarin	361	1%	400	2%	144	1%	87	2%	992	2%
Other chemical	161	1%	132	1%	80	1%	94	2%	467	1%
Foot pump	7,234	29%	7,176	29%	3,141	32%	1,401	27%	18,952	29%
Intermittent calf compression	7,186	29%	7,768	31%	2,993	30%	1,724	33%	19,671	30%
TED stockings	15,054	61%	16,017	64%	5,931	60%	3,344	64%	40,346	62%
Other mechanical	117	<1%	70	<1%	34	<1%	41	1%	262	<1%
None recorded	54	<1%	36	<1%	15	<1%	12	<1%	117	<1%
Both chemical and mechanical method	18,270	74%	18,594	75%	7,191	73%	3,617	70%	47,672	74%

2.2.1.4 Untoward intra-operative events

Untoward intra-operative events were reported in a little less than 1% of procedures (Table 2.8). Of the 548 untoward events reported, 47% were 'calcar crack'. This occurred almost twice as often in cementless as cemented hips. Trochanteric fractures (22%) were more common in cemented and hybrid replacements. There were more than four times as many 'calcar cracks' in cementless as cemented replacements.

Table 2.8 Reported untoward intra-operative events for primary hip replacement patients in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Primary resurfacing arthroplasty of joint		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**24,730**		**24,892**		**9,902**		**5,198**		**64,722**	
Not selected	2,357	10%	2,341	9%	883	9%	595	11%	6,176	10%
None specified	22,212	90%	22,250	89%	8,942	90%	4,594	88%	57,998	90%
Event specified	**161**	**1%**	**301**	**1%**	**77**	**1%**	**9**	**<1%**	**548**	**1%**
Calcar crack	41	25%	182	60%	29	38%	3	33%	255	47%
Pelvic penetration	44	27%	35	12%	14	18%	3	33%	96	18%
Shaft fracture	9	6%	19	6%	5	6%	1	11%	34	6%
Shaft penetration	8	5%	5	2%	4	5%	0	0%	17	3%
Trochanteric fracture	49	30%	51	17%	22	29%	0	0%	122	22%
Other	10	6%	9	3%	3	4%	2	22%	24	4%

2.2.1.5 Hip primary components

This section outlines in more detail the trends in brand usage for hips (for a full listing of brands used in 2008, please visit the NJR website at www.njrcentre.org.uk). This section includes an analysis of usage according to National Institute for Health and Clinical Excellence (NICE) guidelines, as interpreted by ODEP [23].

2.2.1.6 Compliance with ODEP and NICE guidelines

In 2008, 124 different brands of acetabular cups, 12 different brands of resurfacing cups and 137 different brands of femoral stems were used and recorded in the NJR in primary and revision procedures. This shows that 4% fewer cup brands and 5% fewer stem brands were used in conventional hip replacements, compared with 2007. This is the first time that such a reduction has been observed since the inception of the NJR.

The NJR 2nd Annual Report, 2004[24], gave a full description of the NICE guidance on the selection of prostheses for primary THRs and metal on metal hip resurfacing arthroplasty. It also described the setting up of ODEP to provide an independent assessment of clinical evidence submitted by suppliers on the compliance of their brands of THR and hip resurfacing implants with the NICE benchmarks for safety and effectiveness.

[23] Orthopaedic Data Evaluation Panel of NHS Supply Chain. See ODEP ratings in Glossary.
[24] See pages 86 – 92 of the NJR 2nd Annual Report, available on the NJR website at **www.njrcentre.org.uk**

ODEP produced detailed criteria for this assessment. A review of this guidance by all stakeholders is ongoing in 2009.

The ODEP committee reviewed suppliers' clinical data submissions and ODEP ratings have been given to 57 brands of femoral stems (44% of those available) and 60 brands of acetabular cups (51%) used in primary procedures. However, there are 37 brands of acetabular cup (31%) and 36 brands of femoral stem (28%) currently being used in England and Wales for which no data has yet been submitted to ODEP. The latest listings for brands currently being used in England and Wales can be seen on the ODEP website at **http://www.supplychain.nhs.uk/portal/page/portal/Communities/Orthopaedics/ODEP%20database**

Analysis of the summary data for primary procedures shows that the usage of products meeting the full 10 year (10A) benchmark, as recommended by NICE, is as follows:

- cemented stems 76% (made up of 15 brands out of 60 recorded on NJR)
- cementless stems 77% (11 brands out of 68)
- cemented cups 49% (12 brands out of 56)
- cementless cups 11% (six brands out of 50)
- resurfacing cups 19% (one brand out of 12).

These percentages are only based on clinical outcomes data already submitted to the ODEP committee. Manufacturers are expected to submit additional data that will result in their revision in the future.

Comparison with the 2007 figures shows that the usage of cemented and cementless stems fully compliant with NICE guidelines has increased from 70% to 74%. However, the corresponding percentages for cementless cups are 16% for 2007 and 11% for 2008, suggesting a growing usage of products with shorter term clinical outcomes data.

2.2.1.6.1 Hip brand usage in primary procedures

The trends in usage of the most popular brands of cemented stems and cups, cementless stems and cups and hip resurfacing cups and stems, during the life of the NJR are shown in Figures 2.8 to 2.12.

Figure 2.8 shows that the market is now completely dominated by polished collarless tapered stems, with the Exeter V40 having a market share of 60%. There has been a corresponding decrease in the usage of Charnley-type low friction arthroplasty implants; this segment in total represents only approximately 10% of the overall market for cemented primary stems.

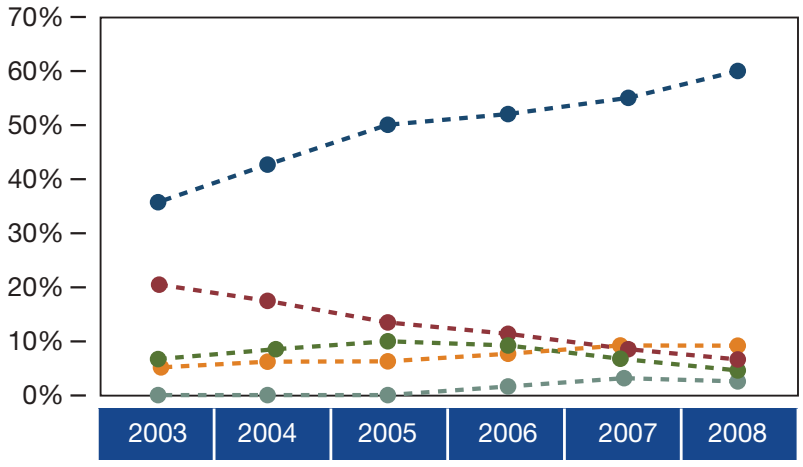


Figure 2.8

Top five cemented hip stem brands usage trends, 2003 – 2008.

The trend for cemented cups (Figure 2.9) shows that sales of different brands are in line with the popularity of the stem manufacturer. Therefore, the market share of the Contemporary cup from Stryker has grown as sales of Exeter stems have increased during the last few years.

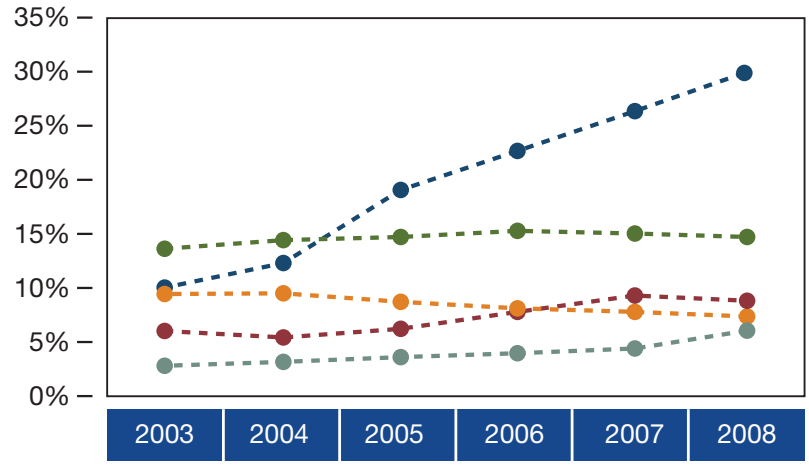


Figure 2.9

Top five cemented hip cup brands usage trends, 2003 – 2008.

There has been a marked change in the relative market shares of the two major manufacturers of cementless stems (Figure 2.10). The Corail prosthesis from DePuy has tripled its market share to 46% whereas the share of the traditional market leader, the Furlong prosthesis, has more than halved during the same period.

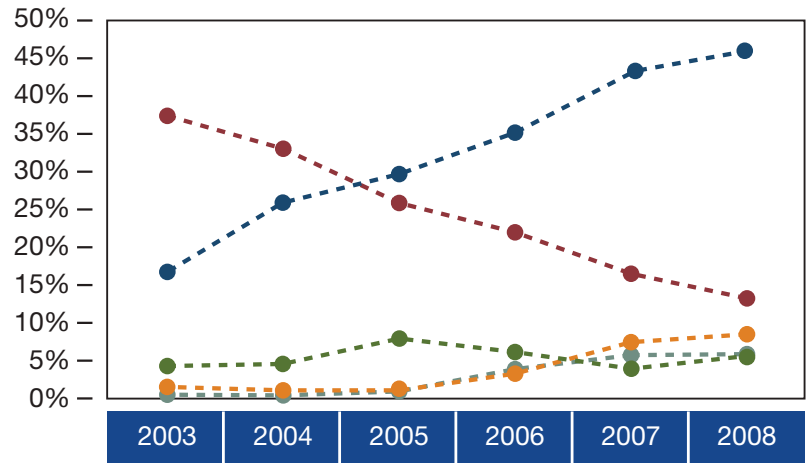


Figure 2.10

Top five cementless hip stem brands, usage trends 2003 – 2008.

The above change in cementless stem market share has been reflected in the sales of the corresponding cementless cups from the same manufacturers, which means that the Pinnacle cup from DePuy has replaced the CSF from Joint Replacement Instrumentation (JRI) as the market leader (Figure 2.11). Another product enjoying growth in this segment is the Trident cup from Stryker, partly due to its usage with the Exeter stem in hybrid procedures.

The only other change of note is the relative decline of the Trilogy cup from Zimmer, which previously was a popular choice in hybrid procedures in combination with other manufacturers' stems.

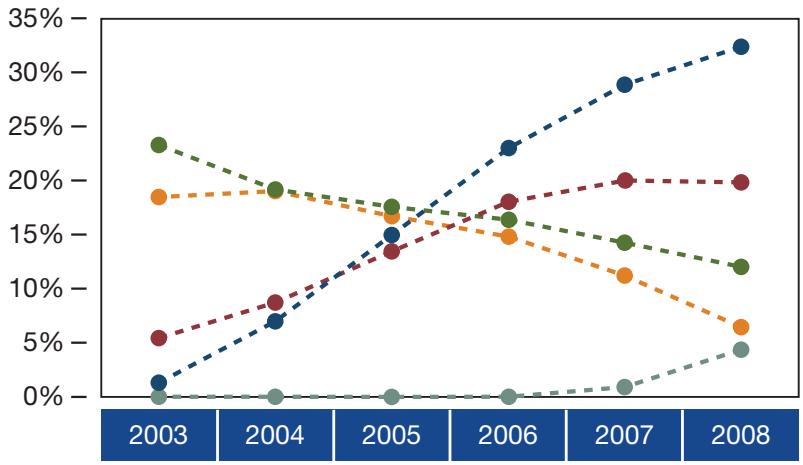


Figure 2.11

Top five cementless hip cup brands, usage trends 2003 – 2008.

Figure 2.12 shows the sales evolution of brands of hip resurfacing prostheses in the English and Welsh markets. It is evident that several new products have been launched during the last few years. Sales of these would appear to have eroded the market share of the Birmingham hip, whereas the share occupied by the Cormet 2000 has remained relatively static. It should also be noted that several of these brands have not yet submitted any data to ODEP.

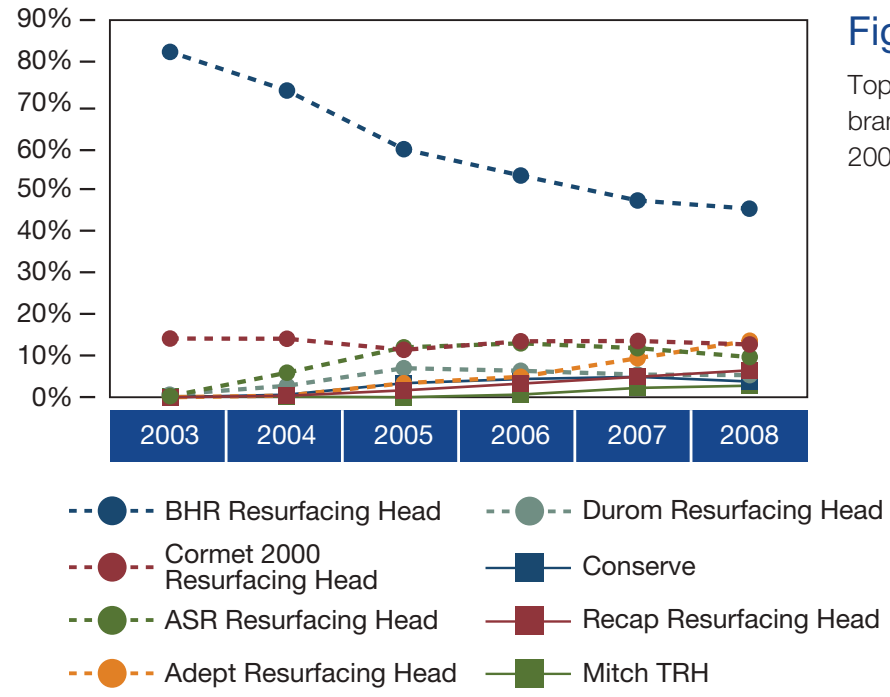


Figure 2.12

Top eight resurfacing head brands, usage trends 2003 – 2008.

2.2.1.6.2 Trends in head size usage

Figure 2.13 shows the relative usage of different femoral head sizes in each year since the inception of the NJR. One can see immediately that there has been a gradual increase in the use of larger head sizes, 36mm diameter and above. This reflects an increase in large head metal on metal articulations and is thought to be the desire of surgeons to reduce the incidence of, and revisions caused by, recurrent dislocation.

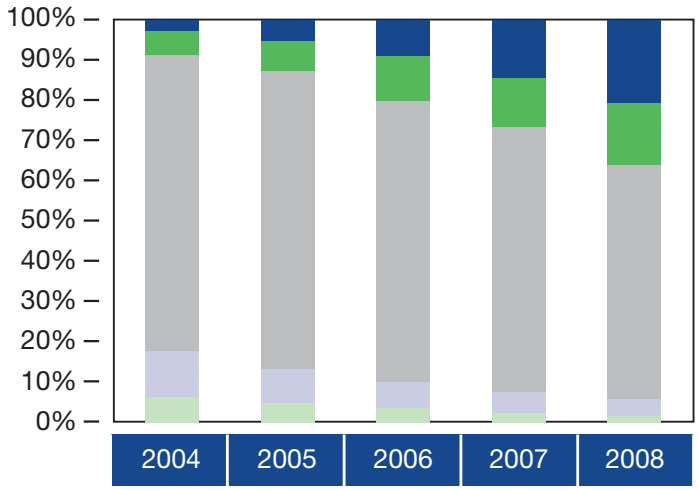


Figure 2.13

Femoral head size trends, 2003 – 2008.

In addition to this, the last two years have seen the introduction of other large head articulation combinations such as ceramic on metal and ceramic on ceramic.

As a result, the NJR Centre has begun a programme of work which will enable more detailed analysis of this sector in future years.

2.2.2 Hip revision procedures, 2008

In total 6,581 hip revision procedures were reported. Table 2.9 shows that of these, 5,634 (86%) were single stage revision procedures, 381 (6%) were stage one of a two-stage process, 493 (7%) procedures were stage two of a two-stage revision and 73 (1%) were excision arthroplasty procedures. Compared with previous years, there has been no change in the types of revision procedures carried out.

2.2.2.1 Patient characteristics

Table 2.9 summarises patient characteristics for the 6,581 hip revision procedures undertaken in 2008. Compared with 2007, the patient demographics have largely remained unchanged. However, the percentage of patients that were graded as being 'fit and healthy' prior to surgery has decreased from 26% in 2003 to 12% in 2008.

There has been an increase in 'pain' as a reason for single stage revisions, with 27% for 2008 compared with 20% in 2007 (Table 2.10). A smaller increase was seen in dislocation/subluxation and periprosthetic fracture indications.

Table 2.9 Patient characteristics for hip revision procedures in 2008, according to type of procedure.

	Hip single stage revision		Hip stage 1 of 2-stage revision		Hip stage 2 of 2-stage revision		Hip excision arthroplasty		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**5,634**	**86%**	**381**	**6%**	**493**	**7%**	**73**	**1%**	**6,581**	
Number with patient data	5,081		345		447		63		5,936	
Average age	70.88		69.41		69.14		67.71		70.26	
SD[25]	11.7		11.43		11.53		16.58		12.19	
Interquartile	63.9-79.3		62.6-77.7		62.5-77.4		59.7-80.0		63.7-79.0	
Gender	**5,081**		**345**		**447**		**63**		**5,936**	
Female	3,022	59%	171	50%	211	47%	40	63%	3,444	58%
Male	2,059	41%	174	50%	236	53%	23	37%	2,492	42%
Patient physical status										
P1 – Fit and healthy	684	12%	39	10%	51	10%	7	10%	781	12%
P2 – Mild disease, not incapacitating	3,565	63%	235	62%	306	62%	35	48%	4,141	63%
P3 – Incapacitating systemic disease	1,314	23%	98	26%	125	25%	28	38%	1,565	24%
P4 – Life threatening disease	69	1%	9	2%	11	2%	3	4%	92	1%
P5 – Not expected to survive 24 hours	2	<1%	0	0%	0	0%	0	0%	2	<1%
Body mass index										
Average	28.1		28.6		28.9		27.0		28.2	
SD[25]	5.1		5.4		6.8		4.8		5.2	
Indications for surgery										
Aseptic loosening	3,355	60%	76	20%	106	22%	18	25%	3,555	54%
Lysis	993	18%	54	14%	46	9%	16	22%	1,109	17%
Pain	1,534	27%	73	19%	64	13%	13	18%	1,684	26%
Dislocation/subluxation	977	17%	24	6%	25	5%	19	26%	1,045	16%
Periprosthetic fracture	537	10%	17	4%	24	5%	8	11%	586	9%
Infection	146	3%	306	80%	322	65%	30	41%	804	12%
Malalignment	392	7%	12	3%	6	<1%	3	4%	413	6%
Fractured acetabulum	99	2%	4	1%	5	<1%	1	<1%	109	2%
Fractured stem	85	2%	4	1%	0	0%	7	10%	96	1%
Fractured femoral head	24	<1%	1	<1%	0	0%	1	<1%	26	<1%
Incorrect sizing/head socket mismatch	16	<1%	1	<1%	0	0%	0	0%	17	<1%
Wear of acetabular component	780	14%	12	3%	16	3%	3	4%	811	12%
Dissociation of liner	92	2%	3	1%	3	1%	1	<1%	99	2%
Other	130	2%	4	1%	9	2%	3	4%	146	2%
Side										
Bilateral	0	0%	0	0%	0	0%	0	0%	0	0%
Left, unilateral	2,674	47%	159	42%	246	50%	34	47%	3,113	47%
Right, unilateral	2,960	53%	222	58%	247	50%	39	53%	3,468	53%

[25] Standard deviation of average

Table 2.10 Indication for surgery for hip revision procedures, 2006 – 2008.

	2006		2007		2008	
	No.	%	No.	%	No.	%
Indications for single stage revisions	**5,394**		**5,896**		**5,634**	
Aseptic loosening	3,416	63%	3,580	61%	3,355	60%
Lysis	1,146	21%	1,077	18%	993	18%
Pain	1,068	20%	1,187	20%	1,534	27%
Infection	105	2%	95	2%	146	3%
Indications for stage 1 of 2-stage revision	**372**		**387**		**381**	
Aseptic loosening	80	22%	71	18%	76	20%
Lysis	57	15%	45	12%	54	14%
Pain	62	17%	56	14%	73	19%
Infection	298	80%	297	77%	306	80%

2.2.2.2 Components removed and components used

Both the acetabular and femoral components were removed in half of all revision procedures (Table 2.11). However, comparing the different types of revision procedures indicates that both components were more likely to be removed during a two-stage revision process or with a hip excision arthroplasty type procedure than during a single stage revision. This is expected since the majority of two-stage revisions are carried out for reasons of infection, where all components are routinely removed. The components used during revision procedures are shown in Table 2.12.

Table 2.11 Components removed during hip revision procedures in 2008.

	Hip single stage revision		Hip stage 1 of 2-stage revision		Hip excision arthroplasty		Total	
	No.	%	No.	%	No.	%	No.	%
Total	**5,634**		**381**		**73**		**6,088**	
Both components	2,637	47%	303	80%	45	62%	2,985	49%
Acetabular component only	1,504	27%	24	6%	5	7%	1,533	25%
Femoral stem only	965	17%	27	7%	7	10%	999	16%
None	528	9%	27	7%	16	22%	571	9%

Table 2.12 Components used during single stage hip revision procedures in 2008.

	Hip single stage revision	
	No.	%
Total	**5,634**	
Femoral prosthesis		
Cemented	2,581	46%
Cementless	1,058	19%
Not revised	1,995	35%
Acetabular prosthesis		
Cemented	1,265	22%
Cementless	3,234	57%
Not revised	1,135	20%

part 2

2.3 knee replacement procedures, 2008

The total number of knee replacement procedures entered into the NJR during 2008 was 75,629, an increase of 4.3% compared with 2007. Table 2.13 summarises the patient characteristics and procedure details of knee replacements according to type of provider.

As a percentage of their activity, independent hospitals performed more unicondylar knee replacement procedures (Figure 2.14) than any other type of provider. As was observed for hip replacement procedures, knee revisions represent a higher percentage of total knee procedures performed at NHS hospitals (7%) than at any other type of provider (5% overall). The revision procedures undertaken at NHS hospitals comprised 81% of all revision procedures performed.

Table 2.13 Patient characteristics and procedure details according to type of provider for knee procedures in 2008.

	NHS hospitals		Independent hospital		NHS treatment centre		Independent sector treatment centre		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**48,452**		**18,391**		**3,875**		**4,911**		**75,629**	
Patient physical status										
P1 – Fit and healthy	5,281	11%	4,069	22%	523	13%	252	5%	10,125	13%
P2 – Mild disease, not incapacitating	34,850	72%	12,980	71%	2,907	75%	4,255	87%	54,992	73%
P3 – Incapacitating systemic disease	8,100	17%	1,307	7%	442	11%	403	8%	10,252	14%
P4 – Life threatening disease	219	<1%	31	<1%	3	<1%	1	<1%	254	<1%
P5 – Not expected to survive 24 hours	2	<1%	4	<1%	0	0%	0	0%	6	<1%
Procedure type										
Primary procedure	**45,135**	**93%**	**17,846**	**97%**	**3,752**	**97%**	**4,794**	**98%**	**71,527**	**95%**
Patello-femoral replacement	676	1%	280	2%	42	1%	32	1%	1,030	1%
Hybrid total knee	377	1%	424	2%	10	<1%	6	<1%	817	1%
Total knee replacement not using cement	2,641	5%	1,459	8%	588	15%	62	1%	4,750	6%
Total knee replacement using cement	38,353	79%	13,695	74%	2,906	75%	4,403	90%	59,357	78%
Unicondylar knee replacement	3,088	6%	1,988	11%	206	5%	291	6%	5,573	7%
Revision procedure	**3,317**	**7%**	**545**	**3%**	**123**	**3%**	**117**	**2%**	**4,102**	**5%**
Knee amputation	3	<1%	0	0%	0	0%	0	0%	3	<1%
Knee conversion to arthrodesis	14	<1%	0	0%	0	0%	2	<1%	16	<1%
Knee re-operation other than revision	94	<1%	5	<1%	10	<1%	6	<1%	115	<1%
Knee single stage revision	2,329	5%	449	2%	86	2%	94	2%	2,958	4%
Knee stage 1 of 2-stage revision	393	1%	39	<1%	10	<1%	5	<1%	447	1%
Knee stage 2 of 2-stage revision	484	1%	52	<1%	17	<1%	10	<1%	563	1%
Bilateral or unilateral										
Bilateral	434	1%	516	3%	18	<1%	66	1%	1,034	1%
Unilateral	48,018	99%	17,875	97%	3,857	99%	4,845	99%	74,595	99%
Funding										
Independent	397	1%	9,087	49%	4	<1%	334	7%	9,822	13%
NHS	46,097	95%	8,691	47%	3,738	96%	4,570	93%	63,096	83%
Not selected	1,958	4%	613	3%	133	3%	7	<1%	2,711	4%

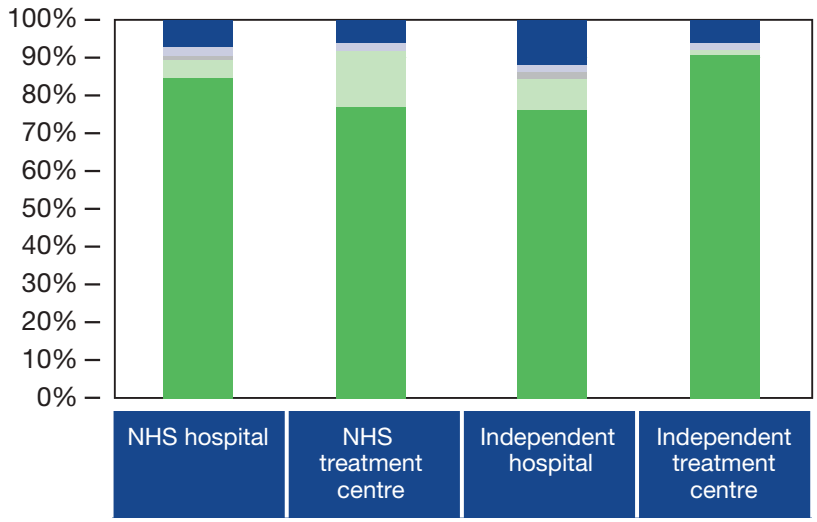


Figure 2.14

Primary knee procedures by provider type.

2.3.1 Primary knee replacement procedures, 2008

Of the 71,527 primary knee replacements undertaken in 2008, 64,924 (91%) were total condylar procedures, 5,573 (8%) were unicondylar knee replacements and 1,030 (1%) were patello-femoral replacements (Table 2.14). Compared with previous years, these proportions have largely remained the same (Figure 2.15).

Table 2.14 Patient characteristics for primary knee replacement procedures in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Unicondylar knee replacement		Patello-femoral replacement		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**59,357**	**83%**	**4,750**	**7%**	**817**	**1%**	**5,573**	**8%**	**1,030**	**1%**	**71,527**	
Number with patient data	54,703		4,421		776		5,125		954		65,979	
Mean age	70.36		68.76		70.12		64.27		60.82		69.7	
SD[26]	9.22		9.38		9.63		9.61		11.92		9.5	
Interquartile	63.9 - 77.2		62.4 - 75.7		63.1 - 77.7		57.9 - 70.9		52.1 - 70.0		63.1 - 76.8	
Gender												
Female	31,720	58%	2,397	54%	463	60%	2,356	46%	732	77%	37,668	57%
Male	22,983	42%	2,024	46%	313	40%	2,769	54%	222	23%	28,311	43%
Patient physical status												
P1 – Fit and healthy	7,241	12%	754	16%	122	15%	1,315	24%	256	25%	9,688	14%
P2 – Mild disease, not incapacitating	43,644	74%	3,405	72%	611	75%	3,876	70%	697	68%	52,233	73%
P3 – Incapacitating systemic disease	8,262	14%	578	12%	80	10%	378	7%	76	7%	9,374	13%
P4 – Life threatening disease	204	<1%	13	<1%	4	<1%	4	<1%	1	<1%	226	<1%
P5 – Not expected to survive 24 hours	6	<1%	0	0%	0	0%	0	0%	0	0%	6	<1%
Body mass index												
Average	30.3		30.5		30.5		30		29.7		30.3	
SD[26]	5.3		5.3		5.8		5.0		5.5		5.3	
Indications for surgery												
Osteoarthritis	57,746	97%	4,601	97%	792	97%	5,507	99%	990	96%	69,636	97%
Avascular necrosis	188	<1%	12	<1%	3	<1%	37	1%	2	<1%	242	<1%
Other inflammatory arthopathy	344	1%	20	<1%	3	<1%	5.0	<1%	3	<1%	375	1%
Infection	8	<1%	1	<1%	0	0%	0	0%	0	0%	9	<1%
Rheumatoid arthritis	1,030	2%	100	2%	9	1%	17	<1%	3	<1%	1,159	2%
Trauma	282	<1%	21	<1%	10	1%	10	<1%	11	1%	334	<1%
Other	537	1%	55	1%	9	1%	26	<1%	39	4%	666	1%
Side												
Bilateral	624	1%	68	1%	26	3%	241	4%	66	6%	1,025	1%
Left, unilateral	27,954	47%	2,299	48%	359	44%	2,715	49%	431	42%	33,758	47%
Right, unilateral	30,779	52%	2,383	50%	432	53%	2,617	47%	533	52%	36,744	51%

[26] Standard deviation of average

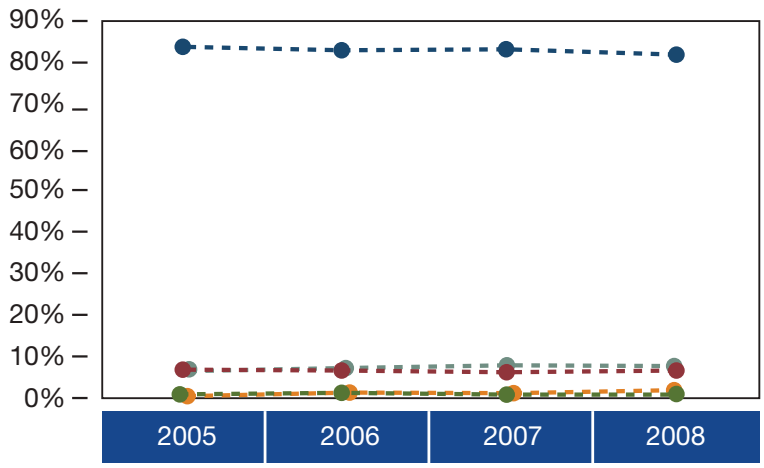


Figure 2.15

Type of primary knee replacement procedure undertaken between 2005 and 2008.

- TKR using cement
- TKR not using cement
- TKR hybrid
- Patello-femoral replacement
- Unicondylar

2.3.1.1 Patient characteristics

The average age was 69.7 years and 57% of the patients were female. Patients undergoing a patello-femoral replacement were the youngest, at an average age of 60.8 years, and 77% of these were female (Table 2.14). On average, female patients were three quarters of a year older than male patients at the time of their primary knee replacement (70.0 years and 69.2 years respectively), see Table 2.15 and Figure 2.16.

According to the ASA grade system, 14% of patients undergoing a primary knee replacement procedure were graded as 'fit and healthy' (Table 2.14). Figure 2.17 shows the trend in ASA grade over the past six years. As has been noted previously for hips, since 2003 there has been a 50% reduction in the number of patients assessed as being fit and healthy at the time of operation. In the case of total knee replacement, this is despite a six month reduction in the average age of patients undergoing surgery. Figure 2.18 shows the increase in BMI[27] over the past five years for patients having knee primary procedures. This is equivalent to a weight increase of 1.85kg (four pounds) for a person of average height. The average knee replacement patient, by BMI measurement, is then clinically obese. This figure has increased from 29.7 to 30.3.

[27] BMI: 20-25 normal, 25-30 overweight, 30-40 obese, >40 morbidly obese.

Table 2.15 Age and gender for primary knee replacements in 2008.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Unicondylar knee replacement		Patello-femoral replacement		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age by gender												
Female	**31,720**		**2,397**		**463**		**2,356**		**732**		**37,668**	
Mean	70.66		69.03		70.82		64.07		60.4		69.96	
SD[28]	9.4		9.63		9.6		9.98		11.7		9.72	
Interquartile	64.1 - 77.7		62.3 - 76.1		63.4 - 78.4		57.2 - 71.4		52.1 - 68.9		63.1 - 77.3	
Male	**22,983**		**2,024**		**313**		**2,769**		**222**		**28,311**	
Mean	69.95		68.44		69.06		64.44		62.14		69.24	
SD[28]	8.96		9.06		9.6		9.27		12.54		9.2	
Interquartile	63.8 - 76.5		62.5 - 75.1		62.6 - 76.4		58.5 - 70.5		52.2 - 71.0		63.0 - 76.0	
Age group by gender												
Female												
< 45 years	186	1%	24	1%	2	<1%	57	2%	61	8%	330	1%
45 - 54 years	1,513	5%	174	7%	29	6%	377	16%	179	24%	2,272	6%
55 - 64 years	7,212	23%	614	26%	106	23%	887	38%	244	33%	9,063	24%
65 - 74 years	11,565	36%	876	37%	152	33%	660	28%	153	21%	13,406	36%
75 - 84 years	9,752	31%	624	26%	151	33%	344	15%	90	12%	10,961	29%
> 85 years	1,492	5%	85	4%	23	5%	31	1%	5	1%	1,636	4%
Male												
< 45 years	162	1%	15	1%	2	1%	52	2%	22	10%	253	1%
45 - 54 years	1,007	4%	137	7%	22	7%	345	12%	42	19%	1,553	5%
55 - 64 years	5,597	24%	577	29%	89	28%	1,096	40%	64	29%	7,423	26%
65 - 74 years	9,217	40%	786	39%	104	33%	908	33%	54	24%	11,069	39%
75 - 84 years	6,260	27%	468	23%	87	28%	343	12%	35	16%	7,193	25%
> 85 years	740	3%	41	2%	9	3%	25	1%	5	2%	820	3%

[28] Standard deviation of average

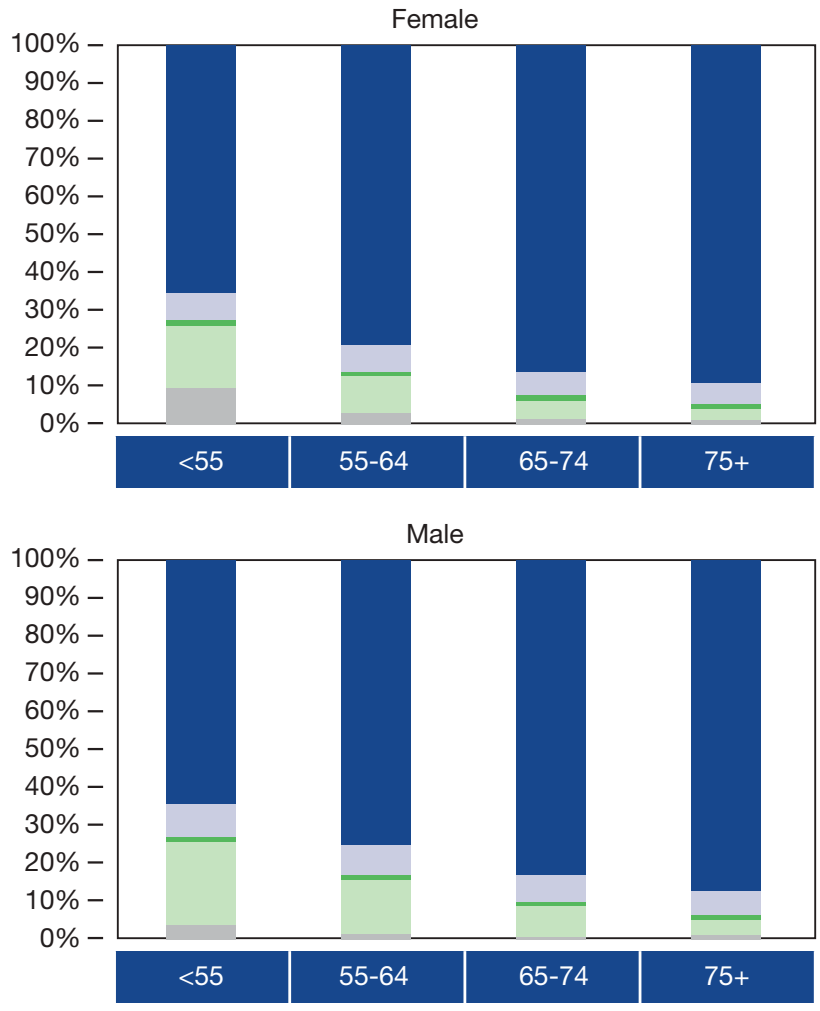


Figure 2.16

Age and gender for primary knee replacement patients in 2008.

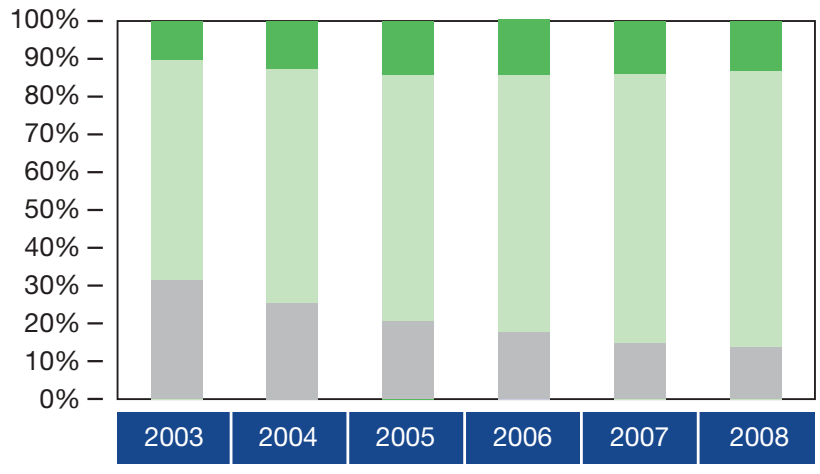


Figure 2.17

ASA grades for primary knee replacement patients, undertaken between 2003 and 2008.

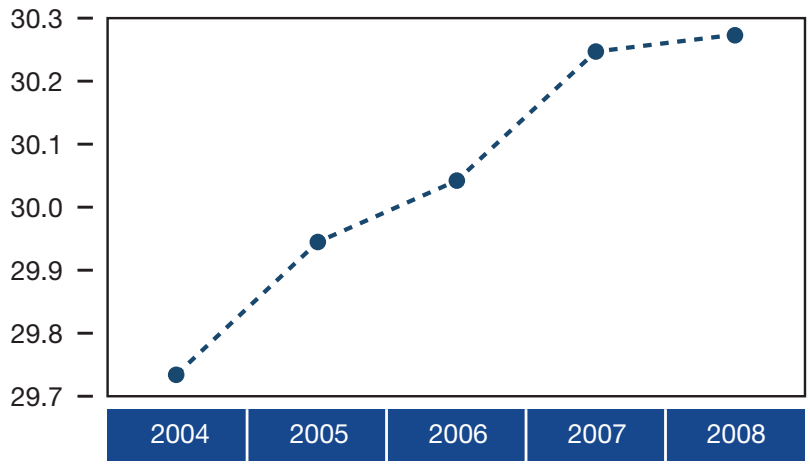


Figure 2.18

Body mass index[29] for primary knee replacement patients, undertaken between 2004 and 2008.

The single largest indication recorded for surgery was osteoarthritis, recorded in 97% of all primary procedures (Table 2.14).

2.3.1.2 Surgical techniques

The most common surgical approach was the medial parapatellar, used in more than 92% of procedures (Table 2.16). Minimally invasive surgery (MIS) was used in 50% of unicondylar knee replacement procedures, but was used in only 3% of all other types of knee replacement interventions.

Compared with previous years, the surgical techniques used in primary knee replacements have largely remained unchanged. However, there has been an increase in the use of MIS in unicondylar knee replacements, from 37% in 2004 to 50% in 2008. The use of bone cement in such procedures is summarised in Figure 2.19.

[29] BMI: 20-25 normal, 25-30 overweight, 30-40 obese, >40 morbidly obese.

Table 2.16 Characteristics of surgical practice for primary knee replacement procedures in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Unicondylar knee replacement		Patello-femoral replacement		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**59,357**		**4,750**		**817**		**5,573**		**1,030**		**71,527**	
Surgical approach												
Lateral parapatellar	505	1%	65	1%	5	1%	159	3%	18	2%	752	1%
Medial parapatellar	54,998	93%	4,474	94%	782	96%	4,905	88%	937	91%	66,096	92%
Mid-vastus	1,508	3%	43	1%	19	2%	187	3%	35	3%	1,792	3%
Sub-vastus	829	1%	42	1%	4	<1%	81	1%	19	2%	975	1%
Other	1,517	3%	126	3%	7	1%	241	4%	21	2%	1,912	3%
Minimally invasive surgery used												
Yes	1,830	3%	194	4%	8	1%	2,769	50%	108	10%	4,909	7%
No	55,789	94%	4,346	91%	779	95%	2,602	47%	864	84%	64,380	90%
Not selected	1,738	3%	210	4%	30	4%	202	4%	58	6%	2,238	3%
Image guided surgery used												
Yes	1,332	2%	294	6%	16	2%	127	2%	9	1%	1,778	2%
No	56,412	95%	4,282	90%	771	94%	5,235	94%	963	93%	67,663	95%
Not selected	1,613	3%	174	4%	30	4%	211	4%	58	6%	2,086	3%
Femoral bone graft used												
Yes	456	1%	44	1%	3	<1%	14	<1%	5	<1%	522	1%
No	58,901	99%	4,706	99%	814	100%	5,559	100%	1,025	100%	71,005	99%
Tibial bone graft used												
Yes	358	1%	37	1%	6	1%	12	<1%	4	<1%	417	1%
No	58,999	99%	4,713	99%	811	99%	5,561	100%	1,026	100%	71,110	99%

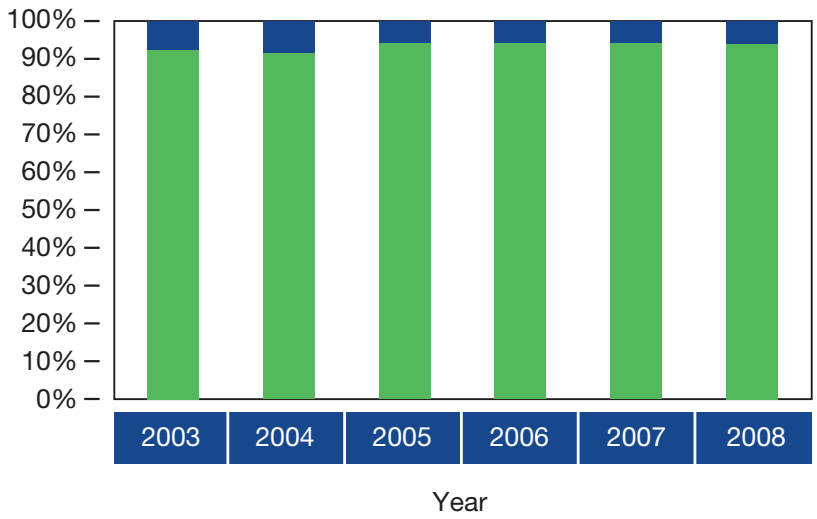


Figure 2.19

Bone cement types for primary knee replacement procedures undertaken between 2003 and 2008.

2.3.1.3 Thromboprophylaxis

The most frequently prescribed chemical method of thromboprophylaxis for knee replacement patients was LMWH, while TED stockings were the most used mechanical method (Table 2.17). Compared with previous years, there has been an increase in the prescription of a combined chemical and mechanical regime, from 49% in 2004 to 75% in 2008. The increase can be attributed to similar changes in the prescription of all other mechanical methods. The prescription of foot pumps increased from 28% in 2007 to 30% in 2008 and intermittent calf compression increased from 26% in 2007 to 30% in 2008.

Table 2.17 Thromboprophylaxis characteristics for primary knee replacement patients.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Unicondylar knee replacement		Patello-femoral replacement		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**59,357**		**4,750**		**817**		**5,573**		**1,030**		**71,527**	
Aspirin	12,882	22%	1,072	23%	160	20%	1,538	28%	294	29%	15,946	22%
Low molecular weight heparin	41,540	70%	3,314	70%	542	66%	3,383	61%	592	57%	49,371	69%
Pentasaccharide	313	1%	46	1%	2	<1%	32	1%	3	<1%	396	1%
Warfarin	737	1%	181	4%	13	2%	46	1%	8	1%	985	1%
Other chemical	966	2%	90	2%	3	<1%	94	2%	17	2%	1,170	2%
Foot pump	16,983	29%	1,910	40%	466	57%	1,563	28%	348	34%	21,270	30%
Intermittent calf compression	17,857	30%	1,535	32%	145	18%	1,733	31%	284	28%	21,554	30%
TED stockings	39,189	66%	3,307	70%	564	69%	3,664	66%	652	63%	47,376	66%
Other mechanical	911	2%	28	1%	12	1%	36	1%	20	2%	1,007	1%
None recorded	483	1%	52	1%	3	<1%	28	1%	17	2%	583	1%
Both chemical and mechanical method	44,409	75%	3,831	81%	627	77%	4,072	73%	737	72%	53,676	75%

2.3.1.4 Untoward intra-operative events

Table 2.18 shows that untoward intra-operative events were rare, reported in 0.3% of knee procedures. Completion of the data field requesting these events was not mandatory and this was the default option. Of the 199 untoward events reported, more than 58% were fractures, which is a 14% increase on 2007.

Patella tendon avulsions and ligament injuries were up by 5% and 11% compared with 2007. There has been a decrease of 26% in 'other' untoward intra-operative events compared with 2007.

Table 2.18 Reported untoward intra-operative events for primary knee replacement patients in 2008, according to type of procedure.

	Primary total prosthetic replacement using cement		Primary total prosthetic replacement not using cement		Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)		Unicondylar knee replacement		Patello-femoral replacement		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**59,357**		**4,750**		**817**		**5,573**		**1,030**		**71,527**	
Not selected	5,849	10%	855	18%	61	7%	471	8%	87	8%	7,323	10%
None specified	53,337	90%	3,887	82%	752	92%	5,088	91%	941	91%	64,005	89%
Total specified	**171**		**8**		**4**		**14**		**2**		**199**	
Fracture	98	57%	4	50%	2	50%	10	71%	2	100%	116	58%
Patella tendon avulsion	24	14%	1	13%	1	25%	1	7%	0	0%	27	14%
Ligament injury	39	23%	3	38%	1	25%	2	14%	0	0%	45	23%
Other	10	6%	0	0%	0	0%	1	7%	0	0%	11	6%

2.3.1.5 Knee primary components

Figure 2.20 shows the leading brands of condylar knees in England and Wales. The PFC Sigma knee marketed by DePuy continues to dominate the market, although the Nexgen knee from Zimmer and the Genesis 2 from Smith and Nephew have increased their market shares during the last couple of years.

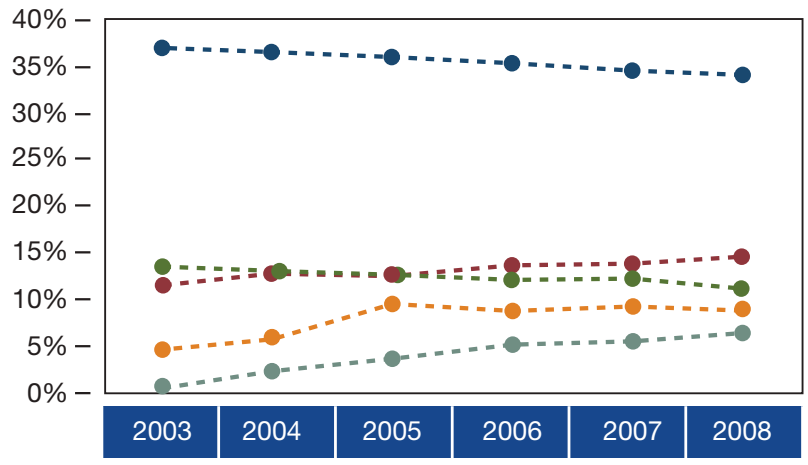


Figure 2.20
Top five total condylar knee brands, usage trends 2003 – 2008.

Likewise, the market for unicondylar knees is dominated by one product, the Oxford partial knee (Figure 2.21), although both the MG Unicondylar and ACM Uniglide implants have grown their share during the period, in a relatively flat market.

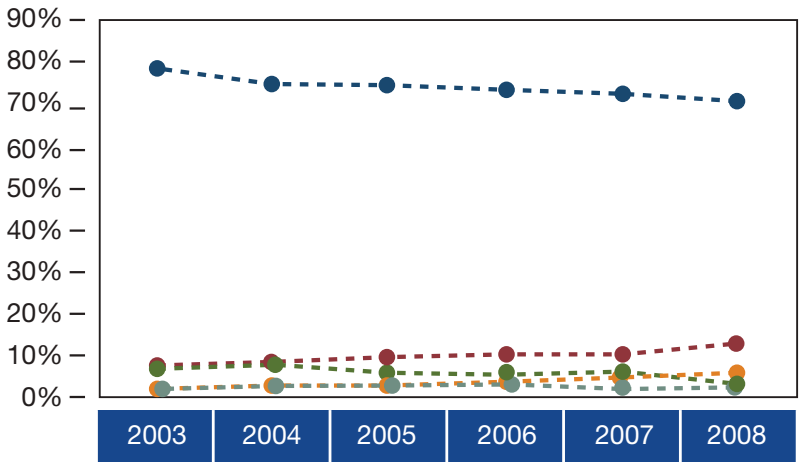


Figure 2.21

Top five unicondylar knee brands, usage trends 2003 – 2008.

- Oxford partial knee
- MG Uni
- Preservation
- ACM/Uniglide
- Sled

The brand sales for patello-femoral prostheses are shown in Figure 2.22 and the equivalent graph for highly constrained and hinged revision knees is shown in Figure 2.23.

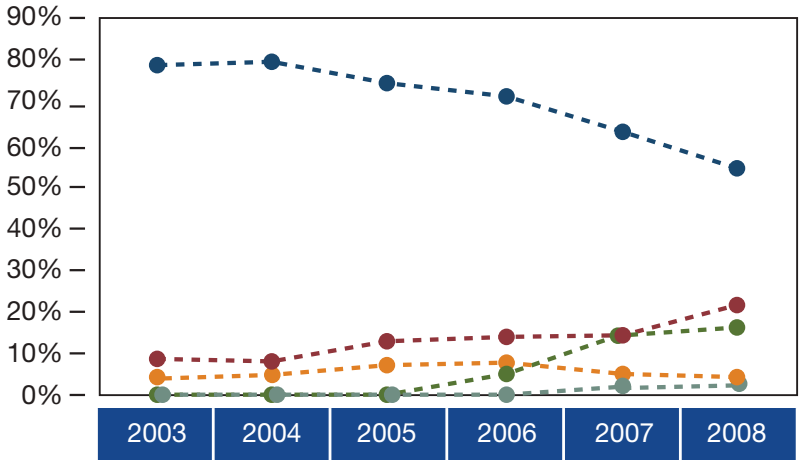


Figure 2.22

Top five patello-femoral knee brands, usage trends 2003 – 2008.

- Avon
- FPV
- Competitor
- LCS patello-femoral
- Journey PF

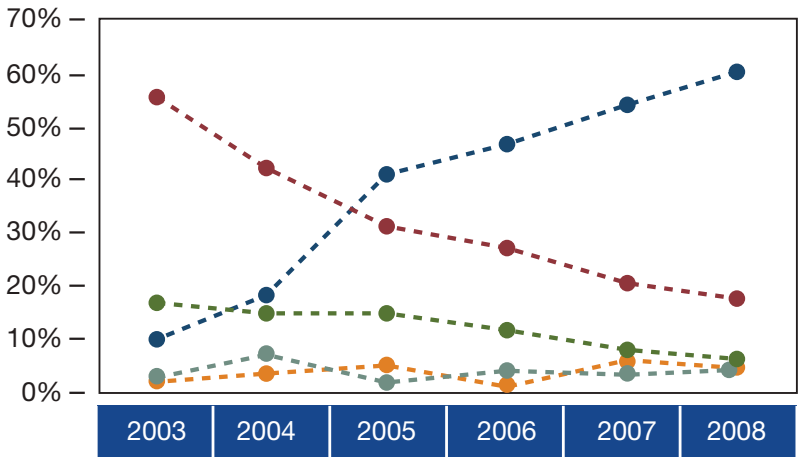


Figure 2.23

Top five fixed hinged knee brands, usage trends 2003 – 2008.

2.3.2 Knee revision procedures, 2008

In total 3,987 knee revision procedures were reported. Of these, 2,958 (74%) were single stage revision operations, 447 (11%) were stage one of a two-stage process and 563 (14%) were stage two of a two-stage revision (Table 2.19). A further 19 procedures were recorded, comprising 16 conversions of previous knee replacements to arthrodesis and three knee amputations. Compared with previous years, there has been no change in the types of revision procedures carried out.

Table 2.19 Patient characteristics for knee revision procedures in 2008, according to type of procedure.

	Knee single stage revision		Knee stage 1 of 2-stage revision		Knee stage 2 of 2-stage revision		Knee conversion to arthrodesis		Knee amputation		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	**2,958**	**74%**	**447**	**11%**	**563**	**14%**	**16**	**<1%**	**3**	**<1%**	**3,987**	
Number with patient data	2,716		400		508		15		3		3,642	
Average age	69.7		69.7		69.8		72.6		63.8		69.7	
SD[30]	10.06		9.71		9.45		12.32		4.9		9.9	
Interquartile	62.8 - 77.0		63.9 - 76.4		63.7 - 76.9		65.0 - 81.3		61.0 - 65.6		63.1 - 76.9	
Gender												
Female	1,471	54%	171	43%	203	40%	8	53%	1	33%	1,854	51%
Male	1,245	46%	229	57%	305	60%	7	47%	2	67%	1,788	49%
Patient physical status												
P1 – Fit and healthy	341	12%	36	8%	50	9%	0	0%	0	0%	427	11%
P2 – Mild disease, not incapacitating	2,020	68%	290	65%	354	63%	7	44%	2	67%	2,673	67%
P3 – Incapacitating systemic disease	584	20%	111	25%	154	27%	9	56%	1	33%	859	22%
P4 – Life threatening disease	13	<1%	10	2%	5	1%	0	0%	0	0%	28	1%
P5 – Not expected to survive 24 hours	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Indications for surgery												
Aseptic loosening	1,322	45%	68	15%	64	11%	2	13%	0	0%	1,456	37%
Pain	631	21%	35	8%	33	6%	1	6%	0	0%	700	18%
Lysis	353	12%	58	13%	50	9%	1	6%	1	33%	463	12%
Wear of polyethylene component	517	17%	16	4%	4	1%	1	6%	0	0%	538	13%
Instability	545	18%	20	4%	25	4%	2	13%	0	0%	592	15%
Infection	137	5%	369	83%	438	78%	8	50%	2	67%	954	24%
Malalignment	250	8%	8	2%	7	1%	0	0%	0	0%	265	7%
Dislocation/subluxation	163	6%	12	3%	5	1%	1	6%	0	0%	181	5%
Periprosthetic fracture	91	3%	3	1%	4	1%	3	19%	0	0%	101	3%
Stiffness	195	7%	7	2%	14	2%	0	0%	0	0%	216	5%
Implant fracture	38	1%	2	<1%	0	0%	0	0%	0	0%	40	1%
Component dissociation	69	2%	4	1%	1	<1%	0	0%	0	0%	74	2%
Other	348	12%	17	4%	27	5%	2	13%	2	67%	396	10%
Side												
Bilateral	6	<1%	3	1%	0	0%	0	0%	0	0%	9	<1%
Left, unilateral	1,442	49%	196	44%	265	47%	9	56%	2	67%	1,914	48%
Right, unilateral	1,510	51%	248	55%	298	53%	7	44%	1	33%	2,064	52%

[30] Standard deviation of average

2.3.2.1 Patient characteristics

The mean age of knee revision patients was 69.7 years (Table 2.19). There were more female (51%) than male patients (49%). This compares with 56% female and 44% male in 2004. Aseptic loosening was the most common indication for single stage revision and infection was the most common indication for two stage revision.

Compared with previous years, the patient characteristics described above have largely remained the same. However, there was an increase in patients with mild or incapacitating disease (ASA grade 2). For example, procedures involving patients with mild disease increased from 61% in 2004 to 67% in 2008.

part 3 implant survivorship 2003 to 2008

3.1 introduction

Part 3 of the National Joint Registry (NJR) Annual Report describes the revision rates of hip and knee replacements that were entered into the NJR from 1st April 2003 until 30th November 2008.

The analysis of the outcomes is based on linkage between the procedures entered into the NJR and records from the Hospital Episode Statistics (HES) database. HES is an administrative database of all NHS and privately funded admissions in NHS hospitals in England and admissions of NHS funded patients in the independent sector. Data from the Patient Episode Database for Wales (PEDW), the corresponding Welsh administrative database, was not available at the time of analysis. Therefore, it was not possible to link the NJR procedures with PEDW. The analysis of outcomes only includes patients treated in England.

This is the third time that linkage between the NJR and HES has been undertaken. Not all procedures entered in the NJR could be linked. As a result, care should be taken in generalising the results of the analyses, particularly when comparing provider types.

The NJR provides information about the type and brand of prosthesis and the surgical procedure. This Annual Report presents, for the first time, rates of revision procedures identified through linkage within the NJR as well as within HES. In previous Annual Reports the HES database was used to identify revisions. By using the NJR as well, the identification of revisions has improved and the level of revision rates reported has increased compared to previous years.

Revision rates are presented as a function of time after surgery according to prosthesis type, including hip resurfacing and unicondylar knee replacement. The increased number of procedures entered into the NJR means that revision rates can now be presented with greater precision. Furthermore, revision rates are presented for a number of frequently used prosthesis brands and bearing surfaces.

A number of the comparisons described above were carried out using multivariable analyses to take into account that patients receiving a particular type of prosthesis might differ from patients receiving other types. However, the adjustment for case mix differences will always be incomplete and will never fully eliminate the impact of confounding factors. Consequently, observed differences in revision rates - even with case mix adjustment based on multivariable analyses - will always be influenced by residual confounding.

3.1.1 Changes compared to the 5th Annual Report

The NJR is continuously updating and improving its methods for data management and analysis. As a consequence, two changes were implemented during the year, which have a considerable impact on the results presented in this report, as set out below.

- A number of prostheses were reclassified or rebranded following scrutiny of the component database. For example, according to last year's report, all but one of the 1,691 Omnifit stems entered in the NJR since April 2003 were classified as cementless. The current report, however, describes 1,973 Omnifit stems, of which only 935 are cementless. Another example is the change in numbers of metal on metal hip prostheses (excluding hip resurfacing procedures). According to last year's report, 4,013 metal on metal prostheses had been reported but this year's report includes only 1,304 since the start of the NJR. Both of the above were caused by reclassification errors by their relevant supplier and have subsequently been corrected by a validation exercise.
- The method used to identify revisions was improved. The HES codes that represent revision procedures of hip or knee replacements were revisited and extended. Longitudinal linkage has been used to identify revisions both within the HES and NJR (see section 3.2). As a result, the revision rates reported in the current Annual Report have increased compared to previous years. The changes are more prominent for knee than hip replacements. Particularly large changes were observed for revision rates following unicondylar knee replacement.

3.1.2 Specialist studies

A number of detailed analyses are being carried out to address five particular topics, outlined below. The results will be reported in separate papers following publication of this report.

- **Data quality.** Initially, two approaches are being pursued. First, a 'capture-recapture analysis' to estimate the completeness of follow up. This type of analysis allows us to estimate how many revisions may have been missed in the HES and NJR databases. Initial results from this analysis indicate that the revision rates continue to be underestimated by at least 15%. Secondly, the patients' physical status (ASA scores)[31] as reported to the NJR will be compared with HES information on co-morbid conditions, based on admissions in the year preceding the hip or knee replacement. Work in progress includes comparison of the NJR primary dataset with medical records and an analysis of revision procedures as recorded by the NJR, HES and theatre operating logbook.
- **Re-revisions.** Investigating the number of patients who have another revision following a first revision of their hip or knee replacement, this study will describe the operative procedures and prosthesis types used for the re-revisions as well as the re-revision rate and mortality.
- **Hydroxyapatite (HA) coating.** An analysis of the impact of HA coating on revision rates following primary hip replacement using cementless prostheses, according to patient characteristics and operative procedures.
- **Thromboprophylaxis.** A study of the method of thromboprophylaxis and its impact on thromboembolic events, haemorrhage, mortality and length of stay.
- **Fractured neck of femur.** The outcomes of total hip replacement in patients with a fractured neck of femur (revision rate, mortality and length of stay) will be assessed according to patient characteristics, operative procedures and prosthesis type used.

[31] American Society of Anaesthesiology system for grading the overall physical condition of the patient, as follows: P1 – Fit and healthy; P2 – Mild disease, not incapacitating; P3 – Incapacitating systemic disease; P4 – Life threatening disease; P5 – Not expected to survive 24 hours.

part 3

3.2 linkage of NJR procedures to the HES database

3.2.1 Linkage to HES records

In this section, the linkage of NJR procedures to HES records is presented. As explained earlier, figures from the Welsh database, PEDW, were not available at the time of analysis, therefore linkage could only be carried out for patients treated in England.

Linkage of hip and knee replacements to HES is possible if they are reported to the NJR and if the reported records contain patient details that allow linkage. Information about the compliance (proportion of all joint procedures undertaken in England and Wales reported to the NJR) and linkability (proportion of all reported procedures that contain either NHS number or patient surname, date of birth and postcode) of NJR records is presented in Part 2.

At the time of analysis, final data from HES was available for hospital admissions up to 31st March 2008. Provisional HES data for admissions from 1st April to 30th November 2008 was also available. Therefore, this Annual Report considers the linkage of all procedures undertaken in the NHS and those funded by the NHS but undertaken in the independent sector between 1st April 2003 and 30th November 2008.

3.2.1.1 Linkage process

Figure 3.1 shows a flow chart of the linkage of NJR procedures to HES records. Linkage was attempted using a hierarchical linkage algorithm based on combinations of NHS number, date of birth, sex, hospital identifier and local hospital number. Therefore, in cases where an NJR procedure was linked to more than one HES record, the link with the highest likelihood to be correct according to this hierarchy was chosen.

The hierarchical linkage algorithm, in descending order of likelihood to be correct, was as follows:

- linkage based on NHS number, year of birth and sex
- linkage based on local hospital, local hospital number, date of birth and sex
- linkage based on local hospital, local hospital number and date of birth
- linkage based on local hospital, date of birth and sex
- linkage based on NHS number, local hospital and local hospital number.

An NJR procedure was classified as being HES linked if:

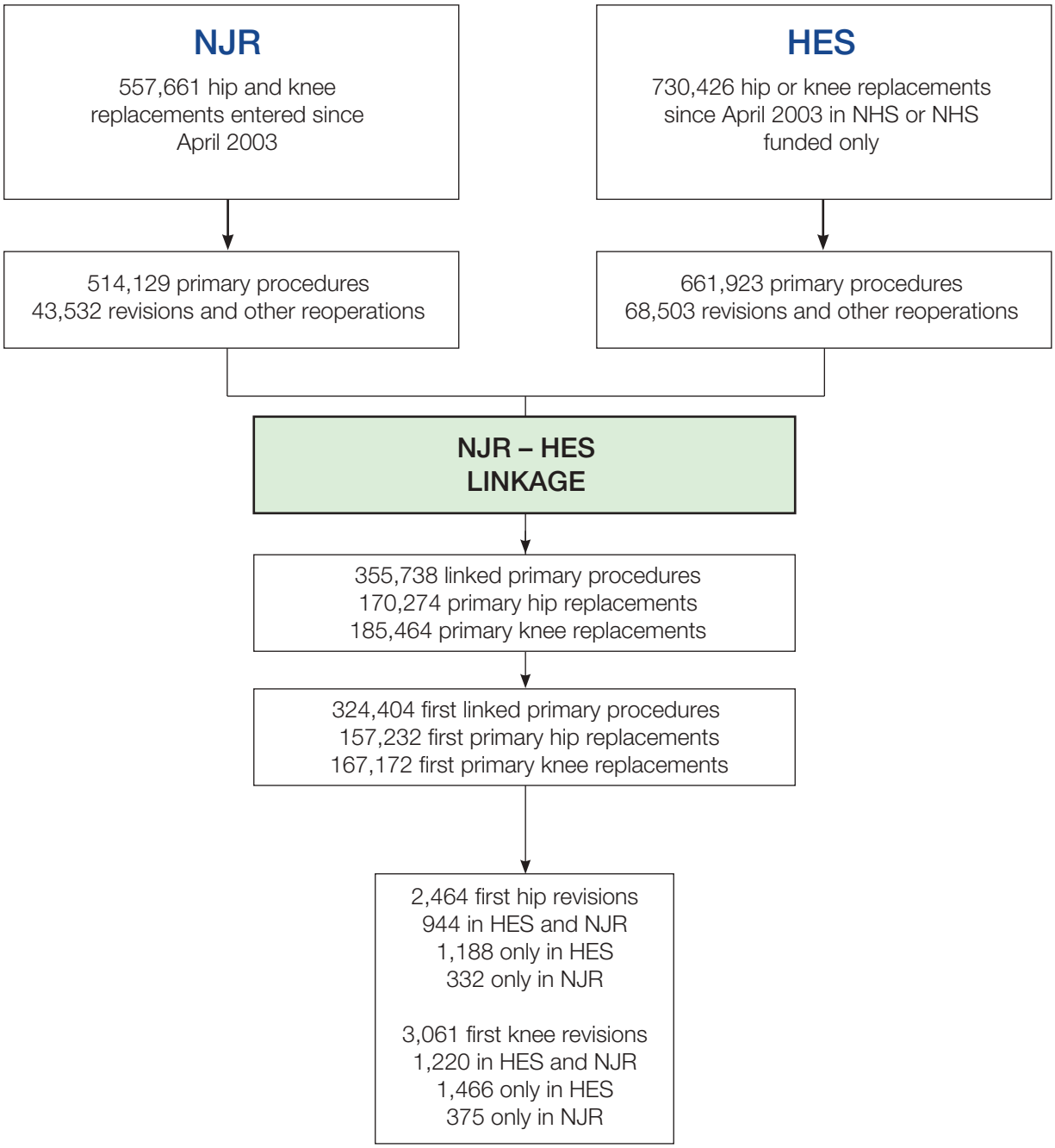
- linkage to such a record episode was achieved
- the operation recorded in the NJR was within the episode start and end dates in the HES database (the period that an admitted patient was under the care of an identified consultant)
- the OPCS[32] 4.3 procedure codes in HES corresponded to a hip or knee procedure.

Details of the OPCS 4.3 procedure codes used are available on request from the Clinical Effectiveness Unit of the Royal College of Surgeons of England.

[32] Office of Population, Censuses and Surveys.

Figure 3.1

Flow chart illustrating linkage of NJR procedures with HES records.



3.2.2 Coverage of linked procedures

All analyses of revision rates only include primary hip and knee procedures for which there was an NJR-HES linked record. Of all 514,129 primary hip or knee replacement procedures carried out in the NHS or NHS funded in the independent sector between 1st April 2003 and 30th November 2008 and reported to the NJR, 170,274 primary hip procedures and 185,464 primary knee procedures could be linked to HES (see Figure 3.1). This gives a linkage percentage of 69%. Of these, 157,232 were the first primary hip replacements (13,042 patients had a linked NJR-HES record of a subsequent primary hip replacement) and 167,172 were first primary knee replacements (18,292 patients had a record of a subsequent primary knee replacement).

However, the proportion of NJR procedures that could be linked differed between provider types. On average, 76% of hip or knee replacement procedures undertaken at NHS hospitals or NHS treatment centres could be linked to a HES record. Fewer procedures were linked for independent sector treatment centres (63%) and independent hospitals (23%). Therefore, the NJR-HES linked procedures are more representative of procedures undertaken in NHS hospitals and NHS treatment centres.

Another concern is the potential for systematic differences between the characteristics of patients whose NJR procedures were HES-linked and those whose were not. However, as demonstrated in earlier reports, differences in the patient characteristics were small.

The proportion of HES linkable procedures carried out since 1st April 2003 and reported to the NJR has risen from 53% in the 4th Annual Report (2007) to 60% in the 5th Annual Report (2008) and 69% in the current report.

3.2.3 Identification of revisions

Revisions were identified through longitudinal linkage in HES based on HESID (the unique patient identifier assigned to episodes of care in NHS hospitals) and longitudinal linkage in the NJR based on NHS number or patient surname, date of birth and postcode.

For the current Annual Report, the OPCS 4.3 procedure codes in HES were also carefully reviewed. These are used to identify primary hip and knee replacements and revision procedures. As a result, the number of revisions that could be identified in HES has increased dramatically. In the 4th Annual Report (2007), 1,015 first revisions were identified in 152,520 first primary procedures and in the 5th Annual Report (2008), 1,659 revisions in 214,735 procedures. In the current Annual Report, 4,818 revisions in 324,404 procedures are identified.

Additionally, for the first time, both NJR and HES records have been used to identify revisions. This increased the number of revision procedures linked to a primary hip or knee replacement by 15%, from 4,818 to 5,525 based on linkage within both the NJR and HES.

part 3

3.3 hip replacement procedures

3.3.1 Outcomes following primary hip replacement, 2003 to 2008

This section presents analyses of revision rates according to prosthesis type, with special attention given to frequently used brands and bearing surfaces. The analyses are based on data on primary hip replacement procedures undertaken between 1st April 2003 and 30th November 2008, which were linked to an episode in the HES database.

3.3.2 Revisions

The following sections report on revision rates observed in the 157,232 patients who had a first primary hip replacement procedure in the NHS or NHS funded in the independent sector between 1st April 2003 and 30th November 2008 in England and for whom there was an NJR-HES linked record (see Figure 3.1).

For each patient with a linked NJR-HES record of a primary procedure, revisions were identified through longitudinal linkage within HES and within the NJR (see section 3.2.3). If the side of the primary replacement or the revision was not recorded, the first revision that occurred following the primary procedure was assumed to be a revision of that primary. Some patients had two primary hip replacement procedures, one on each side, which occurred on different dates and were both linked to a HES record. In such cases, to avoid including a patient twice in the linked database, only the earliest primary procedure was retained. Patients who underwent a bilateral procedure on the same day were entered once.

Revision rates of primary hip replacement were estimated using the Kaplan-Meier survival analysis according to prosthesis type, patient characteristics, procedure type and provider. The end of follow up was deemed to be 30th November 2008 or date of death. Cox proportional hazards regression was used to estimate risk factors for revision adjusted for case mix differences.

3.3.2.1 Prosthesis type

The overall revision rate following primary hip replacement was 1.0% (95%CI: 0.9% - 1.0%) at one year, 2.0% (95%CI: 1.9% - 2.1%) at three years, and 2.8% (95%CI: 2.7% - 3.0%) at five years. Figure 3.2 shows estimates of implant survival to revision, according to prosthesis type, up to three years after primary replacement.

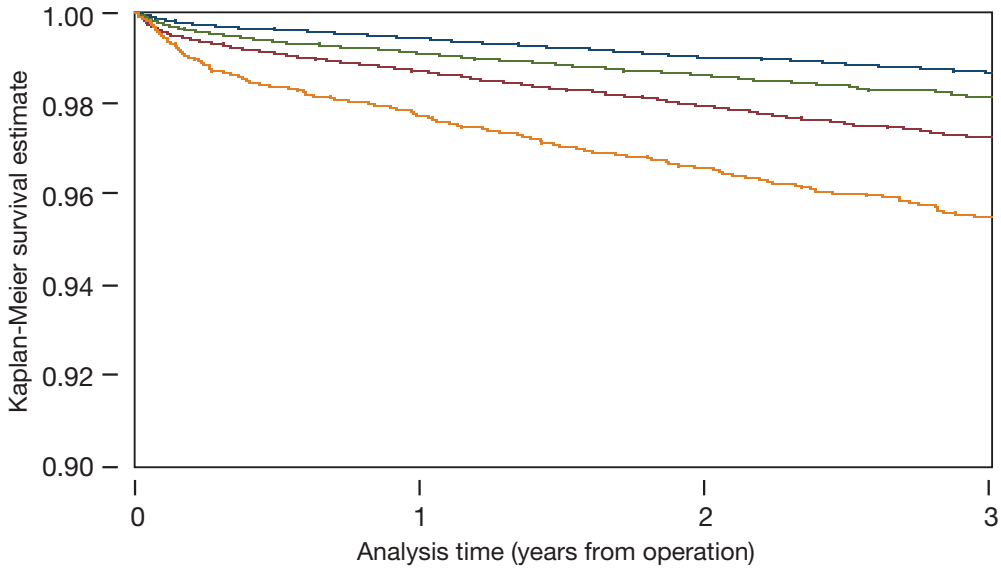


Figure 3.2

Implant survival of NJR-HES linked primary hip replacements, by prosthesis.

Revision rates varied according to type of prosthesis ($p < 0.0001$). The three year revision rate was lowest in patients who received a cemented prosthesis (1.3%, 95%CI: 1.2% - 1.4%) and highest after hip resurfacing (4.5%, 95%CI: 4.0% - 5.0%). The three year revision rate was 2.8% (95%CI: 2.6% - 3.0%) in patients who received a cementless prosthesis and 1.9% (95%CI: 1.7% - 2.1%) in patients who received a hybrid prosthesis. Figure 3.2 demonstrates that the differences among prosthesis type were already apparent within three months of the primary procedures.

3.3.2.2 Age and gender

The age and sex of patients and type of prosthesis used were strongly associated. For example, 91% of the patients who underwent resurfacing were younger than 65 and about two thirds were men; whereas 82% of those who received a cemented prosthesis were 65 or older and about two thirds were women. The influence of age and sex on revision rates following primary hip replacement is explored on subsequent pages.

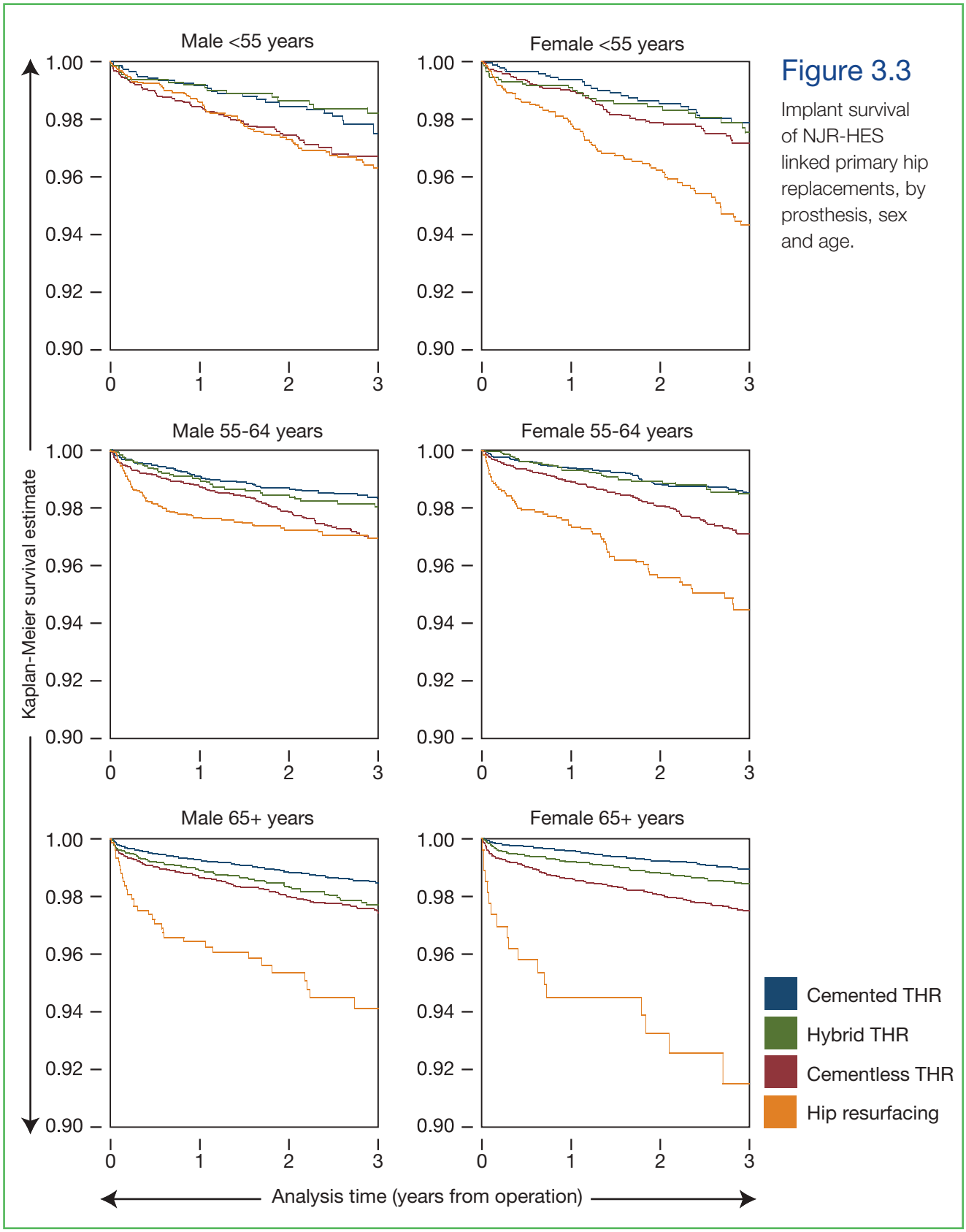


Figure 3.3

Implant survival of NJR-HES linked primary hip replacements, by prosthesis, sex and age.

The three year revision rates in patients younger than 55 years were lowest in those who had a hybrid prosthesis (2.1%, 95%CI: 1.6% - 2.9%) and cemented prosthesis (2.3%, 95%CI: 1.7% - 3.0%); they were highest after resurfacing (4.5%, 95%CI: 3.9% - 5.3%). The corresponding revision rate in those with a cementless prosthesis was 3.1% (95%CI: 2.6% - 3.6%) (see Figure 3.3).

In patients aged 55 to 64 years, the three year revision rate for cemented prostheses (1.6%, 95%CI: 1.3% - 1.9%), hybrids (1.7%, 95%CI: 1.4% - 2.2%) and resurfacing prostheses (4.0%, 95%CI: 3.3% - 4.7%) was lower than in the younger patients' group, whereas the revision rate for cementless prostheses (3.0%, 95%CI: 2.6% - 3.4%) was similar.

In patients of 65 years and above, the three year revision rate of cemented prostheses was lower than in younger patients (1.2%, 95%CI:1.1% - 1.3%) whereas the three year revision rate of resurfacing was higher (6.6%, 95%CI: 5.0% - 8.7%). Corresponding rates for those who had a cementless prosthesis were 2.5% (95%CI: 2.3% - 2.8%) and a hybrid 1.9% (95%CI: 1.6% - 2.2%).

In men, the three year revision rates were 1.6% (95%CI: 1.4% - 1.8%) for a cemented prosthesis, 2.9% (95%CI: 2.6% - 3.2%) for a cementless prosthesis, 2.1% (95%CI: 1.8% - 2.5%) for a hybrid and 3.7% (95%CI: 3.2% - 4.3%) for a resurfacing. In women, corresponding revision rates were 1.2% (95%CI: 1.0% - 1.3%) for a cemented prosthesis, 2.7% (95%CI: 2.4% - 3.0%) for a cementless prosthesis, 1.7% (95%CI: 1.4% - 2.0%) for a hybrid and 5.8% (95%CI: 5.0% - 6.8%) for a resurfacing.

These results demonstrate that the pattern of revision rates depends on age ($p = 0.0001$ for interaction between prosthesis type and age) and sex ($p < 0.0001$ for interaction between prosthesis type and sex). For example, in women the risk of revision decreases with age in patients with cemented, cementless and hybrid prostheses but increases strongly with age in patients who had a resurfacing. In men the risk of revision decreases with age in patients with cemented and cementless prostheses, increases slightly with age in patients with a hybrid prosthesis but increases strongly with age in patients who had a resurfacing. Similarly, women have lower revision rates than men with cemented, cementless and hybrid prostheses, but higher revision rates with resurfacing. However, the latter pattern of revision rates is not found in the youngest age group (<55), where females have higher revision rates than males for both hybrid and resurfacing prostheses.

Table 3.1 Revision at three years for primary hip replacement procedures, 1st April 2003 – 30th November 2008 (hazard rates based on multivariable model).

Category	Number of patients	Revision rate[33] (95%CI)	Hazard ratio[34](95%CI)
Prosthesis type			
Males <55 years			
Total replacement using cement	1,364	2.5% (1.7% - 3.7%)	1
Total replacement not using cement	3,407	3.3% (2.6% - 4.2%)	1.5 (1.0 - 2.3)
Hybrid total replacement	1,284	1.8% (1.1% - 2.9%)	0.8 (0.4 - 1.5)
Hip resurfacing	3,131	3.7% (3.0% - 4.7%)	1.6 (1.0 - 2.6)
Males 55-64 years			
Total replacement using cement	4,488	1.7% (1.3% - 2.2%)	1
Total replacement not using cement	6,469	3.1% (2.5% - 3.7%)	1.8 (1.3 - 2.4)
Hybrid total replacement	2,354	2.0% (1.4% - 2.8%)	1.2 (0.8 - 1.8)
Hip resurfacing	2,886	3.1% (2.4% - 3.9%)	2.3 (1.6 - 3.2)
Males 65+ years			
Total replacement using cement	21,570	1.5% (1.3% - 1.7%)	1
Total replacement not using cement	10,376	2.6% (2.2% - 3.0%)	1.8 (1.5 - 2.2)
Hybrid total replacement	5,305	2.3% (1.8% - 2.9%)	1.6 (1.2 - 1.9)
Hip resurfacing	746	5.9% (4.2% - 8.3%)	4.7 (3.3 - 6.8)
Females <55			
Total replacement using cement	1,762	2.1% (1.4% - 3.1%)	1
Total replacement not using cement	3,861	2.8% (2.2% - 3.7%)	1.4 (0.9 - 2.2)
Hybrid total replacement	1,473	2.5% (1.6% - 3.7%)	1.2 (0.7 - 2.1)
Hip resurfacing	2,161	5.7% (4.6% - 7.1%)	3.0 (1.9 - 4.6)
Females 55-64			
Total replacement using cement	6,534	1.5% (1.2% - 1.9%)	1
Total replacement not using cement	8,278	2.9% (2.5% - 3.5%)	1.9 (1.4 - 2.5)
Hybrid total replacement	3,246	1.5% (1.1% - 2.2%)	1.0 (0.7 - 1.6)
Hip resurfacing	1,576	5.5% (4.3% - 7.1%)	4.2 (3.0 - 5.9)
Females 65+			
Total replacement using cement	41,701	1.1% (1.0% - 1.2%)	1
Total replacement not using cement	14,521	2.5% (2.2% - 2.9%)	2.7 (2.3 - 3.2)
Hybrid total replacement	8,474	1.6% (1.3% - 2.0%)	1.6 (1.3 - 2.0)
Hip resurfacing	265	8.5% (5.3% - 13.6%)	10.1 (6.3 - 16.2)
Patient physical status			
P1 – Fit and healthy	32,512	2.1% (1.9% - 2.3%)	1
P2 – Mild disease not incapacitating	101,363	1.9% (1.8% - 2.0%)	1.2 (1.1 - 1.4)
P3+ – Incapacitating systemic disease or worse	23,357	2.3% (2.1% - 2.0%)	1.7 (1.4 - 1.9)
Provider type			
NHS hospital	131,763	2.1% (2.0% - 2.2%)	1
Independent hospital	8,196	1.8% (1.5% - 2.3%)	0.9 (0.7 - 1.0)
NHS treatment centre	10,477	1.5% (1.2% - 1.8%)	0.6 (0.5 - 0.8)
Independent sector treatment centre	6,796	2.0% (1.4% - 3.0%)	0.9 (0.7 - 1.2)

[33] Calculated using the Kaplan-Meier survival analysis method.
[34] Relative hazard of revision within three years of primary hip replacement compared to a patient with a reference level of the factor (hazard ratio=1), adjusted for all other factors included in the analyses.

Given the strong association between the patient's age and sex and the type of prosthesis used, as well as the interactions between prosthesis type on the one hand and age and sex on the other, the three year revision rates are first presented according to prosthesis type, stratified by age and sex (Table 3.1). These rates are not adjusted for the other factors, patient physical status and provider type.

Secondly, the relative risks are presented (expressed as hazard ratios). These were estimated with a multivariable Cox proportion hazards regression model. The relative risks according to prosthesis type are presented stratified for age and sex and adjusted for all other risk factors included in the model. For example, the hazard ratio shown for hip resurfacing in men under 55 years suggests that the risk of revision within three years of the operation date for a patient who undergoes a resurfacing procedure is 1.6 times higher than the risk for a patient of the same age, sex, physical status and with the same type of provider, who undergoes a cemented procedure. Likewise, the hazard ratio for hybrid hip replacements in women under 55 years indicates that the risk of revision for hybrid procedures is 1.2 times higher than that of cemented procedures in corresponding patients.

The hazard ratios presented in Table 3.1 suggest that revision rates are especially increased in elderly patients and women. As a result, the revision rate for women of 65 years or older, who underwent a hip resurfacing, was estimated to be about 10 times that of women the same age who received a cemented prosthesis.

3.3.2.3 Revision rates for the most frequently used implant brands

Table 3.2 and 3.3 show revision rates for cemented and cementless stems and cups that were most frequently used according to the NJR and of which at least 500 were entered. The three year revision rates of the cemented stems vary between 1.0% and 2.2%. The statistical evidence for an association of brand of cemented stem and revision rates is weak (p=0.10). The highest revision rate of the cementless stems was observed for the S-ROM (3.8%) and the lowest for the Synergy (1.9%) implants. The other 10 implants for which more than 500 were entered all had a three year revision rate between 2.2% and 3.5%. For the cementless stems, there was no statistical evidence that the revision rates are associated with brand (p = 0.21). This p-value, as well as the others presented in this section, is unadjusted for confounding factors, such as age and sex.

Table 3.2 Revision at three years according to stem brands for primary hip replacement procedures undertaken between 1st April 2003 and 30th November 2008, which were linked to a HES episode.

Brand	Number of patients	Revision rate[35] (95%CI)	Hazard ratio[36] (95%CI) (unadjusted)
Cemented stems			
Exeter V40	49,213	1.3% (1.2% - 1.4%)	1
Charnley	10,740	1.3% (1.1% - 1.6%)	1.0 (0.8 - 1.2)
CPT	7,177	1.5% (1.2% - 1.9%)	1.3 (1.0 - 1.7)
C-stem	7,126	1.4% (1.1% - 1.8%)	1.1 (0.9 - 1.4)
Stanmore modular	2,212	1.4% (0.9% - 2.3%)	0.9 (0.6 - 1.5)
C-stem AMT	1,882	1.0% (0.5% - 2.0%)	0.8 (0.4 - 1.5)
Elite Plus	1,145	1.1% (0.6% - 2.0%)	0.8 (0.5 - 1.5)
MS-30	1,123	1.1% (0.5% - 2.4%)	0.8 (0.4 - 1.6)
Muller-Biomet	1,081	1.6% (0.9% - 2.7%)	1.5 (0.9 - 2.5)
Muller STR	1,041	1.3% (0.7% - 2.3%)	1.1 (0.6 - 1.9)
Omnifit	1,038	1.8% (1.1% - 3.0%)	1.5 (0.9 - 2.4)
SP II	1,037	2.2% (1.4% - 3.4%)	1.8 (1.2 - 2.8)
CPS-PLUS	915	1.2% (0.5% - 2.7%)	1.3 (0.6 - 2.7)
Furlong HAC	794	1.2% (0.6% - 2.4%)	0.9 (0.5 - 1.9)
Total	**86,524**	**1.3% (1.2% - 1.4%)**	**-**
Cementless stems			
Corail	18,905	2.6% (2.3% - 3.0%)	1
Furlong	10,701	2.7% (2.3% - 3.1%)	1.2 (1.0 - 1.4)
SL-plus	2,588	2.6% (1.9% - 3.6%)	1.1 (0.8 - 1.5)
Accolade	2,379	2.8% (1.8% - 4.3%)	1.1 (0.8 - 1.6)
Taperlock	2,006	2.9% (1.9% - 4.4%)	1.3 (0.9 - 1.8)
Synergy	1,608	1.9% (1.2% - 3.0%)	0.8 (0.5 - 1.3)
Bimetric	1,518	2.5% (1.6% - 3.8%)	1.0 (0.6 - 1.4)
CLS	1,475	2.2% (1.4% - 3.6%)	0.9 (0.6 - 1.4)
ABG II	1,429	2.7% (1.9% - 3.8%)	1.2 (0.8 - 1.7)
Omnifit	935	2.5% (1.7% - 3.9%)	1.1 (0.7 - 1.7)
Versys	873	3.5% (2.3% - 5.2%)	1.5 (1.0 - 2.3)
S-ROM	683	3.8% (2.4% - 5.9%)	1.5 (1.0 - 2.5)
Total	**45,100**	**2.6% (2.4% - 2.8%)**	**-**

[35] Calculated using the Kaplan-Meier survival analysis method.
[36] Relative hazard of revision within three years of primary hip replacement compared to a patient with a reference level of the factor (hazard ratio=1).

Table 3.3 Revision at three years according to cup brands for primary hip replacement procedures undertaken between 1st April 2003 and 30th November 2008, which were linked to a HES episode.

Brand	Number of patients	Revision rate[37] (95%CI)	Hazard ratio[38] (95%CI) (unadjusted)
Cemented cups			
Contemporary	16,193	1.3% (1.1% - 1.6%)	1
Elite Plus Ogee	10,979	0.9% (0.7% - 1.2%)	0.7 (0.5 - 0.9)
Charnley	6,719	1.3% (1.0% - 1.6%)	0.9 (0.7 - 1.2)
Exeter Duration	6,408	1.5% (1.2% - 1.9%)	1.2 (0.9 - 1.6)
Charnley Ogee	5,440	1.7% (1.3% - 2.1%)	1.2 (0.9 - 1.6)
Elite Plus	5,338	1.0% (0.7% - 1.4%)	0.8 (0.5 - 1.1)
Opera	3,613	0.8% (0.5% - 1.3%)	0.6 (0.4 - 1.0)
ZCA	3,454	1.4% (1.1% - 2.1%)	1.1 (0.8 - 1.6)
Low Profile Muller	1,886	0.6% (0.3% - 1.3%)	0.5 (0.3 - 1.0)
Cenator	1,555	1.0% (0.6% - 1.8%)	0.8 (0.4 - 1.4)
Ultima	1,335	1.8% (1.1% - 2.8%)	1.3 (0.8 - 2.1)
Wroblewski Golf Ball	1,270	0.4% (0.2% - 1.1%)	0.3 (0.1 - 0.8)
Stanmore - Arcom	1,239	1.4% (0.8% - 2.6%)	1.1 (0.6 - 1.9)
Apollo	1,014	2.2% (1.4% - 3.6%)	1.9 (1.2 - 3.1)
Furlong	944	1.3% (0.7% - 2.3%)	1.0 (0.5 - 1.8)
M2A	868	2.1% (1.1% - 3.8%)	1.3 (0.7 - 2.4)
ODC	820	2.0% (1.2% - 3.4%)	1.6 (0.9 - 2.7)
Total	**69,075**	**1.3% (1.2% - 1.4%)**	**-**
Cementless cups			
Pinnacle	14,902	2.2% (1.9% - 2.7%)	1
Trident	10,437	1.8% (1.5% - 2.2%)	0.9 (0.7 - 1.1)
CSF	9,047	2.7% (2.3% - 3.1%)	1.4 (1.1 - 1.7)
Trilogy	8,378	2.3% (1.9% - 2.7%)	1.1 (0.9 - 1.4)
Duraloc	3,984	2.2% (1.8% - 2.8%)	1.1 (0.8 - 1.4)
EPF-Plus	2,500	2.6% (1.9% - 3.7%)	1.2 (0.9 - 1.7)
Reflection	2,016	1.1% (0.7% - 1.8%)	0.6 (0.4 - 1.0)
ABG II	1,907	1.9% (1.4% - 2.7%)	0.9 (0.6 - 1.4)
Exceed	1,679	2.8% (1.4% - 5.4%)	1.1 (0.7 - 1.7)
Allofit	1,137	2.1% (1.1% - 3.8%)	0.8 (0.4 - 1.4)
Plasmacup	1,023	2.5% (1.6% - 4.0%)	1.1 (0.7 - 1.8)
CSF Plus	940	Insufficient follow up	1.3 (0.7 - 2.6)
Furlong Threaded	812	2.2% (1.3% - 3.8%)	1.1 (0.7 - 1.9)
Total	**58,762**	**2.2% (2.0% - 2.4%)**	**-**

[37] Calculated using the Kaplan-Meier survival analysis method.
[38] Relative hazard of revision within three years of primary hip replacement compared to a patient with a reference level of the factor (hazard ratio=1).

The three year revision rates of the cemented cups varied from 0.4% for the Wroblewski Golf Ball and 0.6% for the Low Profile Muller to 2.2% for the Apollo. The statistical evidence that brand is associated with revision rates is very strong ($p < 0.0001$).

There was similar variation in the three year revision rates of the cementless cups, although the lowest was 1.1% for the Reflection. The highest revision rate was for the Exceed (2.8%) with similar revision rates for the CSF (2.7%) and EPF-Plus (2.6%). Statistical testing indicates that there is strong statistical evidence for an association between brand and revision rate ($p = 0.005$).

Six hip resurfacing brands were entered at least 500 times (Table 3.4). The lowest three year revision rate was seen for the BHR (3.3%) and the highest for the ASR (7.5%) and Conserve (7.4%). There is very strong statistical evidence for an association between brand and revision rate ($p < 0.0001$).

Table 3.4 Revision at three years according to resurfacing cup brands for primary hip replacement procedures undertaken between 1st April 2003 and 30th November 2008, which were linked to a HES episode.

Brand	Number of patients	Revision rate[39] (95%CI)	Hazard ratio[40] (95%CI) (unadjusted)
Resurfacing			
BHR	6,746	3.3% (2.9% - 3.9%)	1
Cormet 2000	1,697	6.0% (4.7% - 7.5%)	1.8 (1.4 - 2.4)
ASR	1,332	7.5% (5.9% - 9.5%)	2.2 (1.7 - 2.9)
Adept	791	4.2% (2.4% - 7.2%)	1.3 (0.8 - 2.0)
Durom	683	4.9% (3.3% - 7.3%)	1.4 (0.9 - 2.2)
Conserve	521	7.4% (5.2% - 10.7%)	2.5 (1.7 - 3.7)
Total	**11,770**	**4.5% (4.0% - 4.9%)**	**-**

3.3.2.4 Revision rates according to bearing surface

Of the 157,232 first primary hip replacements (see section 3.2.2), data on bearing surface were entered in the NJR for 120,987, excluding all resurfacing procedures and implants with large head sizes (>32mm). Table 3.5 presents the three year revision rates for the four most frequently entered articulation combinations.

The highest revision rate was seen in patients with a ceramic on ceramic surface (2.2%) and lowest in those with a metal on polyethylene surface (1.6%). However, multivariable analysis adjusting for age, sex, physical status and prosthesis type demonstrated that the statistical evidence for an effect of bearing surface on revision rate was weaker ($p = 0.07$).

Table 3.5 Revision at three years according to bearing surface for primary hip replacement procedures (excluding all resurfacing procedures) undertaken between 1st April 2003 and 30th November 2008, which were linked to a HES episode.

Bearing surface	Number of patients	Revision rate[39] (95%CI)	Hazard ratio[40] adjusted for age, sex and physical status
Metal on polyethylene	94,012	1.6% (1.5% - 1.7%)	1
Ceramic on polyethylene	15,743	1.7% (1.5% - 2.0%)	0.8 (0.7 - 1.0)
Ceramic on ceramic	9,928	2.2% (1.8% - 2.6%)	0.9 (0.8 - 1.1)
Metal on metal	1,304	1.9% (1.2% - 3.0%)	0.8 (0.5 - 1.3)

[39] Calculated using the Kaplan-Meier survival analysis method.
[40] Relative hazard of revision within three years of primary hip replacement compared to a patient with a reference level of the factor (hazard ratio=1).

part 3

3.4 knee replacement procedures

3.4.1 Outcomes following primary knee replacement, 2003 to 2008

This section presents analyses of revision rates according to prosthesis type, including unicondylar and patello-femoral knee replacements. The analyses are based on data of primary joint replacements undertaken between 1st April 2003 and 30th November 2008, which were reported to the NJR and could be linked to an episode in the HES database.

3.4.2 Revision

This section summarises revision rates of the 185,464 primary knee replacements that could be included (see Figure 3.1). As explained in section 3.3 on hip replacement procedures, revisions were identified through longitudinal linkage within the NJR and HES. See section 3.2.3 for further information.

3.4.2.1 Prosthesis type

The overall revision rate following primary knee replacement was 0.7% (95%CI: 0.6% - 0.7%) at one year, 2.5% (95%CI: 2.4% - 2.6%) at three years and 3.7% (95%CI: 3.5% - 3.9%) at five years after surgery. Figure 3.4 shows estimates of implant survival to revision, according to prosthesis type up to three years after primary replacement.

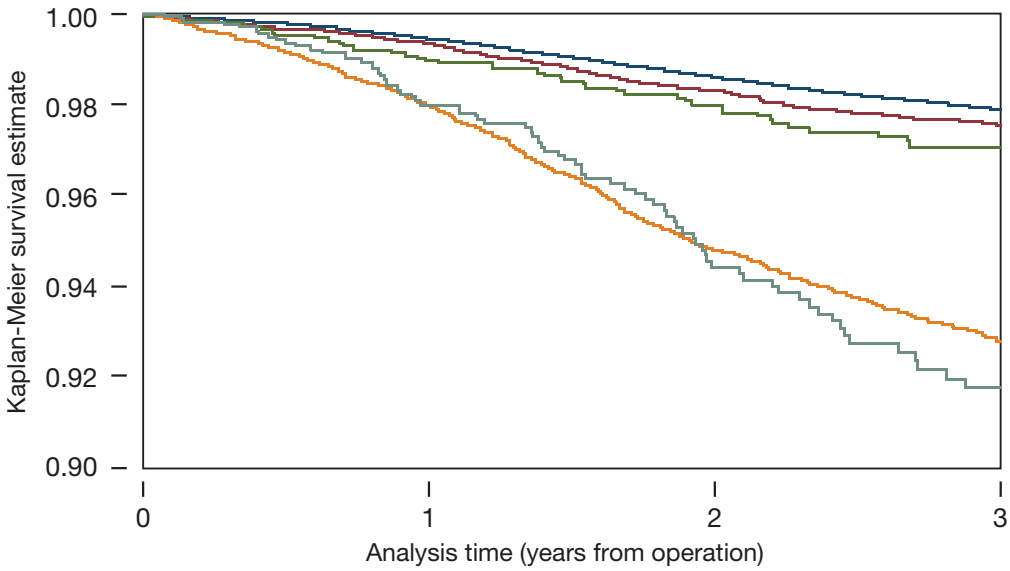


Figure 3.4
Implant survival of NJR-HES linked primary knee replacements, by prosthesis.

Revision rates varied according to type of prosthesis ($p < 0.0001$). The three year revision rate was lowest in patients who received a cemented prosthesis (2.1%, 95%CI: 2.0% - 2.2%) and highest in patients who received a patello-femoral replacement (8.3%, 95%CI: 6.6% - 10.5%). In those who received a unicondylar replacement the three year revision rate was 7.2% (95%CI: 6.6% - 7.9%). The corresponding rate for a cementless prosthesis was 2.4% (95%CI: 2.1% - 2.9%) and for a hybrid 2.9% (95%CI: 2.2% - 3.9%).

3.4.2.2 Age and gender

In all five types of replacements, younger patients had higher revision rates than older patients (Figure 3.5). There is no statistical evidence that the pattern of revision rates according to prosthesis type depends on age ($p = 0.7$ for interaction between prosthesis type and age). In patients younger than 65 years, the three year revision was 3.2% (95%CI: 3.0% - 3.5%) for a cemented prosthesis, 3.6% (95%CI: 2.9% - 4.5%) for a cementless prosthesis, 4.2% (95%CI: 2.7% - 6.6%) for a hybrid, 9.6% (95%CI: 8.7% - 10.7%) for a unicondylar and 9.4% (95%CI: 7.1% - 12.5%) for a patello-femoral.

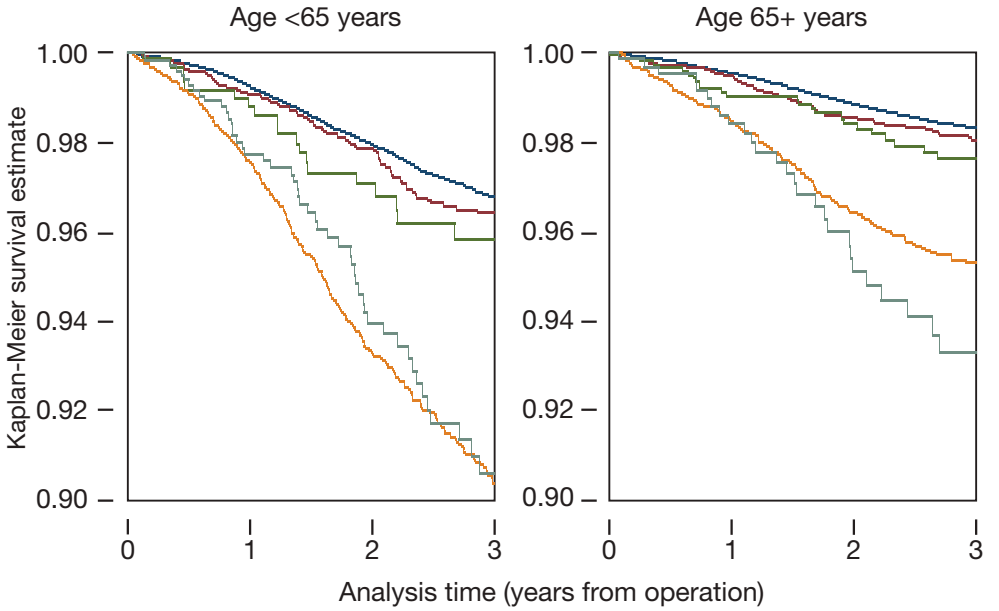


Figure 3.5

Implant survival of NJR-HES linked primary knee replacements, by age.

In patients of 65 years and older, the three year revision rates were 1.7% (95%CI: 1.6% - 1.8%) with a cemented prosthesis, 2.0% (95%CI: 1.6% - 2.4%) with a cementless prosthesis, 2.4% (95%CI: 1.6% - 3.6%) with a hybrid, 4.7% (95%CI: 4.0% - 5.5%) with a unicondylar and 6.7% (95%CI: 4.6% - 9.8%) with a patello-femoral.

Overall, three year revision rates were lower in women (2.4%, 95%CI: 2.3% - 2.5%) than in men (2.7%, 95%CI: 2.6% - 2.9%; p=0.0001; see Figure 3.6). The pattern of revision rates according to prosthesis type is different between men and women (p = 0.001 for interaction between prosthesis type and sex).

In women, the three year revision rate was 1.9% (95%CI: 1.8% - 2.1%) with a cemented prosthesis, 2.6% (95%CI: 2.1% - 3.1%) with a cementless prosthesis, 2.4% (95%CI: 1.5% - 3.7%) with a hybrid, 7.0% (95%CI: 7.0% - 8.9%) with a unicondylar and 8.7% (95%CI: 6.8% - 11.2%) with a patello-femoral. In men, corresponding percentages were 2.3% (95%CI: 2.2% - 2.5%) with a cemented prosthesis, 2.4% (95%CI: 1.9% - 2.9%) with a cementless prosthesis, 3.6% (95%CI: 2.4% - 5.4%) with a hybrid, 6.5% (95%CI: 5.7% - 7.4%) with a unicondylar and 6.8% (95%CI: 3.9% - 11.6%) with a patello-femoral.

In other words, men seem to have higher revision rates for cemented and hybrid prostheses and lower revision rates for cementless, unicondylar and patello-femoral replacements.

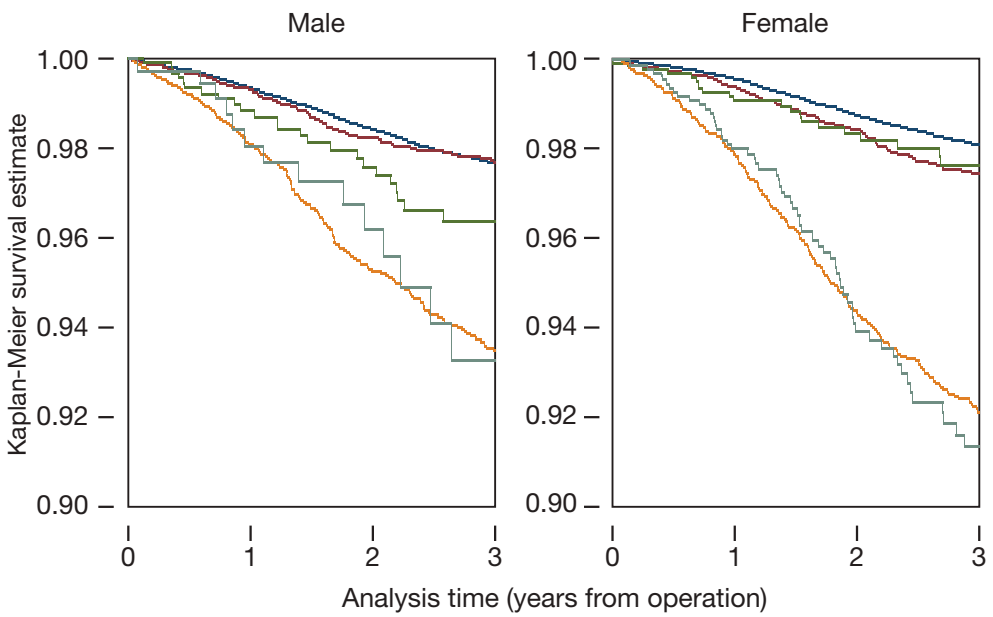


Figure 3.6

Implant survival of NJR-HES linked primary knee replacements, by sex.

A multivariable analysis was carried out to investigate the association between prosthesis type and revision in the first three years following surgery, adjusted for age, sex, physical status and provider type (Table 3.6; see section 3.4.2.2 for further explanation of multivariable analysis). Because of the significant interaction between prosthesis type and sex, this analysis estimated the influence that prosthesis type has on revision rates separately for men and women.

Table 3.6 Revision at three years for primary knee replacement procedures, 1st April 2003 – 30th November 2008 (hazard rates based on multivariable model).

Category	Number of patients	Revision rate[41] (95%CI)	Hazard ratio[42] (95%CI)
Age			
< 65 years	48,080	4.2% (3.9% - 4.4%)	1
>=65 years	119,092	1.9% (1.8% - 2.0%)	0.5 (0.5 - 0.6)
Patient physical status			
P1 – Fit and healthy	26,975	3.0% (2.8% - 3.3%)	1
P2 – Mild disease not incapacitating	114,503	2.4% (2.3% - 2.5%)	1.0 (0.9 - 1.1)
P3+ – Incapacitating systemic disease or worse	25,694	2.5% (2.3% - 2.8%)	1.2 (1.0 - 1.3)
Prosthesis type - males			
Total replacement using cement	59,075	2.3% (2.2% - 2.5%)	1
Total replacement not using cement	4,961	2.4% (1.9% - 2.9%)	1.0 (0.8 - 1.3)
Hybrid total replacement	915	3.6% (2.4% - 5.4%)	1.6 (1.1 - 2.4)
Unicondylar	5,854	6.5% (5.7% - 7.4%)	2.5 (2.2 - 2.9)
Patello-femoral replacement	362	6.8% (7.0% - 8.9%)	2.3 (1.3 - 4.0)
Prosthesis type - females			
Total replacement using cement	82,115	1.9% (1.8% - 2.1%)	1
Total replacement not using cement	5,925	2.6% (2.1% - 3.1%)	1.3 (1.1 - 1.6)
Hybrid total replacement	1,152	2.4% (1.5% - 3.7%)	1.3 (0.8 - 2.0)
Unicondylar	5,549	7.9% (7.0% - 8.9%)	3.7 (3.2 - 4.2)
Patello-femoral replacement	1,262	8.7% (6.7% - 11.2%)	3.6 (2.8 - 4.7)
Provider type			
NHS hospital	138,112	2.6% (2.5% - 2.7%)	1
Independent hospital	9,577	2.5% (2.1% - 3.0%)	1.0 (0.8 - 1.1)
NHS treatment centre	11,870	2.1% (1.8% - 2.5%)	0.9 (0.8 - 1.1)
Independent sector treatment centre	7,613	2.5% (1.8% - 3.3%)	1.0 (0.8 - 1.3)

The results of this multivariable analysis indicate that even after adjustment for other factors, prosthesis type is an important determinant of revision in men and women. For example, in men, the risk of revision in the first three years following surgery with a unicondylar prosthesis was 2.5 times higher than with a cemented total knee prosthesis, whereas in women with a unicondylar prosthesis the risk was 3.7 times higher. Revision rates were also increased with a patello-femoral replacement and, again, the relative increase was larger in women. In men, the revision rates were not found to be higher for a cementless replacement than a cemented replacement, but there was evidence for such an increase in women.

[41] Calculated using the Kaplan-Meier survival analysis method.
[42] Relative hazard of revision within three years of primary knee replacement compared to a patient with a reference level of the factor (hazard ratio=1), adjusted for all other factors included in the analyses.

3.4.2.3 Revision rates for the most frequently used brands

The revision rates for the 10 most frequently used brands for total condylar replacement are presented in Table 3.7. The highest revision rate was observed for the Optetrak (8.0%) and the lowest rate for the Triathlon (0.4%). There is strong statistical evidence that revision rates depend on brand ($p < 0.0001$). The observed three year revision rates of PFC Sigma, Nexgen and AGC, the three most popular brands, vary between 1.7% and 2.1%.

The Oxford Partial Knee is the most frequently used brand for unicondylar knee replacement, with the MG Uni and Preservation being the second and third most frequently used brands. The three year revision rate was lowest for the MG Uni (4.5%) and highest for the Preservation (12%) mobile bearing implant ($p < 0.0001$).

Table 3.7 Revision rates at three years according to brands for knee replacement procedures undertaken between 1st April 2003 and 30th November 2008, which were linked to a HES episode.

Brand	Number of patients	Revision rate[43] (95%CI)	Hazard ratio[44] (95%CI) (unadjusted)
Total condylar			
PFC Sigma	52,792	1.7% (1.6% - 1.9%)	1
Nexgen	20,259	1.8% (1.6% - 2.1%)	1.0 (0.9 - 1.2)
AGC	19,490	2.1% (1.8% - 2.3%)	1.2 (1.0 - 1.4)
Scorpio	12,133	2.2% (1.9% - 2.6%)	1.3 (1.1 - 1.5)
Kinemax	7,140	2.5% (2.2% - 3.0%)	1.5 (1.2 - 1.7)
Genesis 2	6,561	2.0% (1.6% - 2.6%)	1.2 (0.9 - 1.5)
LCS	5,339	2.1% (1.6% - 2.7%)	1.2 (0.9 - 1.5)
Endoplus	4,601	2.2% (1.6% - 3.0%)	1.4 (1.1 - 1.8)
Profix	2,932	2.2% (1.6% - 3.0%)	1.3 (1.0 - 1.8)
Triathlon	2,283	0.4% (0.2% - 0.9%)	0.5 (0.2 - 1.1)
Insall-Burstein 2	2,119	2.5% (1.8% - 3.3%)	1.4 (1.0 - 1.9)
MRK	1,553	1.7% (0.9% - 3.2%)	0.8 (0.5 - 1.5)
LCS	1,385	2.3% (1.6% - 3.2%)	1.3 (0.9 - 1.9)
Rotaglide +	1,317	3.2% (2.3% - 4.5%)	1.9 (1.3 - 2.6)
Advanced	1,266	2.5% (1.6% - 4.0%)	1.4 (0.9 - 2.2)
Maxim	1,110	2.9% (1.9% - 4.5%)	1.6 (1.0 - 2.4)
NK2	1,065	1.9% (1.1% - 3.6%)	0.9 (0.5 - 1.6)
Vanguard	1,056	1.9% (0.7% - 5.1%)	1.2 (0.6 - 2.6)
Columbus	836	4.2% (2.3% - 7.8%)	2.5 (1.5 - 4.1)
Optetrak	575	8.0% (5.0% - 12.7%)	4.1 (2.7 - 6.3)
Total	**145,802**	**2.0% (1.9% - 2.1%)**	-
Unicondylar			
Oxford Partial Knee	8,280	6.9% (6.2% - 7.7%)	1
MG Uni	1,178	4.5% (3.2% - 6.5%)	0.6 (0.4 - 0.9)
Preservation	633	12.0% (9.2% - 15.5%)	1.7 (1.3 - 2.2)
Total	**10,091**	**7.0 % (6.4% - 7.7%)**	-
Patello-femoral			
Avon	974	6.9% (5.0% - 9.5%)	N/A

[43] Calculated using the Kaplan-Meier survival analysis method.
[44] Relative hazard of revision within three years of primary knee replacement compared to a patient with a reference level of the factor (hazard ratio=1).

glossary

A	
Acetabular component	The portion of a total hip replacement prosthesis that is inserted into the acetabulum – the socket part of a ball and socket joint.
Acetabular cup	See Acetabular component.
Acetabular prosthesis	See Acetabular component.
Arthrodesis	A procedure where a natural joint is fused together (stiffened).
Arthroplasty	A procedure where a natural joint is reconstructed with an artificial prosthesis.
ASA	American Society of Anaesthesiology (ASA) scoring system for grading the overall physical condition of the patient, as follows: P1 – Fit and healthy; P2 – Mild disease, not incapacitating; P3 – Incapacitating systemic disease; P4 – Life threatening disease; P5 – Not expected to survive 24 hours.
B	
Bilateral operation	Operation performed on both sides; for example, left and right knee procedures carried out during a single operation.
Body mass index (BMI)	A statistical tool used to estimate a healthy body weight based on an individual's height. The BMI is calculated by dividing a person's weight (kg) by the square of their height (m^2).
Brand (of prosthesis)	The brand of a prosthesis (or implant) is the manufacturer's product name, e.g. the Exeter V40 brand for hips, the PFC Sigma brand for knees.
C	
Case ascertainment	Proportion of all relevant joint replacement procedures performed in England and Wales that are entered in the NJR.
Case mix	Term used to describe variation in surgical practice, relating to factors such as indications for surgery and patient age and sex.
Cement	An acrylic cement.
Cemented	Prostheses designed to be fixed into the bone using cement.
Cementless	Prostheses designed to be fixed into the bone by bony ingrowth or ongrowth without using cement.
Compliance	The percentage of all total joint procedures which were performed in an individual unit, that have been entered into the NJR within any given period.
Cup	See Acetabular component.
D	
Data collection periods for Annual Report analysis	The NJR Annual Report Part 1 is about data collected between 1st April 2008 and 31st March 2009. The NJR Annual Report Part 2 is an overview of hip and knee replacement procedures that took place between 1st January and 31st December 2008. The NJR Annual Report Part 3 is about hip and knee joint replacement revision rates for procedures that took place between 1st April 2003 and 30th November 2008.
E	
Excision arthroplasty	A procedure whereby the articular ends of the bones are simply excised, so that a gap is created between them.

F	
Femoral component (hip)	Part of a total hip joint, that is inserted into the femur (thigh bone) of the patient. It normally consists of a stem and head (ball).
Femoral component (knee)	Portion of a knee prosthesis that is used to replace the articulating surface of the femur (thigh bone).
Femoral head	Spherical portion of the femoral component of the artificial hip replacement.
Femoral prosthesis	Portion of a total joint replacement used to replace damaged parts of the femur (thigh bone).
Femoral stem	See Femoral component (hip).
H	
Hazard ratio	A comparative statistical measure of the instantaneous risk of experiencing the event of interest (e.g. implant revision) between two groups (e.g. two different products).
Head	See Femoral head.
Healthcare provider	NHS or independent sector organisation that provides healthcare; in the case of the NJR, orthopaedic hip and knee replacement surgery.
HES	Hospital Episode Statistics.
Hybrid procedure	Joint replacement procedure in which cement is used to fix one prosthetic component while the other is cementless.
I	
Image/computer guided surgery	Surgery performed by the surgeon, using real time images to assist alignment and positioning of prosthetic components.
Indication (for surgery)	Reason for surgery. The NJR system allows for more than one indication to be recorded.
K	
Kaplan-Meier	A statistical method of survival analysis that can take into account 'censored' data, i.e. patient losses from the sample before the final outcome is observed (for instance, if a patient dies).
L	
Levy	Additional payment placed on the sales of specific hip and knee implants to cover the costs associated with ongoing operations and development of the NJR.
Linkable percentage	Linkable percentage is an estimate of the percentage of all relevant procedures that have been entered into the NJR, which may be linked via NHS number to other procedures performed on the same patient.
Linkable procedures	Procedures entered into the NJR database that are linkable to a patient's previous or subsequent procedures by the patient's NHS number.
M	
MDS	Minimum data set, the set of data fields collected by the NJR. Some of the data fields are mandatory (i.e. they must be filled in). Fields that relate to patients' personal details must only be completed where informed patient consent has been obtained.
MDS 1 (MDSv1)	Minimum data set version one, used to collect data from 1st April 2003. MDS 1 closed to new data entry on 1st April 2005.
MDS 2 (MDSv2)	Minimum data set version two, introduced on 1st April 2004. MDS 2 replaced MDS 1 as the official data set on 1st June 2004.

MDS 3 (MDSv3)	Minimum data set version three, introduced on 1st November 2007 as the new official data set.
Minimally invasive surgery (MIS)	Surgery performed using small incisions (often less than 8cm). This may require the use of special instruments.
Mixing and matching	Also known as 'cross-breeding'. Hip replacement procedure in which a surgeon chooses to implant a femoral component (incorporating a metallic or ceramic modular head) from one manufacturer with an acetabular component (incorporating a polyethylene bearing surface) from another.
Modular	Component composed of more than one piece, e.g. a modular acetabular cup shell component with a modular cup liner.
N	
NHS	National Health Service.
NICE	National Institute for Health and Clinical Excellence.
NICE benchmark	See ODEP ratings.
NJR	National Joint Registry for England and Wales. Since 1st April 2003, the NJR has collected and analysed data on hip and knee replacements. It covers both the NHS and independent healthcare sectors to ensure complete recording of national activity in England and Wales.
NJR Centre	National co-ordinating centre for the NJR.
NJR StatsOnline	Web facility for viewing and downloading NJR statistics on **www.njrcentre.org.uk**
NSTS	NHS Strategic Tracing Service. Used to source missing NHS numbers and to determine when patients recorded on the NJR have died.
O	
ODEP	Orthopaedic Data Evaluation Panel of the NHS Supply Chain.
ODEP ratings	ODEP ratings are the criteria for product categorisation of prostheses for primary total hip replacement against NICE benchmarks. The categorisation is based on NICE benchmarks – pre-entry benchmark (products commercially available that are involved in post-market clinical follow-up studies); entry benchmark (after three, five and seven years; level A – acceptable evidence, level B – weak evidence); full benchmark (10 years; level A – strong evidence, level B – reasonable evidence, level C – weak evidence). For each year, there is a level for unacceptable evidence, where products should only be used as part of a clinical trial.
OPCS-4	Office of Population, Censuses and Surveys: Classification of Surgical Operations and Procedures, 4th Revision – a list of surgical procedures and codes.
P	
Patella resurfacing	Replacement of the surface of the patella (knee cap) with a prosthesis.
Patello-femoral knee	Procedure involving replacement of the trochlear and replacement resurfacing of the patella.
Patello-femoral prosthesis	Two piece knee prosthesis that provides a prosthetic (knee) articulation surface between the patella and femoral condyles.
Patient consent	Patient personal details may only be submitted to the NJR where explicit informed patient consent has been given. If a patient does not give consent, only the anonymous operation and implant data may be submitted.
Patient physical status	See ASA.
Patient procedure	Type of procedure carried out on a patient, e.g. primary total prosthetic replacement using cement.

PEDW	Patient Episode Database Wales, the Welsh equivalent to Hospital Episode Statistics (HES) in England.
Primary hip/knee replacement	First total joint replacement operation performed on any individual patient.
Prosthesis	Orthopaedic implant used in joint replacement procedures, e.g. a total hip or a unicondylar knee.
R	
Resurfacing (hip)	Resurfacing of the femoral head with a surface replacement femoral prosthesis and insertion of an acetabular cup with or without cement.
Revision hip/knee replacement	Operation performed to remove and replace one or more components of a total joint prosthesis for whatever reason.
S	
Single stage revision	A revision carried out in one operation.
Surgical approach	Method used by a surgeon to gain access to, and expose, the joint.
Survival analysis	A statistical method that is used to determine what fraction of a population, such as those who have had a particular hip implant, have survived unrevised past a certain time.
T	
TED stockings	Thrombo embolus deterrent (TED) stockings. Elasticated stockings that can be worn by patients following surgery and which may help reduce the risk of deep vein thrombosis (DVT).
THR	Total hip replacement (total hip arthroplasty). Replacement of the femoral head with a stemmed femoral prosthesis and insertion of an acetabular cup, with or without cement.
Thromboprophylaxis	Drug or other post-operative regime prescribed to patients with the aim of preventing blood clot formation in the post-operative period.
TKR	Total knee replacement (total knee arthroplasty). Replacement of both tibial and both femoral condyles, with or without resurfacing of the patella and with or without cement.
Total condylar knee	Type of knee prosthesis that replaces the complete contact area between the femur and the tibia of a patient's knee.
Treatment centre (TC)	Treatment centres are dedicated units that offer elective and short stay surgery and diagnostic procedures in specialities such as ophthalmology, orthopaedic and other conditions. These include hip and knee replacements. Treatment centres may be NHS or privately funded.
Trochanter	Bony protuberance of the femur, found just below the femoral head.
Trochanteric osteotomy	Temporary incision of the trochanter, used to aid exposure of hip joint during some types of total hip replacement.
Two-stage revision	A revision procedure carried out as two operations, often used in the treatment of deep infection.
Type (of prosthesis)	Type of prosthesis is the generic description of a prosthesis, e.g. modular cemented stem (hip), patella-femoral joint (knee).
U	
Uncemented	See cementless
Unicondylar arthroplasty	Replacement of one tibial condyle and one femoral condyle, with or without resurfacing of the patella.
Unicondylar knee replacement	See unicondylar arthroplasty.
Unilateral operation	Operation performed on one side only, e.g. left hip.

Produced by M&M Communications Ltd www.mmcomms.co.uk

NJR Centre contact details

National Joint Registry
Northgate Information Solutions (UK) Ltd
Peoplebuilding 2
Peoplebuilding Estate
Maylands Avenue
Hemel Hempstead
Hertfordshire
HP2 4NW

Telephone: 0845 345 9991
Fax: 0845 345 9992

Email: health_servicedesk@northgate-is.com
Website: www.njrcentre.org.uk