Information about:

Hip and knee replacements

Surgery FAQs

Latest research

Contacts and advice

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This document is available as a free download from the NJR website at www.njrcentre.org.uk and at www.hqip.org.uk
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Part 1

Information for public, patients and carers about the NJR and joint replacement in general

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Section 1.1
Introduction

This guide is a summary of the National Joint Registry for England and Wales (NJR) 8th Annual Report. This guide will present the key findings of the report which will hopefully be of interest to patients, their carers and the wider public. As well as the Annual Report data, we have provided specialist information specifically for patients around joint replacement surgery. This includes an interview with the NJR patient representative, Mary Cowern (see page 7).

Section 1.2
When and why the NJR started

Hip, knee and ankle joint replacements have become more commonplace and highly successful operations bring many patients improved mobility and relief from pain. A number of people may at some time in the future need another operation on the same joint (this is called a revision). The reasons for this can be varied, but most commonly because the joint implant has worn out. To further improve the success of this surgery, the Department of Health and the Welsh Government set up the National Joint Registry (NJR) in order to monitor the performance of joint implants.

The National Joint Registry (NJR) of England and Wales was established in 2002. Its purpose is to define, improve and maintain the quality of care of individuals receiving hip, knee and ankle joint replacement surgery across the NHS and the independent healthcare sector. The NJR works by hospitals providing specific data on the patient’s joint replacement surgery. This will include data such as the patients age and gender, how fit and healthy they were prior to surgery, the side of the body the implant will go into and what type of implant will be used. There may also be data on any revision surgery after the first operation. This will only be achievable if the patient consents to having their data stored on the NJR.

A wide range of implants can be used in joint replacement operations. The registry helps to monitor the performance of these implants and the effectiveness of different types of surgery, improving clinical standards and benefiting patients, clinicians and the orthopaedic industry.

From 1 April 2008, the management of the NJR was transferred from the Department of Health to the Healthcare Quality Improvement Partnership (HQIP), which is directed by a consortium comprising the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices.

Aims and objectives of the NJR

• To establish an understanding of the types of people throughout England and Wales undergoing hip, knee and ankle joint replacement surgery.
• To ensure that patients obtain the best clinical care during and following their joint replacement operation.
• To ensure that NHS and other healthcare resources are best used.
• To improve surgical practice through the understanding of what works best in orthopaedic units and hospitals.
• To identify and review the performance of surgeons with higher than expected revision rates.
• To isolate any implants showing high failure rates so as to allow their prompt removal from the market if necessary.
• To improve evidence-based purchasing of joint replacement implants for orthopaedic units and hospitals.
• To provide evidence of the best performing implants to patients, clinicians, healthcare purchasers, commissioners, regulators and implant suppliers.
Section 1.3
An introduction to the Public & Patient Guide to the NJR 2011 Annual Report by Mary Cowern, patient representative for the NJR

Mary Cowern is Local Development Manager for the charity Arthritis Care and has been a patient representative on the NJR Steering Committee since 2006. Mary was diagnosed with rheumatoid arthritis in 1988 at the age of 22 and had her first knee replacement at 31.

How did your diagnosis with arthritis affect you on a professional level?

Being diagnosed was life changing in more ways than one. It prompted me to become a self management trainer with Arthritis Care and encouraged me to study for a Health and Social Care degree with the Open University. After spending 13 years as a volunteer for Arthritis Care, serving as the organisation’s Trustee and Wales Chair, I am now on the staff team working as Local Development Manager for South Wales. The job is incredibly varied and ranges from developing relationships with commissioners to gathering intelligence on the needs of people with arthritis, service delivery and policy developments as well as supporting my staff and volunteer team.

Living with arthritis also motivated me to become involved in patient representation work. I’ve been a patient representative for Hywel Dda Health Board since 1998 and was one of the founder members of the All Wales Patient Representation Group from 2004–2009. I currently chair the Long Term Conditions Alliance Cymru, an all-Wales alliance of voluntary sector organisations and service users who represent people with long term conditions.

As Chair of the Alliance I promote the sharing of best practice, service user empowerment and engagement and raise awareness of common concerns to the Welsh Government. Since January 2010 I have been a member of the Welsh Government’s Self Care Board where I provide expertise, advice and support to improve self care across Wales, contribute to evaluating and monitoring the Welsh Government’s Self Care Framework and advising on research and development requirements. I am also a member of the Wales Arthritis Research Network Service User Advisory Group.

As well as being diagnosed with arthritis, were there elements of the care you received that have driven you in your extensive patient representation work?

I have been a patient representative on the NJR Steering Committee since 2006 and one of the driving forces for applying was my experience of joint replacement surgery. My first knee replacement went wrong due to surgeon error and turned into a lengthy saga to put right. Thankfully my revision and other knee replacement had better outcomes! When I heard about the NJR I realised that if the registry had been around in 1996, the problem I experienced could have been picked up sooner or even avoided. Hence I’m very passionate that all patients should be made aware of the NJR and its importance.

What does your NJR role involve?

Primarily my role on the committee is to feed into the strategic decision making process as well as monitoring the NJR work programme. I’m also there to ensure the NJR understands and reflects the needs and views of patients. The wider networks which I have links with are therefore important as I can utilise rich and diverse intelligence on issues relating to joint replacement surgery. I attend four full steering committee meetings per year and I also contribute to the work of our sub-groups, particularly the two outlier sub-groups, and have given presentations from a patient perspective to NJR Network events across England and Wales. Whilst the Steering Committee is made up of different professions, we are all equal around the table. I am proud to say my role has never felt tokenistic.
What progress have you seen since you joined the NJR Steering Committee?

The NJR and the Steering Committee have come a long way. In 2006 our work mainly focused on improving data collection and quality, however 2009 saw the introduction of our Strategic Plan which set up a number of projects aimed at adding greater value for all stakeholders. One of our goals is to improve information availability to all who have an interest in the NJR. Previously information was mainly focused at clinicians however more recently we have begun to develop a programme of engagement aimed towards patients and the public.

This publication is a prime example of steps we are taking to ensure the NJR is more accessible to patients and the public. The traditional view of patients as passive, compliant recipients of care is no longer seen as the ideal model. With the right information, coupled with the right support, patients can be supported to make informed choices. Resources such as the NJR gives patients quality, evidenced-based information which in turn gives them the confidence to have more informed dialogues with their health care team.

When I first joined the NJR, we could only report on revision outcomes. However significant progress has now been made in a number of areas, not least with the NJR's involvement in the extension to the Patient Reported Outcome Measures (PROMs) study in England. The capacity to collect follow-up data at 12 months provides us with a significant opportunity to develop a greater understanding of joint replacement surgery and will considerably help improve patient care in the future. It is our intention to follow up the same patients at three- and five-year intervals, creating rich intelligence that will help inform surgical practice as well as contribute to patient choice.

March 2011 saw the registry pass the one million procedures mark, which was certainly a cause to celebrate. Equally, April 2010 saw the expansion of the NJR to include ankle joints and it is our future aim to commence data collection for elbow and shoulder joints. Increasing the scope of the NJR will enable us to benefit more patients.

What for you are the main patient-related challenges the NJR still faces? How do you think those might be surmounted?

Whilst we have seen patient consent rise from 81% in 2006/07 to nearly 89% in 2010/11 I still feel there is work to be done to raise awareness of the importance of all patients fully agreeing to include their data on the NJR.

By patients giving full consent, the NJR is able to link all joint replacement operations to a single patient, thus allowing us to report how well an implant or surgeon is performing. Without a high level of consent there is an increased risk of not identifying problems at an early stage and not being able to take appropriate action. The wider communications plans we have for the NJR, coupled with more focused patient engagement should help raise awareness of the NJR and hopefully in turn see an increase in patient consent. I would love to see us reach a stage where all patients actively ask to sign an NJR consent form. The primary aim of the NJR is to improve patient care and that can only happen if we have robust, accurate and timely data.

Linked with the above, it is vital that all hospitals submit data to the NJR in a timely fashion. Since I’ve joined the NJR compliance has been variable between hospitals, although taken overall we have seen an increase.

Since 1 April 2011, NHS providers in England and Wales are now expected to record all hip, knee and ankle replacement operations on the NJR, which should mean more accurate data submissions. Patients are able to see how many procedures are submitted each month on the NJR website and can request a copy of the data held for their hip, knee or ankle procedure on the NJR database by completing a Patient Data Request Form. This should hopefully encourage patients to be proactive in ensuring their data is submitted.

As the Steering Committee's work has grown I’ve found it quite challenging being the only patient representative, but I am extremely pleased that a second representative, Sue Musson, has recently been recruited to the committee.

Talk us through the structure of this guide and how you think patients, carers, the public and others should use it.

This patient guide is a first for the NJR and covers elements which are both informative and relevant for patients and the public, but most importantly is understandable to all. We wanted to ensure this was a document which readers could dip in and out of, and which could also add a greater understanding of joint replacement surgery.
Many patients facing surgery have an array of questions, and if they are anything like me, ones they forget to ask their consultant or at pre-assessment. We’ve therefore included a comprehensive frequently asked questions section (page 10) which explores questions ranging from ‘what healthcare staff will be involved in my treatment?’ to ‘will my implant set off metal detectors at airports?’. We’ve also included questions which relate well to the more clinically-focused information in Part 2 of this document such as ‘what kind of artificial joint will be used?’.

When I was seeking information on my own procedures, one of the things I found especially confusing was the complexity of the language and terminology used. Hence we’ve included a comprehensive Glossary listing the most commonly-used terms and phrases patients, carers and the public will come across. To complement this section we have also included a section on further contacts and some useful links.

Part 2, clinical activity, explains the different operation types, how many there were during the period covered in the report, where they took place and information on patient features such as age, gender and physical condition.

Part 3, implant survivorship, is explained in terms of the types of implant (prosthesis) and how long the implant survived (including analysis of patient characteristics, when and why devices are used, and also revision risks).

Why do you feel the National Joint Registry is important for current and future patients?

I truly feel the NJR is an essential tool that puts the patient at its centre and I hope this guide will prove a vital addition to its progress. Joint replacement procedures are complex and there are many variables. It’s therefore essential patients use NJR information as a tool to aid discussions with their healthcare team.

The NJR highlights innovation, provides clinical results and gives patients facing joint replacements confidence for future outcomes. By all stakeholders working together the NJR will help improve the quality of care for people like myself and the thousands of others who will need a joint replacement in the future.
Section 1.4
Frequently Asked Questions for joint replacement surgery

1. What is a joint replacement?
A joint replacement, often referred to as a prosthesis (and sometimes simply as a ‘device’), is, in basic terms, an artificial device that replaces a body joint, such as hip, knee or ankle (or an individual part of a joint) that is defective.

Joint replacements are nearly always carried out because of pain that cannot be controlled by other methods such as painkillers, physiotherapy or other surgery. The most common form of pain is osteoarthritis.

2. What healthcare staff will be involved with my treatment?
Once it has been suggested to you (commonly by your GP) that a joint replacement may be advisable, they may well refer you to a muscular skeletal clinic (MSC) or another GP with a speciality in the area for further assessment. If you are then referred to hospital you will see an orthopaedic surgeon. This may be followed by a pre-surgery assessment clinic where you may be seen by nurse practitioners.

3. Do I have to have a joint replacement? Can I get a second opinion? What are the alternatives to surgery?
No: the final decision remains with the patient, based on the risks and benefits of having a joint replacement or choosing not to (these choices should be made clear to you). It may be that other options are available including, but not limited to, medication, physiotherapy, weight loss or other lifestyle changes. Regarding second opinions, meetings such as those outlined in point 2 (MSC referrals, hospital-based assessments) are designed to further analyse your GP’s initial diagnosis. If you are unsatisfied having met with your surgeon, you can return to your GP and ask to see a different surgeon.

4. What are the risks involved with having a joint replacement procedure?
The overall risk involved in joint replacement is very low. With any surgical procedure there is a small risk of medical complications such as heart attack, stroke and thrombosis. Infection is rare; rates are normally lower than 1%. Other surgical problems are also rare, but include dislocation, fracture, unequal length, pain and stiffness. Your surgeon will go through all of the risks before you sign a surgery consent form.

With time, some implants wear out or work loose, and occasionally break, leading to the need for further replacement (revision) surgery. Some devices do fail more quickly or more frequently than others. Analysis of the performance of devices over time is included in the main NJR Annual Report (available free online) and in part 3 of this report; this includes results for different demographic groups.

5. What kind of prosthesis (artificial joint) will be used? Do I have a choice?
There are several types of prosthesis largely described by how they are constructed and the materials that make up their major components (for example, metal-on-polyethylene, metal-on-metal, ceramic-on-polyethylene, ceramic-on-ceramic). As part of your assessments, the most suitable device for your individual situation will be established and you are able to discuss this with your surgeon. The most regularly used devices and options are outlined in the guide (see the Glossary pages to begin with) and in greater detail in the NJR Annual Report.
6. How can I find out how many joint replacement procedures my local hospital carries out and the results of those operations? My local hospital seems to have high rates for procedures such as revisions, should I be concerned?

Your GP and/or your clinical team should be able to provide information as to the numbers and results of procedures carried out locally. Statistics such as the numbers of revisions carried out should not be taken as a guide as to the standards of a hospital or Trust. The fact that your local organisation carries out significant numbers of revisions could be attributable to a number of reasons, including that it could be a specialist centre in performing such surgery. If you have any doubts or questions though, do speak with your GP, your clinical team or one of the patient groups highlighted in the ‘Useful contacts and links’ area of this guide, such as Arthritis Care.

7. Can I choose which hospital and surgeon perform the operation?

Technically, yes - as part of the NHS Choices initiative, patients do have that option in England (options may be more limited elsewhere). Of course each individual case is unique, and the reasons for requesting a specific hospital do need to be justified, as do any costs and other implications associated with a request to be treated at a non-local hospital for instance. There may also be disadvantages in being a long distance from the hospital where your operation took place. You can discuss this in greater detail with your GP.

8. How do I find out how much experience my surgeon has?

This information is not in the public domain, so the simplest solution is to talk to your surgeon about their experience. Length of service or numbers of procedures carried out are not necessarily indicative of the standard of care you are likely to receive of course, but it is worth talking to your surgeon about your needs.

9. What kind of anaesthetic is available and do I have a choice?

You might have a general anaesthetic or a spinal anaesthetic (injection in the spine) or a combination of both. It is not always mentioned when you first meet your surgeon so if it matters to you, it is worth asking and discussing with the anaesthetist.

10. What improvements to my movement can I realistically expect?

In the majority of cases, movement will be improved following surgery however, not to the full range of movement before the joint became diseased.

It must be remembered that your operation is not being carried out specifically to increase movement and improvements cannot be guaranteed. Pain is the main indication for a joint replacement.

11. How long will I have to wait for my operation? What happens in the meantime and how should I prepare for surgery?

The target time is for patients to be seen within 18 weeks (England) or 26 weeks (Wales) of being referred by their GP, and you should discuss your likely wait time with them. Your GP will also be able to consider your individual situation and advise on preparation for surgery.
12. How long will the surgery itself take, how long will I be in hospital for and what aftercare will I need?

Again, each case is unique, but primary surgery (the first time a device is fitted) in general takes around 60 to 90 minutes. Your stay in hospital could be as short as two or three days, but decisions will be made according to your individual situation and needs. Overall recovery takes around 6-12 weeks for the most part although it can be a year or more before the full benefit is realised. While in hospital, it is preferable that you meet with an occupational therapist (often referred to as an OT) before your operation who can advise on aftercare in the first instance and what support may be available from your local authority or provider. Support from friends or family will also be important during this time.

13. For how long will the hospital provide aftercare, and will I need to have follow-up appointments?

You will definitely return to hospital for assessment at least once post-operation but again, further contact will depend on your specific situation.

14. What is the recommended post-operative care for the incision site? What do I need to do to maintain my joint?

Your clinical team as well as your GP will be able to advise you on caring for your incision site including how to keep the area clean and how to aid the healing in general. Similarly on caring for your joint, whether it be day-to-day activities or specific exercises.

After returning home, if there are any problems, your surgeon will expect you to contact the hospital where your operation took place.

15. When can I resume regular activity following surgery?

Again, the specific answer to this will be unique to you. But, on a general level, most patients are able to drive after six weeks of their operation and those in sedentary jobs can often return to work in the same timeframe. Discuss with your surgeon and GP regarding sports and other high-impact activities.
16. Does the joint replacement implant set off metal detectors at airports?

Patients with one joint replacement can set off metal detectors, those with more than one often do. It may suit you to mention this to security staff before you go through the detectors.

17. I find some of the language and terminology regarding joint replacement confusing. Is there somewhere that lists and explains the most commonly-used words and phrases?

Yes - this guide has been designed to help patients understand joint replacement procedures, the relevant aspects connected with them and the language that is used to describe them. In particular, consult the Glossary on page 16 and also refer to ‘Useful contacts and links’ on page 21.

18. Where can I get in touch with someone who has had the same procedure?

This may be possible via your clinical team or GP, but a great way to contact others is through online resources, such as the Arthritis Care’s discussion forum (see ‘Useful links’ for details).

19. Can I contribute to the National Joint Registry? How does the NJR help me and inform future joint replacement surgery?

Your hospital should ask you to consent to your details being entered into NJR, and we recommend that you do. Please ask for the NJR consent form if it is not offered to you.

The registry now contains over one million hip, knee and ankle joint replacement procedure details (the largest of its kind in the world) meaning it provides a unique source of information, the analysis of which ultimately means better care for you and other patients. Recording your procedure on the NJR can also speed up the process of reviewing patients in the rare event that a problem is found with a particular type of prosthesis.
Section 1.5
What we’ve achieved and where we’re going: performance against key indicators and Strategic Plan

Within the NJR there are three key performance indicators that are used to measure the completeness and quality of the data: these are compliance, consent and linkability.

• Compliance – the number of records of joint replacements held on the NJR against the total number of joints bought in England and Wales. The NJR have a target for 95% compliance. Since the beginning of the NJR, compliance has been growing steadily and is now 103.4%.

• Consent – the number of records on the NJR with patient consent to use their personal details. With patient consent, a record of each joint replacement can be linked and that will help to measure how well the implant performs. The NJR target is a 90% patient consent rate. The consent rate for 2010 was 88.6%.

• Linkability – the number of patients on the NJR whose operation can be linked to other operations they may have had. To do this the patient will need to have given consent and the record will need to include the NHS number. The NJR target is 95% linkability. In 2010 the NJR almost met that target with a rate of 94.7%.

Summarising 2009/11 and looking to the future: the Strategic Plan for the NJR

Elaine Young is the NJR Lead at the Healthcare Quality Improvement Partnership (HQIP), the organisation that manages the NJR on behalf of the Department of Health. Here Elaine summarises what has been a landmark year for the registry and outlines the NJR’s vision for the future.

Let me begin by welcoming you to this, the NJR’s first Public & Patient Guide to the Annual Report. Everything we do and aim for with the registry ultimately has one goal: better patient care. A hugely significant part of that is empowering patients, carers and the wider public; communicating clearly and concisely is fundamental to achieving that empowerment and I am certain this guide will take us a long way in this mission.

In that spirit then, I have summarised NJR recent activity and future plans in bullet form below. The NJR has currently been reviewing its Strategic Plan for the next two years (2011/13) which will build on the significant work which has already been undertaken since 2009. Some of the key achievements for the registry during 2010/11 have been:

1. Awarding three major NJR contracts to support the work of the registry, these being with Northgate Information Solutions Ltd for data management, University of Bristol for the provision of statistical support and data analysis and HQIP for all aspects of marketing and communications.

2. Recording one million records on the NJR database, making the NJR the largest database of its kind in the world.

3. Continuing to improve rates of compliance, linkability and consent, which are vital components to ensure the quality of the data held in the NJR.

4. Continuing to work on surgeon and implant performance monitoring.

5. Incorporating ankle joint replacement data collection.

6. Implementing the NJR Supplier Feedback system to support the post-market surveillance of implants for quality and performance by implant suppliers.

7. Implementing the pioneering NJR Patient Related Outcome Measures (PROMs) study to follow up on patient input at one year after joint replacement surgery.

8. Launching the NJR research strategy, including two research fellowships and a new dedicated research website.

In terms of future strategy and objectives, the NJR has an exciting and ambitious agenda ahead. With one million records on the database, the registry is now mature, and so offers more options and opportunities for supporting its stakeholders. In addition, the NJR is now mandatory in England, meaning all relevant English NHS organisations must ask patients if they would consent to having details of their operation recorded on the registry and must submit any resulting data. In turn, this means that the quality of the NJR information will now be even more representative and even more useful. These two factors of mandation and compliance will now further assist the NJR to actively deliver its primary aim: the continuous improvement of patient outcomes.

Within this context, looking ahead, the main focus of NJR work will be around the following areas:

A compliance rate of over 100% indicates that more joints have been bought and not yet used than operations entered into the registry. This often occurs when hospitals bulk buy implants for economic reasons.

1
1. Continued improvement of data quality: more information from more patients
   This will continue to be a primary objective which will include a planned programme of data validation audits, and ensuring that the application of NJR statistical methods are adequately adjusted for case mix (case mix refers to the type or mix of patients treated by a hospital or unit).

2. Review of organisational arrangements and structure
   To ensure that the NJR management framework continues to support development.

3. Data access: making the right information easily available, keeping information secure
   To ensure that the NJR has adequate systems of information governance and processes in place to manage access to NJR data.

4. Transparency and outcomes: ensuring openness in reporting what happens to joint patients in hospitals
   To support the central agenda for greater transparency and reporting of outcomes.

5. Continued support and development of the NJR research capability
   To build on the existing research framework and promote the NJR in supporting the wider orthopaedic research and study agenda, including the development of NJR specialist outcome assessment studies. The NJR is unique in terms of size and contains a wealth of detailed information. Simply put, more research means more insight into healthcare techniques and patients’ experiences and therefore, better care for patients.

6. Continued programme of NJR PROMs (Patient Reported Outcome Measures)
   PROMs is where patients are invited to fill in questionnaires about their health and quality of life before they have an operation, and about their health and the effectiveness of the operation after it. The idea is that this will help the NHS measure and improve the quality of its care. The NJR is working to extend the national PROMs work through the Department of Health (in England) to survey patient input at three-and-five years after joint replacement surgery.

7. International collaboration: sharing knowledge and learning from others’ experiences
   The NJR is to pursue a programme of greater international collaboration with worldwide registries to both share the work of the NJR and benefit from the work of other registries.

8. Extension of the NJR beyond England and Wales: providing an even more complete set of information
   To explore the possible inclusion of other geographical areas to the registry with an initial focus on Northern Ireland and the Republic of Ireland.

9. Extension of the NJR to incorporate additional joints
   The NJR is looking to match its achievements for hip, knee and ankle patients by adding data collection for elbow and shoulder joint replacements.

10. Development of stakeholder guidance and improved communication: the right information for the right groups delivered in the right way
    The NJR has developed a clear strategy to promote communication between and engagement with the NJR and its stakeholders.

11. Launch of a ‘Hospital Management Feedback’ system
    This will provide information directly to senior hospital management to support effective local clinical governance.
### Section 1.6

**Glossary**

The information in this glossary will hopefully help readers in understanding some of the technical data and terms that are described in Part 2 and 3.

<table>
<thead>
<tr>
<th>A</th>
<th>Acetabular component</th>
<th>The portion of a total hip replacement prosthesis that is inserted into the acetabulum – the socket part of a ball and socket joint.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Articular surface</td>
<td>The cartilage lining on the end of a bone which moves against a similar surface on the adjacent bone to form a joint. In artificial joints these are replaced with different combinations of metal, plastic and ceramic.</td>
</tr>
<tr>
<td>A</td>
<td>Arthroplasty</td>
<td>A procedure where a natural joint is reconstructed with an artificial prosthesis.</td>
</tr>
<tr>
<td>A</td>
<td>ABHI</td>
<td>Association of British Healthcare Industries. Industry association for the medical technology sector in the UK. Most manufacturers of joint implants are part of this association.</td>
</tr>
<tr>
<td>A</td>
<td>ASA grades</td>
<td>American Society of Anaesthesiology 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.</td>
</tr>
<tr>
<td>B</td>
<td>Bearings</td>
<td>The two surfaces that articulate together in a joint replacement. Options include metal-on-polyethylene, metal-on-metal, ceramic-on-polyethylene and ceramic-on-ceramic.</td>
</tr>
<tr>
<td>B</td>
<td>Bilateral operation</td>
<td>Operation performed on both sides, e.g. left and right knee procedures carried out during a single operation.</td>
</tr>
<tr>
<td>B</td>
<td>BMI</td>
<td>Body Mass Index. 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 (m²).</td>
</tr>
<tr>
<td>B</td>
<td>BOA</td>
<td>British Orthopaedic Association.</td>
</tr>
<tr>
<td>B</td>
<td>Brand (of prosthesis)</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>CQC</td>
<td>Care Quality Commission. This organisation regulates the care provided by the NHS, private and voluntary organisations.</td>
</tr>
<tr>
<td>C</td>
<td>Cement</td>
<td>The material used to fix cemented joint replacements to bone.</td>
</tr>
<tr>
<td>C</td>
<td>Cemented</td>
<td>Prostheses designed to be fixed into the bone using cement.</td>
</tr>
<tr>
<td>C</td>
<td>Cementless</td>
<td>Prostheses designed to be fixed into the bone in the long term by the patient’s own bone growing into or onto the implant. Introduced with the theory that this bond could be more durable than with cement.</td>
</tr>
<tr>
<td>C</td>
<td>Chromium ions</td>
<td>See metal ions.</td>
</tr>
<tr>
<td>C</td>
<td>Cobalt</td>
<td>See metal ions.</td>
</tr>
<tr>
<td>C</td>
<td>Compliance</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>Component</td>
<td>A part or section of the implant used in the joint replacement.</td>
</tr>
<tr>
<td>C</td>
<td>Constrained condylar implant (Knee)</td>
<td>The tibial and femoral parts of the implant are attached to each other with a hinge-like joint.</td>
</tr>
<tr>
<td>C</td>
<td>Cup (hip)</td>
<td>The artificial part replacement for the hip socket. See acetabular component.</td>
</tr>
</tbody>
</table>
### Data collection periods for annual report analysis

- **The NJR Annual Report Part 1** is about data collected between 1 April 2010 and 31 March 2011 – the 2010/11 financial year. The NJR Annual Report Part 2 analyses data on hip and knee procedures undertaken between 1 January and 31 December 2010 inclusive – the 2010 calendar year. The NJR Annual Report Part 3 is about hip and knee joint replacement revision rates for procedures that took place between 1 April 2003 and 31 December 2010.

### DH

- **Department of Health.**

### Excision arthroplasty

- A procedure where the surface ends of the bones are simply cut out so that a gap is created between them or when a joint replacement is removed and not replaced by another prosthesis.

### Femoral

- Relating to the femur (thigh bone).

### 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

- The top spherical section of the artificial hip replacement.

### Femoral prosthesis

- See femoral component.

### 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. Data on the types of cases, procedures, length of stay and other hospital statistics collected routinely by NHS hospitals in England.

### Hybrid procedure

- Joint replacement procedure in which cement is used to fix one prosthetic component while the other is cementless. For hip procedures, the term hybrid covers both reverse hybrid (cementless stem, cemented socket) and hybrid (cemented stem, cementless socket).

### HQIP

- Health Quality Improvement Partnership.

### Independent hospital

- A hospital managed by a commercial company that predominantly treats privately funded patients but does also treat NHS funded patients.

### Indication (for surgery)

- The reason for surgery i.e. osteoarthritis or pain. The NJR system allows for more than one indication to be recorded.

### ISTC

- Independent Sector Treatment Centre.

### Levy

- Additional payment placed on the sales of specific hip and knee implants to cover the costs associated with ongoing operation and development of the NJR.

### Linkable percentage

- Linkable percentage is the percentage of all relevant procedures that have been entered into the NJR, which may be linked via a 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.

### LHMoM

- Large head metal-on-metal. Large femoral head normally used with a resurfacing cup.

### Lysis

- An area of bone around a joint replacement that has been destroyed. These areas tend to develop in response to failure of the joint replacement.
### M

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malalignment</td>
<td>The incorrect alignment of joint replacement components.</td>
</tr>
<tr>
<td>Metal ions (Chromium and Cobalt)</td>
<td>Particles of metal from worn joint replacements that can be detected in the bloodstream. Elevated levels can be an early indication of a failing metal-on-metal joint replacement.</td>
</tr>
<tr>
<td>MHRA</td>
<td>Medicines and Healthcare products Regulatory Agency. This Government agency monitors medicines and medical devices work and are acceptably safe.</td>
</tr>
<tr>
<td>Minimally invasive surgery</td>
<td>Surgery performed using small incisions (usually less than 8cm). This may require the use of special instruments.</td>
</tr>
<tr>
<td>Mixing and matching</td>
<td>Also known as 'cross breeding'. Hip replacement procedure in which a surgeon chooses to implant a femoral implant part from one manufacturer with an acetabular implant part from another.</td>
</tr>
<tr>
<td>Modular</td>
<td>An implant part composed of more than one piece.</td>
</tr>
<tr>
<td>MoM</td>
<td>Metal-on-metal. A bearing surface in which both articulating surfaces are made of metal, usually cobalt-chrome alloy.</td>
</tr>
</tbody>
</table>

### N

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Voices</td>
<td>A coalition of health and social care organisations advocating on behalf of those using health and social care services.</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service.</td>
</tr>
<tr>
<td>NICE</td>
<td>National Institute for Health and Clinical Excellence.</td>
</tr>
<tr>
<td>NJR</td>
<td>National Joint Registry for England and Wales. Since 1 April 2003, the NJR has collected and analysed data on hip and knee replacements.</td>
</tr>
<tr>
<td>NJR Centre</td>
<td>National co-ordinating centre for the NJR.</td>
</tr>
</tbody>
</table>

### O

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthritis</td>
<td>The most common form of arthritis leading to the need for a joint replacement.</td>
</tr>
</tbody>
</table>

### P

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patella resurfacing</td>
<td>Replacement of the surface of the patella (knee cap) with prosthesis.</td>
</tr>
<tr>
<td>Patello-femoral knee</td>
<td>Procedure involving replacement of the trochlear (part of the knee where the kneecap and the thighbone meet) and replacement resurfacing of the patella.</td>
</tr>
<tr>
<td>Patello-femoral prosthesis</td>
<td>Two-piece knee prosthesis that provides a prosthetic (knee) articulation surface between the patella and femoral condyles.</td>
</tr>
<tr>
<td>Patient consent</td>
<td>Where a patient consents to provide data onto the NJR.</td>
</tr>
<tr>
<td>Patient procedure</td>
<td>Type of procedure carried out on a patient, e.g. primary total prosthetic replacement using cement.</td>
</tr>
<tr>
<td>PEDW</td>
<td>Patient Episode Database Wales, the Welsh equivalent to Hospital Episode Statistics (HES) in England.</td>
</tr>
<tr>
<td>Primary hip/knee/ankle replacement</td>
<td>The first time a total joint replacement operation is performed on any individual joint in a patient.</td>
</tr>
<tr>
<td>Prosthesis</td>
<td>Orthopaedic implant used in joint replacement procedures, e.g. a total hip or a unicondylar knee.</td>
</tr>
<tr>
<td>PROMs</td>
<td>Patient Reported Outcome Measures.</td>
</tr>
</tbody>
</table>

### R

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resurfacing (hip)</td>
<td>A type of hip replacement in which the covering of the femoral head and socket are resurfaced, with metal implants.</td>
</tr>
<tr>
<td>Revision hip/knee replacement</td>
<td>Operation performed to remove and replace one or more components of a total joint prosthesis for whatever reason.</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Survivorship analysis</td>
<td>A statistical method that is used to determine what fraction of a population, such as those who have had a particular hip implant, has survived unrevised past a certain time.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>T</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TAR (ankle)</td>
<td>Total ankle replacement (total ankle arthroplasty). Replacement of both tibial and talar surfaces, with or without cement.</td>
</tr>
<tr>
<td>Tibial</td>
<td>Relating to the tibia (shin bone).</td>
</tr>
<tr>
<td>Tibial component (knee)</td>
<td>Portion of a knee prosthesis that is used to replace the surface of the joint where the ends of the bone meet the tibia (shin bone) and the knee joint.</td>
</tr>
<tr>
<td>Tibial component (ankle)</td>
<td>Portion of an ankle prosthesis that is used to replace the surface of the joint where the ends of the bone meet the tibia (shin bone) at the ankle joint.</td>
</tr>
<tr>
<td>THR</td>
<td>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.</td>
</tr>
<tr>
<td>Thromboprophylaxis</td>
<td>Chemical or mechanical post-operative regime prescribed to patients with the aim of preventing blood clot formation in the post-operative period.</td>
</tr>
<tr>
<td>TKR (knee)</td>
<td>Total knee replacement (total knee arthroplasty). Replacement of both tibial and femoral condyles, with or without resurfacing of the patella and with or without cement.</td>
</tr>
<tr>
<td>Total condylar knee</td>
<td>Type of knee prosthesis that replaces the complete contact area between the femur and the tibia of a patient's knee.</td>
</tr>
<tr>
<td>Treatment centre</td>
<td>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 (NHS treatment centre) or privately funded (independent sector treatment centre – ISTC).</td>
</tr>
<tr>
<td>Type (of prosthesis)</td>
<td>Type of prosthesis is the generic description of a prosthesis, e.g. modular cemented stem (hip), patello-femoral joint (knee).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>U</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncemented</td>
<td>See cementless.</td>
</tr>
<tr>
<td>Unconstrained implant</td>
<td>The knee replacement implant that is attached allows the large ligament in the knee (the one that enables it to roll back) to be retained to give the knee extra support.</td>
</tr>
<tr>
<td>Unicondylar arthroplasty (knee)</td>
<td>Replacement of one tibial condyle and one femoral condyle in the knee.</td>
</tr>
<tr>
<td>Unicondylar knee replacement</td>
<td>See unicondylar arthroplasty.</td>
</tr>
<tr>
<td>Unilateral operation</td>
<td>Operation performed on one side only, e.g. left hip.</td>
</tr>
</tbody>
</table>
Section 1.7
Contacts and links

Useful contacts and links for joint replacement patients

**Age UK**
http://www.ageuk.org.uk
0800 169 6565

**Agecare**
http://www.agecare.org.uk
01892 611542

**Arthritis Care**
http://www.arthritiscare.org.uk
0808 800 4050

**Arthritis and Musculoskeletal Alliance**
http://www arma.net/
020 7842 0910/11

**Arthritis Research UK**
http://www.arthritisresearchuk.org/
0300 790 0400

**Action Against Medical Accidents**
http://www.avma.org.uk
0845 123 2352

**BackCare**
http://www.backcare.org.uk/
0845 130 2704

**Brittle Bone Society**
http://www.brittlebone.org/
01382 204446

**Care Choices**
http://www.carechoices.co.uk/
01223 207770

**Carers UK**
http://www.carersuk.org
0808 808 7777

**CHARGE Family Support Group**
http://www.chargesyndrome.org.uk/
020 8265 3604

**Community Health Involvement & Empowerment**
Forum http://www.chiefcic.com/
0161 798 7526

**Connect**
http://www.ukconnect.org/
020 7367 0840

**Contact the Elderly**
http://www.contact-the-elderly.org.uk/
0800 716543

**Counsel and Care**
http://www.counselandcare.org.uk/
0845 300 7585

**Disabled Parents Network**
http://www.disabledparentsnetwork.org.uk
0300 3300 639

**Elderly Accommodation Council**
http://www.eac.org.uk/
020 7820 1343

**Equalities National Council**
http://www.encweb.org.uk
020 7474 9812

**Health Advocacy Partnership**
http://www.hapuk.co.uk/
0845 094 9497

**National Joint Registry**
www.njrcentre.org.uk
Healthcare Quality Improvement Partnership
www.hqip.org.uk
020 7469 2522

Health Professions Council
http://www.hpc-uk.org/
020 7582 0866

Health Talk Online
http://www.healthtalkonline.org/
01865 201330

National Association of Patient Participation
http://www.napp.org.uk/
01932 242350

National Joint Registry
http://www.njrcentre.org.uk
0845 345 9991

National Osteoporosis Society
0845 450 0230

National Rheumatoid Arthritis Society
http://www.nras.org.uk/
0800 298 7650

National Voices
http://www.nationalvoices.org.uk/
020 3176 0738

NHS Choices
http://www.nhs.uk
London - 0300 456 2370

Older People’s Advocacy Alliance
http://www.opaal.org.uk/
01782 844036

The Patients Association
http://www.patients-association.com/
0845 608 4455

Patient Concern
http://www.patientconcern.org.uk/
Email only: patientconcern@hotmail.com

The Patients Forum
http://www.patient.co.uk/
Contact via website only

Patient Opinion
http://www.patientopinion.org.uk/
0800 122 3135

RSI Action
http://www.rsiaction.org.uk/
Email only: info@rsiaction.org.uk

RSI Awareness
http://www.rsi.org.uk/
023 8029 4500

Sickle Cell Society
http://www.sicklecellsociety.org/
020 8961 7795

Strongbones Children’s Charitable Trust
http://www.strongbones.org.uk/
01708 750599

www.njrcentre.org.uk
Part 2

Summary of results from the 8th NJR Annual Report (2011): clinical activity

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Section 2.1
Introduction

This part of the Annual Report summarises the data and findings for hip, knee and ankle procedures carried out in England and Wales between 1 January 2010 and 31 December 2010. The first section will look at the clinical activity across all units submitting data to the NJR. To support the understanding of both Parts 2 and 3, a list and explanation of some general orthopaedic terms are provided below:

Hip information

Prosthesis types

Cemented – an implant designed to be fixed into the bone using special cement.

Cementless – an implant designed to be fixed into the bone by bony in-growth or on-growth, without using cement.

Hybrid – a prosthesis where one of its components is fixed with cement and its other is cementless.

Resurfacing – a hip implant that consists of a cap on the upper end of the femur and a metal socket. This implant allows more bone to be preserved as the head of the femur is simply reshaped and resurfaced rather than being removed.

Bearing surfaces

The bearing surface is used to describe the area where the two moving parts of the hip – the ball (femoral head) and hip socket (cup) join together and create the moveable joint.

The original bearing was metal-on-polyethylene, this is where the head of the implanted femur is made of metal and the lining of the cup is made up of polyethylene. This type of bearing surface is seen as durable with a history of success when implanted.

However long-term experience from other registries has shown that the risk of failure in the second decade of implantation was higher for younger patients due to polyethylene wear. Although the polyethylenes used in modern bearings have been improved, some surgeons are using harder bearings which may have lower wear rates in these patients, though this has yet to be proved.

Metal-on-metal – this is when the head of the femur is replaced with a metal ball and the material used to line the hip socket implant is also made of metal. Metal bearings can allow for the use of larger femoral head sizes, generally 36mm or larger which more resemble a natural hip ball and socket (these are often called large head metal-on-metal).

Ceramic-on-polyethylene – ceramic femoral heads are harder than metal and therefore scratch resistant which reduces the wear of the polyethylene cup lining. In the past there have been incidences of head fractures with the original ceramic material but the technology has been much improved.

Ceramic-on-ceramic – these use the same type of tougher improved ceramic for both the head and the cup liner. These bearings are generally used in younger more active hip replacement patients however a risk of squeaking, head or liner fracture remains.
Knee information

Prosthesis types

Cemented – an implant designed to be fixed into the bone using a special cement.

Cementless – an implant designed to be fixed into the bone by bony in-growth or on-growth, without using cement.

Hybrid – a prosthesis where one of its components is fixed with cement and its other is cementless.

Patello-femoral – a two-piece knee implant that provides a join between the patella (knee cap) and the thigh bone (femur).

Unicondylar – an implant is attached to only one part of the shin bone (tibia) and one part of the femur, this is normally described as a partial knee replacement.

Bicondylar – an implant that is attached to both parts of the tibia and femur – often called a total knee replacement. A patella replacement is often used as well.

Implant stability levels

Within knee replacement procedures, different implants offer different types of constraints. The implant constraint is the level of stability that the implant offers and the type the patient is provided with will be dependent on the patient’s needs as determined by their clinician. Below are the types of constraints analysed in the Annual Report.

Unconstrained – the artificial components inserted into the knee are not linked to each other and have no stability built into the system. It relies on the person’s own soft tissues - ligaments and muscles for stability.

Posterior stabilised – this type of artificial knee has some additional stability built into it. In these designs, the cushion of the tibial component has a raised surface with an internal post that fits into a special bar (called a cam) in the femoral component. The posterior cruciate ligament is removed to fit the components to the bone. The pieces work together to do what the posterior cruciate ligament would do: prevent the thighbone from sliding forward too far on the shinbone when the knee is bent.

Constrained condylar – the tibial and femoral components are attached with a hinge mechanism. This type of knee replacement is used when the patient’s knee is highly unstable and the soft tissues and ligaments would not be able to support the other type of knee replacements. It is useful in the treatment of severely damaged knees particularly in very elderly people undergoing a revision replacement procedure. The disadvantage of this type of knee joint is that it is not expected to last as long as the other types.

Bearing surfaces

When the knee joint is replaced the ends of the bones that link the knee together are replaced with metal ends and an insert is placed in between them. In the Annual Report two types of bearing joints are analysed.

Fixed bearing – the polyethylene of the tibial component is attached firmly to the metal implant beneath. This type of bearing may reduce the level of pain experienced following the procedure however in some cases excessive activity or weight gain can cause a fixed bearing to wear down more quickly.

Mobile bearing – the insert is less fixed and is more moveable and requires support from soft tissues around the joint. This allows it to rotate short distances. This may allow more movement in the knee, greater function of the knee joint and less wear.
Section 2.2
Hip replacement procedures

Operation totals
The full list of tables and figures relating to the operation totals are listed in the full Annual Report. In summary:

- In 2010, 76,759 hip replacement procedures were recorded on the NJR, representing a 6% increase compared with the same reporting period the previous year. Of these, 68,907 were primary hip replacements and 7,852 were revision surgeries, representing a revision ratio of 11%.
- Of the 68,907 primary hip procedures undertaken, 36% were cemented total hip replacements (THRs), 43% were cementless THRs and 14% were hybrids or reverse hybrid THRs. The remaining 2% were large head metal on metal and 3% resurfacing total hip replacements (LHMoM THRs).
- There was a decrease in the volume of resurfacing hip procedures and in procedures where a large head is used with a resurfacing cup between 2009 and 2010.
- The percentage of cementless hip replacements continued to increase in 2010.
- The percentage of primary hip resurfacings undertaken in independent hospitals (5%) is nearly double that of NHS hospitals (3%). At NHS treatment centres, 66% of primary procedure activity relates to cementless hip primary procedures – a greater proportion than at any other type of provider.
- More revisions take place within NHS hospitals. Revision procedures account for a higher percentage of total procedures (84%) than at any other type of provider (10% overall). NHS hospitals perform 84% of all hip revision procedures.

Section 2.3
Patient characteristics

Patient age and gender were included for those patients who gave consent for their data to be entered into the NJR and where consent was ‘not recorded’. Patient characteristics in terms of age and gender distribution have not changed substantially since 2003. In 2010, 66% of patients were 65 years of age and above, 23% between the ages of 55 and 64 and 12% below the age of 55.
This year, the range of ASA gradings, which ranks the physical condition of patients prior to surgery, is similar to last year with 16% being regarded as fit and healthy prior to surgery (17% in 2009). However, there continues to be a decrease in the number of patients regarded as being fit and healthy prior to surgery (ASA grade 1).

From looking at Figure 1 it is clear the average body mass index (BMI) has increased to 28.5, compared with 27.3 in 2004, a healthy BMI is between 19 – 25. It would appear that NHS hospitals are dealing with less fit patients, with 20% being ASA grade 3 or 4, compared with 7% in independent hospitals, 14% in NHS treatment centres and 6% in ISTCs. Data suggests that the average recipient of a hip or knee prosthesis in an NHS hospital has become less fit and more obese during the eight years that the NJR has been recording data.

• Patients’ age and gender significantly influenced how the implant is fixed and type of replacement operation carried out. For example, in male patients under 55 years of age, 22% underwent resurfacing and 11% cemented replacements, compared with male patients over 75 years of age in whom less than 1% were resurfacings and 48% were cemented.
• In female patients less than 55 years of age, 6% underwent resurfacing operations and 15% cemented replacements, compared with female patients over 75 years of age in whom less than 1% were resurfacings and 56% were cemented.
• Patients undergoing a resurfacing procedure were the youngest, at an average age of 54.8 years (Table 1a).
• Four times as many males have a resurfacing procedure compared with females.
• 93% of patients at independent hospitals and ISTCs were graded as fit and healthy or with mild disease according to the ASA system, compared with 80% at NHS units.

### Table 1a. Patient characteristics for primary hip replacement procedures in 2010, according to procedure type.

<table>
<thead>
<tr>
<th></th>
<th>Primary total prosthetic replacement using cement</th>
<th>Primary total prosthetic replacement not using cement</th>
<th>Primary total prosthetic replacement not classified elsewhere (e.g. hybrid)</th>
<th>Primary resurfacing arthroplasty of joint</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Total hip primaries</td>
<td>24,604</td>
<td>36%</td>
<td>30,827</td>
<td>45%</td>
<td>10,964</td>
</tr>
<tr>
<td>Total hip primaries with patient data</td>
<td>23,418</td>
<td>29,082</td>
<td>10,320</td>
<td>2,293</td>
<td>65,113</td>
</tr>
<tr>
<td>Average age</td>
<td>73.00</td>
<td>65.57</td>
<td>69.81</td>
<td>54.84</td>
<td>67.2</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15,395</td>
<td>66%</td>
<td>16,399</td>
<td>56%</td>
<td>6,512</td>
</tr>
<tr>
<td>Male</td>
<td>8,023</td>
<td>34%</td>
<td>12,683</td>
<td>44%</td>
<td>3,808</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>28.21</td>
<td>28.82</td>
<td>28.42</td>
<td>28.42</td>
<td>28.51</td>
</tr>
<tr>
<td>Indications for surgery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>22,956</td>
<td>93%</td>
<td>28,822</td>
<td>93%</td>
<td>9,874</td>
</tr>
<tr>
<td>Avascular necrosis</td>
<td>447</td>
<td>2%</td>
<td>810</td>
<td>3%</td>
<td>328</td>
</tr>
<tr>
<td>Fractured neck of femur</td>
<td>549</td>
<td>2%</td>
<td>438</td>
<td>1%</td>
<td>377</td>
</tr>
<tr>
<td>Other</td>
<td>396</td>
<td>2%</td>
<td>443</td>
<td>1%</td>
<td>205</td>
</tr>
</tbody>
</table>

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National Joint Registry

PPG NJR 5/06/11.indd 27
07/12/2011 11:57
Section 2.4
Hip revision procedures 2010

Patients undergoing a hip replacement procedure may have to have the joint replacement revised after a period of time. A total of 7,852 hip revision procedures were reported, an increase of 649 compared with 2009. The main reason for revision was aseptic loosening (50%), followed by pain (27%) and dislocation (17%). The full table for patient characteristics for hip revision procedures can be found in the main report.

Section 2.5
Thromboprophylaxis

Thromboprophylaxis is the name for the treatment given in order to prevent blood clots following a joint replacement operation. The type of treatment offered to patients will depend on their risk factors. This will include whether a patient has previous experience of a blood clot.

There are two main types of thromboprophylaxis – chemical and mechanical.

A large majority of patients will receive one or more of the chemical options (e.g. heparin – the most used) together with one or more of the mechanical types (e.g. elasticated stockings – again the most used). The number of procedures for which both chemical and mechanical methods were prescribed rose from 63% in 2007 to 87% in 2010. Please see the main report for more detailed information on thromboprophylaxis regimes for hips and knees.
Section 2.6
Knee replacement procedures

Operation totals

The total number of knee replacement procedures entered into the NJR during 2010 was 81,979, an increase of 5.7% compared with 2009. Of the 81,979 procedures submitted, 76,870 were primary procedures and 5,109 were revision procedures.

As a percentage of their activity, independent hospitals performed more unicondylar knee replacement procedures than any other type of provider and ISTC’s performed more cemented bicondylar knee procedures than any other provider. The revision procedures undertaken at NHS hospitals comprised 83% of all revision procedures performed.

Of the 76,870 primary knee replacements undertaken in 2010, 69,649 (91%) were bicondylar procedures (total knee replacements or TKRs), 6,119 (8%) were unicondylar knee replacements and 1,102 (1%) were patello-femoral replacements. Compared with previous years, these proportions have largely remained the same with 85% of procedures using cement and 5% of procedures being cementless. There is a slight increase in cemented TKR over the past 2 years. The single largest reason recorded for surgery was osteoarthritis, recorded in 97% of all primary procedures.

Section 2.7
Patient characteristics

In 2010/2011 the average age of patients was 67.5 years and 57% were female. Patients undergoing a patello-femoral replacement were the youngest, at an average age of 60.9 years and 72% of these were female. Female patients were, on average, older than male patients for cementless, cemented and hybrid procedures but younger for patello-femoral and unicondylar procedures.

According to the ASA grade system, 12% of patients undergoing a primary knee replacement procedure were graded as fit and healthy.

Since 2003, there has been a 61% reduction in the number of patients assessed using the ASA grade as being fit and healthy at the time of their operation. Figure 2 shows the increase in BMI over the past eight years for patients having primary knee procedures. This figure has increased from 29.2 to 30.6 over the past six years. There has been a steady increase in the number of patients within the BMI range 30 to 39. The average knee replacement patient in 2010, by BMI measurement, was clinically obese.
Table 1b. Age and gender for primary knee replacement patients in 2010.

<table>
<thead>
<tr>
<th>Age group by gender</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;45 years</td>
<td>250</td>
<td>181</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>45 - 54 years</td>
<td>1,867</td>
<td>1,356</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>55 - 64 years</td>
<td>8,088</td>
<td>6,446</td>
<td>23%</td>
<td>24%</td>
</tr>
<tr>
<td>65 - 74 years</td>
<td>13,347</td>
<td>10,407</td>
<td>37%</td>
<td>40%</td>
</tr>
<tr>
<td>75 - 84 years</td>
<td>10,486</td>
<td>6,989</td>
<td>29%</td>
<td>27%</td>
</tr>
<tr>
<td>&gt; 85 years</td>
<td>1,717</td>
<td>956</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Average age by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>Total No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>35,755</td>
<td>86%</td>
<td>1,913</td>
<td>5%</td>
<td>329</td>
<td>1%</td>
<td>745</td>
<td>2%</td>
<td>2,675</td>
<td>6%</td>
<td>41,417</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26,335</td>
<td>83%</td>
<td>1,714</td>
<td>5%</td>
<td>269</td>
<td>&lt;1%</td>
<td>283</td>
<td>&lt;1%</td>
<td>3,027</td>
<td>10%</td>
<td>31,628</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2
BMI for primary knee replacement patients between 2004 and 2010
Section 2.8
Knee revision procedures 2010

A total of 5,082 knee revision procedures were reported, an increase of 11% on 2009. Compared with previous years, there has been no change in the types of revision procedures carried out. The average age that a knee revision took place was 69 and 52% of all knee revisions were on female patients. The main reasons that knee revisions took place were aseptic loosening (33%), infection (23%) and pain (17%). A full breakdown of patient characteristics for revision surgery can be found in the main Annual Report.

Section 2.9
Ankle replacement procedures 2010

Operation totals

The NJR started recording primary and revision total ankle replacements on 1 April 2010.

358 ankle replacements, comprising 334 primary and 24 revision procedures carried out between 1 April and 31 December 2010, were submitted to the NJR by 28 February 2011. Due to the small numbers the information on these procedures are summarised with more data available in the main Annual Report.

Of the 334 primary procedures, 265 (79%) were performed in the NHS sector, 53 (16%) in the Independent Sector and 16 (5%) in ISTCs. 98% of the primary procedures performed were cementless and the remaining were cemented procedures. Of all the ankle procedures carried out 88% were funded by the NHS. 85% of patients were classified as P1 – fit and healthy (15%) or P2 – had mild disease not incapacitating (70%).

Section 2.10
Patient characteristics

The average age of patients having a primary procedure is 66.8 years and 56% of patients undergoing an ankle replacement were male. The BMI average is 29.9. No procedures where both ankles were replaced at the same time were submitted to the NJR and 53% of procedures were performed on the right ankle. 79% of patients have their procedure performed due to osteoarthritis. The average age for female patients (65.3 years) is less than for male patients (68.2 years).

Section 2.11
Ankle revision procedures 2010

The average age for a patient having a revision procedure is 63.7 years which is 3.1 years less than the average age for patients having a primary procedure. 17% of patients were fit and healthy and 52% of patients are male. Right foot revisions account for 71% of the recorded revisions. The main reasons for ankle revision surgery were aseptic loosening (tibial) (29%), infection low suspicion, lysis tibia and malalignment which were all at 25%.
Part 3

Summary of the results from the 8th NJR Annual Report: implant survivorship

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Section 3.1
What is implant survivorship?

In general terms, implant survivorship measures how long on average the primary implant lasts until it needs to be revised due to a loss of function e.g. pain, dislocation, wear etc. At the NJR, survivorship is analysed taking into consideration many variables including the patient’s gender, age and the make-up of the implant. The analysis for the survivorship of implants in Part 3 is taken from the time the NJR began collecting data in April 2003 until December 2010. To support your understanding of this section it may be useful to refer to the glossary in Part 1 and the general orthopaedic terms listed in Part 2.

A full and detailed analysis can be found in the main NJR Annual Report, including a breakdown of survivorship by different brands of prosthesis. This is available free online at www.njrcentre.org.uk.

Section 3.2
What data is used to measure survivorship?

Along with the data stored in the NJR, the Hospital Episodes Statistics database (HES) and the Patient Episode Database for Wales (PEDW) are linked with the NJR database to help measure survivorship. HES and PEDW data is routinely collected by the Department of Health to monitor hospital activity in the NHS.

Section 3.3
About Part 3 data

The data in Part 3 reflects main estimates based on confidence intervals. It is common practice in statistics to estimate a 95% confidence interval for a result. This is because there is always a degree of uncertainty around any measurement as the results could vary if they were calculated on a different sample of patients or on a different day. The 95% confidence interval means that 95% of similar samples over a similar time period should produce a result that lies within the 95% confidence interval. Where confidence intervals for two results overlap, generally the difference is not statistically significant and so could be a chance finding. The 95% confidence intervals for these results are reported in the full NJR Annual Report but have been omitted here for simplicity. Therefore, it is important to remember that very small differences between groups shown here may not reflect statistically significant differences.

Table 3a. Estimated revision rates following primary hip replacement, by prosthesis type 2003-2010.

<table>
<thead>
<tr>
<th>Prosthesis type</th>
<th>30 days</th>
<th>90 days</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Total procedures analysed</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemented</td>
<td>0.18%</td>
<td>0.34%</td>
<td>0.67%</td>
<td>1.07%</td>
<td>1.48%</td>
<td>1.84%</td>
<td>2.23%</td>
<td>2.64%</td>
<td>3.08%</td>
<td>132,511</td>
<td>(44.1%)</td>
</tr>
<tr>
<td>Uncemented</td>
<td>0.50%</td>
<td>0.78%</td>
<td>1.37%</td>
<td>2.20%</td>
<td>3.02%</td>
<td>3.70%</td>
<td>4.44%</td>
<td>5.07%</td>
<td>5.46%</td>
<td>102,688</td>
<td>(34.2%)</td>
</tr>
<tr>
<td>Hybrid</td>
<td>0.36%</td>
<td>0.56%</td>
<td>1.03%</td>
<td>1.48%</td>
<td>1.93%</td>
<td>2.34%</td>
<td>2.92%</td>
<td>3.64%</td>
<td>4.36%</td>
<td>43,933</td>
<td>(14.6%)</td>
</tr>
<tr>
<td>Resurfacing</td>
<td>0.45%</td>
<td>1.13%</td>
<td>2.17%</td>
<td>3.55%</td>
<td>5.01%</td>
<td>6.74%</td>
<td>8.48%</td>
<td>9.88%</td>
<td>11.81%</td>
<td>21,242</td>
<td>(7.1%)</td>
</tr>
<tr>
<td>All</td>
<td>0.34%</td>
<td>0.58%</td>
<td>1.07%</td>
<td>1.69%</td>
<td>2.32%</td>
<td>2.89%</td>
<td>3.50%</td>
<td>4.07%</td>
<td>4.65%</td>
<td>300,374</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

The databases are linked by using patient identifiers such as the patients NHS number or date of birth. This information will only appear for a patient on the NJR database if they have given consent (please see Part 1). If consent is not given it is impossible to link the procedures undertaken by a single patient and again their information will not be used to measure the survivorship of an implant.
Hips

Section 3.4
Outcomes after primary hip replacement, 2003–2010

The analysis examines the number of failures over time for different primary hip replacements.

Section 3.4.1 Outcomes: all cause revision and mortality

This section looks at the data for the first revision a patient has after a primary hip replacement (due to any cause). Analysis in this section is undertaken on the NJR-HES/PEDW linked data without taking the patient’s age, gender or implant brand into account.

Prosthesis type

The Annual Report looks at the risk of needing a joint revised using the 4 main prosthesis types. This is summarised in Table 3a.

- Overall revision rates were relatively low: only around 1.1% of primary hip replacements had been revised after one year (Table 3a). This rises to 2.3% at year three, 3.5% by year five, and 4.7% by year seven.
- In the first year following surgery, the risk of revision in the first 30 or 90 days after the operation was proportionally greater than the rest of the first year for all prosthesis groups. However, overall this remained a small risk.
- There was substantial variation in revision rates according to prosthesis type with the lowest rates associated with cemented prostheses (3.1% at seven years) (Table 3a). In contrast, revision rates for resurfacing procedures were almost four times higher than those for cemented procedures.

Bearing surfaces

There was a very small difference in the risk of needing a revision between the ceramic-on-ceramic, ceramic-on-polyethylene and metal-on-polyethylene bearing surface groups. However, the risk of revision for metal-on-metal and resurfacing prostheses was considerably higher than for other bearing surfaces. Metal-on-metal total hip replacement was close to the revision rate for resurfacing (which also comprises of a metal-on-metal implant) up to six years after surgery. This is because of a sharp increase in the risk of revision at around six years for the metal-on-metal group with large heads and resurfacing cups. These results should be interpreted cautiously at this stage as more data and added years to the NJR may have an impact on results. The details are summarised in Table 3b. If you would like to see more information on metal-on-metal bearing surfaces and related confidence intervals, please see the main NJR report.

Metal-on-metal bearing surfaces

It is important to note that patients with metal-on-metal bearing surfaces comprise a relatively small group of the total hip replacements considered here (7.3%, with resurfacing accounting for 7.1%). However, some studies have raised concerns about metal-on-metal implants in terms of higher revision rates and poorer patient outcomes (related to pain and function) compared with other bearing surfaces. In particular, there are concerns about the possibility of metal debris damage to soft tissue surrounding the joint (metallosis) and the uncertain effects of any release of cobalt and

Table 3b. Estimated revision rates following primary hip replacement, by bearing surface 2003 – 2010.

<table>
<thead>
<tr>
<th>Bearing surface</th>
<th>Ceramic-on-ceramic</th>
<th>Ceramic-on-polyethylene</th>
<th>Other/unknown</th>
<th>Metal-on-polyethylene</th>
<th>Metal-on-metal</th>
<th>Resurfacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 days</td>
<td>0.39%</td>
<td>0.27%</td>
<td>0.51%</td>
<td>0.30%</td>
<td>0.43%</td>
<td>0.45%</td>
</tr>
<tr>
<td>90 days</td>
<td>0.68%</td>
<td>0.45%</td>
<td>0.68%</td>
<td>0.50%</td>
<td>0.67%</td>
<td>1.13%</td>
</tr>
<tr>
<td>Year 1</td>
<td>1.22%</td>
<td>0.88%</td>
<td>1.28%</td>
<td>0.89%</td>
<td>1.29%</td>
<td>2.17%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.89%</td>
<td>1.33%</td>
<td>1.85%</td>
<td>1.35%</td>
<td>2.55%</td>
<td>3.55%</td>
</tr>
<tr>
<td>Year 3</td>
<td>2.35%</td>
<td>1.84%</td>
<td>2.50%</td>
<td>1.79%</td>
<td>4.10%</td>
<td>5.01%</td>
</tr>
<tr>
<td>Year 4</td>
<td>2.78%</td>
<td>2.22%</td>
<td>2.95%</td>
<td>2.17%</td>
<td>5.62%</td>
<td>6.74%</td>
</tr>
<tr>
<td>Year 5</td>
<td>3.37%</td>
<td>2.66%</td>
<td>3.49%</td>
<td>2.59%</td>
<td>7.26%</td>
<td>8.48%</td>
</tr>
<tr>
<td>Year 6</td>
<td>4.06%</td>
<td>3.03%</td>
<td>4.42%</td>
<td>3.02%</td>
<td>9.50%</td>
<td>9.88%</td>
</tr>
<tr>
<td>Year 7</td>
<td>4.33%</td>
<td>3.31%</td>
<td>4.94%</td>
<td>3.44%</td>
<td>13.61%</td>
<td>11.81%</td>
</tr>
<tr>
<td>Total procedures analysed</td>
<td>35,296 (11.7%)</td>
<td>30,795 (10.2%)</td>
<td>11,286 (3.8%)</td>
<td>179,838 (59.9%)</td>
<td>21,917 (7.3%)</td>
<td>21,242 (7.1%)</td>
</tr>
<tr>
<td>Percentage of total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
chromium ions into the patient’s blood. Attention has tended to focus on whether these problems could be associated with the use of large diameter head sizes and on particular designs such as the ASR implants which were voluntarily recalled by the manufacturer DePuy in August 2010.

- The majority of metal-on-metal patients considered here had an uncemented fixation (88.7%) and most had a larger head size (89.7%).
- The ASR results are noticeably worse than other groups by two years post-surgery, but because these cases comprise less than 10% of the total, these results do not markedly distort the overall figures for the metal-on-metal group.
- Revision rates for the small head metal-on-metal group and the large head conventional modular cup group were slightly lower than revision rates for those with a large head resurfacing cup. However, these rates remain higher than those of other bearing surfaces.

Section 3.5
The effects of patient characteristics on revision rates

This analysis takes into account the patients age, gender and implant brand when assessing the revision rates. The results summarised in Table 3c indicate that patients with a cemented prosthesis were more likely to be older, female, and in poorer health than were those in the other groups. Patients in the resurfacing group were notably younger and more commonly male than those in other groups. The use of ceramic-on-ceramic and metal-on-metal bearing surfaces was also associated with younger patients.

Section 3.6
Adjusting the revision rates for the risk of death in patients

This year the NJR, as well as looking at the risk of a patient needing to get an implant revised have also looked at the risk of a patient dying following joint replacement surgery. Because patients tend to be older when their joint replacement procedures take place, it was felt important to look at this risk and distinguish it from the analysis looking at the risk of revision, to give an accurate picture of the likelihood of revision for the different implant types.

Below are the results when the analysis for the risk of revision was adjusted to take account of the competing risk of death. The data looked at patients whose reason for joint replacement was osteoarthritis and is grouped by ASA grade and age. For the tables associated with these results please refer to the main Annual Report.

Results for patients under 60 with ASA grade less than 3 and osteoarthritis 2003–2010

- Revision rates for the cemented and hybrid groups were the lowest and were very similar to each other. This suggests that hybrid fixation is as successful as cemented fixation for patients aged under 60 and that...
either of these techniques results in the lowest revision rates in the first five years after surgery. Uncemented revision rates were slightly higher but the difference was very small.

- Revision rates for the resurfacing and metal-on-metal groups were significantly higher than for other groups
- Revision rates tended to be slightly lower for women than for men in the cemented, uncemented and hybrid groups.
- In contrast, revision rates for women in the resurfacing and metal-on-metal groups were significantly higher than those for men in those groups. Revision rates for metal-on-metal at five years were around twice that of the cemented and hybrid groups for men and over three times as high for women.

Section 3.7
Outcomes: revisions other than for infection

This section moves on to consider revisions other than for infection. This analysis involves a move to using the NJR linked data discussed in Section 3.2 as HES/PEDW data does not provide the reason for a revision. For the tables associated with these results please refer to the main Annual Report.

Results for patients aged 60–69 with ASA grade less than 3 and osteoarthritis 2003–2010

- Revision rates were lowest for the cemented group. Slightly higher for the hybrid group and slightly higher again for uncemented procedures.
- Revision rates for the resurfacing and metal-on-metal groups were significantly higher than for other groups.
- Revision rates for women were significantly higher than those for men in the resurfacing and metal-on-metal groups. Around one in eight women aged 60–69 years with a resurfacing had been revised within five years.
- As seen with the under 60 year olds, revision rates for metal-on-metal procedures at five years were around twice that of the cemented and hybrid groups for men and over three times as high for women.
- As before, revision rates tended to be slightly lower for women than for men in the cemented, uncemented and hybrid groups.

Results for patients aged 70 or over with ASA grade less than 3 and osteoarthritis 2003–2010

- There is a clear differences in revision rates between the cemented group (with the lowest rates) and the hybrid and uncemented for both men and women, suggesting that cemented fixation is the most successful (in terms of revision rates by five years) for older patients.
- As seen before, revision rates for women in the cemented, uncemented and hybrid groups tended to be lower than for men in these groups.
- Resurfacing remained the least successful operation in terms of five-year revision rates, although numbers receiving this type of surgery were small in this age group.
- As seen with the other age groups, revision rates for metal-on-metal at five years were around twice that of the cemented and hybrid groups for men and over three times as high for women.

NJR revision rates excluding those for infection

This section briefly considers revision operations that take place other than for infection. Infection can be an unfortunate result of joint replacement surgery, but does not reflect how well the implant is performing. Removing infection as a reason for revising an implant allows the analysis to concentrate on the implants that have failed. The NJR linked data includes independently funded patients and others that could not be matched to HES/PEDW so it is a larger and more representative dataset.

Infection was the reason for revision for 20.3% of the revised patients considered here. Other reasons for revision included aseptic loosening (26.7%), dislocation/subluxation (22.1%), pain (20.8%), periprosthetic fracture (12.6%), malalignment (10.6%), lysis (4.3%), and failure of the implant or liner (6.6%). These results will not be representative of reasons for all revisions in the longer term. For example, infection is likely to occur in the early years after primary surgery whereas loosening often occurs later. Therefore at this relatively early stage of data collection by the NJR, analysis of all reasons for revision could be affected by the disproportionate number revised for infection.

The proportion of revisions that were due to infection varied by prosthesis group as revisions for infection were more commonly associated with the use of cement. For example, 30.7% of revisions for cemented implants were revised for infection compared with 17.1% of the uncemented group and 23.2% of the hybrid group. The equivalent figure for the resurfacing group was 10.5%.

The type of cement used for these hip replacements was mainly antibiotic-loaded (92.6%) as this has been demonstrated to reduce the incidence of deep infection after joint replacement. It is important to note that having
a cemented procedure doesn’t necessarily mean a greater risk of infection, but is just an indication of what the data is showing us at this time.

The table summarising revision rates other than for infection is available in the main report and are compared with NJR revision rates for all causes. Overall, revision rates other than for infection were lower than all-cause revision rates at all time periods although the extent varied across prosthesis groups.

Section 3.8
Conclusion and recommendations

It has been the policy in previous reports not to draw conclusions or make recommendations derived from the data reported, but rather to allow the reader to draw their own conclusions. However the NJR felt that this year the data shows some strong trends that merit discussion and recommendations. We hope that this will provoke debate and encourage surgeons and manufacturers to re-evaluate their practice in light of the evidence provided. At present it is unclear whether these trends will continue in the longer term. How long an implant lasts also gives little indication of satisfaction, relief of pain, improvement in function and greater participation in society. In many instances these are more important to patients than survivorship. Moreover, the data is imperfect and we are reliant on surgeons completing the data accurately and recording every procedure without exception.

• The data shows that implanting metal-on-metal bearings with a larger head leads to much higher revision rates regardless of whether it’s done in a resurfacing procedure or as part of a total hip replacement (THR).

• The data indicates a potentially marked increase in failure of the implant at around the sixth year. However, more data is needed to confirm this finding. Likewise, it is difficult to draw firm conclusions on metal-on-metal bearings with a smaller head size as relatively few have been recorded in the NJR.

• A resurfacing procedure has a higher revision rate than a total hip replacement regardless of brand. Even the resurfacing brand with the best survivorship results has worse survivorship than almost all of the common total hip replacement combinations up to five years.

• Resurfacing procedures and metal-on-metal bearings for THR do particularly badly in women of all ages. Likewise the survivorship in men is far poorer than conventional hip replacement with alternative bearings. This is true, even in men under the age of 60.

• In men and women over the age of 70 all cemented hip replacements have the best survivorship (at seven years of data). These are also quite often the cheapest available option.

• In patients under the age of 70 the data is less clear cut between the performance of cemented and hybrid implants and between hybrid and uncemented hip implants. The revision rates appear to differ by about one percentage point between these options. We do not thus feel that they can offer guidance as to which option the surgeon should take based on the current survivorship data. However, longer follow-up may give a clearer picture.

The NJR feel it would be useful to look at the performance of resurfacing procedures compared with total hip replacements for different sub-groups of patients to see if there are any benefits to having a joint resurfaced with regards to how long it may last and what patients report about the outcome of their surgery.
Knees

The section will explore the implant survivorship analysis related to knee joint replacement surgery. To support your understanding of this section it may be useful to refer to the glossary in Part 1 and the general terms listed in Part 2.

Section 3.9
Outcomes after primary knee replacement, 2003–2010

The analysis examines the numbers of failures over time for different primary knee replacements.

Table 3d. Estimated revision rates following primary knee replacement by prosthesis type 2003–2010.

<table>
<thead>
<tr>
<th></th>
<th>Prosthesis type</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cemented</td>
<td>Uncemented</td>
</tr>
<tr>
<td>30 days</td>
<td>0.06%</td>
<td>0.09%</td>
</tr>
<tr>
<td>90 days</td>
<td>0.13%</td>
<td>0.18%</td>
</tr>
<tr>
<td>Year 1</td>
<td>0.58%</td>
<td>0.85%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.43%</td>
<td>2.04%</td>
</tr>
<tr>
<td>Year 3</td>
<td>2.16%</td>
<td>2.91%</td>
</tr>
<tr>
<td>Year 4</td>
<td>2.66%</td>
<td>3.58%</td>
</tr>
<tr>
<td>Year 5</td>
<td>3.08%</td>
<td>3.95%</td>
</tr>
<tr>
<td>Year 6</td>
<td>3.48%</td>
<td>4.33%</td>
</tr>
<tr>
<td>Year 7</td>
<td>3.81%</td>
<td>4.75%</td>
</tr>
<tr>
<td>Total procedures</td>
<td>288,729</td>
<td>20,542</td>
</tr>
<tr>
<td>Percentage of total</td>
<td>(94.4%)</td>
<td>(6.0%)</td>
</tr>
</tbody>
</table>

- Overall, revision rates were relatively low: only around 0.7% of primary knee replacements had been revised by one year after the primary surgery. This rises to 2.7% at year three, 3.9% by year five, and 4.9% by year seven. The risk of revision in the first few months after surgery was very low at only 0.14% by 90 days.
- There were differences in revision rates according to prosthesis type with the lowest rates associated with cemented prostheses (3.8% at seven years).
- There was no real difference between the uncemented and hybrid groups and revision rates for these types of implants were only slightly higher than for cemented prostheses. In contrast, revision rates for patello-femoral procedures were around five times higher (20.4%) than for cemented procedures at seven years.
- Revision rates for unicondylar knees were also relatively high at 16.6% by seven years. Results were similar for patello-femoral and unicondylar knees for the first two or three years after primary surgery and then the patello-femoral revision rates became higher than the unicondylar revision rates. Both unicondylar knees and patello femoral joints can fail for arthritis progression in other parts of the knee.

Implant stability levels and bearing types

Revision rates based on the implant constraint (stability levels) for bicondylar knees are shown in Table 3e. This indicates that posterior cruciate-retaining implants had the lowest revision rates although these were very similar to those of the monobloc tibia group. Use of a posterior stabilised implant was associated with higher revisions rates (for example, 4.3% at seven years compared with 3.7% for posterior cruciate-retaining implants).
Revision rates by fixed or mobile bearing surfaces for total knee replacements that were unconstrained and posterior cruciate-stabilised implants indicated that:

- Revision rates for posterior cruciate-retaining implants were lower for fixed bearings than for mobile bearings (3.4% versus 5.0% at seven years).
- There was a similar pattern of results for posterior stabilised implants but differences between fixed and mobile bearings were smaller.
- Analysis is not shown for unicondylar knees as there were no statistically significant differences in revision rates between fixed bearings, mobile bearings and monobloc tibia implants.

Therefore, the analysis indicates the lowest revision rates were associated with an anterior cruciate-retaining fixed bearing prosthesis. There tended to be a relationship between how the implant is fixed and the implant constraint and bearing surface. Cemented total knee replacements more commonly involved an anterior cruciate-retaining fixed bearing prosthesis (53.7%) than total knee replacements with an un cemented or hybrid fixation (31.3%). Table 3f briefly explores the combined effect on revision rates by fixation, constraint and bearing type. This shows that the lowest revision rates were for a cemented total knee with an anterior cruciate-retaining fixed bearing prosthesis although rates for an uncemented/hybrid fixation with an anterior cruciate-retaining fixed bearing prosthesis were only slightly higher.

### Table 3e. Estimated revision rates for bicondylar knees, by implant constraint.

<table>
<thead>
<tr>
<th>Implant constraint</th>
<th>All bicondylar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posterior cruciate-retaining</td>
</tr>
<tr>
<td>90 days</td>
<td>0.13%</td>
</tr>
<tr>
<td>Year 1</td>
<td>0.57%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.39%</td>
</tr>
<tr>
<td>Year 3</td>
<td>2.07%</td>
</tr>
<tr>
<td>Year 4</td>
<td>2.55%</td>
</tr>
<tr>
<td>Year 5</td>
<td>2.95%</td>
</tr>
<tr>
<td>Year 6</td>
<td>3.29%</td>
</tr>
<tr>
<td>Year 7</td>
<td>3.67%</td>
</tr>
<tr>
<td>Total procedures analysed</td>
<td>189,601 (60.0%)</td>
</tr>
<tr>
<td>Percentage of total</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3f. Estimated revision rates by fixation, implant constraint and bearing type for bicondylar knees.

<table>
<thead>
<tr>
<th>Fixation, constraint and bearing type</th>
<th>Cemented</th>
<th>Uncemented/hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posterior cruciate-retaining fixed bearing</td>
<td>Other constraint and bearing type</td>
</tr>
<tr>
<td>Year 1</td>
<td>0.53%</td>
<td>0.65%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.29%</td>
<td>1.60%</td>
</tr>
<tr>
<td>Year 3</td>
<td>1.90%</td>
<td>2.44%</td>
</tr>
<tr>
<td>Year 4</td>
<td>2.34%</td>
<td>3.02%</td>
</tr>
<tr>
<td>Year 5</td>
<td>2.74%</td>
<td>3.46%</td>
</tr>
<tr>
<td>Year 6</td>
<td>3.09%</td>
<td>3.93%</td>
</tr>
<tr>
<td>Year 7</td>
<td>3.41%</td>
<td>4.27%</td>
</tr>
<tr>
<td>Total procedures analysed</td>
<td>155,087 (49.5%)</td>
<td>133,641 (42.7%)</td>
</tr>
<tr>
<td>Percentage of total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 3.10
The effect of patient characteristics on revision rates

While there was some variation in patient characteristics between the different implant type and implant constraint groups, this was not as pronounced as among the hip patients. Overall, patello-femoral and unicondylar knee implants were typically used with younger patients (Table 3g). Patello-femoral implants were more commonly used in women (76.9% were female). Generally, patients with mobile bearings had a younger average age than those with fixed bearings but the differences were not large.

Table 3g indicates there are relatively minor variations in patient characteristics for knee joint replacement and therefore patient characteristics are not key to the different revision rates among the prosthesis groups shown in Table 3f.

Table 3g. Summary of patient characteristics by knee prosthesis type and implant constraint 2003–2010.

<table>
<thead>
<tr>
<th>Prosthesis type</th>
<th>Percentage of all</th>
<th>Average age (years)</th>
<th>Percentage female</th>
<th>Percentage with osteoarthritis</th>
<th>Average ASA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemented</td>
<td>84.4%</td>
<td>70.0</td>
<td>57.9%</td>
<td>96.7%</td>
<td>2.0</td>
</tr>
<tr>
<td>Uncemented</td>
<td>6.0%</td>
<td>68.5</td>
<td>53.6%</td>
<td>97.6%</td>
<td>2.0</td>
</tr>
<tr>
<td>Hybrid</td>
<td>1.1%</td>
<td>68.6</td>
<td>55.0%</td>
<td>95.9%</td>
<td>2.0</td>
</tr>
<tr>
<td>Patello-femoral</td>
<td>1.1%</td>
<td>60.4</td>
<td>76.9%</td>
<td>96.0%</td>
<td>1.9</td>
</tr>
<tr>
<td>Unicondylar</td>
<td>7.4%</td>
<td>63.8</td>
<td>48.7%</td>
<td>98.9%</td>
<td>1.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implant constraint for bicondylar knees</th>
<th>Percentage of all</th>
<th>Average age (years)</th>
<th>Percentage female</th>
<th>Percentage with osteoarthritis</th>
<th>Average ASA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconstrained</td>
<td>55.4%</td>
<td>69.9</td>
<td>57.8%</td>
<td>97.1%</td>
<td>2.0</td>
</tr>
<tr>
<td>Fixed bearing</td>
<td>47.6%</td>
<td>70.1</td>
<td>58.0%</td>
<td>97.0%</td>
<td>2.0</td>
</tr>
<tr>
<td>Mobile bearing</td>
<td>7.9%</td>
<td>68.8</td>
<td>55.9%</td>
<td>97.7%</td>
<td>2.0</td>
</tr>
<tr>
<td>Posterior stablisised</td>
<td>19.1%</td>
<td>69.8</td>
<td>58.0%</td>
<td>96.1%</td>
<td>2.0</td>
</tr>
<tr>
<td>Fixed bearing</td>
<td>17.2%</td>
<td>70.2</td>
<td>58.4%</td>
<td>96.1%</td>
<td>2.1</td>
</tr>
<tr>
<td>Mobile bearing</td>
<td>1.9%</td>
<td>66.5</td>
<td>54.8%</td>
<td>96.2%</td>
<td>2.0</td>
</tr>
<tr>
<td>Constrained</td>
<td>2.1%</td>
<td>70.0</td>
<td>53.3%</td>
<td>96.2%</td>
<td>2.0</td>
</tr>
<tr>
<td>Monobloc tibia</td>
<td>12.8%</td>
<td>70.2</td>
<td>56.8%</td>
<td>97.3%</td>
<td>2.0</td>
</tr>
<tr>
<td>Other</td>
<td>0.7%</td>
<td>70.9</td>
<td>62.9%</td>
<td>86.9%</td>
<td>2.1</td>
</tr>
<tr>
<td>Hinged/linked</td>
<td>0.3%</td>
<td>72.0</td>
<td>67.9%</td>
<td>76.7%</td>
<td>2.2</td>
</tr>
<tr>
<td>Custom</td>
<td>0.4%</td>
<td>69.9</td>
<td>58.4%</td>
<td>96.0%</td>
<td>2.0</td>
</tr>
<tr>
<td>Not known</td>
<td>1.4%</td>
<td>68.4</td>
<td>57.6%</td>
<td>95.7%</td>
<td>2.0</td>
</tr>
<tr>
<td>Total procedures analysed: 342,120</td>
<td>100.0%</td>
<td>69.4</td>
<td>57.3%</td>
<td>96.9%</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Section 3.11
Outcomes: revisions other than for infection

This section moves on to consider revision operations other than for infection. This analysis involves a shift to using the NJR linked data discussed in Section 3.2. For tables associated with these results please see the main report.

NJR revision rates excluding those for infection

This section briefly considers revision operations other than for infection. Infection as part of joint replacement is an unfortunate result of surgery, but does not reflect how well the implant is performing. The removal of infection as a reason for revising an implant is to allow the analysis to concentrate on the implants that have failed. Analysis is based on the NJR linked data only and excludes revisions undertaken for infection (these patients are treated as no longer observed at the point they have a revision for infection). The NJR linked data includes independently funded patients and others that could not be matched to HES/PEDW so it is a larger and more representative dataset.

Infection was the reason for revision for 25.6% of the patients considered here. Other reasons for revision included aseptic loosening (26.5%), pain (23.2%), instability (13.1%), malalignment (9.2%), stiffness (6.9%), dislocation/subluxation (4.9%), lysis (4.8%), periprosthetic fracture (3.3%), and wear or failure of some part of the implant (5.3%). These results will not be representative of reasons for all revisions. For example, infection is likely to occur in the early years after primary surgery whereas loosening often occurs much later. Therefore at this relatively early stage of the registry, an analysis of all revisions could be affected by the much higher numbers revised for infection. A major advantage of NJR is that, unlike the HES and PEDW databases, it is possible to identify revisions for infection.

Revision rates other than for infection are compared with NJR revision rates for all causes in the main report. Overall, revision rates other than for infection were lower than all-cause revision rates (including infection). This was especially so in the early months after primary surgery, but revision was so rare in the first 90 days after knee replacement that these 90 day figures should be treated with caution. By year five, revision rates excluding infections were 23.6% lower than all-cause revision rates. This trend varied across prosthesis groups. For example, the five-year revision rate for cemented knees excluding infections was 32% lower than the all-cause revision rate (1.35% versus 1.99%). In contrast, unicondylar revision rates were just 7.3% lower at five years when revisions for infection were excluded (6.71% versus 7.24%). This is probably because of their higher revision rate at 90 days and in the first year compared with other groups.
Section 3.12
Conclusions and recommendations

The NJR provides only part of the picture, that of how well the implant lasts before it needs to be revised (survivorship), and only survivorship of a short to medium term duration. We do not know whether these trends will continue in the longer term. One of the lessons that have resulted from this analysis is that survivorship is not linear. Survivorship also gives little indication of satisfaction, relief of pain, improvement in function and greater participation in society. In many instances these are more important to patients than survivorship. Moreover, the data is imperfect and we are reliant on surgeons completing the data accurately and recording every procedure without exception.

The data shows that short to medium-term survivorship is excellent after almost all common types of total knee replacements whether they are cemented, uncemented or have hybrid fixation. However, multiple studies have now demonstrated that some patients are dissatisfied with their pain and/or function after total knee replacement. It is therefore advisable that surgeons and patients consider patient-based outcome measures in addition to survivorship when choosing prostheses. However some key findings of the analysis are:

- For bicondylar knee replacements, posterior cruciate-retaining implants had lower revision rates than posterior cruciate-stabilised implants, while mobile bearing prostheses tended to have a higher failure rate than fixed bearing prostheses.
- The lowest revision rates were associated with posterior cruciate-retaining fixed bearing prostheses (at seven years of data). This type of implant is used on patients with least damage to their existing joint.
- Patello-femoral joint replacements have a very high failure rate and are undertaken for different reasons than a total knee replacement. This is because of problems with a different part of the knee and so the reason for revision may be unrelated to the original procedure.

We recommend that further research be undertaken into the cause of patello-femoral arthritis, thereby leading to more effective strategies to treat this difficult condition.

Unicondylar knee replacements have a higher failure rate than total knee replacements. It would be useful to establish if unicondylar knee replacements give significantly better function and pain relief to justify using them despite the high revision rate. Further research needs to be undertaken in this field including qualitative research into the rationale of using unicondylar knee replacements and into the rationale of revision of both unicondylar and total knee replacements.
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