National Joint Registry
www.njrcentre.org.uk

National Joint Registry for England and Wales

Summary Report to the **2nd** Annual Report | September 2005

…realising the potential

NJR StatsOnline

"NJR StatsOnline is a helpful and easy-to-use tool that encourages patients to access information about the participation in the NJR of hospitals in their area. The map search facility allows current data to be at a patient's fingertips instantly."

Terry Garrett - British Orthopaedic Association, Patient Liaison Group

Patient Consent Initiative - Postal Consent

"Patient consent is part of the integrated care pathway. We now write to patients in advance of arrival to request consent and we have also been writing to previous patients retrospectively to ensure their involvement. It's proving to work very well."

Julie Burgoyne - Acting Manager, Birkdale Clinic, Rotherham, South Yorkshire

"We realise the importance of collecting NJR patient consent and make every effort to ask our patients to participate. If NJR consent is missed at the preoperative assessment, we follow this up by posting a consent form to the patient following their operation."

Henry Lumley - Assistant General Manager Musculoskeletal Directorate, North Bristol NHS Trust's Southmead Hospital (Avon Orthopaedic Centre)

1. Introduction

This summary report has been issued in parallel with the full 2nd Annual Report of the National Joint Registry (NJR) for England and Wales. Following the successful launch of the first Annual Report at the British Orthopaedic Association (BOA) Annual Congress in September 2004, the NJR has become increasingly established within the orthopaedic arena and is already proving to be a useful resource. Since the launch of the NJR's data collection system in April 2003, development of the registry has continued in a number of areas and usage of NJR data has progressively increased. The range of stakeholders who are actively engaged with the NJR has also grown and the NJR remains dedicated to meeting the needs of all stakeholders.

The full report is available on the NJR website (at www.njrcentre.org.uk). Its structure is summarised in Box 1 below.

Box 1 - Structure of full 2nd Annual Report

Part 1 reports on key activities that took place between 1 January 2004 and 31 July 2005 that were not included in the 1st Annual Report.

Part 2 focuses on data analysis and interpretation. Data available for analysis covers 21 months and has allowed a wider range of analyses to be carried out. Reflecting developments in technologies and techniques, analyses examine, for example, the prevalence of hip resurfacing and use of minimally invasive surgery. Although early findings must be regarded as preliminary, their possible implications are of interest.

Part 3 of the report provides appendices to support Parts 1 and 2 analyses. The web version of the report includes additional appendices.

This summary report:

- Briefly covers some of the highlights and developments of the NJR
- Looks at where we are now
- Examines data quality, analyses and their interpretation

Further detail, including additional graphs and tables, can be found in the full version of the 2nd Annual Report.

2. Highlighting developments

The Steering Committee continues to oversee NJR activities. The intense activity of the set-up period of the NJR has continued, but spread across a broader range of areas:

- As development of the NJR has progressed, a structure of advisory groups and sub committees has evolved to support the work of the Steering Committee. These are the:
  - NJR Outlier Performance Advisory Group (NOPAG)
  - NJR Research Sub Committee (NJR RSC)
  - Patient Reported Outcomes Measurement Studies (PROMS) group
- Further development of the Minimum Dataset was carried out to enhance future data analysis and subsequent interpretation to improve patient outcomes. MDS v2 also aims to provide a more objective measure of epidemiological case mix and complexity. Overall, MDS v2 provides a more comprehensive dataset yet requires fewer but more targeted fields to be completed. In parallel, the data entry system has evolved to become more user friendly and make data entry easier.
- As a consequence of listening to early feedback, major developments initiated in 2004 included the development of a bar code reader facility and a bulk data upload facility. Also, the number of surgeon default

techniques available has been expanded. All of these developments reduce both time needed for data entry and reduce the likelihood of errors.

- The NJR has continued to focus on increasing data submission and consent rates. A number of key initiatives have supported this including a Patient Consent Initiative and piloting of the Data Integrity Audit process.
- Following an initial survey of stakeholder reporting requirements, a stakeholder reporting strategy was developed. Establishment of the NJR stakeholder reporting process will enable stakeholder groups to obtain information they need quickly, easily and in a convenient format. In Phase 1, standard reports are in preparation for: hospital management; NHS Purchasing and Supply Agency; manufacturers and suppliers; and surgeons.
- NJR StatsOnline - a web facility for viewing and downloading NJR statistics - was launched in May 2005. It initially made data available for NHS hospitals and treatment centres. Subsequently, agreement was reached with the vast majority of independent sector organisations to make their equivalent data openly available. It is understood that this is the first time that independent sector data has been voluntarily released in this way - a positive endorsement of the aims of the NJR.
- The Orthopaedic Data Evaluation Panel (ODEP) was established by NHS PASA to provide an independent assessment of the clinical outcomes data, submitted by implant manufacturers, regarding the compliance of brands of total hip and hip resurfacing prostheses with the NICE benchmarks for the effectiveness of different brands of hip prostheses. The NJR's input in to the ODEP process has proved of great value. In 2005, an exercise was undertaken comparing NJR entries with products submitted for ODEP evaluation. The result was that a considerable number of products were identified as being implanted, but not put forward to ODEP. This NJR input has allowed building on the work of ODEP to provide a comprehensive view of hips available on the UK market and their compliance with the benchmarks set by NICE. See Section 4.10.1 for further details.
- A PROMS (Patient Reported Outcomes Measurement Studies) interim study took place in the first half of 2005. It satisfied two main aims:
  - Examining how patients viewed the outcome of their joint replacement at least one year after surgery
  - Providing an initial test of the logistics for running a postal patient reported outcomes survey on patients whose data had been entered onto the NJR database

  An overall response rate of 88% was achieved which is very encouraging.

3. Where are we now?

By the end of July 2005, the average weekly submission of completed records had reached 2,400 operations, with the NJR receiving its 200,000th record on 24 June 2005. By the end of July 2005, 98.8% of all hospitals on the NJR database had submitted data.

72.9% of records being submitted to the NJR in July 2005 had patient consent.

There has been a marked improvement in the linkability of records at the midpoint of 2005 which at the end of July was calculated as 35.7%. This has increased from a linkability percentage for 2004 of 27% and for 2003 of 21%. See Section 4.6 for further details.

4. Analyses and interpretation

Analyses and interpretation of data were carried out by the Royal College of Surgeons Clinical Effectiveness Unit. Contributions were also made by ODEP. Analysis was mainly focused on hip and knee replacement procedures carried out between 1 January 2004 and 31 December 2004 inclusive and entered into the NJR by 28 February 2005.

For hip procedures, data were collected for total primary hip replacement (THR) with/without cement, THR with hybrid fixation, resurfacing hip arthroplasty, and revision of all these procedures. For knee procedures, data were collected for primary total knee replacement (TKR) with/without cement, TKR using hybrid fixation, unicondylar procedures, patello-femoral replacements, and revision of all these procedures.

4.1 Number of primary and revision joint replacement procedures (hip and knee) in the NJR

Table 1 summarises the data analysed.

4.2 Description of orthopaedic units in England and Wales

381 centres in total participated in the 2004 data collection period, an increase of 41 centres compared to the 2003 data collection period[1]. The participation rate for independent hospitals was higher than for NHS hospitals (99% of independent hospitals entering procedures versus 90% of NHS hospitals).

Joint replacements performed in independent treatment centres were more likely to be cementless than those performed in other treatment provider types. In NHS and independent hospitals and NHS treatment centres, THR using cement was the most common hip procedure type (roughly 50% of all procedures performed). THR not using cement was the next most frequently performed, constituting between 17% and 28% of hip procedures. For independent treatment centres, however, the reverse is seen with 53% of procedures performed being THRs not using cement and 17% being THR using cement. TKR not using cement was uncommon in NHS and independent hospitals (6.9% and 6.8%) and rare

Table 1 - *Hip and knee replacement procedures carried out in England and Wales from 1 January 2004 until 31 December 2004 and entered into the NJR database by 28 February 2005, according to country, type of procedure and provider type*

	Hips		Knees		Total	
	Number	(%)	Number	(%)	Number	(%)
Country						
England	47,427	(96.8)	43,603	(97.1)	91,030	(97.0)
Wales	1,560	(3.2)	1,295	(2.9)	2,855	(3.0)
Type of procedure						
Primary	44,262	(90.4)	42,791	(95.3)	87,053	(92.7)
Revision	4,516	(9.2)	1,966	(4.4)	6,482	(6.9)
Re-operation other than revision	209	(0.4)	141	(0.3)	350	(0.4)
Type of treatment provider						
NHS hospital	30,990	(63.2)	29,592	(65.9)	60,582	(64.5)
Independent hospital	16,203	(33.1)	13,333	(29.7)	29,536	(31.5)
NHS treatment centre	1,118	(2.3)	1,186	(2.6)	2,304	(2.5)
Independent treatment centre	676	(1.4)	787	(1.8)	1,463	(1.5)
Total	**48,987**		**44,898**		**93,885**	

[1] The 2004 data collection period relates to hip and knee replacement procedures that took place between 1 January and 31 December 2004 inclusive and that were entered into the NJR database by 28 February 2005. These data were then used in analyses for the 2nd Annual Report. The 2003 data collection period relates to hip and knee replacement procedures that took place between 1 April and 31 December 2003 inclusive and that were entered onto the NJR database by 31 March 2004. These data were then used in analyses for the 1st Annual Report. (Data for both 2003 and 2004 have continued to be entered onto the NJR database beyond these end dates, although they could not contribute to the 1st and 2nd Annual Report analyses respectively.)

in NHS treatment centres (0.9%) but constituted roughly 1 in 5 knee procedures performed in independent treatment centres.

4.3 Data completeness

'Case ascertainment' is the proportion of all relevant joint replacement procedures performed in England and Wales that are actually included in the NJR. Table 2 compares the number of hip and knee replacements performed in NHS trusts in 2004 that were entered into the NJR with the number of procedures recorded in Hospital Episode Statistics (HES) and the Patient Episode Database, Wales (PEDW) over a similar time period[2].

In the 1st Annual Report, the case ascertainment for NHS centres was stated as being 51%. Thus, the percentage for 2004 - 60% - whilst still moderate, represents a reasonable improvement on last year and suggests a trend towards complete data entry, as the NJR becomes increasingly well established.

The number of levies collected from purchasers of implants in 2004 was 155,450[3]. A total of 93,885 procedures were entered into the NJR (NHS and independent sector combined). This gives an estimated overall case ascertainment of 60%, suggesting that case ascertainment in the independent sector is similar to that in the NHS.

4.4 Consent

The NJR contains data on the joint replacement procedure, the implants used and the patients receiving them. Data on the procedure may be entered regardless of whether patient consent is obtained. However, patient identifiers (name, date of birth, gender, postcode and NHS number) are only recorded in the NJR if the patient gives consent.

Patient identifiers are essential for analysing outcomes and revision rates (of key interest in later reports as follow-up time increases). This is because NHS numbers can be derived from patient identifiers (if not provided at time of data collection) and then be used to link a primary procedure with any subsequent future operations performed on the same patient. Identifiers are also needed for a patient to be eligible for participation in feedback processes such as the Patient Reported Outcomes Measurements Study (PROMS) survey, described in Section 4.14.

In the event of a prosthesis in use being found to perform unsatisfactorily, there is a serious danger that patients implanted with the prosthesis will not be traceable through the NJR system unless these key patient identifiers are consistently and invariably entered.

It should be noted that for patient identifiers to be included in the NJR database, two steps need to occur. Firstly the patient must have provided specific NJR-related consent and secondly, the record of this consent needs to be available to the person at the centre entering the data onto the NJR.

Of the 93,885 procedures entered into the NJR in 2004, patient consent was obtained for 60,831, corresponding to a consent rate of 65%, similar to that for 2003 (63%). The consent rate for operations performed in England was 64%, whilst that in Wales was 78%. Overall, consent rates in the independent sector were higher than those in the NHS sector. Consent rates for treatment centres (both independent (39%) and NHS (31%)) were considerably lower than for hospitals (independent hospitals 69%, NHS hospitals 65%).

Table 2 - *Number of joint replacements expected from HES/PEDW data compared with number entered into the NJR for 2004*

	Hip procedures		Knee procedures		All procedures	
	Expected number of procedures	Number entered into NJR (%)	Expected number of procedures	Number entered into NJR (%)	Expected number of procedures	Number entered into NJR (%)
NHS Trusts in England (n = 146)	49,622	31,034 (62.5)	50,988	29,893 (58.6)	100,610	60,927 (60.6)
NHS Trusts in Wales (n = 12)	2,514	1,074 (42.7)	2,608	885 (33.9)	5,122	1,959 (38.2)
All NHS Trusts (n = 158)	**52,136**	**32,108 (61.6)**	**53,596**	**30,778 (57.4)**	**105,732**	**62,886 (59.5)**

4.5 NHS number availability

The percentage of consented procedures for which NHS numbers were available for individual hospitals is shown in table 3. In an improvement on 2003, more than half of hospitals achieved NHS number percentages of over 80% (last year the figure was one third of hospitals). At 24 hospitals, NHS numbers were available for all consenting patients.

4.6 Total number of linkable procedures

The total number of linkable procedures can be calculated as a product of A x B x C, where:

A = % of NHS procedures[4], recorded in HES/PEDW, that were entered into the NJR ('case ascertainment')

B = % of those procedures entered for which NJR consent was obtained (consent rate)

C = % of those procedures where the patient gave consent for which NHS numbers were available

Table 4 gives the linkable percentage for 2004 alongside that for 2003.

The linkable percentage has also been calculated for the midpoint of 2005 (using levy comparison to calculate A) and it is encouraging to see an increase from 27% in 2004 to 35.7% at the end of July 2005. However, this is still inadequate and the NJR would not be able to trace all patients possessing a prosthesis with unsatisfactory performance or patients operated on by a surgeon or hospital under scrutiny. In addition, reliable analyses of outcomes and revision rates are impossible, without a risk of bias. In particular, there is a risk of false conclusions being drawn due to the missing data. For example, analysis of the small number of primary procedures for which a revision procedure can already be found in the database (see Section 4.9) revealed primary procedures performed by one particular surgeon to be more likely to be revised than those performed by other surgeons (more primary procedures of this

Table 3 - *Number of hospitals according to percentage of NHS numbers available for consenting patients for 2004*

	Percentage of NHS numbers available for consenting patients					
	0	1 – 19%	20 – 39%	40 – 59%	60 – 79%	80%+
Number of hospitals (%) (n=356[5])	15 (4.2)	26 (7.3)	32 (9.0)	33 (9.3)	67 (18.8)	183 (51.4)

Table 4 - *The percentage of joint replacement procedures performed in England and Wales that have been entered into the NJR with NHS numbers and so are linkable ('linkable percentage') for the 2003 and 2004 data collection periods*

	% all procedures entered into NJR	x	% consent obtained	x	% with NHS numbers	=	% linkable procedures (linkable percentage)
Previous data collection period (2003)							
All procedures	51.3%		62.8%		65.1%		21%
Current data collection period (2004)							
All procedures	59.5%		64.8%		69.9%		27%
Hip procedures	61.6%		64.5%		69.2%		27%
Knee procedures	57.4%		65.1%		70.7%		26%
England	60.6%		64.4%		70.6%		28%
Wales	38.2%		78.2%		52.6%		16%

[2] HES data for the 12-month period April 2003 - March 2004; PEDW data for the 12-month period April 2003 - March 2004

[3] A levy is collected each time specific hip or knee components are purchased. A single levyable component is normally used in each hip procedure that should be entered into the NJR database, although there are some exceptions, e.g. when custom-made implants are used, when a revision operation does not involve removal and replacement of the acetabular cup. However, the number of levies invoiced by suppliers gives a good approximation to total number of procedures undertaken. The equivalent situation applies to knee procedures, where it is the femoral component that attracts a levy charge

[4] An estimate of overall case ascertainment (NHS and independent sectors combined) can be obtained by comparing the number of hip and knee procedures in the NJR with the total number of levies collected from hospitals

[5] The 25 hospitals that had consent rates of zero are not included in table 3

surgeon could be linked to a revision in the database than for other surgeons). However, closer inspection showed the linkable percentage for this surgeon to be much higher than the average and so the high number of linked revision procedures found for this surgeon was in fact because the data entered by this surgeon was far more complete, rather than that the surgeon was underperforming. Indeed, calculation of the linkable percentage for each NHS trust reveals wide variation between centres.

4.7 Primary hip replacement procedures

4.7.1 Description of patient characteristics

Table 5 shows that the mean age of primary hip replacement patients in the NJR and who had procedures performed in 2004 was 68 years. Patients undergoing a resurfacing arthroplasty procedure were the youngest group on average. 59% of consenting patients were female. The same pattern is seen for each procedure type with the exception of resurfacing arthroplasty, where almost two-thirds of consenting patients were male.

Table 5 - *Patient characteristics for primary hip replacement procedures in 2004, according to type of procedure*

	Patient Procedure									
	Total replacement using cement		Total replacement not using cement		Hybrid or reverse hybrid[6]		Resurfacing arthroplasty		Total	
Age, years (consenting patients only)[7]										
Mean (sd)	72.2	(9.2)	65.1	(11.0)	67.5	(10.7)	55.0	(9.3)	68.1	(11.3)
Inter-quartile range	66.8 – 78.5		58.7 – 72.4		61.2 – 74.6		49.5 – 61.1		61.2 – 76.0	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Gender (consenting patients only)[8]										
Male	5,575	(35.4)	2,489	(43.1)	1,496	(38.8)	2,208	(63.3)	11,768	(40.8)
Female	10,189	(64.6)	3,281	(56.9)	2,359	(61.2)	1,278	(36.7)	17,107	(59.2)
Physical status[9]										
P1 - Fit and healthy	5,817	(24.3)	3,018	(33.7)	1,938	(31.5)	3,146	(61.0)	13,919	(31.5)
P2 - Mild disease, not incapacitating	14,752	(61.5)	4,983	(55.6)	3,531	(57.4)	1,867	(36.2)	25,133	(56.8)
P3 - Incapacitating systemic disease	3,217	(13.4)	898	(10.0)	652	(10.6)	135	(2.6)	4,902	(11.1)
P4/P5 - Life threatening disease/ expected to die within 24hrs[10]	206	(0.8)	58	(0.7)	34	(0.5)	10	(0.2)	308	(0.6)
Indications for surgery[11]										
Osteoarthritis	22,548	(94.0)	8,381	(93.6)	5,651	(91.8)	4,871	(94.4)	41,451	(93.7)
Avascular necrosis	774	(3.2)	341	(3.8)	242	(3.9)	183	(3.6)	1,540	(3.5)
Congenital dislocation/dysplasia of hip	181	(0.8)	189	(2.1)	121	(2.0)	168	(3.3)	659	(1.5)
Fractured neck of femur	344	(1.4)	108	(1.2)	85	(1.4)	13	(0.3)	550	(1.2)
Seropositive rheumatoid arthritis	243	(1.0)	67	(0.8)	63	(1.0)	15	(0.3)	388	(0.9)
Failed internal fixation	190	(0.8)	82	(0.9)	61	(1.0)	13	(0.3)	346	(0.8)
Other hip trauma	48	(0.2)	20	(0.2)	27	(0.4)	20	(0.4)	115	(0.3)
Previous arthrodesis	6	(0.03)	6	(0.1)	2	(0.03)	3	(0.1)	17	(0.04)
Other[12]	559	(2.3)	255	(2.9)	206	(3.4)	146	(2.8)	1,166	(2.6)
Side										
Bilateral[13]	45	(0.2)	28	(0.3)	32	(0.5)	30	(0.6)	134	(0.3)
Left, unilateral	10,640	(44.4)	4,108	(46.0)	2,769	(45.2)	2,468	(48.1)	19,985	(45.3)
Right, unilateral	13,263	(55.4)	4,793	(53.7)	3,322	(54.3)	2,631	(51.3)	24,009	(54.4)
Waiting list initiative/patient choice[14,15]										
Yes	2,289	(17.5)	1,259	(23.8)	719	(21.5)	413	(14.1)	4,680	(19.0)
No	10,788	(82.5)	4,029	(76.2)	2,619	(78.5)	2,516	(85.9)	19,952	(81.0)
Tertiary referral[14,15]										
Yes	534	(4.2)	414	(8.1)	235	(7.3)	309	(10.8)	1,492	(6.3)
No	12,156	(95.8)	4,666	(91.9)	3,002	(92.7)	2,543	(89.2)	22,367	(93.7)
Total	**23,992**		**8,957**		**6,155**		**5,158**		**44,262**	

Osteoarthritis was the most frequently reported indication for surgery, present in 94% of all patients.

Looking at females alone who received a resurfacing arthroplasty, the mean age at operation was 54.4 years. 90% of females having resurfacing operations were aged 65 or under. However, there were females reportedly having this operation up to the age of 89.5 years.

4.7.2 Description of primary hip replacement procedures

Description of surgeons

Table 6 shows that the lead surgeon was a consultant in 82% of all procedures. For resurfacing arthroplasty procedures, this percentage was 96%.

There were 2,052 different lead surgeons in total on the database, declared as lead surgeons for between 1 and 381 primary hip procedures.

Table 6 - *Characteristics of lead surgeons performing primary hip replacement procedures in 2004, according to type of procedure*

	Patient Procedure									
	Total replacement using cement		Total replacement not using cement		Hybrid or reverse hybrid		Resurfacing arthroplasty		Total	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Lead surgeon grade[16]										
Consultant	18,445	(76.9)	7,633	(85.2)	5,029	(81.7)	4,954	(96.0)	36,061	(81.5)
Associate Specialist/Staff Grade/ Clinical Assistant[17]	2,877	(12.0)	908	(10.1)	341	(5.5)	54	(1.1)	4,180	(9.4)
With consultant assistance	316	(11.0)	106	(11.7)	29	(8.5)	14	(25.9)	465	(11.1)
Without consultant assistance	2,561	(89.0)	802	(88.3)	312	(91.5)	40	(74.1)	3,715	(88.9)
SPR/SHO/Other[18]	2,670	(11.1)	416	(4.7)	785	(12.8)	150	(2.9)	4,021	(9.1)
With consultant assistance	1,255	(47.0)	213	(51.2)	354	(45.1)	91	(60.7)	1,913	(47.6)
Without consultant assistance	1,415	(53.0)	203	(48.8)	431	(54.9)	59	(39.3)	2,108	(52.4)
Lead surgeon from non-UK surgical team[19]										
Yes	407	(1.7)	319	(3.6)	235	(3.8)	4	(0.1)	965	(2.2)
No/not selected	23,585	(98.3)	8,638	(96.4)	5,920	(96.2)	5,154	(99.9)	43,297	(97.8)
Lead surgeon is a locum										
Yes	1,424	(5.9)	590	(6.6)	231	(3.8)	67	(1.3)	2,312	(5.2)
No	22,568	(94.1)	8,367	(93.4)	5,924	(96.2)	5,091	(98.7)	41,950	(94.8)
Total	**23,992**		**8,957**		**6,155**		**5,158**		**44,262**	

[6] A hybrid is a procedure where the femoral prosthesis is cemented and the acetabular prosthesis is not cemented. In a reverse hybrid, the acetabular prosthesis is cemented whilst the femoral prosthesis is not cemented

[7] Statistics based on that subset of procedures for which patient consent was obtained and a plausible date of birth recorded in the NJR or obtained from the NSTS (28,805 primary hip procedures). Where the date of birth recorded in the NJR differed from that in the NSTS, the latter was selected as the more reliable

[8] Statistics based on that subset of procedures for which patient consent was obtained and sex was recorded in the NJR or obtained from the NSTS (28,875 primary hip procedures). Where the sex recorded in the NJR differed from that in the NSTS, the latter was selected as the more reliable

[9] Patient physical status according to American Society of Anaesthesiology scoring system (ASA grade)

[10] It is unlikely that so many patients will have been of physical status P4 or P5 before surgery. Hence, for procedures with patient ASA grade P4 or P5 this data item may have been mis-entered

[11] More than one indication may be selected per procedure, so these values add up to more than 100%

[12] Other indications for surgery included fractured acetabulum, ankylosing spondylitis, failed hemi-arthroplasty, previous infection, psoriatic arthropathy, slipped upper femoral epiphysis, trauma and seronegative rheumatoid arthritis

[13] Bilateral operations are classed as two procedures. Therefore, the 134 bilateral primary hip procedures reported count as 268 procedures elsewhere in the table

[14] Based on that subset of procedures entered into the NJR using MDS version 2 and for which the item was recorded. Data item not present in MDS version 1

[15] Figures for waiting list initiative/patient choice and for tertiary referral should be interpreted with caution as hospitals may have been interpreting the term in different ways when submitting data

[16] It is possible that the number of lead surgeons who were consultants is an overestimate as a consultant may have been declared the lead for any procedures under his consultancy, even if he was not actually performing them

[17] Definitions of staff positions are provided in the Glossary in the full report

[18] Other grades reported included 'fellow', 'clinical lecturer', 'professor' and 'locum consultant'

[19] Numbers for 'lead surgeon from non-UK surgical team' should be interpreted with caution as data quality checks revealed some misinterpretation of this data item. The percentage from overseas is likely to be an over-estimate

Table 7 - *Number of primary hip replacements entered into the NJR in 2004 per surgeon*

	Number of primary hip replacements entered into the NJR per surgeon				
	< 25	25 – 49	50 – 99	100 – 199	200 +
Number of surgeons (%)					
Consultant (n = 1,328)	838 (63.1)	262 (19.7)	179 (13.5)	44 (3.3)	5 (0.4)
Associate Specialist/Staff Grade/ Clinical Assistant (n = 123)	88 (71.5)	24 (19.5)	9 (7.3)	2 (1.7)	0 (0)
SPR/SHO/Other (n = 601)	552 (91.9)	33 (5.5)	12 (2.0)	4 (0.6)	0 (0)

1,328 were consultants, with an average of 27 procedures each. Table 7 gives further information of the volume of procedures entered for each surgeon.

Description of surgical practice in primary hip replacements

Table 8 shows that 95% of procedures took place in a laminar flow theatre, as recommended by British Orthopaedic Association guidance. Whilst the use of image guided surgery remains low (at 0.7%), the percentage of all procedures using a form of minimally invasive surgery is 6.5%. Indeed, for cementless total hip replacements, almost 12% of procedures used a minimally invasive surgery technique.

The most common mechanical method of intended post-operative thrombo-prophylaxis regime (recommended at time of operation) was TED stockings (intended for use following 54% of procedures) and low molecular weight heparin was the most frequently recommended chemical method, intended for use after half of all procedures.

In the majority of procedures using cement, pulsatile/powered lavage was used (over 90% for both femoral and acetabular components). Overall, a cement pressuriser was used for acetabular cement in 72% of procedures. Cement was mixed using vacuum mixing or fume extraction (instead of the traditional open bowl method) over 90% of the time.

Description of untoward intra-operative events

Untoward events occurring during the hip replacement operation were rare, with none specified in over 99% of procedures. A calcar crack was the most commonly reported untoward intra-operative event (4 in every 1,000 procedures). Untoward events were more frequently reported for cementless total hip replacements than cemented, hybrid or resurfacing procedures. A calcar crack was reported to have occurred during 1.1% of cementless total hip replacements, and a trochanteric fracture (the next most commonly reported event), during 0.5% of cementless procedures.

Description of primary hip replacement procedures in young patients

Of the 44,128 primary hip replacement patients, 3,450 (8%) were young patients (under 55 years, using the American Hip Society age cut-off). This corresponds to 3,471 procedures since 42 procedures were bilateral. Resurfacing arthroplasty was the most common procedure type in this age group: 46% of primary procedures performed on young patients were resurfacing arthroplasty procedures (table 9 on page 10). By comparison, 7.5% of primary procedures performed on patients aged 55 or over (figure not shown) were resurfacing operations. The frequent use of resurfacing arthroplasties in young patients is remarkable given the current lack of evidence about its long term outcome.

[20] More than one type of anaesthesia may be used for a single procedure

[21] Based on a sub sample of procedures entered into the NJR using MDS version 2 and for which this data item was completed

Table 8 - *Characteristics of surgical practice for primary hip replacement procedures in 2004, according to procedure type*

	Patient Procedure									
	Total replacement using cement		Total replacement not using cement		Hybrid or reverse hybrid		Resurfacing arthroplasty		Total	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Laminar flow theatre										
Yes	20,841	(94.6)	7,886	(93.6)	5,452	(94.1)	4,545	(95.1)	38,724	(94.4)
No	1,182	(5.4)	538	(6.4)	344	(5.9)	232	(4.9)	2,296	(5.6)
General anaesthesia used[20]										
Yes	13,388	(55.8)	5,031	(56.2)	3,789	(61.6)	3,637	(70.5)	25,845	(58.4)
No	10,604	(44.2)	3,926	(43.8)	2,366	(38.4)	1,521	(29.5)	18,417	(41.6)
Epidural anaesthesia used[20]										
Yes	4,088	(17.0)	1,278	(14.3)	1,215	(19.7)	805	(15.6)	7,386	(16.7)
No	19,904	(83.0)	7,679	(85.7)	4,940	(80.3)	4,353	(84.4)	36,876	(83.3)
Nerve block anaesthesia used[20]										
Yes	2,319	(9.7)	1,010	(11.3)	589	(9.6)	579	(11.2)	4,497	(10.2)
No	21,673	(90.3)	7,947	(88.7)	5,566	(90.4)	4,579	(88.8)	39,765	(89.8)
Spinal anaesthesia used[20]										
Yes	11,476	(47.8)	3,771	(42.1)	2,785	(45.3)	1,982	(38.4)	20,014	(45.2)
No	12,516	(52.2)	5,186	(57.9)	3,370	(54.7)	3,176	(61.6)	24,248	(54.8)
Sedation used[20,21]										
Yes	1,660	(9.9)	566	(8.6)	408	(9.7)	253	(7.0)	2,887	(9.3)
No	15,066	(90.1)	6,056	(91.4)	3,800	(90.3)	3,371	(93.0)	28,293	(90.7)
Patient position										
Lateral	18,702	(78.0)	7,267	(81.1)	5,749	(93.4)	4,979	(96.5)	36,697	(82.9)
Supine	5,290	(22.0)	1,690	(18.9)	406	(6.6)	179	(3.5)	7,565	(17.1)
Incision										
Anterior/Antero-Lateral/Lateral	16,603	(69.2)	5,867	(65.5)	3,267	(53.1)	1,430	(27.7)	27,167	(61.4)
Posterior	7,389	(30.8)	3,090	(34.5)	2,888	(46.9)	3,728	(72.3)	17,095	(38.6)
Trochanteric osteotomy										
With	1,596	(6.7)	193	(2.2)	171	(2.8)	168	(3.3)	2,128	(4.8)
Without	22,396	(93.4)	8,764	(97.9)	5,984	(97.2)	4,990	(96.7)	42,134	(95.2)
Complex osteotomy[21]										
With	102	(0.6)	15	(0.2)	10	(0.2)	15	(0.4)	142	(0.5)
Without	16,624	(99.4)	6,607	(99.8)	4,198	(99.8)	3,609	(99.6)	31,038	(99.5)
Incision length[21]										
Greater than 10 cm	11,955	(85.6)	4,081	(73.3)	2,867	(82.0)	2,775	(91.4)	21,678	(83.2)
Less than or equal to 10cm	2,015	(14.4)	1,485	(26.7)	630	(18.0)	260	(8.6)	4,390	(16.8)
Femoral bonegraft used										
Yes	334	(1.4)	180	(2.0)	54	(0.9)	101	(2.0)	669	(1.5)
No	23,658	(98.6)	8,777	(98.0)	6,101	(99.1)	5,057	(98.0)	43,593	(98.5)
Acetabular bonegraft used										
Yes	1,254	(5.2)	693	(7.7)	585	(9.5)	259[49]	(5.0)	2,791	(6.3)
No	22,738	(94.8)	8,264	(92.3)	5,570	(90.5)	4,899	(95.0)	41,471	(93.7)
Femoral cement used										
Yes	23,992	(100)	0	(0)	5,846	(95.0)	4,405	(85.4)	34,243	(77.4)
No	0	(0)	8,957	(100)	309	(5.0)	753	(14.6)	10,019	(22.6)
Acetabular cement used										
Yes	23,992	(100)	0	(0)	309	(5.0)	58319	(11.3)	24,884	(56.2)
No	0	(0)	8,957	(100)	5,846	(95.0)	4,575	(88.7)	19,378	(43.8)
Minimally invasive surgery used										
Yes	1,042	(4.6)	1,010	(11.8)	350	(5.9)	331	(6.7)	2,733	(6.5)
No	21,858	(95.4)	7,524	(88.2)	5,569	(94.1)	4,577	(93.3)	39,528	(93.5)
Image guided surgery used										
Yes	131	(0.6)	74	(0.9)	38	(0.7)	36	(0.7)	279	(0.7)
No	22,263	(99.4)	8,253	(99.1)	5,764	(99.3)	4,774	(99.3)	41,054	(99.3)
Total	**23,992**		**8,957**		**6,155**		**5,158**		**44,262**	

Table 9 - *Procedure type for 'young' patients*[22]

'Young' patients		
	Number	(%)
Procedure type		
Total hip replacement using cement	611	(17.6)
Total hip replacement not using cement	853	(24.6)
Hybrid or reverse hybrid	422	(12.2)
Resurfacing arthroplasty	1,585	(45.6)
Total	**3,471**	

In this sub group of young patients, there were more males than females (53% male). The majority (60%) of young patients had a physical status of 'fit and healthy'. Osteoarthritis remains the most common indication for operation (85% of procedures), although an increased percentage of patients in this age group had avascular necrosis (7.7%) or congenital dislocation/dysplasia of the hip (7.6%) as an indication. Most young patients were given a general anaesthetic (70%). More incisions were posterior as opposed to anterior, antero-latero or supine for this sub group, reflecting the high proportion of resurfacing procedures. The percentages of procedures in young patients involving minimally invasive surgery and image guided surgery are largely similar to those for primary hip procedures in patients over 55 (6.4% and 0.4% as compared to 7.1% and 0.6%).

Comparison with 2003 data

The breakdown of primary hip procedures according to the different procedure types in 2004 was broadly similar to that in 2003. THR using cement remains the most commonly entered procedure type, though to a lesser extent: 54% of all primary procedures in 2004 compared with 63% in 2003. The proportion of THR procedures not using cement has grown slightly from 16% in 2003 to 20% in 2004, and there has also been a small increase in the percentage of hybrid procedures (11% to 14%). Likewise, the percentage of resurfacing procedures has risen marginally (10% to 12%).

Characteristics of patients undergoing primary hip replacements in 2004 are unchanged from 2003. Characteristics of surgeons performing the procedures are also unchanged, except for an increase in the numbers of surgeons reported as coming from overseas surgical teams.

In terms of surgical practice for primary hip procedures, the most noteworthy change is an increase in the use of minimally invasive surgery, from 3.9% in 2003 to 6.5% in 2004. The use of femoral bone grafts and the use of cement have dropped slightly (the drop in cement use reflecting the overall fall in the percentage of procedures that were THR using cement). Otherwise surgical practice in 2004 is consistent with that in 2003.

4.8 Primary knee replacement procedures

4.8.1 Description of patient characteristics

Table 10 shows that the mean age of patients receiving primary knee replacements was 70 years. The general medical condition of the majority of patients (62%) was 'mild disease, not incapacitating'[23]. Osteoarthritis was the most common indication for surgery, present in 96% of all patients.

4.8.2 Description of primary knee replacement procedures

Description of surgeons

Overall, the lead surgeon was a consultant in 79% of procedures (table 11 on page 12). For unicondylar knee replacements, a consultant was the lead surgeon 91% of the time, and for patello-femoral replacements, this figure was 94%.

There were 2,150 lead surgeons in total on the database for knee procedures. The number of primary knee replacements entered per surgeon over the 12-month reporting period ranged from 1 to 354. 1,350 lead surgeons were consultants and 118 were associate specialists, staff grades or clinical assistants, with an average of 25 procedures each.

Table 10 - Patient characteristics for primary knee replacement procedures in 2004, according to procedure type

	Patient procedure					
	Total replacement using cement	Total replacement not using cement	Hybrid[24]	Unicondylar knee replacement	Patello-femoral replacement	Total
Age, years (consenting patients only)[25]						
Mean (sd)	71.0 (9.1)	69.5 (9.6)	69.5 (9.8)	65.0 (9.6)	62.9 (10.9)	70.3 (9.4)
Inter-quartile range	65.0 – 77.5	63.4 – 76.5	63.7 – 76.6	58.2 – 72.1	56.1 – 70.7	64.2 – 77.1
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Gender (consenting patients)[26]						
Male	9,703 (42.7)	921 (47.1)	252 (43.2)	1,253 (52.5)	53 (19.9)	12,182 (43.6)
Female	13,044 (57.3)	1,033 (52.9)	332 (56.8)	1,134 (47.5)	214 (80.1)	15,757 (56.4)
Physical status[27]						
P1 - Fit and healthy	8,213 (23.8)	818 (26.3)	270 (28.9)	1,411 (37.1)	155 (37.1)	10,867 (25.4)
P2 - Mild disease, not incapacitating	21,573 (62.5)	1,864 (60.0)	543 (58.0)	2,122 (55.7)	238 (56.9)	26,340 (61.6)
P3 - Incapacitating systemic disease	4,548 (13.2)	416 (13.4)	115 (12.3)	260 (6.8)	25 (6.0)	5,364 (12.5)
P4 - Life threatening/expected to die within 24hrs[28]	188 (0.5)	10 (0.3)	8 (0.8)	14 (0.4)	0 (0)	220 (0.5)
Indications for surgery[29]						
Osteoarthritis	33,027 (95.7)	2,989 (96.2)	900 (96.2)	3,770 (99.0)	400 (95.7)	41,086 (96.0)
Avascular necrosis	163 (0.5)	5 (0.2)	5 (0.5)	15 (0.4)	0 (0)	188 (0.4)
Rheumatoid arthritis	1,100 (3.2)	109 (3.5)	23 (2.5)	7 (0.2)	3 (0.7)	1,242 (2.9)
Trauma	70 (0.2)	6 (0.2)	3 (0.3)	4 (0.1)	2 (0.5)	85 (0.2)
Other[30]	631 (1.8)	39 (1.3)	22 (2.4)	29 (0.8)	18 (4.3)	739 (1.7)
Side						
Bilateral[31]	204 (0.6)	28 (0.9)	2 (0.2)	40 (1.1)	15 (3.7)	289 (0.7)
Left	16,263 (47.4)	1,486 (48.2)	430 (46.1)	1,877 (49.8)	191 (47.3)	20,247 (47.6)
Right	17,852 (52.0)	1,566 (50.9)	501 (53.7)	1,849 (49.1)	198 (49.0)	21,966 (51.7)
Waiting list initiative/patient choice[32,33]						
Yes	4,447 (23.9)	355 (21.6)	181 (28.5)	421 (20.5)	21 (9.6)	5,425 (23.4)
No	14,162 (76.1)	1,286 (78.4)	455 (71.5)	1,632 (79.5)	198 (90.4)	17,733 (76.6)
Tertiary referral[32,33]						
Yes	1,130 (6.3)	53 (3.4)	72 (11.8)	93 (4.6)	25 (11.5)	1,373 (6.2)
No	16,718 (93.7)	1,528 (96.6)	540 (88.2)	1,913 (95.4)	192 (88.5)	20,891 (93.8)
Total	**34,522**	**3,108**	**936**	**3,807**	**418**	**42,791**

[22] Patients under 55 years, in line with the American Hip Society cut-off

[23] Classification of general medical condition according to the American Society of Anaesthesiology scoring system (ASA grade)

[24] A hybrid procedure is one where either the femoral or tibial side of the joint receives a cemented prosthetic component and the other side receives a cementless component

[25] Statistics based on that subset of procedures for which patient consent was obtained and a plausible date of birth recorded in the NJR or obtained from the NSTS (27,870 primary knee procedures). Where date of birth recorded in the NJR differed from that in the NSTS, the latter was selected as the more reliable

[26] Statistics based on that subset of procedures for which patient consent was obtained and sex was recorded in the NJR or obtained from the NSTS (27,939 primary knee procedures). Where sex recorded in the NJR differed from that in the NSTS, the latter was selected as the more reliable

[27] Patient physical status according to American Society of Anaesthesiology scoring system (ASA grade)

[28] It is unlikely that so many patients will have been of physical status P4 or P5 before surgery. Hence, for procedures with patient ASA grade P4 or P5 this data item may have been mis-entered

[29] More than one indication may be selected per procedure so these values add up to more than 100%

[30] Other indications for surgery included previous infection and failed internal fixation

[31] Bilateral operations are classed as two procedures. Therefore, the 289 bilateral primary knee procedures count as 578 procedures elsewhere in the table

[32] Based on that subset of procedures entered into the NJR using MDS version 2 and for which the item was recorded. Data item not present in MDS version 1

[33] Figures for waiting list initiative/patient choice and for tertiary referral should be interpreted with caution as hospitals may have been interpreting the term in different ways when submitting data

Table 11 - Characteristics of lead surgeons performing primary knee replacement procedures in 2004, according to type of procedure

	Patient procedure					
	Total replacement using cement	Total replacement not using cement	Hybrid	Unicondylar knee replacement	Patello-femoral replacement	Total
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Lead surgeon grade[34]						
Consultant	26,830 (77.7)	2,382 (76.6)	724 (77.4)	3,457 (90.8)	394 (94.3)	33,787 (79.0)
Associate specialist/Staff grade/ Clinical Assistant	2,398 (7.0)	308 (9.9)	119 (12.7)	115 (3.0)	3 (0.7)	2,943 (6.9)
With consultant assistance	123 (5.1)	7 (2.3)	5 (4.2)	12 (10.4)	1 (33.3)	148 (5.0)
Without consultant assistance	2,275 (94.9)	301 (97.7)	114 (95.8)	103 (89.6)	2 (66.7)	2,795 (95.0)
SPR/SHO/Other[35]	5,294 (15.3)	418 (13.5)	93 (9.9)	235 (6.2)	21 (5.0)	6,061 (14.1)
With consultant assistance	2,308 (43.6)	178 (42.6)	49 (52.7)	118 (50.2)	17 (81.0)	2,670 (44.1)
Without consultant assistance	2,986 (56.4)	240 (57.4)	44 (47.3)	117 (49.8)	4 (19.0)	3,391 (55.9)
Lead surgeon from non-UK surgical team[36]						
Yes	918 (2.7)	66 (2.1)	54 (5.8)	44 (1.2)	0 (0)	1,082 (2.5)
No/not selected	33,604 (97.3)	3,042 (97.9)	882 (94.2)	3,763 (98.8)	418 (100)	41,709 (97.5)
Lead surgeon is a locum						
Yes	2,298 (6.7)	288 (9.3)	44 (4.7)	98 (2.6)	3 (0.7)	2,731 (6.4)
No	32,224 (93.3)	2,820 (90.7)	892 (95.3)	3,709 (97.4)	415 (99.3)	40,060 (93.6)
Total	**34,522**	**3,108**	**936**	**3,807**	**418**	**42,791**

Description of surgical practice in primary knee replacements

Table 12 shows that 94% of procedures took place in a laminar flow theatre. General anaesthesia was the most frequently used type of anaesthesia (55%). Spinal anaesthesia was the next most commonly used (42%). The surgical approach was primarily medial parapatellar (for 93% of procedures). It was rare for use of a femoral or tibial bone graft to have been reported. Of the 761 hybrid procedures for which cementing details were given[37], 83% involved a cemented tibial component, whilst the femoral component was not cemented. The remaining 17% involved a cemented femoral component, whilst tibial cement was not used. Image guided surgery was used infrequently (1.1% of procedures). Minimally invasive surgery was used in 6.1% of all procedures. There was wide variation in the frequency of use of minimally invasive surgery for the different procedure types: 1.3% of TKR procedures without cement and 2.6% of TKR procedures using cement compared with 43% of unicondylar replacements.

For each component (whether the femur, tibia or patella) vacuum mixing was used for 90-91% of procedures.

Description of untoward intra-operative events

Very few untoward intra-operative events were reported. Fracture was the most frequently reported adverse event. There was little variation in the probability of an untoward event for the different procedure types.

Description of primary knee replacement procedures in young patients

1,575 (3.7%) of the 42,791 primary knee replacement procedures were known to have been performed on 'young patients', i.e. patients of less than 55 years old[38] (table 13 on page 14). Considerably fewer TKRs using cement were performed on young patients than on patients over 55 (65% versus 82%[39]). The proportion of procedures that were unicondylar replacements in young patients was much higher (21%) than for patients over 55 (7.8%). The proportion of procedures that were patello-femoral replacements was also marginally higher (3.8% to 0.8%).

Table 12 - *Characteristics of surgical practice for primary knee replacement procedures in 2004, according to procedure type*

	Patient procedure											
	Total replacement using cement		Total replacement not using cement		Hybrid		Unicondylar knee replacement		Patello-femoral replacement		Total	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Laminar flow theatre												
Yes	30,118	(94.8)	2,435	(87.5)	843	(95.7)	3,218	(94.3)	371	(95.6)	36,985	(94.2)
No	1,665	(5.2)	348	(12.5)	38	(4.3)	194	(5.7)	17	(4.4)	2,262	(5.8)
General anaesthesia used[40]												
Yes	18,615	(53.9)	1,609	(51.8)	475	(50.8)	2,462	(64.7)	279	(66.8)	23,440	(54.8)
No	15,907	(46.1)	1,499	(48.2)	461	(49.2)	1,345	(35.3)	139	(33.2)	19,351	(45.2)
Epidural anaesthesia used[40]												
Yes	6,356	(18.4)	449	(14.5)	191	(20.4)	575	(15.1)	65	(15.6)	7,636	(17.8)
No	28,166	(81.6)	2,659	(85.5)	745	(79.6)	3,232	(84.9)	353	(84.4)	35,155	(82.2)
Nerve block anaesthesia used[40]												
Yes	6,717	(19.5)	669	(21.5)	153	(16.4)	723	(19.0)	99	(23.7)	8,361	(19.5)
No	27,805	(80.5)	2,439	(78.5)	783	(83.6)	3,084	(81.0)	319	(76.3)	34,430	(80.5)
Spinal anaesthesia used[40]												
Yes	14,774	(42.8)	1,396	(44.9)	403	(43.1)	1,246	(32.7)	132	(31.6)	17,951	(42.0)
No	19,748	(57.2)	1,712	(55.1)	533	(56.9)	2,561	(67.3)	286	(68.4)	24,840	(58.0)
Sedation used[40,41]												
Yes	1,910	(7.9)	185	(8.5)	52	(6.8)	186	(6.8)	17	(6.1)	2,350	(7.8)
No	22,234	(92.1)	1,981	(91.5)	709	(93.2)	2,556	(93.2)	261	(93.9)	27,741	(92.2)
Surgical Approach												
Lateral parapatellar	665	(1.9)	58	(1.9)	12	(1.3)	109	(2.9)	6	(1.4)	850	(2.0)
Medial parapatellar	32,078	(92.9)	2,918	(93.9)	816	(87.2)	3,519	(92.4)	399	(95.5)	39,730	(92.9)
Sub-Vastus	564	(1.6)	87	(2.8)	39	(4.2)	32	(0.8)	6	(1.4)	728	(1.7)
Other[42]	1,215	(3.6)	45	(1.4)	69	(7.3)	147	(3.9)	7	(1.7)	1,483	(3.4)
Femoral bone graft used[40]												
Yes	147	(0.6)	46	(2.1)	10	(1.3)	9	(0.3)	1	(0.4)	213	(0.7)
No	23,997	(99.4)	2,120	(97.9)	751	(98.7)	2,733	(99.7)	277	(99.6)	29,878	(99.3)
Tibial bone graft used[40]												
Yes	162	(0.7)	51	(2.4)	9	(1.2)	6	(0.2)	1	(0.4)	229	(0.8)
No	23,982	(99.3)	2,115	(97.6)	752	(98.8)	2,736	(99.8)	277	(99.6)	29,862	(99.2)
Tibial cement used[40]												
Yes	24,144	(100)	0	(0)	633	(83.2)	2,673	(97.5)	79	(28.4)	27,529	(91.5)
No	0	(0)	2,166	(100)	128	(16.8)	69	(2.5)	199	(71.6)	2,562	(8.5)
Femoral cement used[40]												
Yes	24,144	(100)	0	(0)	128	(16.8)	2,676	(97.6)	257	(92.5)	27,205	(90.4)
No	0	(0)	2,166	(100)	633	(83.2)	66	(2.4)	21	(7.5)	2,886	(9.6)
Minimally invasive surgery used												
Yes	865	(2.6)	38	(1.3)	26	(2.9)	1,511	(43.4)	32	(8.0)	2,472	(6.1)
No	32,088	(97.4)	2,854	(98.7)	871	(97.1)	1,967	(56.6)	366	(92.0)	38,146	(93.9)
Image guided surgery used												
Yes	355	(1.1)	36	(1.2)	18	(2.0)	51	(1.5)	6	(1.5)	466	(1.1)
No	32,580	(98.9)	2,856	(98.8)	872	(98.0)	3,404	(98.5)	393	(98.5)	40,105	(98.9)
Total	**34,522**		**3,108**		**936**		**3,807**		**418**		**42,791**	

[34] It is possible that the number of lead surgeons who were consultants is an overestimate as a consultant may have been declared the lead for any procedures under his consultancy, even if he was not actually performing them due to misinterpretation of the data item

[35] Other grades reported included 'fellow', 'professor' and 'locum consultant'

[36] Numbers of lead surgeons from non-UK surgical teams should be interpreted with caution as data quality checks revealed some misinterpretation of this data item. The percentage from overseas is likely to be an overestimate

[37] Details of which components used cement were only available for procedures entered using MDS version 2

[38] The actual numbers of procedures performed on young patients may be higher as age could only be determined for consenting patients, so there may be additional young patients amongst those who did not give consent

[39] Figures for patients over 55 years not shown

[40] More than one type of anaesthesia may be used for a single procedure

[41] Based on a sub-sample of procedures entered into the NJR using MDS version 2 and for which this data item was completed

[42] Other surgical approaches given included intra-vastus, insall, tri vector and mid vastus

Table 13 - *Procedure type for 'young' patients*[43]

'Young patients'		
	Number	(%)
Procedure type		
Total knee replacement using cement	1,022	(64.9)
Total knee replacement not using cement	114	(7.2)
Hybrid	46	(2.9)
Unicondylar knee replacement	334	(21.2)
Patello-femoral replacement	59	(3.8)
Total	**1,575**	

Comparison with 2003 data

Patient characteristics were distributed similarly to that in 2003. The characteristics of the lead surgeons were also largely consistent with those found in 2003. A slightly larger percentage of the lead surgeons in 2004 were Specialist Registrars, Senior House Officers or other grades (14% in 2004 compared with 10% in 2003). More lead surgeons came from an overseas surgical team.

Surgical practice and use of thrombo-phrophylaxis regime in 2004 reflected that in 2003, with no noteworthy changes.

4.9 Revision of hip and knee replacement procedures

A total of 4,516 hip revision procedures were entered into the NJR over this time period. There were 1,966 knee revision procedures.

The mean age of hip revision patients was 69 years. There were more female than male patients (57% to 43%). For over three quarters of revision procedures the patient general medical condition was classed as 'fit and healthy' or with 'mild disease, not incapacitating'. Overall, aseptic loosening was the most common indication for revision (for 79% of all procedures), followed by lysis (25%) and pain (16%). Infection was a frequently given indication for hip Girdlestone procedures (63%) and for two-stage revision procedures (64%).

The mean age of patients undergoing knee revision procedures was 70 years. For 82% of procedures the patient had an overall general medical condition of 'fit and healthy' or 'mild disease, not incapacitating'. Overall, aseptic loosening was the most common indication for revision, given for 59% of procedures. Pain (18%) and lysis (17%) were the next most common indications. Infection was also frequently reported (15%). As expected, it was the most common indication for two-stage procedures (81%) and for conversion to arthrodesis (three out of the four cases).

Description of surgeons performing revision procedures

The lead surgeon was a consultant in 91% of hip revision procedures. For 94% of knee revision procedures, the lead surgeon was consultant.

Description of implants removed in revision procedures

Tables 14 and 15 summarise the combinations of implants removed during hip and knee revision procedures respectively.

Table 14 - *Combinations of implants removed during hip revision procedures*

Reported combinations of implants removed		
	Number	(%)
Femoral head alone	61	(2.1)
Femoral stem alone (includes monobloc stems with no separate head)	325	(11.2)
Acetabular cup or shell and/or liner alone	390	(13.5)
Femoral head + femoral stem	135	(4.7)
Acetabular cup or shell and/or liner + femoral head	293	(10.1)
Acetabular cup or shell and/or liner + femoral stem	903	(31.2)
Acetabular cup or shell and/or liner + femoral head + femoral stem	649	(22.5)
None	135	(4.7)
Total	**2,891**	

Table 15 - *Combinations of implants removed in revision knee replacement procedures*

Reported combinations of implants removed		
	Number	(%)
Femoral component alone	78	(6.6)
Tibial component alone	68	(5.7)
Patella button alone	26	(2.2)
Femoral component and tibial component	601	(50.6)
Femoral component and patella button	41	(3.5)
Tibial component and patella button	3	(0.3)
Femoral component and tibial component and patella button	260	(21.9)
None of the above[44]	110	(9.2)
Total	**1,187**	

Description of re-operations other than revisions

Tables 16 and 17 summarise the types of re-operations performed on hips and knees, after an initial replacement procedure[45].

Table 16 - *Types of hip re-operations entered into the NJR database*

Type of re-operation	Number	(%)
Wound exploration	20	(9.6)
Open reduction of dislocation	20	(9.6)
Socket augmentation	19	(9.1)
Orif femur	12	(5.7)
Excision of heterotopic bone	5	(2.4)
Orif trochanter	5	(2.4)
Focal bonegraft only (femur)	2	(1.0)
Focal bone graft only (acetabulum)	1	(0.5)
Other procedure[46]	148	(70.8)
Total	**209**	

Table 17 - *Types of knee re-operations entered into the NJR database*

Type of re-operation	Number	(%)
Resurfacing of patella	68	(48.2)
Manipulation under anaesthesia	16	(11.3)
Washout	16	(11.3)
Soft tissue repair/realignment	10	(7.1)
Wound debridement	6	(4.3)
Orif peri-prosthetic fracture	3	(2.1)
Other procedure[47]	39	(27.7)
Total	**141**	

The lead surgeon was a consultant in 53% of hip re-operations and 78% of knee re-operations. These are lower proportions than for revision procedures and this reflects the non-elective nature of many of the interventions for these complications.

Revisions linkable with NJR primary procedures

Here, as numbers are small, any revisions so far in the NJR database, performed in either 2003 or 2004, which are linked to a primary procedure, are considered. 122 hip revision or re-operation procedures performed between 1 April 2003 and 31 December 2004 are linked to a primary procedure in the database. 54 knee revision or re-operation procedures performed over this time period are linked.

Description of linked hip procedures

Of the 122 hip revision or re-operation procedures, in seven cases, two revision procedures were linked to the same primary procedure. Only the first revision/re-operation is considered here. Of these 115 linked procedures, 12 were re-operations other than revisions. Thus, 103 revisions are considered further. Just over half of 103 hip revision procedures (where specified) were single stage revisions. Three procedures were stage 2 of two-stage revisions and 2 procedures were stage 1 of a two-stage. Both the 1 and 2 stages are included here (unlike in the descriptions of all revisions) as the information available shows that the procedures are all for different patients.

The most common indication for revision was dislocation (47%). This reflects the fact that all the linked revisions are early revisions due to the short follow-up. Indeed, the median time from primary to revision procedure was 39 days.

54% of patients with linked hip procedures were female. 38% of the linked revisions were linked to primary total replacements using cement.

[43] Patients under 55 years

[44] Implants removed could instead be a hinged knee or a simple exchange of tibial insert or other component

[45] Since re-operation procedures will often take place out of normal working hours, and often in emergency theatres, the data is likely to be very fragmented at this stage of the evolution of the NJR

[46] Where the free-text field 'Other hip re-operations' was completed, responses (quoted exactly as entered into the field) included 'reconstruction of abductor', 'closed reduction of dislocation', 'removal of screws' and 'application of PLAD' (posterior lipped augmentation device)

[47] Where the free-text field 'Other knee re-operations' was completed, responses (quoted exactly as entered into the field) included 'draining of abscess', 'exploration', 'lateral release', 're-cutting of tibia' and 'replacement of spacer'

35% were linked to primary total replacements not using cement. One in 10 linked primary procedures were performed using minimally invasive surgery. Image guided surgery was not used in any of the linked primary procedures. The lead surgeon for the primary procedure was a consultant 85% of the time.

Description of linked knee procedures

Three of the 54 primary knee procedures were linked to two different revision/re-operation procedures. In the descriptions that follow, only the earliest revision is considered, leaving 51 procedures in total.

Nine procedures were re-operations other than revision. 42 procedures were revision procedures (57% single stage revisions, 7.1% stage 1 and 7.1% stage 2 of two-stage revision procedures, and the remainder unspecified). Both stage 1 and stage 2 of two-stage procedures are included as none correspond to the same patient.

The most common indications for revision were aseptic loosening (29%) and infection (29%), followed by instability (14%) and pain (14%). 62% of patients with linked knee procedures were male. The median time to revision was 210 days.

55% of primary procedures were total knee replacements using cement. Total knee replacement procedures not using cement were rare (2.4%). 41% of primary procedures were unicondylar replacements. Minimally invasive surgery was used in 12% of primary procedures. Image guided surgery was not used in any of the linked primary procedures. A consultant performed 93% of primary procedures.

4.10 Prostheses used in hip replacement procedures (primary and revision)

In total, for the 2004 data collection period, 88 different brands of acetabular cups and 101 different brands of femoral stems were recorded in the NJR[48].

4.10.1 The Orthopaedic Data Evaluation Panel

In December 2002, PASA established the Orthopaedic Data Evaluation Panel (ODEP) to provide an independent assessment of the clinical outcomes data, submitted by implant manufacturers, regarding the compliance of brands of total hip and hip resurfacing prostheses with the NICE benchmarks[49]. Following extensive dialogue between ODEP and industry representatives through the Association of British Healthcare Industries, a document was produced outlining the ODEP criteria for product categorisation against the NICE benchmarks - see table 18.

Table 18 - *ODEP criteria for categorising products in relation to NICE's benchmarks*

Pre-entry benchmark products	
Manufacturers are requested to keep ODEP informed of all commercially available prostheses that are involved in postmarket clinical follow-up studies. (This need not include products still in development). The details should consist of: Number of centres Number of surgeons Number of patients Methodology of study All UK implanting centres identified ODEP will then list these products for surgeons' information	**3 years** *Level A – Acceptable evidence* – Failure rate of 3% or less – Kaplan Meier survivorship submitted – 95% confidence intervals to include benchmark – All UK implanting centres identified – All product failures identified – A list provided of all studies (published or unpublished) including all initiated by the manufacturer – All English and Welsh data now being entered into NJR *Level B – Weak evidence* – Acceptable failure rate – Study results submitted – Failures identified
Products that do not meet the benchmark should only be used as part of a clinical trial	*Unacceptable evidence*

Analysis of the summary data shows that the usage of products meeting the full ten year benchmark as recommended by NICE is as follows:

Cemented Stems - 72.5 %
(9 brands out of 45 seen on NJR database)

Cementless Stems - 58.1 %
(5 brands out of 48 seen on NJR database)

Cemented Cups - 53.6 %
(7 brands out of 41 seen on NJR database)

Cementless Cups - 0.0 %
(0 brands out of 39 seen on NJR database)

However, there are 22 brands of femoral stem, 27 brands of acetabular cup and two brands of resurfacing prostheses for which there have been no submissions to ODEP. Submissions for a further 22 brands of stem,19 brands of cup and four brands of resurfacing prostheses contain only up to a maximum of three years clinical outcomes data or contain unacceptable longer-term outcome data; these prostheses therefore fail to meet the benchmarks set by NICE. One important role of the NJR is in monitoring of the performance of these newer technologies.

4.10.2 Hip brands and combinations entered into the NJR

Of the 39,174 hip replacement procedures included in the 2004 data, 9,718 (25%) used 'mixed and matched'[50] cup-stem combinations.

Of the 36,567[51] femoral heads recorded in the NJR, roughly three quarters were made of metal. The remainder were ceramic (alumina or zirconia). This is very similar to the figures found for the 2003 data (76% metal).

Entry benchmark		Full benchmark
5 years	**7 years**	**10 years**
Level A – Acceptable evidence – Failure rate of 5% or less – Kaplan Meier survivorship submitted – 95% confidence intervals to include benchmark – All UK implanting centres identified – All product failures identified – Data beyond developing centre submitted – A list provided of all studies (published or unpublished) including all initiated by the manufacturer – All English and Welsh data now being entered into NJR	*Level A – Acceptable evidence* – Failure rate of 7% or less – Kaplan Meier survivorship submitted – 95% confidence intervals to include benchmark – All UK implanting centres identified – All product failures identified – Data beyond developing centre/s submitted – A list provided of all studies (published or unpublished) including all initiated by the manufacturer – All English and Welsh data now being entered into NJR	*Level A – Strong evidence* – Failure rate of 10% or less – Cohort of more than 500 joints at start of study – All product failures identified – Kaplan Meier survivorship at 10 years on acceptable size cohort – Registry data or multicentre (3 or more centres including non developing) *Level B – Reasonable evidence* – Failure rate of 10% or less – Multicentre (more than one) data submitted – Data beyond developing centre/s submitted *Level C – Weak evidence (products given two years to improve data or they are deemed unacceptable)* – Failure rate of 10% or less – Study results submitted
Level B – Weak evidence – Acceptable failure rate – Study results submitted – Failures identified	*Level B – Weak evidence* – Acceptable failure rate – Study results submitted – Failures identified	
Unacceptable evidence	*Unacceptable evidence*	*Unacceptable evidence*

NICE benchmark

[48] This total includes cemented and cementless prostheses and resurfacing cups and heads

[49] National Institute for Clinical Excellence (2000) Technology Appraisal Guidance - No.2 Guidance on the selection of prostheses for primary total hip replacement

National Institute for Clinical Excellence (2000) Technology Appraisal Guidance - No.44 Guidance on the use of metal on metal hip resurfacing arthroplasty

[50] Stem brand manufacturer is different from cup brand manufacturer

[51] This is less than the total number of relevant hip procedures due to the usage of monobloc stems that do not require a separate head. Also, for some heads entered, the size or material used was unknown

Looking at just the 'young' patients (less than 55 years old), there is a much more even split between metal and ceramic use. Ceramic heads have actually been used more frequently than metal heads in this age group, with 42% being metal.

The 28 mm head size is by far the most commonly used (in 72% of all procedures using heads).

Comparison with 2003 data

The total number of brands entered into the NJR has increased. 88 different brands of acetabular cups and 101 different brands of femoral stems were recorded in the NJR in 2004, compared with 78 cup brands and 91 stem brands in 2003[52]. A total of 22 brands of cups and 28 brands of stems are new in the 2004 data, whilst there are 12 brands of cups and 18 brands of stems that appeared in data from 2003 and that do not appear in the 2004 data[53].

There are two brands of resurfacing prostheses new to the 2004 data.

The percentage of 'mixed and matched' cup-stem combinations is slightly larger than for the 2003 data collection period (25% versus 22%).

4.11 Prostheses used in knee replacement procedures (primary and revision)

4.11.1 Knee brands and combinations entered into the NJR

A total of 33 different brands of total condylar knee prostheses were recorded. In addition, 10 brands of unicondylar prostheses, three brands of patello-femoral replacement prostheses and seven brands of hinged prostheses were recorded.

The patella was resurfaced in 14,847 procedures in 2004. This is 37% of the 40,673 total knee replacements and hybrid primary and revision procedures.

Comparison with 2003 data

There are four brands of total condylar prostheses that are new to the 2004 data, whilst seven brands of total condylar prostheses that appeared in 2003 do not appear in 2004. There is one additional unicondylar prosthesis brand in the 2004 data and another unicondylar prosthesis brand no longer appears. There is also one new patello-femoral joint knee brand[53].

The percentage of tibial inserts that are mobile bearing has increased slightly from 12% in 2003 to 15% in 2004.

4.12 Cement and bone substitute use

The majority (89%) of procedures entered into the NJR in 2004 involving cement, where reported, used antibiotic-loaded cement, as opposed to non-antibiotic.

More than one packet of cement could be entered for a particular procedure. For knee procedures, between 1 and 11 packets were entered for a single procedure. For hip procedures, up to 10 packets were entered.

Bone substitutes were recorded for just 182 (0.2%) of the 93,885 hip and knee procedures.

4.13 Mortality of hip and knee replacement patients

31,060 primary hip replacement patients with operation dates between 1 April 2003 and 31 December 2004 have NHS numbers. A date of death was traced for 533 (1.7%) of these patients through the National Strategic Tracing Service (NSTS) in March 2005.

203 of the 31,060 primary hip replacement patients have a date of death within 3 months of their operation. This corresponds to an overall 3-month mortality rate of 0.64% (0.56%, 0.73%)[54]. Males had a higher 3-month mortality rate than females (0.69% versus 0.60%). The 3-month mortality rate increased with age, as might be expected.

29,857 primary knee replacement patients with operation dates between 1 April 2003 and 31 December 2004 have NHS numbers. A date of death was traced for 474 (1.6%) of these patients through the NSTS.

153 of the 29,857 primary knee replacement patients have a date of death within 3 months of their operation. This corresponds to an overall 3-month mortality rate of 0.49% (0.42%, 0.58%). 3-month mortality amongst male primary knee replacement patients was higher than for females. The 3-month mortality rate increased with age.

For both hips and knees, there were differences in mortality rates between procedure types. But care is needed in interpreting results as the mortality rates were not adjusted to take account of possible differences in case mix. For example, resurfacing arthroplasty patients tend to be younger than patients undergoing other hip procedures.

4.14 Patient reported outcomes measurement - interim study

In March 2005, the NJR carried out a postal survey in a group of 10,000 patients who had undergone a replacement of a hip joint and in a group of 10,000 patients who had undergone a replacement of a knee joint in England or Wales between April and December 2003. The aim of this survey was to examine how patients viewed the outcome of their joint replacement at least one year after the surgery. The questionnaire contained the Oxford Hip Score or the Oxford Knee Score.[55] Both instruments consist of 12 questions on problems and symptoms related to the joint replacement in the last four weeks. They were developed to be completed by patients having a joint replacement. The answer to each question is rated on a scale ranging from 1 to 5 with higher scores indicating more severe problems. The scores for each question are added to generate an overall score between 12 and 60.

Patients were also asked whether they had experienced problems other than those addressed in the Oxford Hip or Knee Scores and whether they were satisfied with their prosthesis. The survey questionnaire that was used for patients who had undergone a hip replacement was broadly similar to the one that was used for the National Total Hip Replacement Outcome Study. This study was carried out in more than 13,000 patients who had undergone a primary total hip replacement in a 12-month period in 1996-1997 in three regions in England.[56]

4.14.1 Outcomes after a primary unilateral hip replacement - key facts

Of the 10,000 survey questionnaires sent to patients, 9,942 could be linked with data in the NJR database. Of these, questionnaires sent to 8,922 patients who had undergone a unilateral primary procedure could be considered. 7,838 (88%) of eligible patients returned their survey questionnaires.

The 91% of returned questionnaires from which the Oxford Hip Score could be calculated, suggest that about 30% of patients have no or hardly any problems related to their hip replacement. However, 6.1% of patients had an Oxford Hip Score suggesting that they have moderate to severe problems.

Of 7,705 patients who responded to the question, 90% were satisfied with their hip replacement and 3.5% were not satisfied.

[52] Numbers include resurfacing heads and cups and revision stems (hence larger than numbers reported in 1st Annual Report which excluded these prosthesis types)

[53] Figures should be interpreted with caution as brand names may have changed and some brands have been redefined so that e.g. a single brand in 2003 has been subdivided into two separate brands in 2004

[54] Obtained from survival analysis, taking into account the differing lengths of time patients have been in the NJR database

[55] Questionnaire on the perceptions of patients about total hip replacement - Dawson J, Fitzpatrick R, Carr A, Murray D. Journal of Bone and Joint Surgery(Br) 1998 (78-B: 185-190); Questionnaire on the perceptions of patients about total knee replacement - Dawson J, Fitzpatrick R, Murray D, Carr A. Journal of Bone and Joint Surgery(Br) 1998 (80-B: 63-69)

[56] National Total Hip Replacement Outcome Study. Final report to the Department of Health, January 2000 - A Joint Report from The Royal College of Surgeons of England and the British Orthopaedic Association

4.14.2 Outcomes after a primary unilateral knee replacement - key facts

Of the 10,000 survey questionnaires sent to patients, 9,935 could be linked with data in the NJR database. Of these, questionnaires sent to 9,417 patients who had undergone a unilateral primary knee procedure could be considered. 8,231 (87%) of eligible patients returned their survey questionnaires.

The 88% of returned questionnaires from which the Oxford Knee Score could be calculated, suggest that slightly less than 10% of patients have no or hardly any problems related to their knee replacement. However, 11% of patients had an Oxford Knee Score suggesting that they have moderate to severe problems.

Of 8,095 patients who responded to the question, 82% were satisfied with their knee replacement and 7.0% were not satisfied.

4.14.3 Analysis of 'free text' responses

The last item of the questionnaire invited patients to make 'any other comments' about their operation or recovery. The free text responses from 1,000 questionnaires each for hip and knee (randomly selected) were analysed. This demonstrated that the majority of the patients are content with the outcome of their joint replacement. On the other hand, there is also a group of patients that is less happy mainly because they have a painful joint and are impaired in their daily functioning.

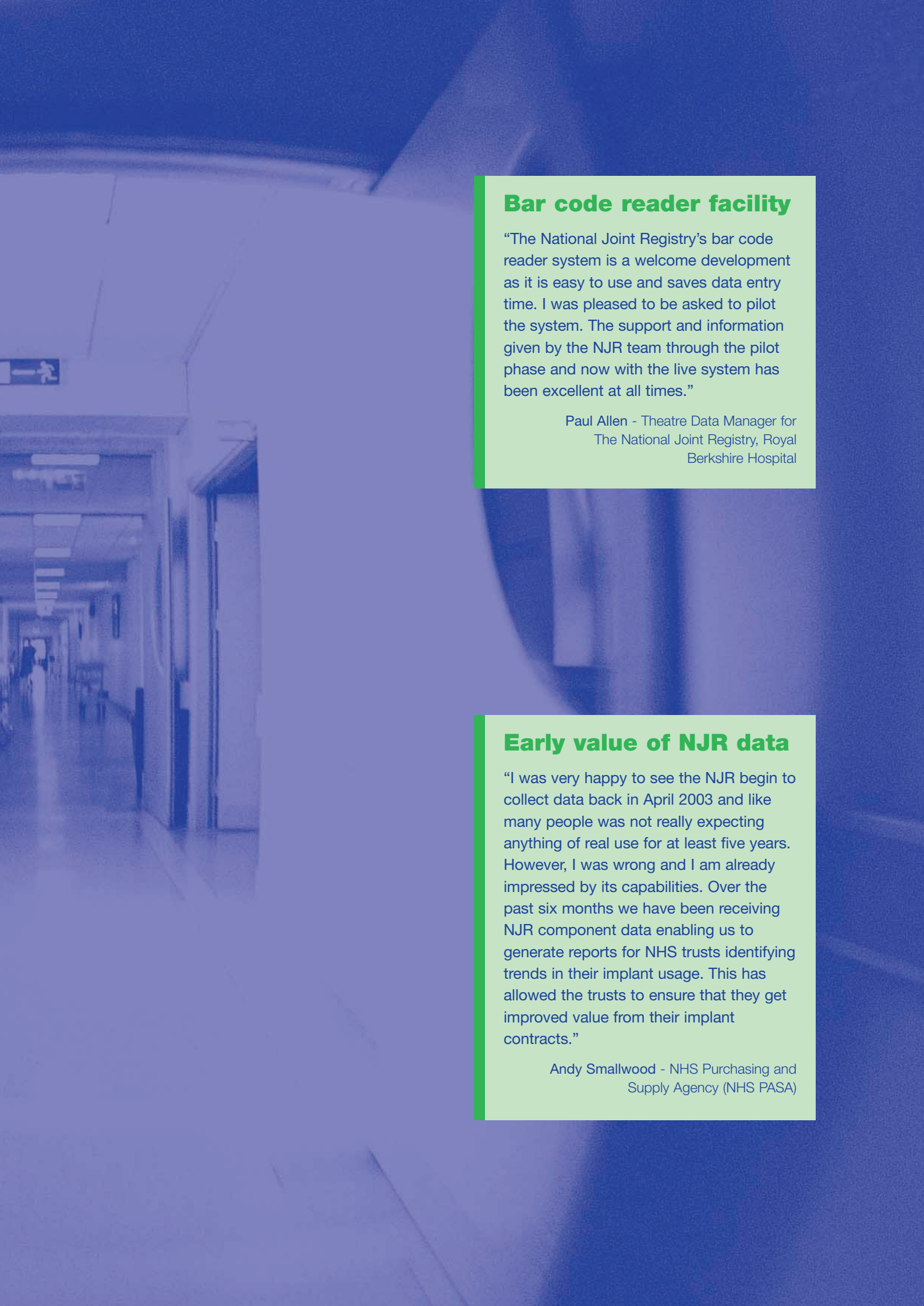
The proportions of positive and negative comments for knees are similar to that for hips, which is remarkable as patients who have had a knee replacement are often thought to be less satisfied than patients who have had a hip replacement.

For more information

The NJR **website - at www.njrcentre.org.uk** - complements the data entry system since both use the internet. The NJR website is the main source of information and communication, and has dedicated sections that cater specifically for healthcare providers (including independent hospitals and implant suppliers), patients and the public, and NJR StatsOnline (that provides NJR statistics for all relevant hospitals and treatment centres in England and Wales). There is also an area for Welsh language users.

The NJR produces a **quarterly newsletter - Joint Approach** - which is made available on the NJR website. It is also disseminated via direct email to the NJR co-ordinators within hospitals, and hard copies are distributed at conferences and events.

www.njrcentre.org.uk



Bar code reader facility

"The National Joint Registry's bar code reader system is a welcome development as it is easy to use and saves data entry time. I was pleased to be asked to pilot the system. The support and information given by the NJR team through the pilot phase and now with the live system has been excellent at all times."

Paul Allen - Theatre Data Manager for The National Joint Registry, Royal Berkshire Hospital

Early value of NJR data

"I was very happy to see the NJR begin to collect data back in April 2003 and like many people was not really expecting anything of real use for at least five years. However, I was wrong and I am already impressed by its capabilities. Over the past six months we have been receiving NJR component data enabling us to generate reports for NHS trusts identifying trends in their implant usage. This has allowed the trusts to ensure that they get improved value from their implant contracts."

Andy Smallwood - NHS Purchasing and Supply Agency (NHS PASA)