

Scottish Arthroplasty Project



Biennial Report 2012

A summary of procedures and outcomes for patients undergoing arthroplasty operations during 2010 & 2011



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Foreword

This report presents the numbers of arthroplasties for 2010 and 2011 and complications for these patients. Previously published as an annual report, the current change was instituted due to the temporary suspension of the Scottish Arthroplasty Project in 2011 for economic reasons. The extensive surgeon support for the project was highlighted at this time by a unanimous call for its re-establishment. We are currently considering retaining this biennial format with topics of interest published on alternate years. The report as usual includes named NHS Board data and, along with all previous reports, will be available on the SAP website at www.arthro.scot.nhs.uk.

We are grateful for the continued support of the surgeons and NHS Boards in both the provision and checking of the quality of data and for their participation in the governance process. Summary data for individual surgeons will continue to be provided directly to the surgeons in a tabular format. This information provides an important resource in helping in the continued improvement in patient care and for individual surgeons' revalidation procedures.

The implementation of the continual monitoring of surgeon complications with CUSUM (our method for quickly identifying unusual sequences of complications) has resulted in a more rapid response to potential problems and is now well established. This year we will be investigating its effectiveness in monitoring NHS boards and will report on this next year.

The close relationship the SAP has with Scottish consultants has recently been recognised by a number of arthroplasty registers from around the world, with members of the committee presenting to the orthopaedic surgeons in those countries. These groups are interested in trying to implement the best aspects of the successful Scottish feedback process.

The next two years will be challenging for the Arthroplasty Project and the committee recognises the urgent need for the tracing of the different implant types in use in Scotland. We are exploring the differing options at present and hope to increase the breadth of data whilst retaining the feedback process. Exciting initiatives led by NHS Scotland in electronic patient records offers us unique opportunities for such audit. We will also need to work with our colleagues in other registers in creating uniform information collection across Europe.

Mr. G.P. Ashcroft

Chair, Scottish Arthroplasty Project Steering Committee

Introduction

The Scottish Arthroplasty Project (SAP) analyses hospital inpatient information to link joint replacement surgery (arthroplasty) patients with subsequent medical complications resulting from each operation. Hip and knee replacements are by far the most numerous type of arthroplasty carried out in Scotland¹.

Operations and subsequent complications are routinely monitored and any causes for concern (where the rate of incidence of complications rises above an agreed level) are notified to the care team involved. They then review each complication involved, and submit their review and proposed remedial action (if required) for appraisal.

Engagement of the orthopaedic surgery community with this clinical governance process is, with minor exceptions, excellent.

The SAP is administrated by the Information Services Division (ISD) of National Services Scotland (NSS), a special NHS Health Board which provides national strategic support services and expert advice to NHS Scotland. The SAP is managed by the Scotlish Arthroplasty Project Steering Committee (SAPSC), and clinical members of the SAPSC carry out appraisal on submitted reviews and remedial action plans. The SAP is overseen by the Scotlish Committee for Orthopaedics and Trauma (SCOT).

Previously the monitoring and review process has included complication rates at consultant level only. Developmental work has taken place in 2012 and the extension of this process at hospital and NHS Board level has commenced. This will, in future, allow the identification of causes for concern within extended and multiple care teams.

The SAPSC would like to thank the orthopaedic surgery community for their ongoing support and active engagement with the SAP audit process.

¹ It should be noted that this report covers NHS patients and their operations. Where information is presented at NHS Board level, NHS patients treated by independent hospitals are grouped as a proxy NHS Board (Independent Hospital). These data refer to episodes where NHS treatment is carried out by independent (private) providers under local agreements with NHS Boards. They do not represent fully 'private' patients; data for these patients is not available to ISD.

Key Points

- Since 2006, the number of NHS hip and knee replacement operations in Scottish hospitals has remained relatively steady. There were 6,956 primary hip NHS replacements and 6,552 primary knee NHS replacements in Scotland in 2011 (Section 1.1).
- Relatively high numbers of hip and knee arthroplasties were carried out by consultants who performed these operations relatively infrequently, increasing the risk of subsequent complication (Section 1.3).
- The average length of inpatient stay when undergoing hip or knee surgery continued to decrease; from 10 days in 2001 to six in 2011 (Section 3.1).
- Scottish rates of death following hip or knee arthroplasty were less than 0.5% (the lowest ever for hip arthroplasty, Section 4.1).
- Scottish rates of major orthopaedic complications were all less than 1.5% (Section 4.1).
- Scottish rates of revision within one year of hip or knee arthroplasty were less than 1% (Section 6.1).
- Scottish rates of revision within five years of hip or knee arthroplasty were less than 2.5% (Section 6.1).

1. Number of Arthroplasties

1.1 National rates

Since 2006, the number of NHS hip and knee replacement operations in Scottish hospitals has remained relatively steady.

The vast majority of operations continued to be performed as elective procedures (in 2011, 95% of primary hip replacements and 88% of revisions; 99% of primary knee replacements and 95% of revisions). In 2011, 11% of all hip arthroplasties were revisions. Seven per cent of all knee arthroplasties were revisions.

Figure 1a—Recent trends in numbers of primary hip and knee arthroplasty, Scotland

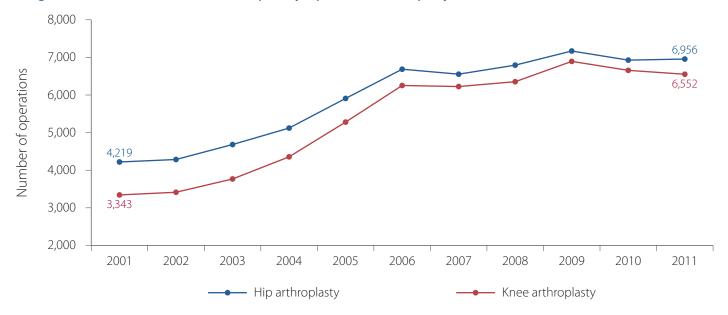
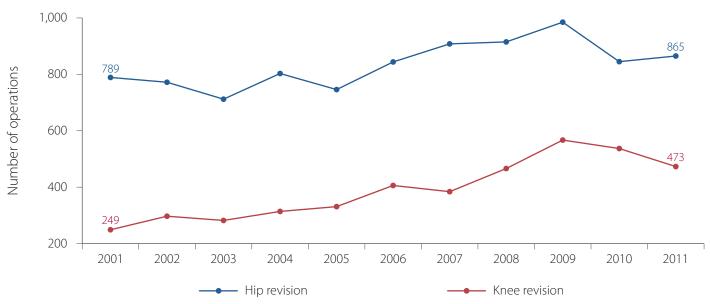


Figure 1b—Recent trends in numbers of revision hip and knee arthroplasty, Scotland



1.2 Number of arthroplasties by NHS Board

The number of primary hip and knee arthroplasty operations carried out by NHS Boards broadly reflects the population in each board.

The Golden Jubilee National Hospital (GJNH) is a special NHS Board and accepts NHS patients from all of Scotland. Similarly, NHS patients from all of Scotland may receive NHS funded treatment in independent hospitals (at the discretion of their NHS Board).

Orkney and Shetland NHS Boards do not routinely schedule arthroplasty operations, and patients requiring orthopaedic surgery are scheduled with mainland NHS Boards.

Figure 2a—Number of primary hip arthroplasties 2010/11, by NHS Board of treatment (NHS GG&C split)

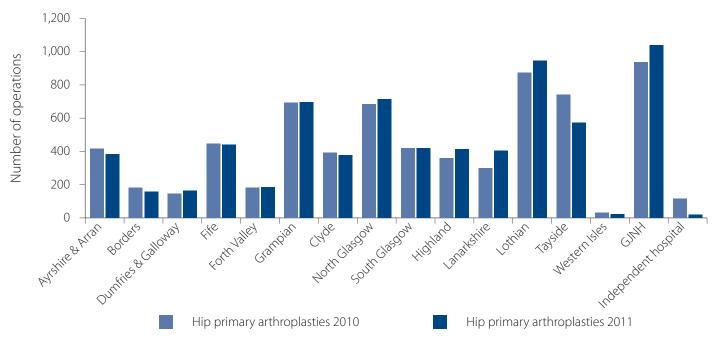


Figure 2b—Number of primary knee arthroplasties 2010/11, by NHS Board of treatment (NHS GG&C split)

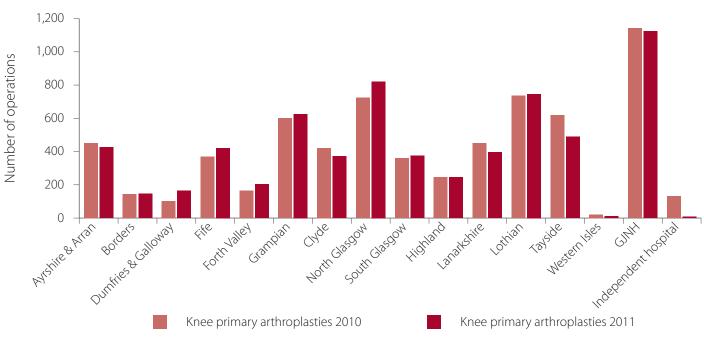


Table 1a—Number of hip arthroplasties by NHS Board of treatment (NHS GG&C split)

NHS Board	Average number of operations 2006–2009	Number of operations 2010	Number of operations 2011	Average number of revisions 2006–2009	Number of revisions 2010	Number of revisions 2011
Ayrshire & Arran	361	417	385	43	52	42
Borders	147	181	158	8	1	5
Dumfries & Galloway	121	147	165	7	5	6
Fife	352	447	440	39	45	43
Forth Valley	175	183	186	37	28	31
Grampian	723	694	695	125	84	93
Clyde	338	394	377	43	56	60
North Glasgow	693	685	713	119	99	114
South Glasgow	407	421	419	128	106	90
Highland	393	360	414	34	31	37
Lanarkshire	376	299	404	47	43	39
Lothian	918	874	945	161	136	155
Tayside	715	741	573	87	75	63
Western Isles	44	31	24	0	0	0
GJNH	722	938	1038	34	81	87
Independent hospital	319	116	20	2	3	0
Scotland	6,801	6,928	6,956	913	845	865

Table 1b—Number of knee arthroplasties by NHS Board of treatment (NHS GG&C split)

NHS Board	Average number of operations 2006–2009	Number of operations 2010	Number of operations 2011	Average number of revisions 2006–2009	Number of revisions 2010	Number of revisions 2011
Ayrshire & Arran	305	450	425	26	33	31
Borders	134	143	145	9	14	4
Dumfries & Galloway	112	102	164	6	1	
Fife	382	367	420	35	55	48
Forth Valley	190	164	202	21	18	20
Grampian	546	598	624	38	64	42
Clyde	353	420	370	30	42	44
North Glasgow	758	721	819	61	47	67
South Glasgow	357	358	373	36	34	43
Highland	290	244	244	22	22	18
Lanarkshire	382	448	395	28	37	33
Lothian	817	734	744	65	79	58
Tayside	556	617	488	40	38	29
Western Isles	16	21	10	0	0	0
GJNH	929	1138	1121	40	52	35
Independent hospital	306	131	8	2		1
Scotland	6,432	6,656	6552	456	536	473

SAP monitors rates for all types of arthroplasty; although hip and knee operations are by far the most common, other orthopaedic replacement operations are routinely undertaken in Scotland. Table 2 shows (in descending order) the number and type of arthroplasties carried out on NHS patients in Scotland.

The numbers of consultants performing operations is included to provide a rough indication of operational requirements throughout Scotland; it is not comprehensive and does not reflect the complex factors involved in workforce planning.

Table 2—Number of arthroplasties and operative consultants in 2010 and 2011

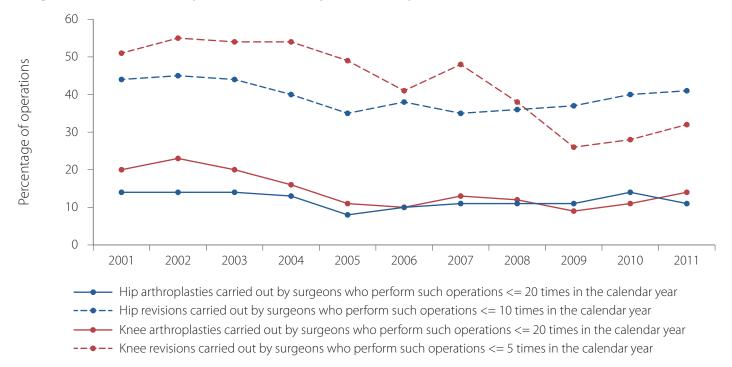
	Average number of operations 2006–2009	Number of operations 2010	Number of operations 2011	Average number of consultants performing operations 2006–2009	Number of consultants performing operations 2010	Number of consultants performing operations 2011
Hip	6,801	6,928	6,956	204	219	219
Knee	6,432	6,656	6,552	186	203	198
Hip revision	913	845	865	140	137	137
Knee revision	456	537	473	104	97	98
Shoulder	375	397	378	92	98	97
Excision	261	280	321	112	114	117
Other	204	129	121	84	62	65
Finger	65	64	66	19	18	21
Elbow	60	10	0	17	6	0
Thumb	51	41	53	15	8	15
Toe	48	37	30	19	14	11
Ankle	43	42	46	9	13	13
Knee resurfacing	35	23	17	19	21	15
Other resurfacing	26	14	18	16	12	16
Shoulder revision	20	22	27	12	11	16
Wrist	20	21	12	7	11	6
Patella resurfacing	18	16	30	13	15	20
Total	15,824	16,062	15,965	1,069	1,059	1,064

Table 2 includes emergency admissions. The number of surgeons performing operations may be inflated by those who carry out occasional emergency surgery.

1.3 Consultants performing small volumes

Consultants who carry out a relatively low volume of orthopaedic surgical operations risk a higher rate of complication due to relatively lower levels of experience and knowledge. Each hospital and consultant will have a unique work pattern and in many cases arthroplasty represents only a small part of the overall surgical workload. However, operating teams are encouraged to promote the use of specialist arthroplasty surgeons in preference to 'occasional' surgeons.

Figure 3—Recent trends in operations carried out by low volume operators



2. Patient Demographics

2.1 Age

Orthopaedic patients are, by the nature of the medical conditions requiring arthroplasty, relatively older inpatients. Since 2001, the average age for primary hip arthroplasty has remained relatively steady, while that of primary knee arthroplasty has decreased slightly in recent years. This may be due to improvements in orthopaedic sport-related treatments allowing their increased provision to younger age groups. Figure 4 shows the recent trends in the average (mean) ages of hip and knee arthroplasty patients.

In 2011 59% of primary hip or knee arthroplasty patients were female, compared to 57% of hip or knee revisions. This trend has been relatively unchanged in recent years.

Patients undergoing revision operations tend to be older than those undergoing primary operations, due to the fact that revisions are carried out on existing implants. Major operations such as joint replacement tend to be undertaken less frequently in the very elderly due to pre-existing complications.

One of the demographic factors contributing to complications following hip or knee arthroplasty is obesity, and consideration of this is common in the review of complications. Analysis of this on a national level would be useful, but due to the nature of nationally established data collection processes, indicators of obesity (BMI, height/weight etc.) are not available.

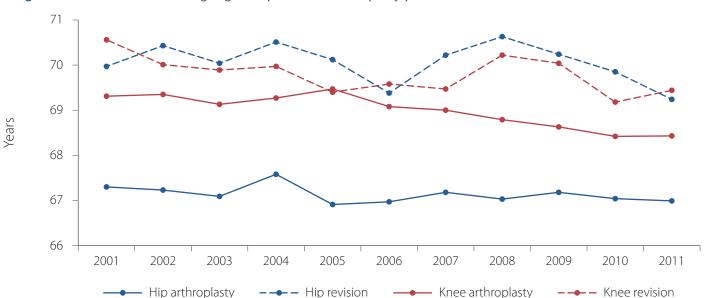


Figure 4—Recent trends in average age of hip and knee arthroplasty patients

2.2 Pre-operative medical conditions

The principal medical condition recorded for patients receiving hip arthroplasty in 2011 was coxarthrosis, a degenerative disease of the hip. The main medical condition recorded for patients receiving knee arthroplasty in 2011 was gonarthrosis, a degenerative disease of the knee.

It should be noted that the principal condition is recorded as the main reason for admission/surgery, but the patient may have additional conditions which are taken into consideration by the care team; the principal condition is not the sole determinant for surgery.

The following charts show recorded principal pre-operative conditions; the 'Other condition' category combines those conditions which were considerably less prevalent than other categories (usually occurring in very low numbers).

Figure 5a—Principal pre-operative conditions, hip arthroplasty, 2011

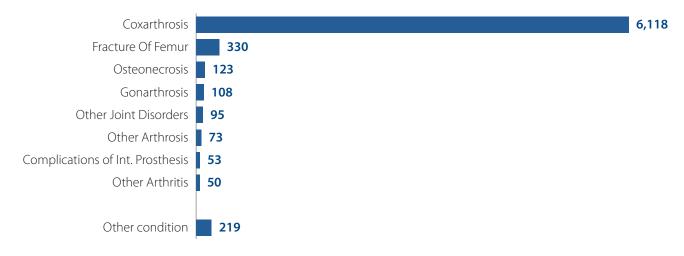


Figure 5b—Principal pre-operative conditions, hip revision, 2011

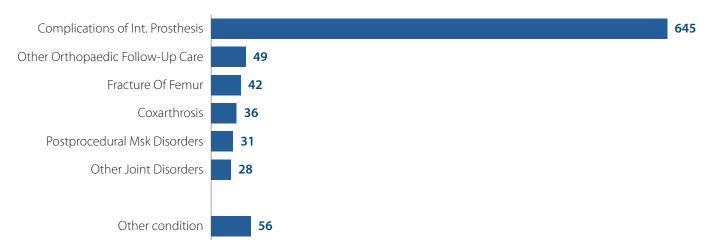


Figure 5c—Principal pre-operative conditions, knee arthroplasty, 2011

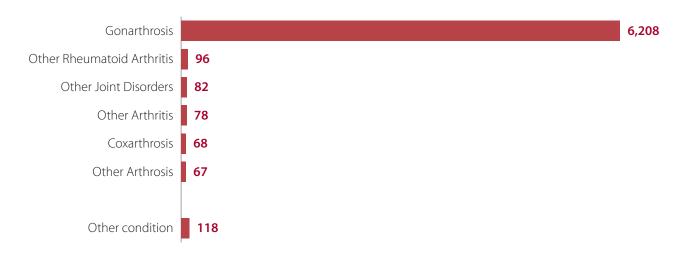
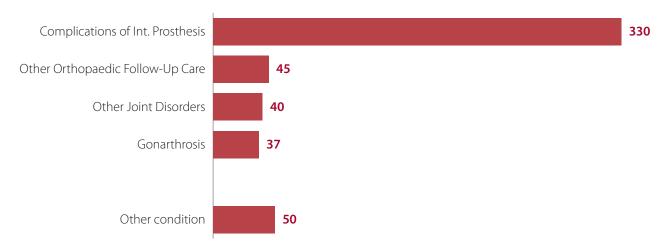


Figure 5d—Principal pre-operative conditions, knee revision, 2011

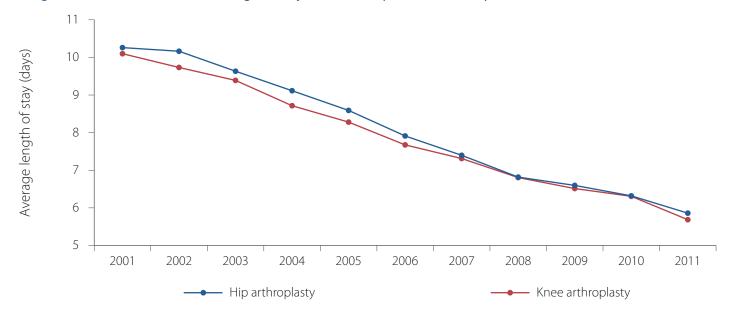


3. Inpatient Episodes

3.1 Length of stay

Since 2006, the mean length of inpatient stay when undergoing HS hip and knee replacement operations in Scottish hospitals has continued to decrease.

Figure 6—Recent trends in overall length of stay for elective hip and knee arthroplasties



The mean pre-operative length of stay for hip and knee arthroplasty patients in each NHS Board is relatively uniform (one day or less); patients are rarely admitted any earlier than the day before surgery.

Length of post-operative care varies widely between boards from four to seven days for hips and knees. Figures 7a and 7b show the average lengths of stay (overall, pre- and post-operative) for each NHS Board.

Within NHS Boards patients spend similar lengths of time in hospitals for both hip and knee replacements. This is due to similar pre-operative planning, anaesthetic regimes, analgesic regimes, care pathways, nursing and medical attitudes to both hip and knee replacement patients in each NHS Board.

Fig 7a—Average length of stay for hip arthroplasties 2011 by NHS Board (NHS GG&C split)

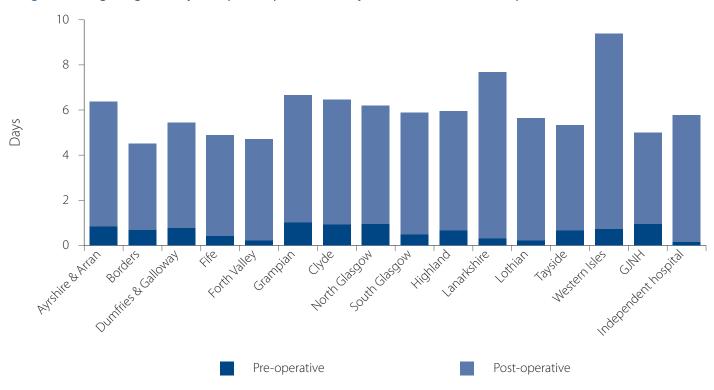
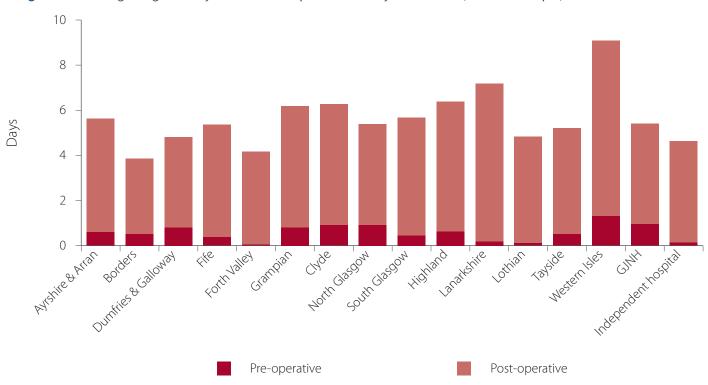


Figure 7b—Average length of stay for knee arthroplasties 2011 by NHS Board (NHS GG&C split)



4. Orthopaedic Complication Rates

The major complications following elective primary hip or knee replacement are:

- Death;
- Dislocation;
- Infection of the operated joint and
- Deep vein thrombosis/pulmonary embolism (DVT/PE).

Complication rates have been standardised for patient age, gender, osteoarthritis and rheumatoid arthritis. Figures showing complication rates with a follow-up period of one year exclude operations carried out in 2011. Figures showing complication rates with a follow-up period of 90 days include operations carried out in 2011.

Where data are presented as a 'funnel' chart, the upper confidence limit represents a warning threshold derived from the national rate and number of operations carried out. Rates of complication which appear above the curved red line are a possible cause for concern and should be investigated where possible.

As described in the Foreword and Introduction, developmental work to apply the CUSUM methodology to NHS Boards and individual hospitals is ongoing. When implemented, their complication rates will be monitored on a quarterly basis and they may be asked to submit to a review process where appropriate.

4.1 National trends

Knee dislocations are very rare so are not included in these charts.

Figure 8a—National rates for complications within 90 days, hip arthroplasty

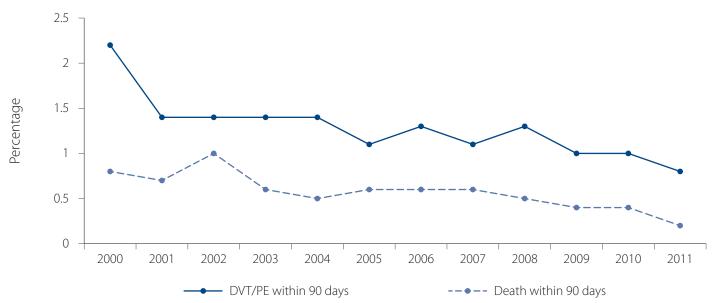


Figure 8b—National rates for complications within one year, hip arthroplasty

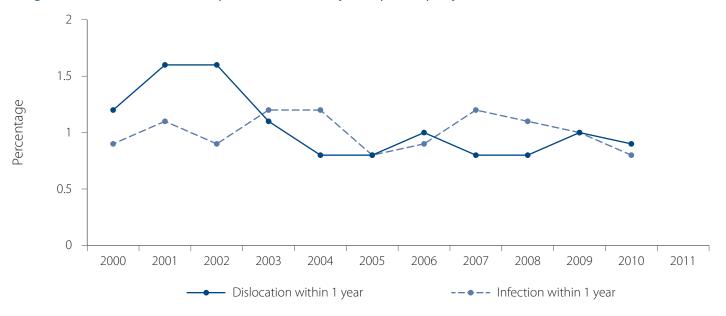


Figure 8c—National rates for complications within 90 days, knee arthroplasty

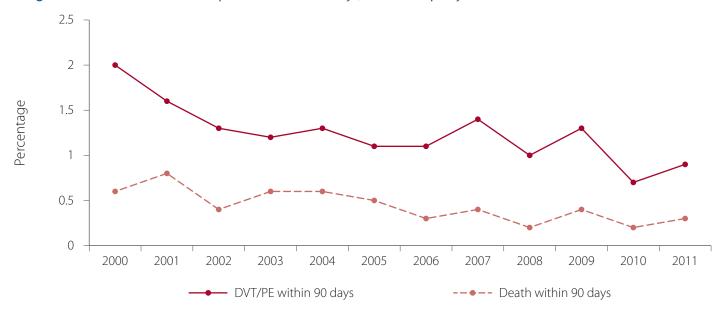
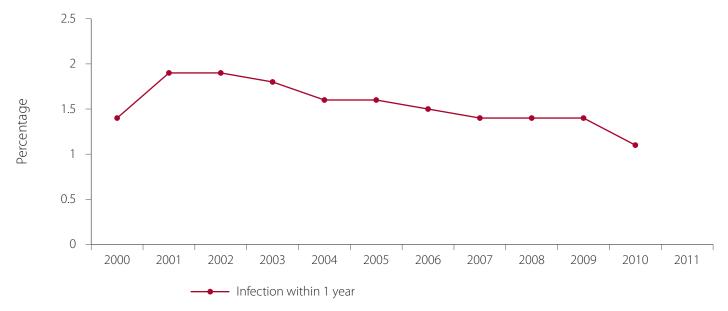
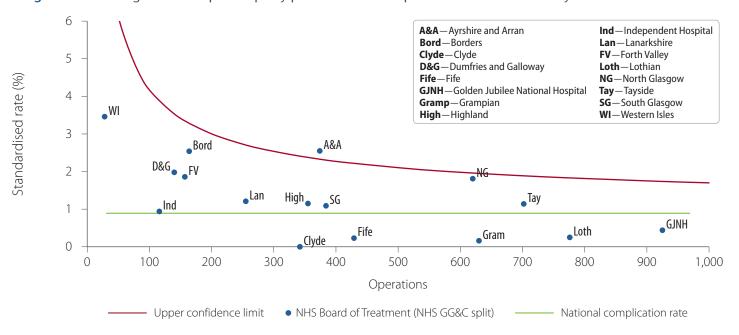


Figure 8d—National rates for complications within one year, knee arthroplasty



4.2 Hip—dislocation within one year

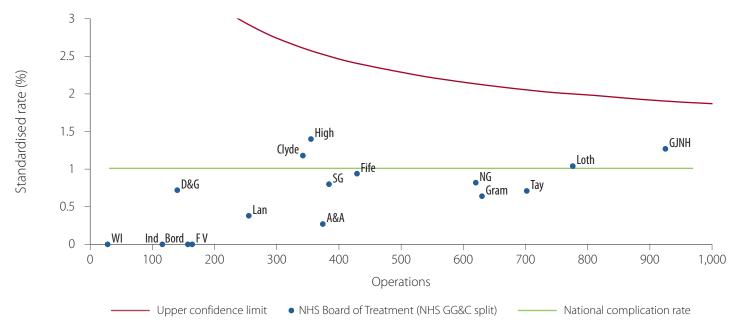
Figure 9—Percentage of 2010 hip arthroplasty patients with subsequent dislocation within one year



Average, funnel and standardisation calculated on 5-year data 2006–2010.

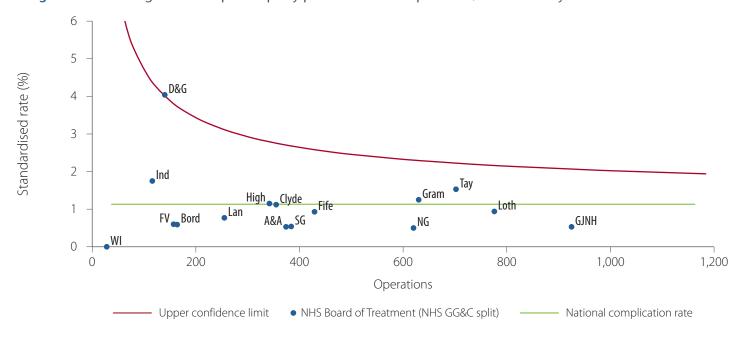
4.3 Hip—infection within one year

Figure 10—Percentage of 2010 hip arthroplasty patients with subsequent infection within one year



4.4 Hip—Deep vein thrombosis/pulmonary embolism (DVT/PE) within one year

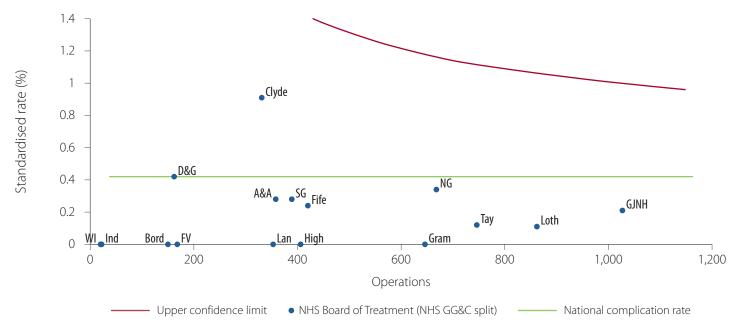
Figure 11—Percentage of 2010 hip arthroplasty patients with subsequent DVT/PE within one year



Average, funnel and standardisation calculated on 5-year data 2006–2010.

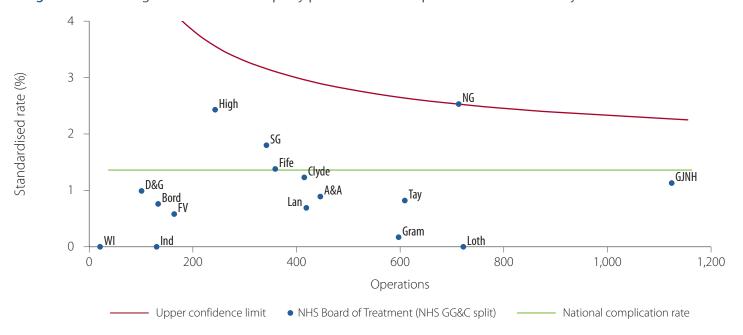
4.5 Hip—Death within 90 days

Figure 12—Percentage of 2011 hip arthroplasty patients who died within 90 days



4.6 Knee—Infection within one year

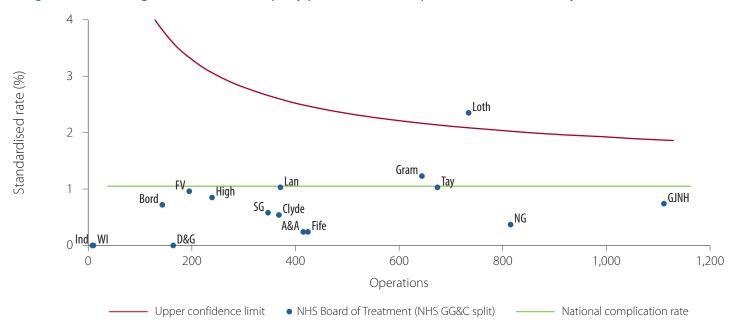
Figure 13—Percentage of 2010 knee arthroplasty patients with subsequent infection within one year



Average, funnel and standardisation calculated on 5-year data 2006–2010.

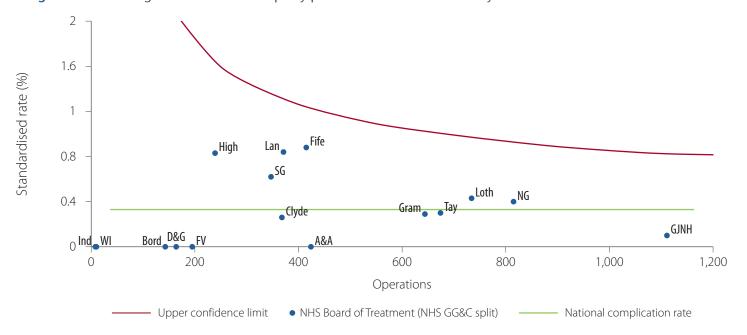
4.7 Knee—Deep vein thrombosis/pulmonary embolism (DVT/PE) within 90 days

Figure 14—Percentage of 2011 knee arthroplasty patients with subsequent DVT/PE within 90 days



4.8 Knee—Death within 90 days

Figure 15—Percentage of 2011 knee arthroplasty patients who died within 90 days



5. Anaesthetic Complication Rates

Complications associated with the surgical application of anaesthetic are:

- Acute myocardial infarction (AMI);
- Acute renal failure and,
- Cerebrovascular accident (CVA) or stroke.

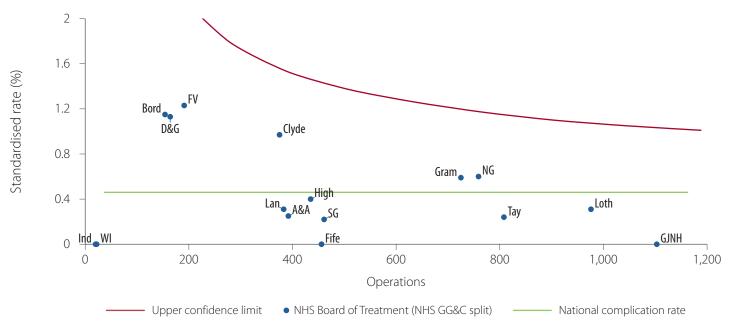
Complication rates are standardised for type of operation (primary or revision), patient age, gender, osteoarthritis and rheumatoid arthritis.

Figures showing complication rates with a follow-up period of one year exclude operations carried out in 2011. Figures showing complication rates with a follow-up period of 90 days include operations carried out in 2011.

Where data are presented as a 'funnel' chart, the upper confidence limit represents a warning threshold derived from the national rate and number of operations carried out. Rates of complication which appear above this curved red line are a possible cause for concern and should be investigated where possible.

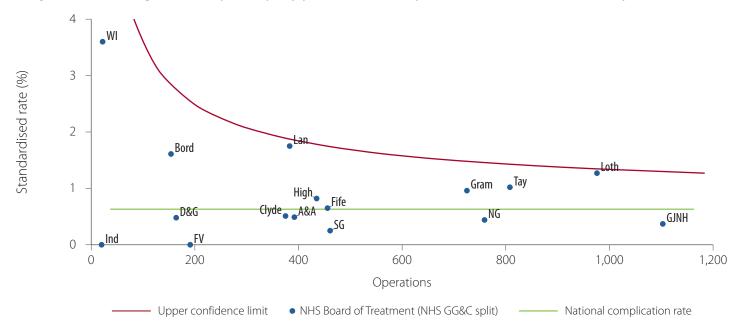
5.1 Hip—AMI within 30 days

Figure 16—Percentage of 2011 hip arthroplasty patients with subsequent AMI within 30 days



5.2 Hip—Acute renal failure within 30 days

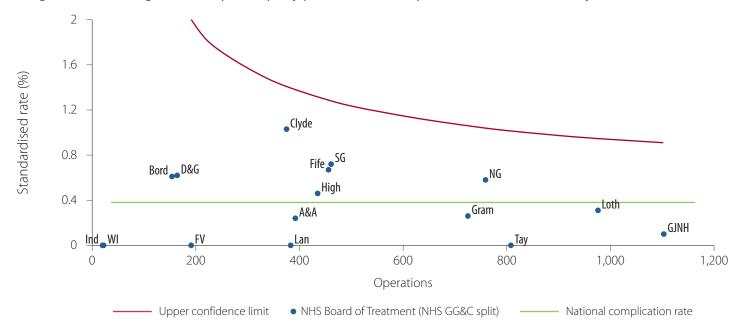
Figure 17—Percentage of 2011 hip arthroplasty patients with subsequent acute renal failure within 30 days



Average, funnel and standardisation calculated on 5-year data 2007–2011.

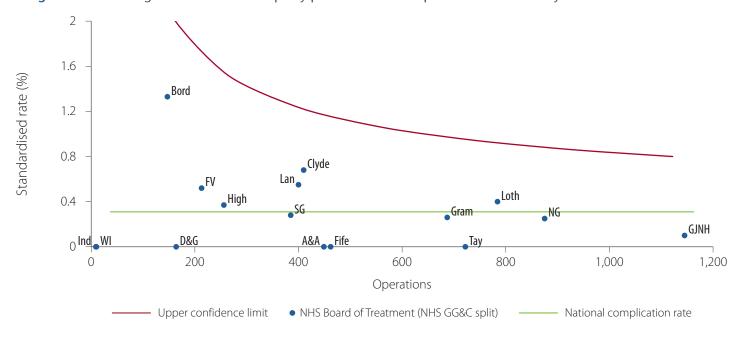
5.3 Hip—CVA/Stroke within 30 days

Figure 18—Percentage of 2011 hip arthroplasty patients with subsequent CVA/stroke within 30 days



5.4 Knee—AMI within 30 days

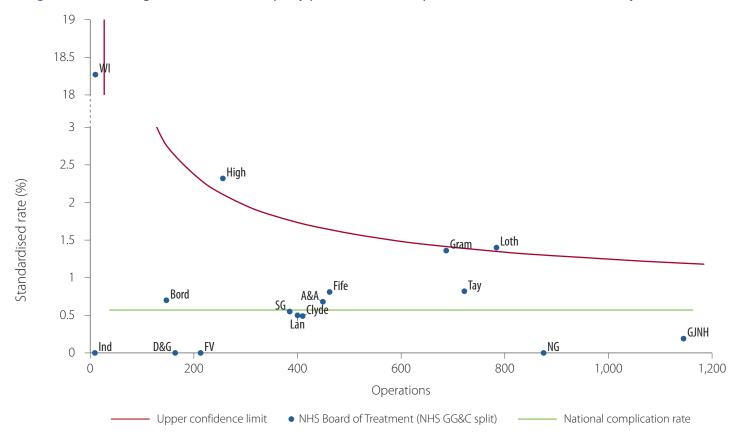
Figure 19—Percentage of 2011 knee arthroplasty patients with subsequent AMI within 30 days



Average, funnel and standardisation calculated on 5-year data 2007–2011.

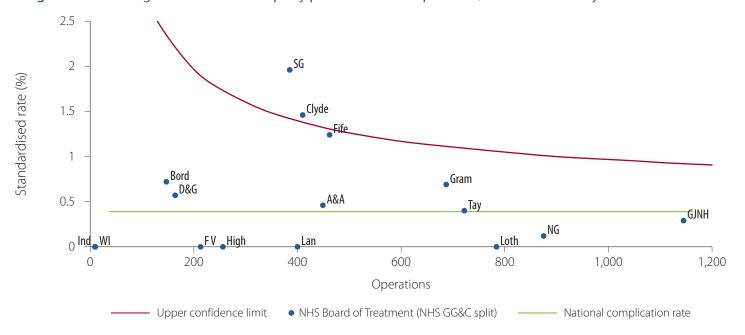
5.5 Knee—Acute renal failure within 30 days

Figure 20—Percentage of 2011 knee arthroplasty patients with subsequent acute renal failure within 30 days



5.6 Knee—CVA/Stroke within 30 days

Figure 21—Percentage of 2011 knee arthroplasty patients with subsequent CVA/stroke within 30 days



6. Revision Rates

Revision rates are calculated at 1, 3 and 5 years after surgery and have been standardised for patient age, gender, osteoarthritis and rheumatoid arthritis.

Where data are presented as a 'funnel' chart, the upper confidence limit represents a warning threshold derived from the national rate and number of operations carried out. Rates which appear above this curved red line are a possible cause for concern and should be investigated where possible.

6.1 National rates

Figure 22a—National rates for hip arthroplasty with subsequent revision

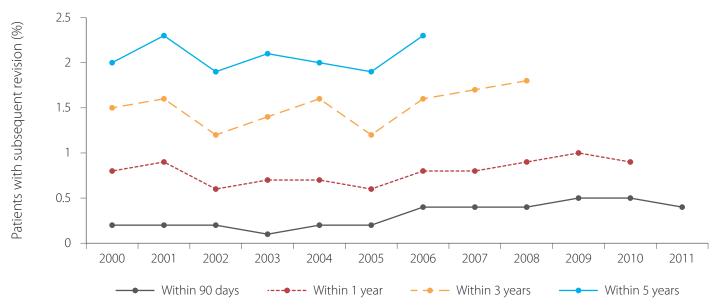
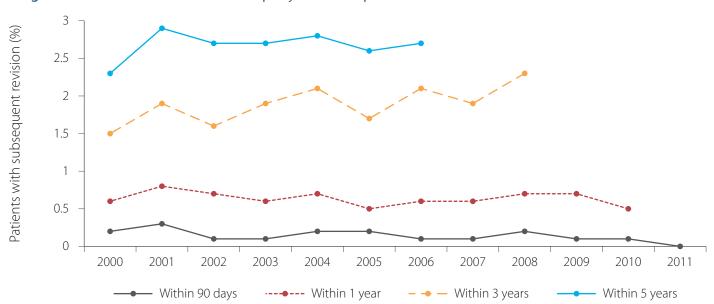
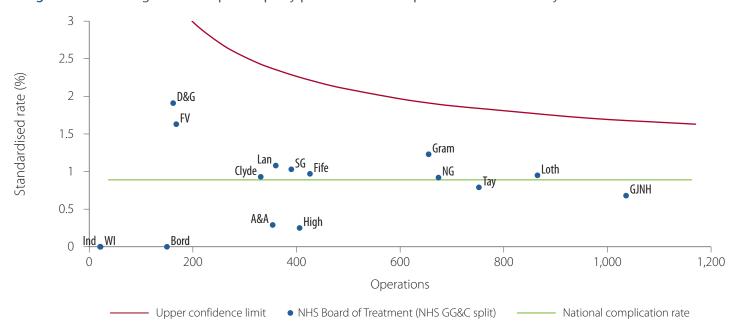


Figure 22b—National rates for knee arthroplasty with subsequent revision



6.2 Hip—Revision within one year

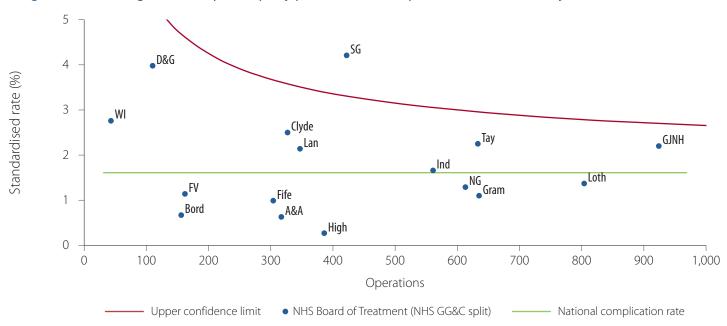
Figure 23—Percentage of 2010 hip arthroplasty patients with subsequent revison within one year



Average, funnel and standardisation calculated on 5-year data 2006–2010.

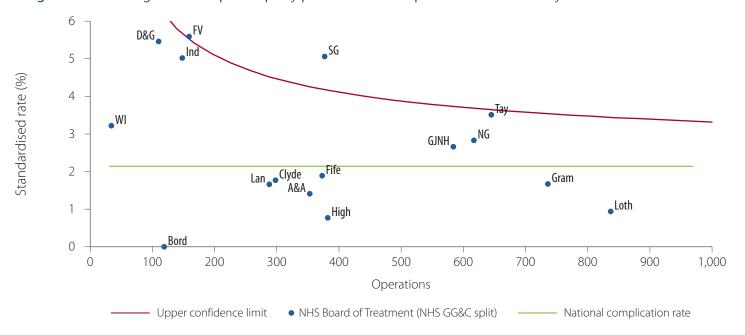
6.3 Hip—Revision within three years

Figure 24—Percentage of 2008 hip arthroplasty patients with subsequent revision within three years



6.4 Hip—Revision within five years

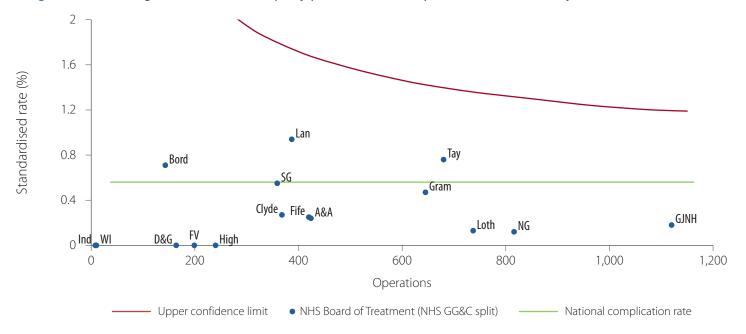
Figure 25—Percentage of 2006 hip arthroplasty patients with subsequent revision within five years



Average, funnel and standardisation calculated on 5-year data 2002–2006.

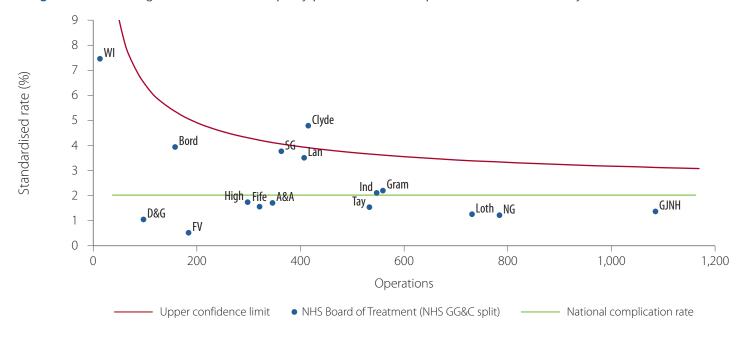
6.5 Knee—Revision within one year

Figure 26—Percentage of 2010 knee arthroplasty patients with subsequent revision within one year



6.6 Knee—Revision within three years

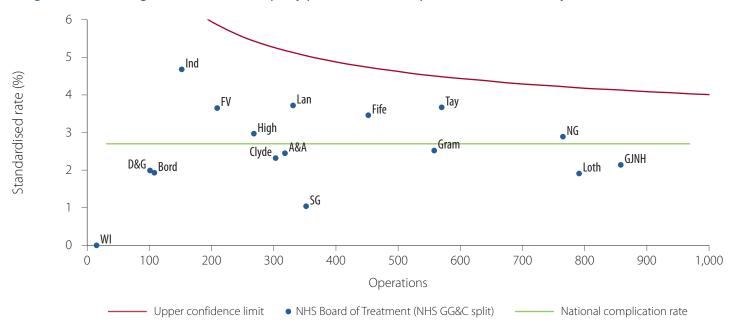
Figure 27—Percentage of 2008 knee arthroplasty patients with subsequent revision within three years



Average, funnel and standardisation calculated on 5-year data 2004–2008.

6.7 Knee—Revision within five years

Figure 28—Percentage of 2006 knee arthroplasty patients with subsequent revision within five years



Clinical Governance Reviews

Clinical Governance: 'A framework through which NHS organisations are accountable for continually improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish.'

Clinical Governance is the system used by NHS organisations to monitor and review the quality of healthcare provided so that high standards of care are maintained and patient safety improved. Since 2004, with the support of the Scottish Committee for Orthopaedics and Trauma (SCOT), the policy of the Scottish Arthroplasty Project (SAP) has been to provide high quality data on activity and complications that can be used at a local level to promote quality improvement. Simple monitoring of activity and quality may influence clinical practice but can be insufficient to create significant change. With the support of the SCOT committee, the SAP operates a feedback and review system at NHS Board and consultant level to identify potential quality issues.

From 2003 to 2009, Shewhart control chart methodology was used to present complication data and identify any unusual variation. In the control charts, 5-year aggregated outcomes for NHS Boards or consultants were casemix-adjusted and plotted in relation to three standard deviations above and below the mean. If an NHS Board or consultant lay outside this statistical limit they were identified as outliers. At this point, under our Clinical Governance remit, we provided them with this information and asked that they review their complications.

In 2010, the SAP developed CUSUM (CUmulative SUMmation) methodology to allow us to better identify unusual runs of complications more quickly than the previous method. In simple terms, operations are plotted on a graph as a rate over time. If an operation has an associated complication, the CUSUM rate increases markedly. Subsequent operations without known complication bring the rate down by smaller increments. Three of these 'jumps' for the same type of complication in close succession, will raise the CUSUM rate over an agreed control limit; in practice the limit is usually breached over longer periods of time, which include more 'jumps' but also many completely successful operations.

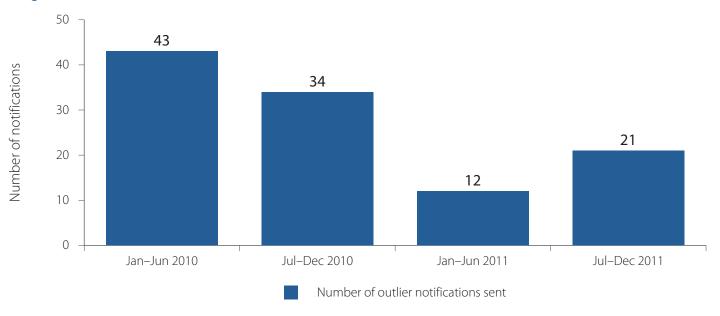
These rates are calculated each month for all consultants carrying out orthopaedic operations on NHS patients in Scotland.

When outliers are identified, recipients are asked to undertake local reviews that investigate the reasons for these results and report back to the SAP. The introduction of a new technique, a new implant or particular case mix issues may be identified as reasons for an apparent rise. Clinical members of the Scottish Arthroplasty Project Steering Committee (SAPSC) grade these reviews and provide feedback. If the response is viewed as less than satisfactory, a resubmission is requested and the issue may be escalated to senior management within the appropriate NHS Board. The review process is administered by ISD analysts and is subject to NSS confidentiality policy—individual consultant responses are anonymised before being passed on for review.

Figure 29 shows the number of outlier notifications passed to consultants during 2010/11. The high number at the beginning of 2010 reflects the inception of CUSUM methodology; being the first time this was run, an initially higher number of outliers were identified. Feedback and the grading of reviews by the committee is confidential; responses, in general, contain high levels of self-review and self-criticism with constructive initiatives to address any issues arising from the analysis.

² Scally G. and Donaldson L.J., (1998), *Clinical governance and the drive for quality improvement in the new NHS in England.*, British Medical Journal 317 (7150), 4 July, pp.61–65.

Figure 29—SAP outlier notifications 2010 and 2011



The purpose of reviewing outliers is to emphasise quality improvement, rather than to attribute blame. The aim of the review process is to continue to encourage local review of clinical practice and data quality, both of which contribute to the continual improvement of patient care.

Appendix A—Data

Data Sources

The Scottish Arthroplasty Project is administrated by the Information Services Division (ISD) of National Services Scotland (NSS), a special NHS Health Board. ISD use information submitted by Scottish hospitals (known as SMR01 data) to calculate statistical information related to NHS arthroplasty operations in Scottish hospitals.

Information on SMR01 is available here: www.isdscotland.org/Products-and-Services/Hospital-Records-Data-Monitoring.

Data completeness

All SMR01 data are required to be securely submitted to ISD no later than six weeks after the end of the month of discharge. Although Medical Records departments within hospitals and NHS Boards make every effort to comply, circumstances outwith their control may mean that this target is not always met. SMR01 data required for the analyses in this report are considered to be 100% complete.

Information on SMR01 data completeness is available here: www.isdscotland.org/Products-and-Services/ Hospital-Records-Data-Monitoring.

Arthroplasty coding

Information on codes used to identify arthroplasty operations is available here: www.arthro.scot.nhs.uk/
Data_Collection/OPCS_codes_summary_150710.pdf.