

Scottish Arthroplasty Project

Annual Report 2010

A summary of arthroplasty procedures and their outcomes
for patients operated on during 2009

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يمكن أن يتوفر هذا الإعلان بلغات مختلفة، وطباعة بحجم أكبر، وطباعة برايل (باللغة الإنجليزية فقط). للحصول على معلومات حول ترجمة هذا الإعلان بلغتك المحلية، يرجى الاتصال بالرقم الوارد أدناه.

यह प्रकाशन विभिन्न भाषाओं, बड़े अक्षरों, ब्रेल लिपि (सिर्फ अंग्रेजी) में उपलब्ध कराया जा सकता है। आपके समुदाय की भाषा में इसे प्रकाशन के अनुवाद के बारे में जानकारी के लिए कृपया नीचे दिए हुए नम्बर पर टेलीफोन करें।

এই প্রকাশনাটি বিভিন্ন ভাষায়, বড় ছাপার অক্ষর-র এবং ব্রেইলী-ত (শুধুমাত্র ইং-রাজী-ত) সরবরাহ করা যে-ত পা-রা। এই প্রকাশনাটি আপনার মাতৃভাষায় অনুবাদ সম্পর্কিত ত-থার প্র-রাজ-ন অনুগ্রহপূর্বক নিম্নলিখিত নাম্বা-র টেলি-ফোন করুন :

ਇਹ ਪ੍ਰਕਾਸ਼ਨ ਵੱਖ ਵੱਖ ਭਾਸ਼ਾਵਾਂ ਵਿਚ, ਵੱਡੇ ਛਾਪੇ, ਬ੍ਰੇਲ (ਸਿਰਫ ਅੰਗਰੇਜ਼ੀ ਵਿਚ) ਉਪਲਬਧ ਕੀਤੀ ਜਾ ਸਕਦੀ ਹੈ। ਇਸ ਪ੍ਰਕਾਸ਼ਨ ਦੇ ਆਪਣੇ ਭਾਈਚਾਰੇ ਦੀ ਭਾਸ਼ਾ ਵਿਚ ਅਨੁਵਾਦ ਲਈ ਜਾਣਕਾਰੀ ਲਈ ਕਿਰਪਾ ਕਰਕੇ ਹੇਠ ਲਿਖੇ ਨੰਬਰ ਤੇ ਫ਼ੋਨ ਕਰੋ।

یہ طبع مختلف زبانوں اور بڑے چھاپ میں دستیاب کی جاسکتی ہے، برائلی (صرف انگریزی میں)۔ اپنی کمیونٹی کے زبان میں اس طبع کے ترجمے کے بارے میں معلومات حاصل کرنے کے لئے، براہ کرم مندرجہ ذیل نمبر پر فون کیجئے۔

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TABLE OF CONTENTS

FOREWORD/REVIEW	1
KEY POINTS.....	2
METHODS	3
NUMBER OF ARTHROPLASTIES	5
PATIENT DEMOGRAPHICS	9
LATERALITY DATA.....	10
TIME OF SURGERY AND LENGTH OF STAY	11
ORTHOPAEDIC COMPLICATION RATES	13
ANAESTHETIC COMPLICATION RATES	18
REVISION RATES	23
CLINICAL GOVERNANCE REVIEWS	28
APPENDIX.....	30

FOREWORD/REVIEW

This report presents the numbers of arthroplasties in 2009 and complications for these patients (complications for July 2008–June 2009 patients if the complication rate is measured at one year post-operation). It includes named NHS Board data and, along with all previous reports, will be available on the SAP website at www.arthro.scot.nhs.uk.

Over the years, surgeons and NHS Boards have given full co-operation to the Scottish Arthroplasty Project governance process, and it is encouraging that we continue to detect an overall improvement in some negative outcomes over time (infection, death, DVT/PE and dislocation).

Since the last annual report in 2009, the Scottish Arthroplasty Project has implemented a range of initiatives to improve efficiency, accuracy and timeliness of the information we provide in times of greater pressure on resources, while remaining focused on our aims to encourage continual improvement in the quality of care provided to joint replacement surgery patients. These initiatives have included the introduction of a new method for quickly identifying unusual sequences of complications; streamlining of internal processes for producing information; and a revised Annual Report which aims to provide more up-to-date and concise information in a consistent format. We will no longer routinely provide individual reports to consultants, although summary data may be available on request.

In addition to this report, the Scottish Arthroplasty Project continues to use the data collected to do more detailed analysis of certain patient groups. This year we have worked with various orthopaedic colleagues to look at the incidence of periprosthetic fractures following a hip replacement, the outcomes of joint arthroplasty in patients with renal problems, and the deep vein thrombosis rate in patients who had underlying varicose veins. Abstracts of these analyses should become available on our website in due course.

In 2010 the National Clinical Data For Quality Improvement Advisory Group (NCDQIAG) appraised the Scottish Arthroplasty Project as a good example of the use of routinely collected data to support quality improvement, and an important vehicle for facilitating improvements in joint replacement. It therefore recommended that we should continue with current methodology and funding. However, the analytical team that supports the Scottish Arthroplasty Project works within ISD's Quality Improvement Program, an area that supports an increasing number of audits and clinical governance projects. With increasing competition for this finite resource, the program will require SAP to find independent sources of finance to maintain our current outputs. The National Joint Registry generates funding through levies on implants, and this may be an avenue that we could also follow in Scotland. Securing such funds will ensure SAP have dedicated analyst support, but will be a major challenge for the Scottish Arthroplasty Steering Committee during the next year.



Ivan Brenkel
Chair, Scottish Arthroplasty Steering Group

KEY POINTS

There were 7,168 hip replacements and 6,884 knee replacements recorded in 2009. The number of hip revisions (986) and knee revisions (567) have continued to rise. Shoulder and finger arthroplasties also continue to increase (405 and 77 respectively—see Table 2). There continues to be an increase in the number of primary hip and knee replacements performed at Golden Jubilee National Facility, with 930 hip and 1085 knee replacements in 2009 (see page 6). Recording of NHS funded arthroplasties performed at independent hospital has improved for 2009, with only a small number of cases now considered missing.

The number of low volume surgeons continued to decrease in 2009. Less than 10% of primary knee replacements and fewer than 30% of knee revisions are now performed by low volume surgeons. See Fig. 3 on page 8.

The length of stay for hip replacements continues to fall year on year. It has decreased from an average of 10.3 days in 2001 to 6.2 days in 2009. The length of stay for knee replacements has decreased from 10.1 days in 2001 to 6.5 days in 2009. The proportion of patients admitted on the day of surgery increased significantly from 28% in 2008 to 35% in 2009. There is still, however, large variation between Health Boards in the time of admission before surgery. See the Time of surgery and Length of stay section on page 11.

The rate of DVT/PE (1%) and mortality (0.4%) at 90 days after hip arthroplasty are now at their lowest level ever. The rate of dislocation and infection within a year of hip arthroplasty do not differ greatly from recent years. Rates for infection, DVT/PE and deaths following knee replacement also remain consistent with recent years. See Orthopaedic complications section on page 13.

Complications such as stroke, acute myocardial infarction, and acute renal failure also continue to be included in the Report. See the Anaesthetic complication rates section on page 18.

This year, for the first time, revision rates are reported at 1, 3 and 5 years following primary hip and knee replacement. Revision rates at 1 and 3 years for hips and knees were lowest in 2005. There has been a small increase in revision rate since then. There was less variation between boards for knee revisions at 1 year compared to hip revisions. This may be due to a more uniform design of knee prostheses compared to hip prostheses. See Revision Rates section on page 23.

METHODS

As in previous years, the Scottish Arthroplasty Project Annual Report 2010 uses Scottish Morbidity Records (SMR01) sent by hospitals to the Information Services Division (ISD) to ascertain the number and outcome of arthroplasties in Scotland. These records are created every time an individual is treated in hospital as an inpatient or daycase. This report mainly presents statistics for arthroplasty patients discharged in the calendar year to 31st December 2009. We summarise:

- national trends in joint replacement, demographics and length of stay;
- infection and dislocation rates for hip and knee replacements within a year of operation;
- deep vein thrombosis (DVT)/pulmonary embolism (PE) and mortality rates for hip and knee replacements within 90 days of operation;
- anaesthetic complications within 30 days of arthroplasty – acute myocardial infarction (AMI), cerebrovascular accident (CVA)/strokes and acute renal failures;
- revision rates at 1, 3 and 5 years; and
- clinical governance results.

As infection and dislocation rates are more appropriately assessed at one year post-operation, rather than 90 days, we have summarised data for arthroplasty patients discharged in the year between July 2008 and June 2009 rather than the full calendar year.

Data are presented throughout at Health Board level. We present data on number of arthroplasties, including emergencies and transfers, by Health Board of treatment.

As in previous reports, we have split Greater Glasgow and Clyde into North Glasgow, South Glasgow and Clyde for treatment data. For treatment data Orkney and Shetland are not included as separate boards as their patients undergo elective arthroplasty surgery in NHS Grampian and are included in the Grampian data. Data from Independent Hospitals may be incomplete, and are plotted separately.

Treatment data, including patient casemix data, are compiled for elective patients (emergency and transfer patients are excluded). The small proportion of patients who have operations on both hips or both knees simultaneously are only included once in the casemix, management and complications analyses. Patients under sixteen years old are excluded.

Data completeness

SMR01 data are expected to be received by ISD up to six weeks following the end of the month of patient discharge from hospital, and are available for inclusion in the SAP extract within a month of this. Details about how data completeness is determined can be found in the 'Managing Data Quality' section on the ISD Website (www.isdscotland.org/isd/1607.html). At the time of going to press, this webpage estimated that for any individual Health Board SMR01 records for patients discharged in 2009 were at least 99% complete, and completeness was 99% overall. Calculation of complication rates requires information up to 30, 90 and 365 days after operation. Health Board records for calculating 30 and 90 day complications (January to March 2010) were at least 95% complete, and 99% overall. Health Board records for calculating complications at 1 year and revisions at 1, 3 and 5 years were at least 77% complete (94% overall) based on latest relevant quarter, April to June 2010, although the proportion of patients with operations late in the year and a complication towards the end of the follow-up period will be very small.

Arthroplasty coding

OPCS codes used to select arthroplasties are now available on the SAP website (www.orthro.scot.nhs.uk/OPCS_codes_summary_150710.pdf).

Complication Rates

Complication data, including early revisions, are standardised for age, gender, osteoarthritis and rheumatoid arthritis and are presented as rates, not as actual numbers of complications. Anaesthetic complications rates are also standardised by whether the operation was primary or revision. The resulting control charts show an upper red funnel-shaped line representing the 99% confidence interval for the mean complication rate. The funnel narrows as the number of operations increases because a smaller deviation from the mean is required before it is statistically significant. So for complication rates above the red funnel line, we can be 99% sure that the board or surgeon's higher rate is not simply due to chance.

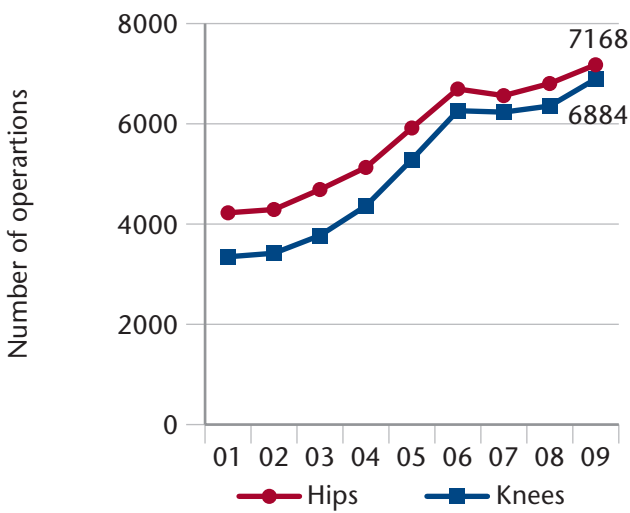
NUMBER OF ARTHROPLASTIES

Number and type of arthroplasties nationally

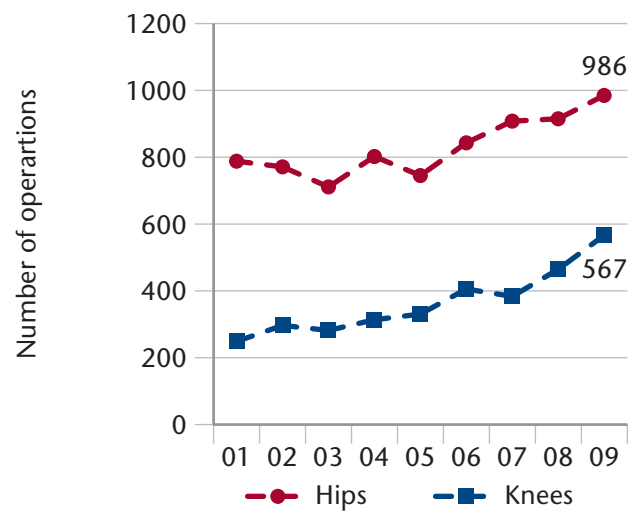
In 2009 the number of combined elective and emergency joint replacement operations (both primary and revision for hip and knee) continued to increase (Fig. 1).

Fig. 1 Recent trends in numbers of hip and knee arthroplasties (primary and revision) in Scotland, 2001 to 2009

a) Primary [Click here to see more detail for Fig 1](#)



b) Revisions



All arthroplasties including emergency admissions; bilateral operations counted twice; hip arthroplasties include hybrid and re-surfacing operations.

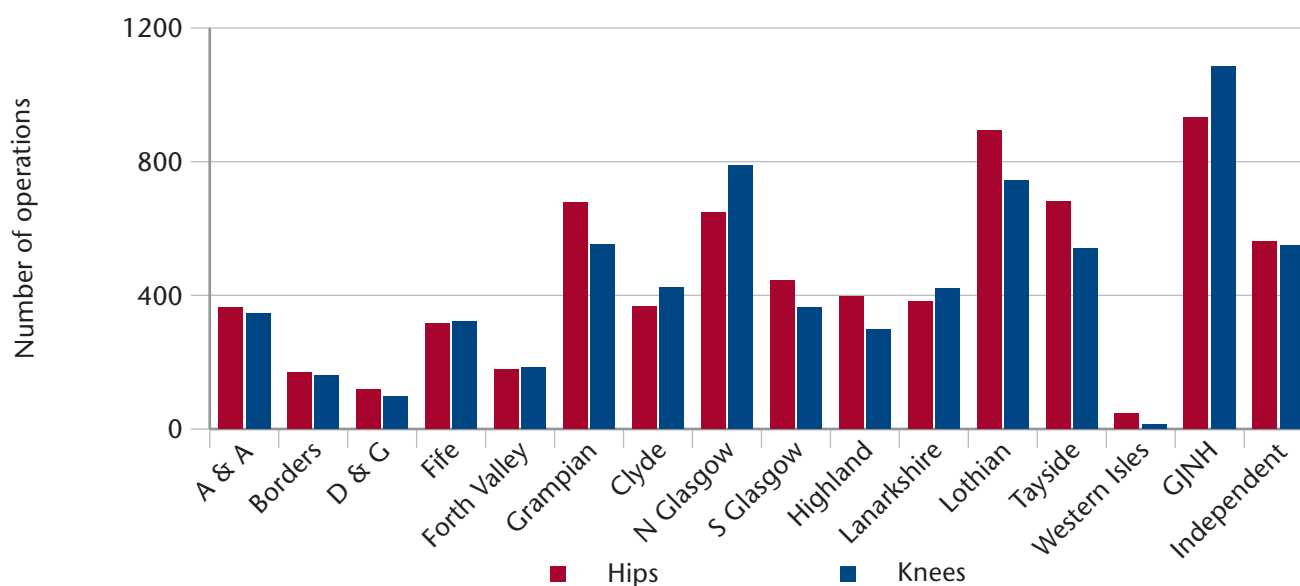
The vast majority of operations continue to be performed as an elective procedure (94% of primary hip replacements and 77% of revisions; 99% of primary knee replacements and 88% of revisions). In 2009, 12% of all hip arthroplasties (primary or revision) were revisions. Eight per cent of all knee arthroplasties were revisions.

Joint replacements are also performed for the NHS in the independent sector. Fig. 1 includes such operations as are reported to ISD, although we do not yet know what proportion of such data is supplied to ISD. Eight per cent of both primary hip arthroplasties and primary knee arthroplasties in Fig. 1 were done in Independent Hospitals in 2009, and although this is an increase from 2% in 2007, it is likely that more are now reported than in 2007 which may explain the difference. Only a few revisions were done in Independent Hospitals.

Number of arthroplasties by Health Board

The number of primary hip and knee arthroplasties in 2009 varied greatly between boards, broadly reflecting the population in each board. [Click here to see more detail for Fig 2](#)

Fig. 2 Number of primary hip and knee arthroplasties in 2009 by Health Board of treatment



All arthroplasties including emergency admissions; bilateral operations counted twice; hip arthroplasties include hybrid and re-surfacing operations.

In general, the volume of primary arthroplasties performed has increased in 2009 for most boards, compared to the average for 2005 to 2008. However, a much larger increase from previous years was observed for the national hospital and independent hospitals, though it is possible that independent figures may have been less complete in previous years (Table 1).

Table 1 Number of arthroplasties by Health Board in 2009 compared to previous years

	HIP-PRIMARY		HIP-REVISION		KNEE-PRIMARY		KNEE-REVISION	
	Mean 2005-2008	2009	Mean 2005-2008	2009	Mean 2005-2008	2009	Mean 2005-2008	2009
Ayrshire & Arran	343	363	42	46	297	346	26	23
Borders	141	170	9	8	118	160	9	11
Dumfries & Galloway	117	117	7	5	107	98	6	6
Fife	349	316	34	41	381	322	26	54
Forth Valley	173	177	36	38	183	184	19	24
Grampian	738	678	124	124	519	553	32	53
Clyde	325	367	38	45	329	422	25	38
North Glasgow	672	649	116	125	711	788	57	76
South Glasgow	407	444	118	129	360	363	35	33
Highland	376	397	37	24	284	298	20	26
Lanarkshire	387	382	43	56	368	420	25	33
Lothian	894	892	155	172	818	744	57	77
Tayside	703	680	79	96	540	540	37	47
Western Isles	44	45			16	13		
GJNH	611	931	17	75	796	1,085	25	65
Independent hospital	209	560	2	2	202	548	1	1
Total	6,486	7,168	854	986	6,026	6,884	397	567

[Click here](#) for number of arthroplasties by Health Board of residence

Number of other arthroplasties and surgeons

The number of hip, knee, shoulder, finger and toe arthroplasties increased in 2009 in contrast to the number of elbow, ankle, wrist, and thumb arthroplasties, which decreased. It must be noted though that where the annual volume of operations is small, the numbers are subject to more variation.

Table 2 Number of arthroplasties and operating surgeons in 2009 compared to previous years

	NUMBER OF OPERATIONS		NUMBER OF SURGEONS	
	Mean 2005–2008	2009	Mean 2005–2008	2009
Hip arthroplasty	6,486	7,168	193	218
Hip revision	854	986	132	147
Knee arthroplasty	6,026	6,884	179	199
Knee revision	397	567	99	110
Shoulder arthroplasty	342	405	85	101
Shoulder revision	17	24	12	11
Elbow arthroplasty	66	43	18	15
Ankle arthroplasty	39	38	9	10
Wrist arthroplasty	22	19	7	7
Finger arthroplasty	59	77	18	23
Thumb arthroplasty	48	41	14	15
Toe arthroplasty	40	61	17	22
Excision	249	287	105	121
Resurf. Of Patella	12	29	9	21
Other knee resurfacing	23	69	15	33
Other resurfacing	28	24	15	15
Other	192	224	79	88
Total	14,897	16,946	1,005	1,156

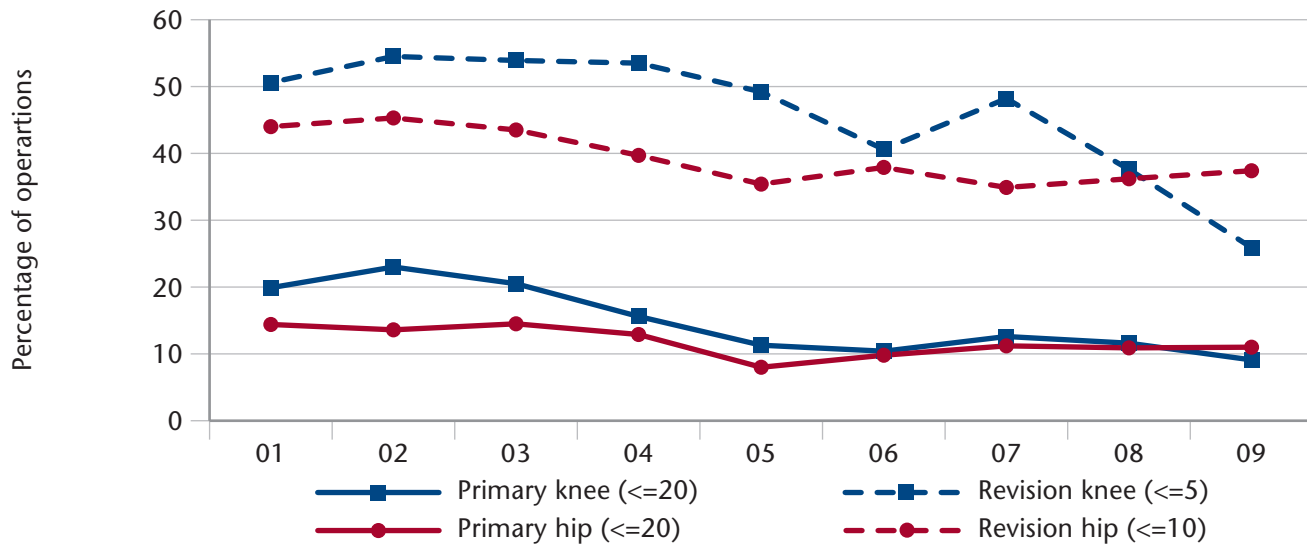
Arthroplasties performed less than ten times in 2009 are not listed separately.

Table 2 includes emergency admissions. The percentage of emergency admissions for each arthroplasty type varied greatly from 1 to 32 %. For arthroplasties where the percentage of emergencies was higher, such as shoulder arthroplasties, the number of surgeons will be inflated by those who carry out occasional emergency surgery.

Surgeons performing small volumes

As previous SAP reports (e.g. Annual Report 2003) have indicated that performing a low volume of any particular type of arthroplasty can result in higher rates of some complications, operating teams have been encouraged to promote the use of specialist arthroplasty surgeons in preference to 'occasional' surgeons. Although Fig. 3 is slightly confounded by the turnover of consultant surgeons and locums, 2009 continued the trend towards fewer procedures being carried out by low volume operators. [Click here to see more detail for Fig 3](#)

Fig. 3 Change in the percentage of hip and knee arthroplasties (primary and revision) carried out by surgeons performing small numbers of such operations, 2001 to 2009



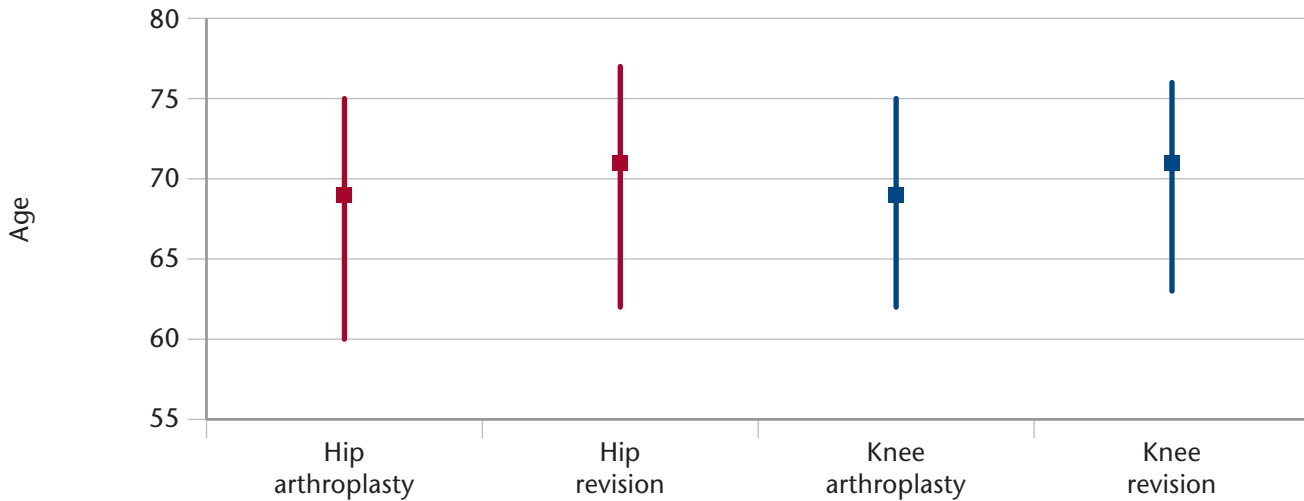
Note that each hospital and consultant has a unique work pattern and in many cases arthroplasty represents only a small part of their overall workload. Consultants who carried out small numbers of operations because they commenced or retired from their post during the year have not been excluded.

PATIENT DEMOGRAPHICS

Approximately 60% of primary hip or knee arthroplasty patients are female, compared to 55% of revision knees or hips. Primary hip and knee arthroplasty patients are 2 and 3 years younger, respectively, than those who return for revisions (Fig. 4).

[Click here to see more detail for Fig 4](#)

Fig. 4 Median age of arthroplasty patients in 2009



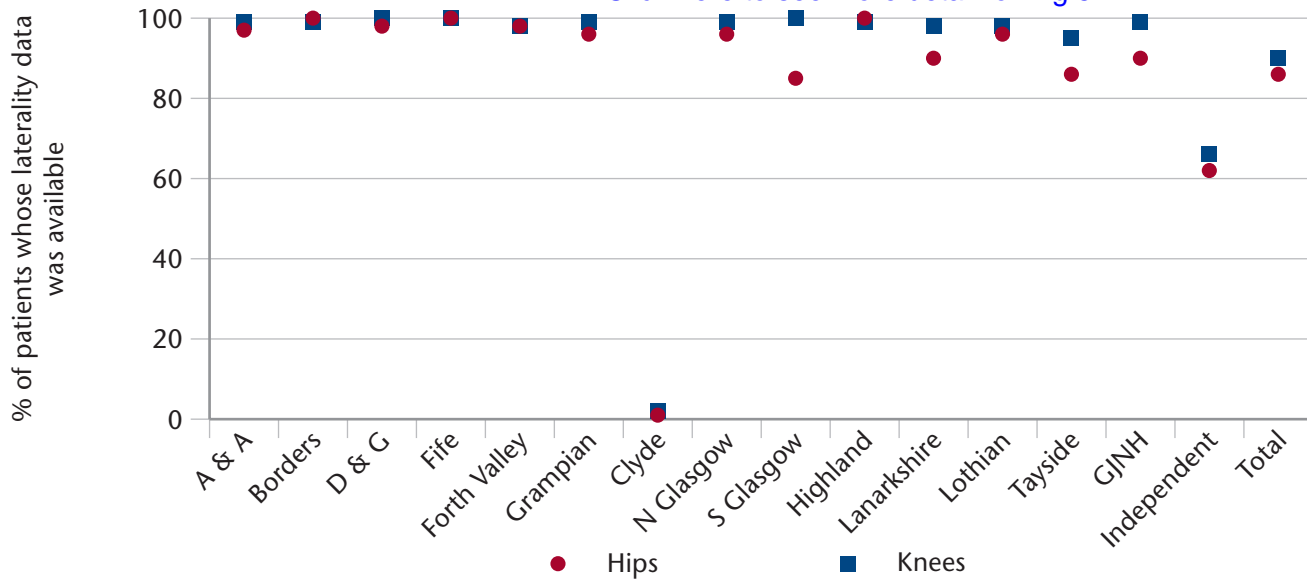
Elective patients only; bilateral operations included once; includes NHS patients operated on in independent hospitals. Lines extend to show the interquartile range (the range in which a quarter of patients are younger and a quarter are older than the median).

LATERALITY DATA

Laterality refers to which hip or knee (left or right) was replaced, allowing more accurate linkage of primary arthroplasties and future revisions of the same joint. Health Boards that had high rates of documented laterality still had a few cases undocumented, perhaps because coding slots were used instead for additional operation definition. However, this was seldom the case for the remaining boards that continue to have problems transferring SMR01 laterality data to ISD (Fig. 5).

Fig. 5 Availability of laterality data for primary hip and knee arthroplasty patients in 2009 by Health Board of treatment

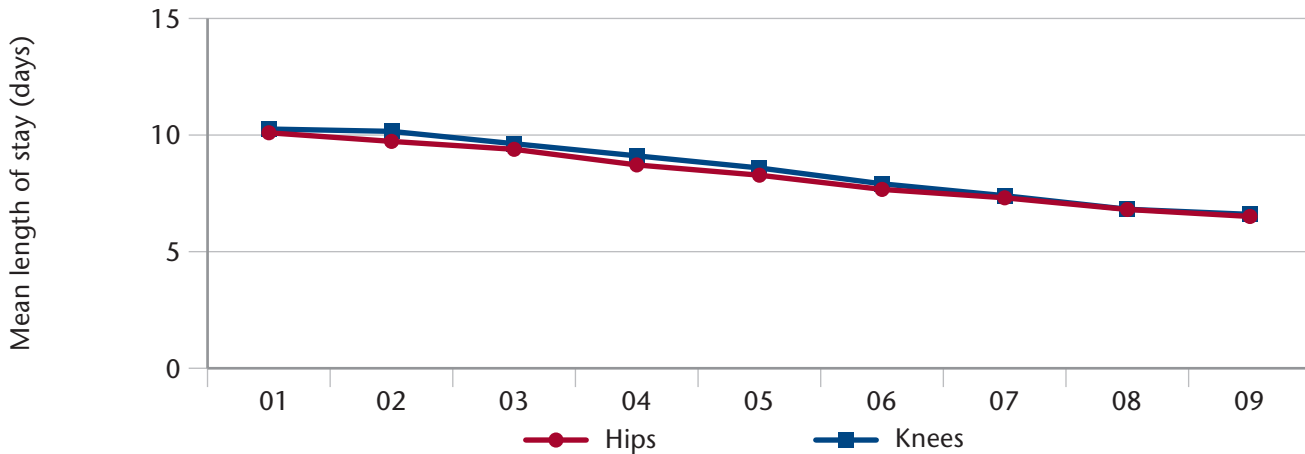
[Click here to see more detail for Fig 5](#)



TIME OF SURGERY AND LENGTH OF STAY

In 2009 the long-term trend of reduced length of overall hospital stay continued for patients having hip and knee replacements (Fig. 6). There is still, however, large variation between Health Boards in the time of admission before surgery (Fig. 7) and the post-operation time to discharge (Fig. 8).

Fig. 6 Trend in mean overall length of stay for elective hip and knee replacements

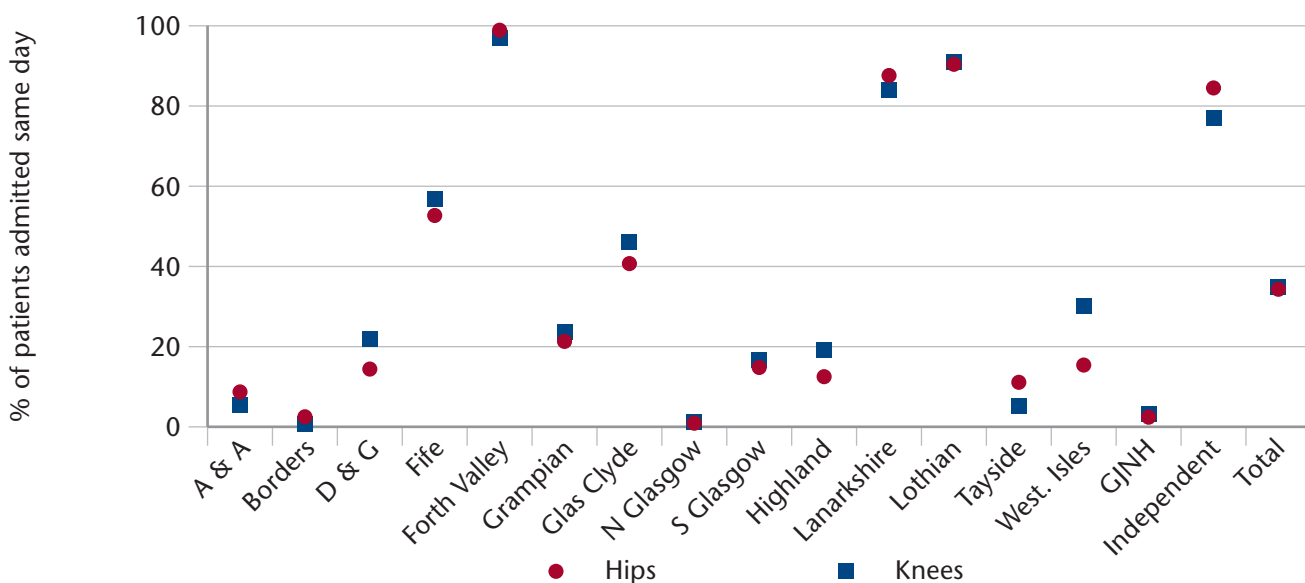


Overall length of stay in hospital (regardless of change in specialty, consultant or ward), including pre-operative and post-operative stay. [Click here to see more detail for Fig 6](#)

Overall, 35% of hip and 34% of knee arthroplasty patients in 2009 were admitted on the same day as surgery (Fig.7), an overall increase from 28% for hips and knees in 2008.

The variation in same-day surgery rates will depend to some extent on how far patients have to travel to hospital. Where they need to travel long distances to attend hospital (i.e. from rural areas, or to National Facilities) it may be more practical to admit them on the day before surgery. However, there is no obvious reason why patients should not be admitted on the same day as their surgery because admitting patients on the same day as surgery frees up beds, improves efficiency and saves money.

Fig. 7 Percentage of patients admitted on same day as arthroplasty surgery by Health Board of treatment

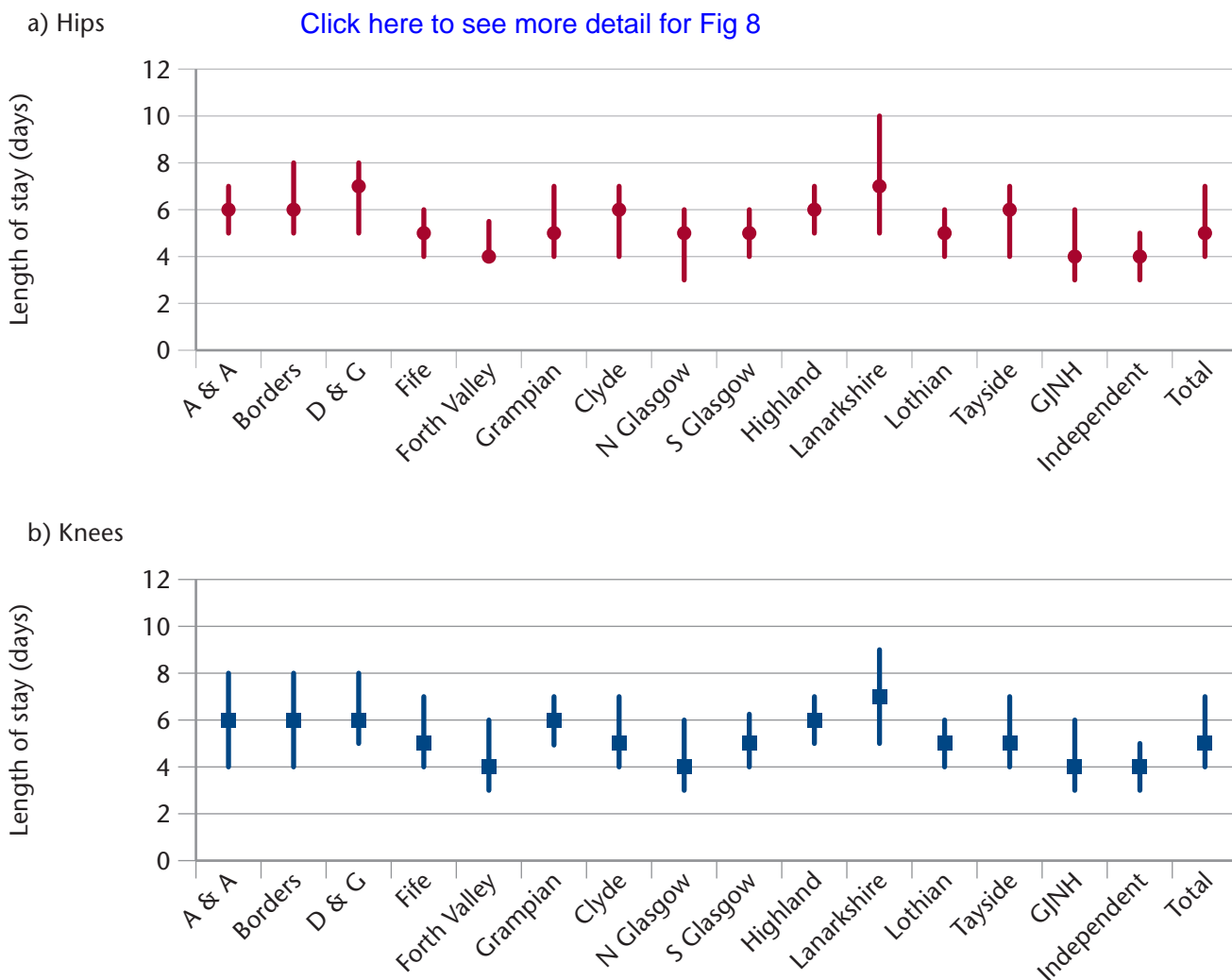


[Click here to see more detail for Fig 7](#)

The number of days between operation and discharge is presented for each health board for elective hip and knee replacements (Fig. 8). The median post-operative stay varies widely between boards from four to seven days for hips and knees. Independent hospitals may have shorter post-operative lengths of stay because they operate on fitter than average patients than in NHS hospitals. More hospitals may be able to reduce length of stay by using enhanced recovery programs. Patients at a number of hospitals remain in hospital for an average of only four or five days post-arthroplasty. Some of these use a regime for patients which includes a comprehensive programme of pre-operative education, multimodal analgesia and multi-disciplinary accelerated education. Hospitals that use enhanced recovery programs show no increase in complication rate and no increase in patient dissatisfaction¹.

Within Health 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 hospital.

Fig. 8 Median post-operative length of stay for elective hip and knee replacements in 2009 by Health Board of treatment



Points represent the median length of hospital stay. Lines extend to show the interquartile range (lower and upper values indicate the number of days within which a quarter and three-quarters of patients were discharged).

¹ Hunt GR, Crealey G, Murthy BV, Hall GM, Constantine P, O'Brien S, Dennison J, Keane P, Beverland D, Lynch MC, Salmon P. The consequences of early discharge after hip arthroplasty for patient outcomes and health care costs: comparison of three centres with differing durations of stay. *Clinical Rehabilitation*. 2009 Dec; 23(12):1067-77.

ORTHOPAEDIC COMPLICATION RATES

In this section data are presented for adverse outcomes of particular concern for orthopaedic surgeons. The selected complications following elective primary hip or knee replacement are:

- Dislocation within a year of surgery (hips only);
- Infection (both superficial and deep) of the joint within a year of surgery. Although the diagnostic code used to identify an infected prosthesis does not differentiate between deep and superficial infections, we only include patients re-admitted to hospital with an infection, so these are more likely to be deep infections. Discharge letters may also note suspected infections which may occasionally be miscoded as confirmed infections;
- Death within 90 days of surgery; and
- Deep vein thrombosis/pulmonary embolism (DVT/PE) within 90 days of surgery.

Complication rates have been standardised for patient age, gender, osteoarthritis and rheumatoid arthritis.

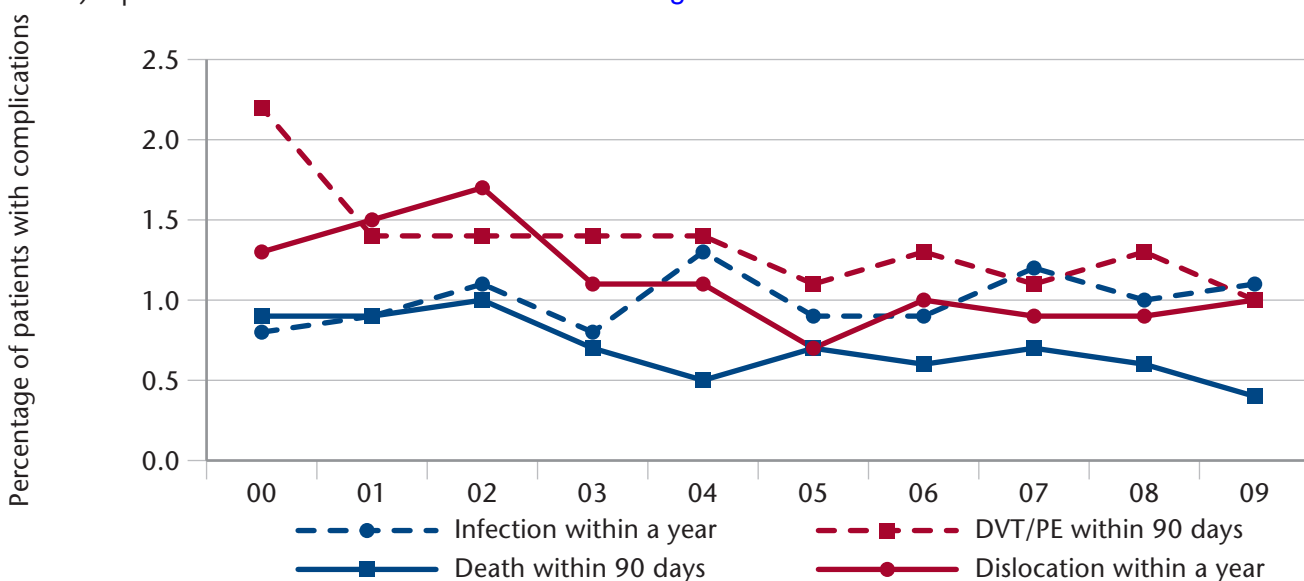
As with previous years, SAP will follow the clinical governance process by asking health boards to review any outlying outcomes.

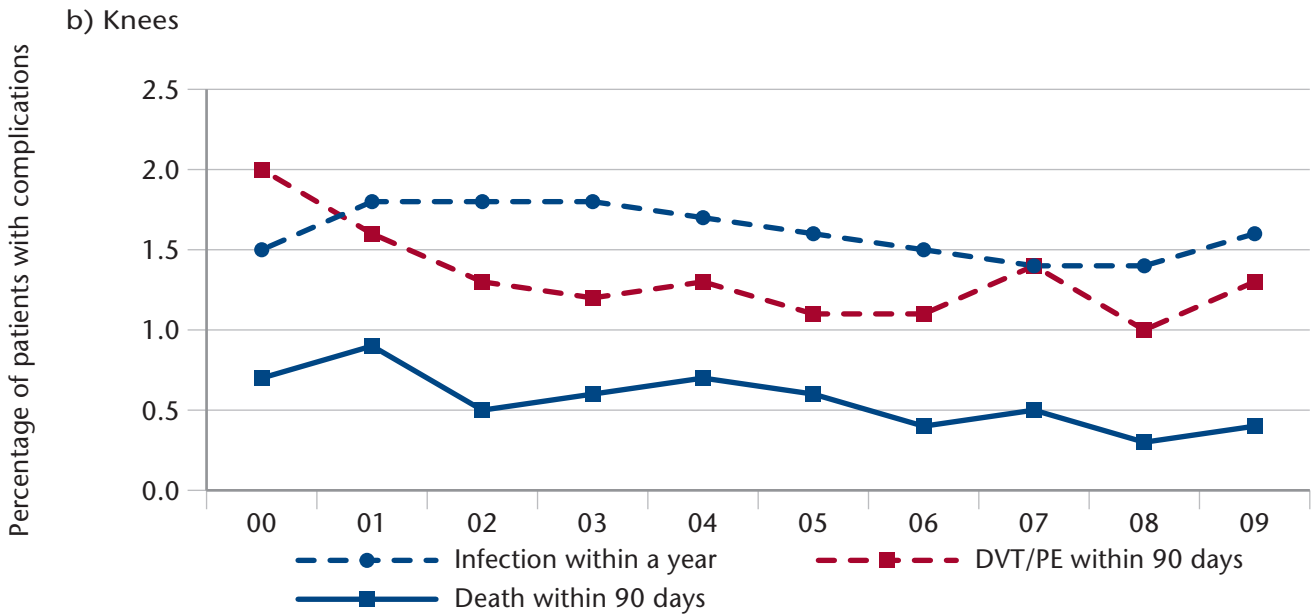
Summary of national trend data

The DVT/PE and mortality rates 90 days after a primary hip arthroplasty fell in 2009, continuing an overall decrease over the last 10 years. Rates of DVT/PE (1.0%) and death (0.4%) are now at their lowest since 2000. The rates of dislocation and infection remain around 1%. Infections, DVT/PEs and mortality after primary knee arthroplasty all show a small increase on last year but do not differ greatly from rates established over the last 3–4 years.

Fig. 9 National rates for complications, 2000 to 2009

a) Hips [Click here to see more detail for Fig 9](#)





Data for elective primary hip and knee replacements. Note that data on these charts relate to the year in which the operations were carried out, as opposed to the retrospective 5-year averages reported in previous Annual Reports (e.g. in previous reports '2009' data would have been for complications occurring in operations carried out between April 2002 and March 2007).

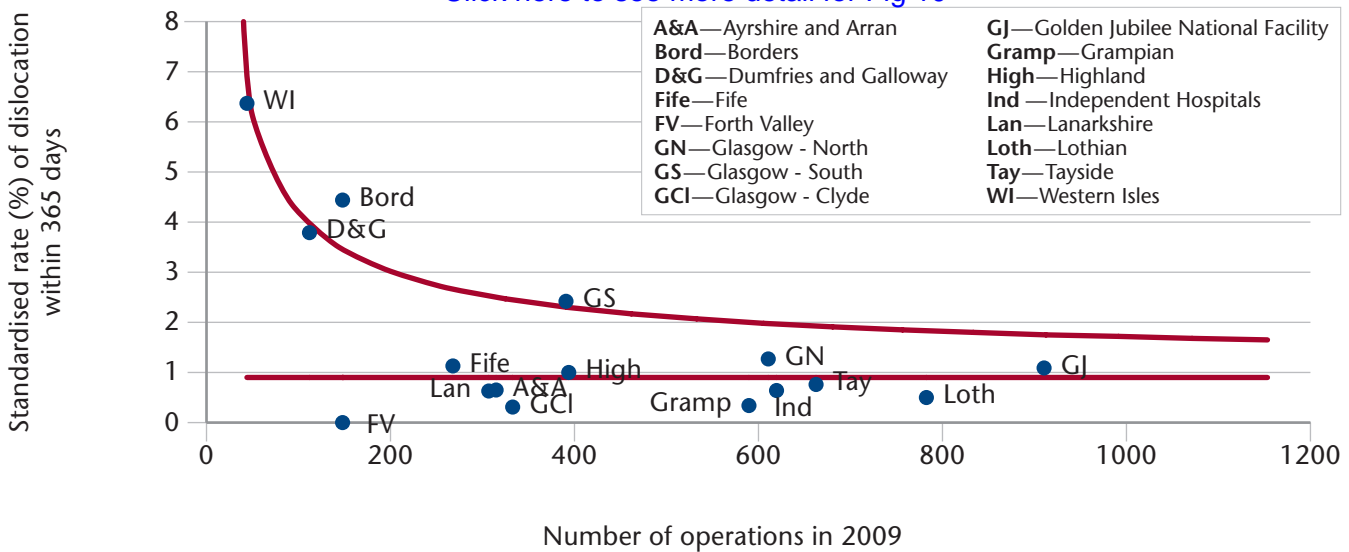
Dislocations—hips

Since SAP introduced the Clinical Governance process in 2004, the rate of hip dislocations has decreased and now averages below 1%.

Two Health Boards had higher dislocation rates than expected in 2009 and two other Health Boards were just within the 99% confidence interval.

Fig. 10 Percentage of 2009 hip arthroplasty patients who dislocated within one year of operation by Health Board

[Click here to see more detail for Fig 10](#)

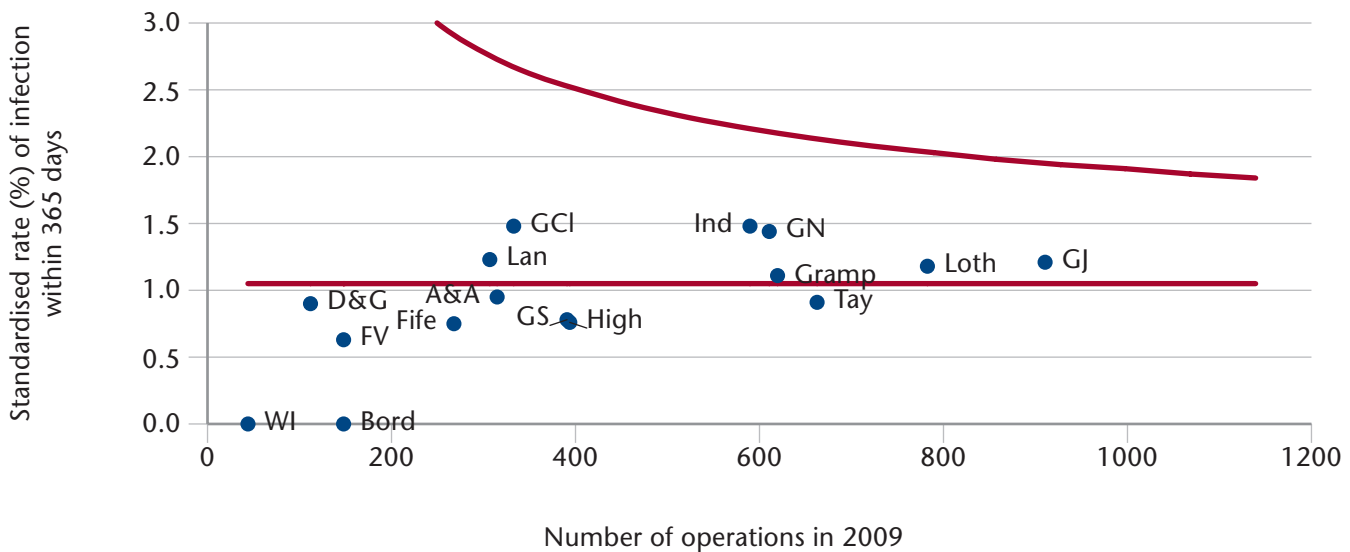


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009.

Infections—hips

All Health Board 365-day infection rates fell within the 99% confidence interval in 2009.

Fig. 11 Percentage of 2009 hip arthroplasty patients who had a joint infection within one year of operation by Health Board [Click here to see more detail for Fig 11](#)

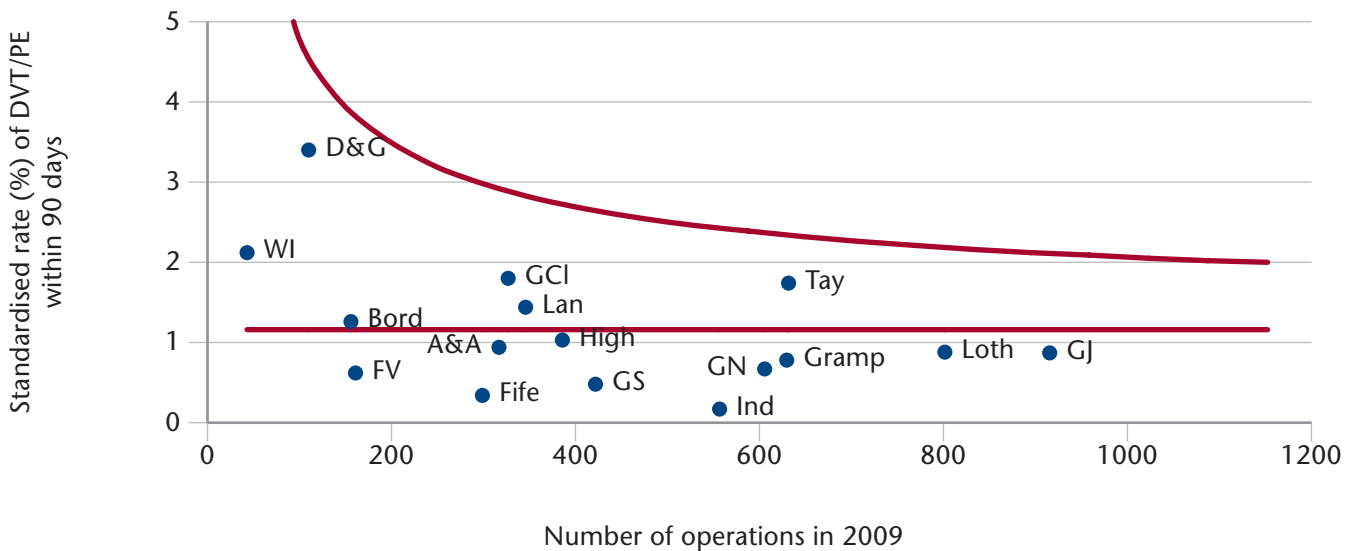


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Deep vein thrombosis/pulmonary embolism—hips

All Health Board 90-day DVT/PE rates fell within the 99% confidence interval.

Fig. 12 Percentage of 2009 hip arthroplasty patients who had DVT/PE within 90 days of operation by Health Board [Click here to see more detail for Fig 12](#)

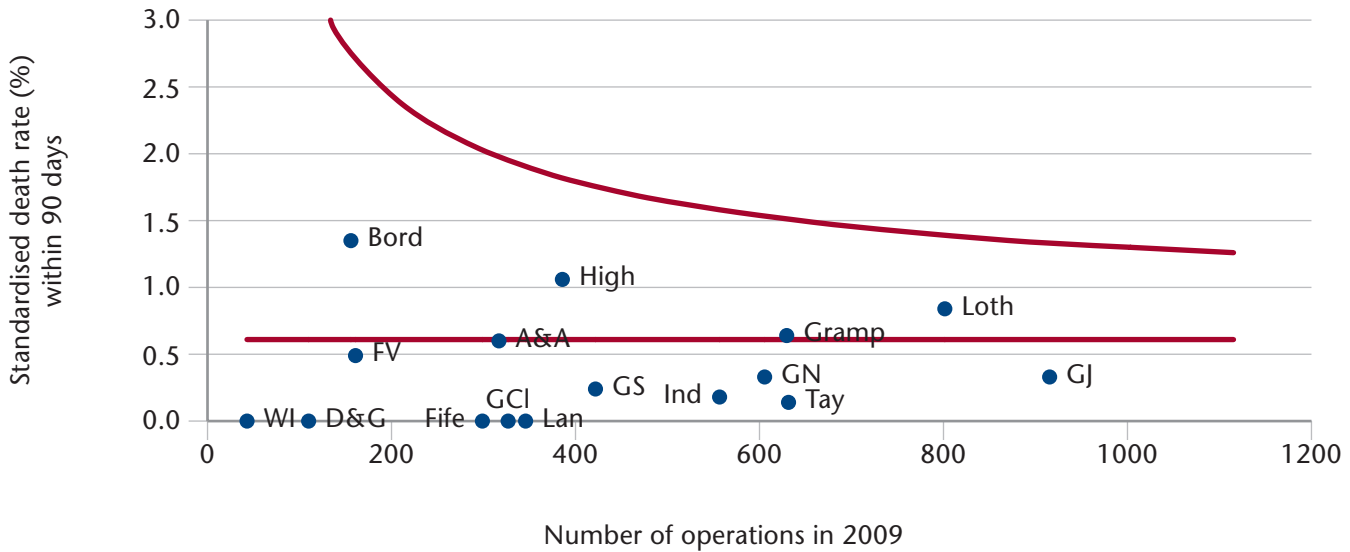


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Mortality—hips [Click here to see more detail for Fig 13](#)

All Health Board 90-day mortality rates fell within the 99% confidence interval in 2009.

Fig. 13 Percentage of 2009 hip arthroplasty patients who died within 90 days of operation by Health Board

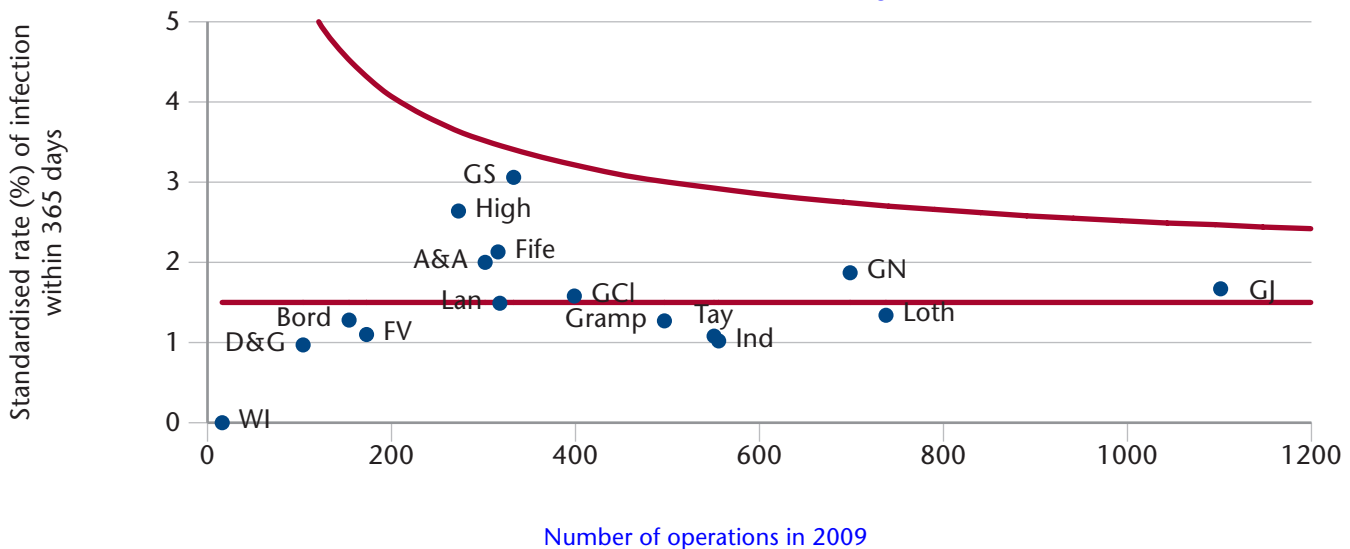


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Infections—knees

No Health Board had a higher infection rate than expected in 2009.

Fig. 14 Percentage of 2009 knee arthroplasty patients who had a joint infection within one year of operation by Health Board [Click here to see more detail for Fig 14](#)

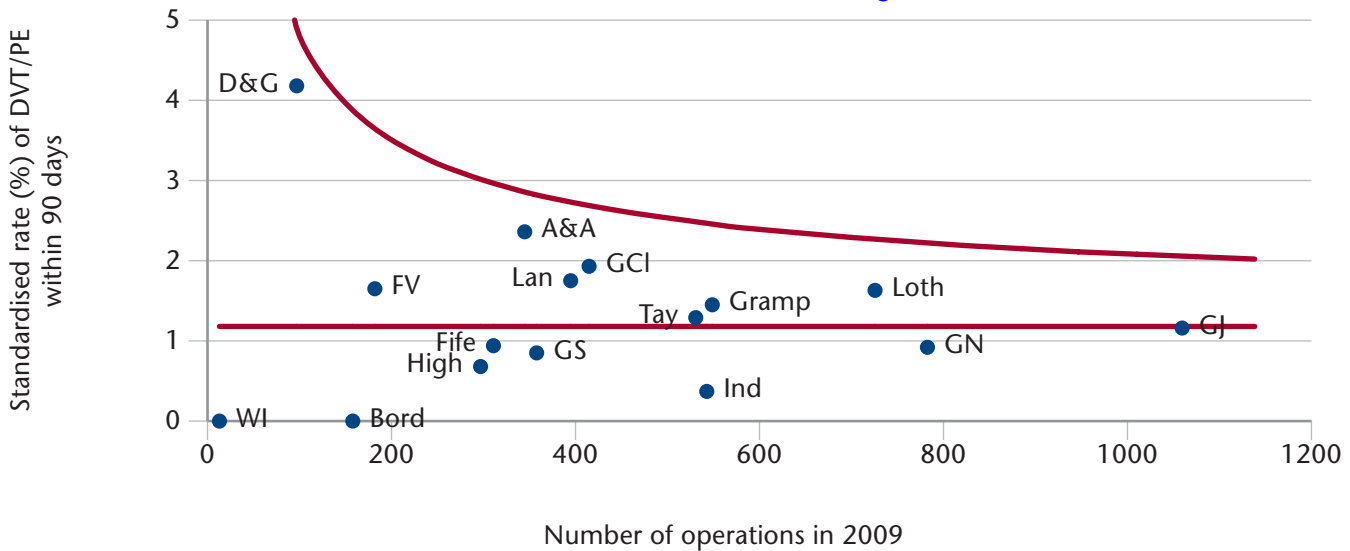


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Deep vein thrombosis/pulmonary embolism—knees

No Health Board 90-day DVT/PE rates fell outside the 99% confidence interval.

Fig. 15 Percentage of 2009 knee arthroplasty patients who had had DVT/PE within 90 days of operation by Health Board [Click here to see more detail for Fig 15](#)

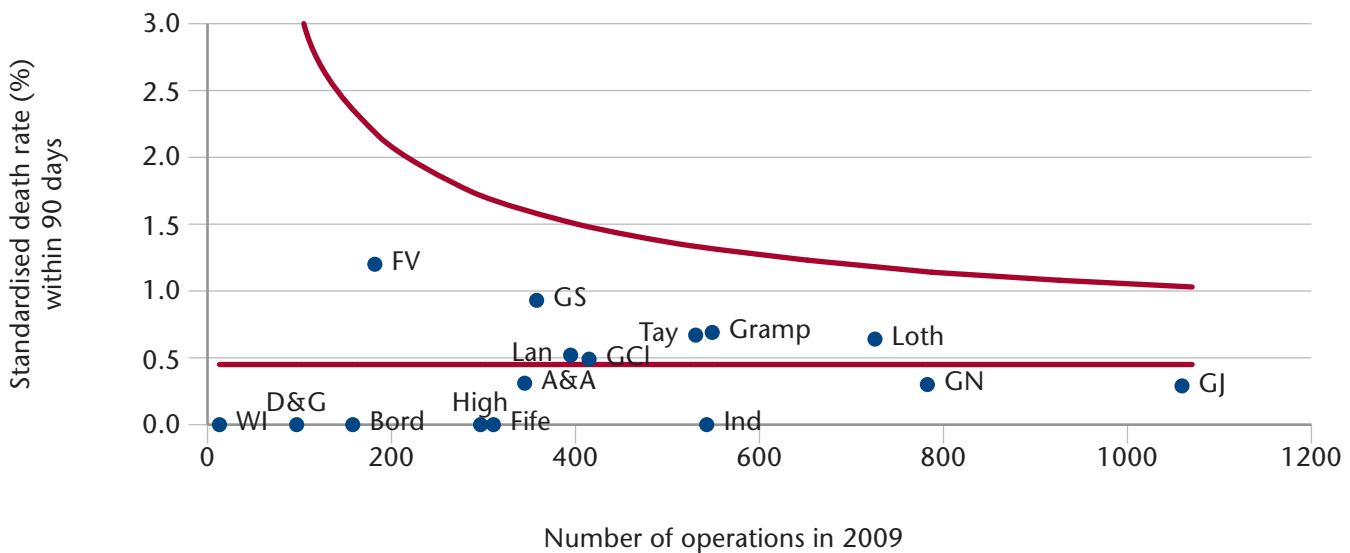


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Mortality—knees [Click here to see more detail for Fig 16](#)

All Health Board 90-day mortality rates fell within the 99% confidence interval in 2009.

Fig. 16 Percentage of 2009 knee arthroplasty patients who died within 90 days of operation by Health Board



Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

ANAESTHETIC COMPLICATION RATES

In this section, complication data are presented for three outcomes of particular concern to anaesthetists. The following anaesthetic complications within 30 days of elective primary hip or knee replacement were investigated:

- Acute myocardial infarction (AMI)
- Acute renal failure
- Cerebrovascular accident (CVA) or stroke

As overall anaesthetic complication rates were similarly low (less than 0.5%) for both primary and revision operations, we have combined these in one analysis that standardised for whether the operation was primary or revision. Complication rates were also standardised for patient age, gender, osteoarthritis and rheumatoid arthritis.

Summary of national trend data

Complication rates can be very difficult to establish for individual anaesthetic departments for several reasons—large numbers of anaesthetists perform arthroplasty surgery, complications may occur after completion of routine anaesthetic review, and patients are not seen by anaesthetists post-discharge in an out-patient clinic. Complication rates therefore tend to be from single institutions and taken as 'snap-shots' of activity.

This routine collection of data on medical complications relating to orthopaedic surgery is unique within the United Kingdom. The accurate collection of data relating to specific conditions complicating surgery is fraught with difficulty. Many conditions exist as a spectrum of severity (such as post-operative renal dysfunction), may or may not need specialist treatment or referral and may be diagnosed or misdiagnosed as other conditions, all of which may lead to under-reporting of complications. However, the generation of SMR01 data are dependent on the generation of a new 'hospital episode' but some complications may be present already or occur at the time of admission leading to mis-coding and over-reporting.

Consequently the supplied complication data cannot be relied on to provide 100% accuracy and needs to be validated with locally collected information. This does not diminish the value of the information as a method of reviewing peri-operative practice. The published complication rates for medical complications following arthroplasty tend to be single institution or retrospective analyses, however the rates quoted are broadly similar for acute myocardial infarction (0.4–1.9%)². The incidence of stroke and renal failure following arthroplasty is less clearly understood (the risk of stroke for non-cardiac or vascular surgery being quoted in the region of 0.08–0.3%)³. No data are available regarding risk for individual anaesthetic departments in Scotland and certainly not for informing individual patients of their particular 'risk'.

The Scotland rates for acute myocardial infarction, renal failure and stroke following hip arthroplasty were around 0.5%. All knee arthroplasty rates were lower than 0.5%. All Health Boards had complication rates within normal variation.

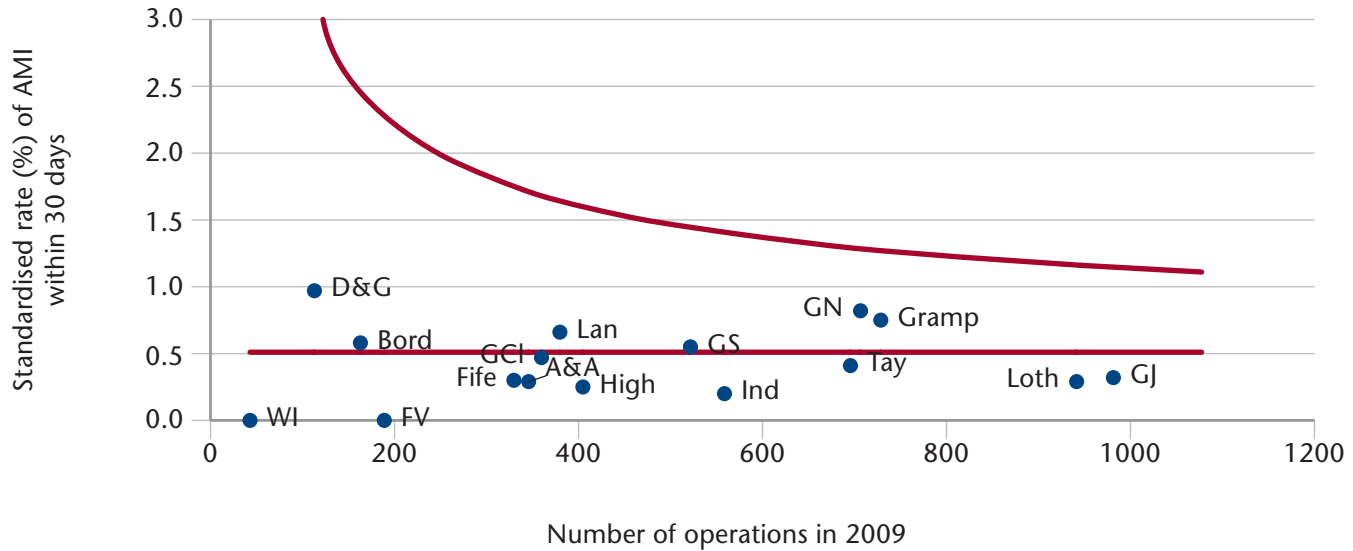
² Wood M, et al. Frequency of Myocardial Infarction, Pulmonary Embolism, Deep Venous Thrombosis and Death following Primary Hip and Knee Arthroplasty. *Anesthesiology* 2002;96(5):1140–46

³ Selim M. Current Concepts: Perioperative Stroke. *New England Journal of Medicine* 2007;356(7):706–13

Acute myocardial infarction—hips

All Health Boards were within the 99% confidence interval for 30-day acute myocardial infarction rate following hip arthroplasty. [Click here to see more detail for Fig 17](#)

Fig. 17 Percentage of 2009 hip arthroplasty patients who had acute myocardial infarction within 30 days of operation by Health Board

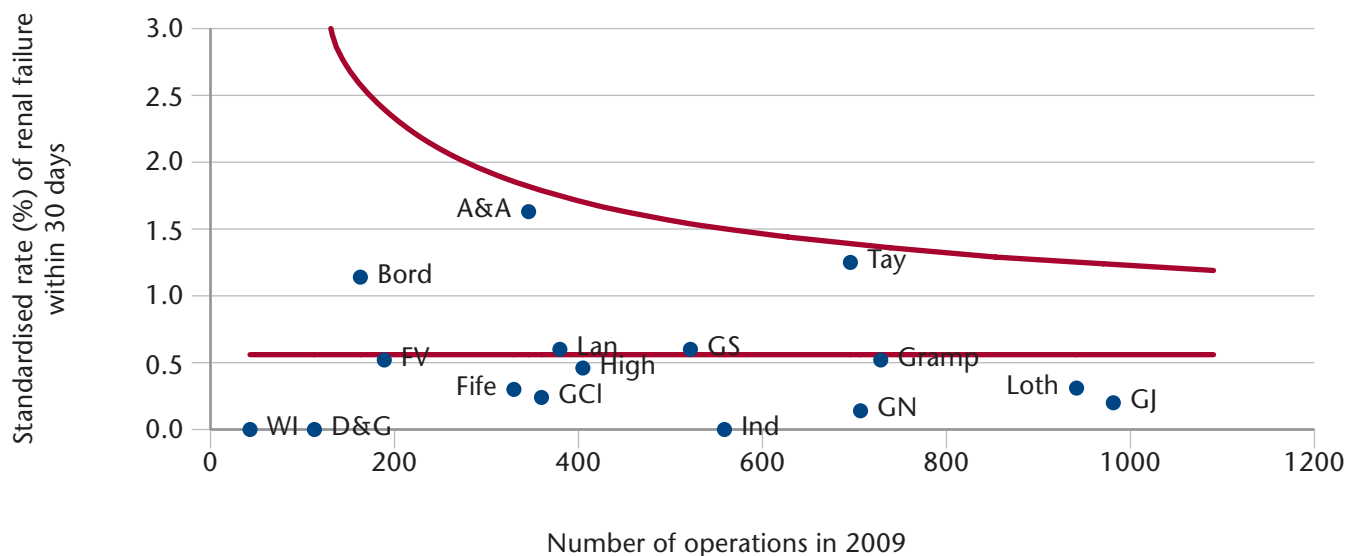


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Renal failure—hips

All Health Boards had 30-day renal failure rates within normal variation.

Fig. 18 Percentage of 2009 hip arthroplasty patients who had renal failure within 30 days of operation by Health Board [Click here to see more detail for Fig 18](#)

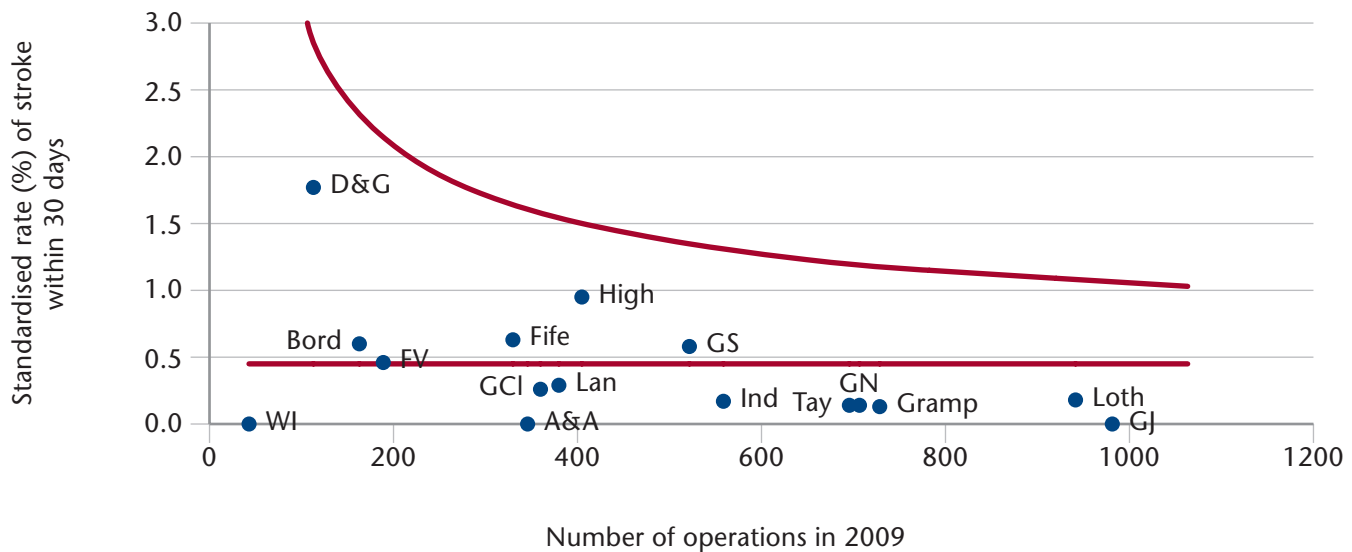


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Stroke—hips

All Health Boards were within the 99% confidence interval for 30-day stroke rate.

Fig. 19 Percentage of 2009 hip arthroplasty patients who had stroke within 30 days of operation by Health Board [Click here to see more detail for Fig 19](#)

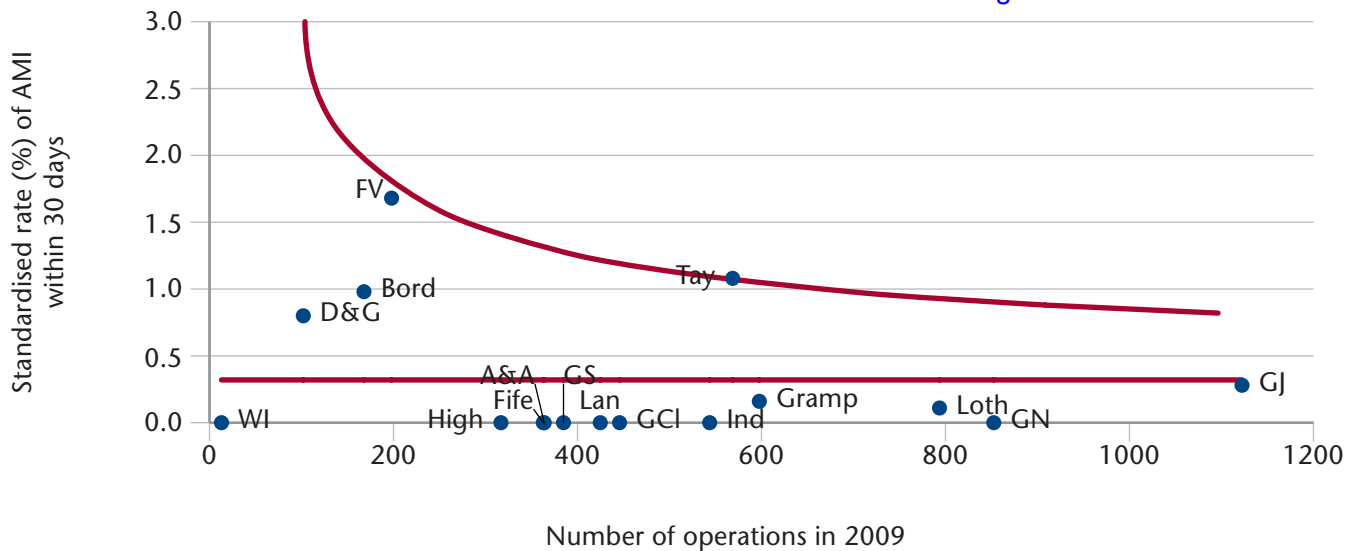


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Acute myocardial infarction—knees

All Health Boards had a 30-day acute myocardial infarction rate within the expected range.

Fig. 20 Percentage of 2009 knee arthroplasty patients who had acute myocardial infarction within 30 days of operation by Health Board [Click here to see more detail for Fig 20](#)

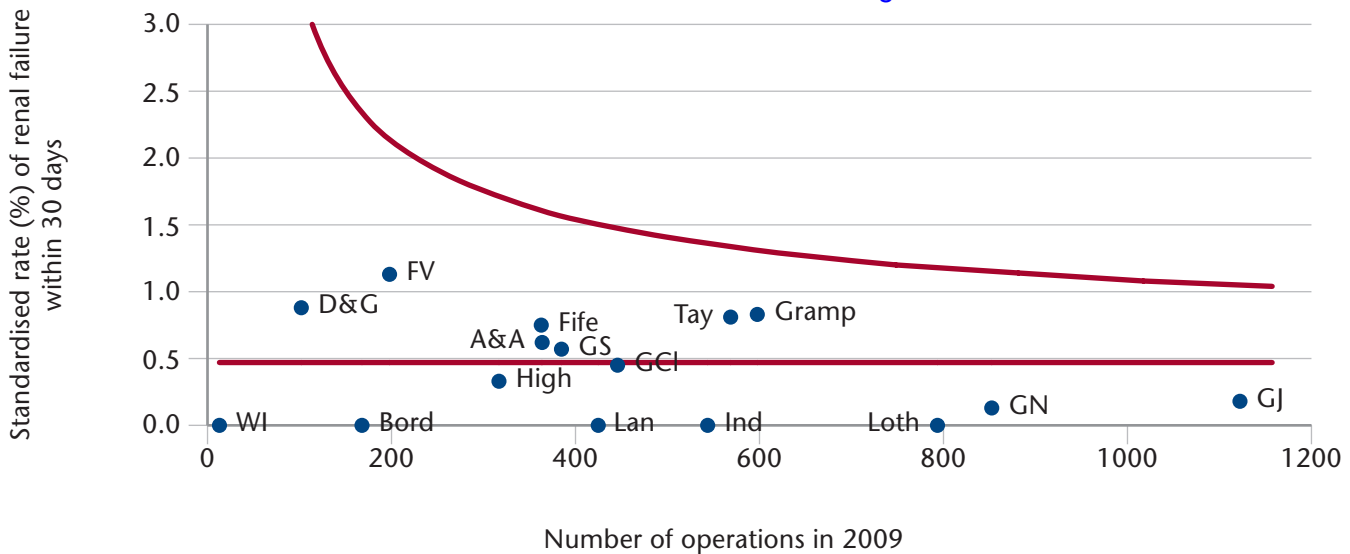


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Renal failure—knees

All Health Boards fell within the expected range for 30-day renal failure rate for hips.

Fig. 21 Percentage of 2009 knee arthroplasty patients who had renal failure within 30 days of operation by Health Board [Click here to see more detail for Fig 21](#)

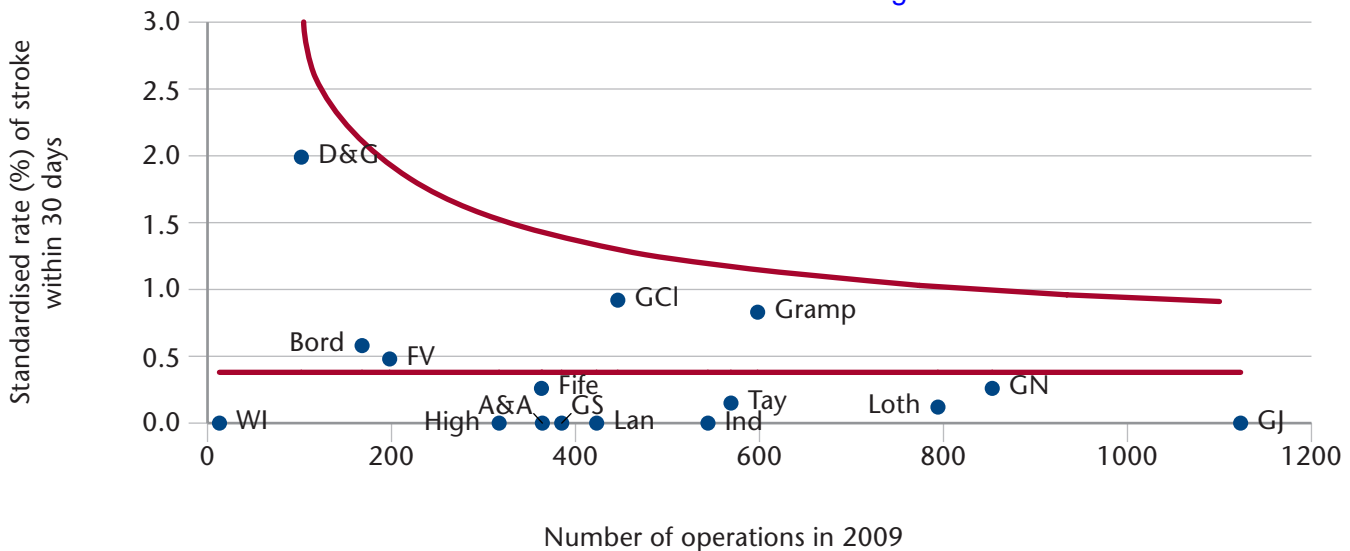


Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Stroke—knees

All Health Boards 30-day stroke rate following knee replacement fell within the 99% confidence interval.

Fig. 22 Percentage of 2009 knee arthroplasty patients who had stroke within 30 days of operation by Health Board [Click here to see more detail for Fig 22](#)



Health Board data points are for operations carried out in 2009. Average, funnel and standardisation is done using 5-years data 2005–2009. For an explanation of Health Board abbreviations see Fig. 10.

Investigating anaesthetic complications

This report provides Health Board specific anaesthetic data for Clinical Directors of every anaesthetic department carrying out arthroplasty procedures in Scotland. Best practice would suggest that anaesthetic departments should aim to review and interpret the data and disseminate any conclusions to all of the perioperative team (anaesthetists and surgeons).

The actual numbers of cases are relatively small and involve different anaesthetists, requiring a departmental approach to subsequent analysis. This is usually most conveniently achieved through existing morbidity and mortality review processes. After completing the relevant Data Protection Act requirements, SAP would be willing to provide a nominated senior person in each board with patient listings of anaesthetic complications. In general every case should be reviewed even though the department may be 'below the line' and not an 'outlier' for that particular complication.

After note review and analysis the results can be presented to a departmental mortality and morbidity meeting for general discussion and comment. Action required can be identified and plans made for subsequent changes to practice. It is important that the surgeons are aware of these discussions, if necessary through discussion at the orthopaedic mortality and morbidity meeting. Some larger anaesthetic departments have formed a specific orthopaedic and trauma group to facilitate the implementation of these and other measures.

Changes that have been introduced as a direct result of this type of analysis include raising awareness of the potential of renal failure ('flagging' at-risk individuals in the anaesthetic record, specific measures for prevention of contrast-induced renal impairment), delaying elective surgery after apparently minor stroke and alterations to the management of patients with coronary artery stents preoperatively.

Some departments combine the use of the SAP report with other audit data, for example from the Scottish Intensive Care Society's Wardwatcher system, to generate a more complete picture of orthopaedic activity and complication rates.

REVISION RATES

In this section data are presented for revision following elective primary hip or knee replacement. Revision rates are calculated at 1, 3 and 5 years after surgery and have been standardised for patient age, gender, osteoarthritis and rheumatoid arthritis.

All revision rates are calculated for operations performed between July and June of each year to maximise completeness of the follow-up period. Data for revisions at 3 years are only available up to the year ending June 2007 because 3 years revision data are required for full follow-up; 5-year revision rates are only available up to year ending June 2005 for the same reason. See the Methods section for data completeness estimates.

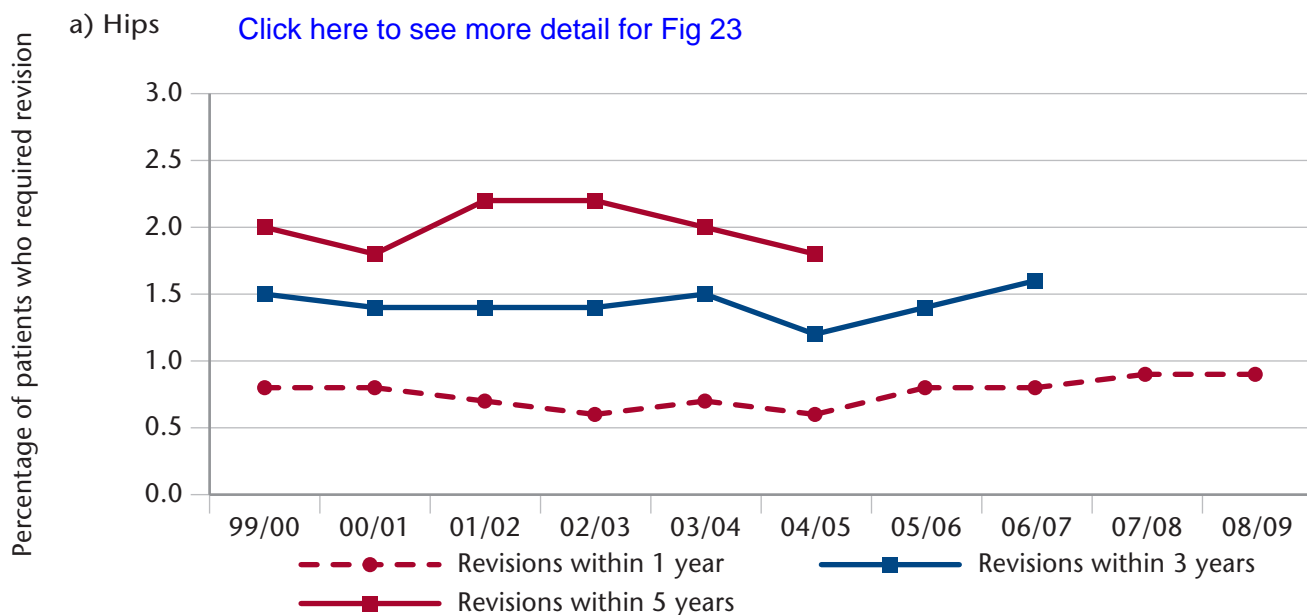
The accuracy of revision rates presented in this year’s report has improved from previous reports by applying a new methodology for determining laterality when it was not recorded directly. Our new methodology is based on simple assumptions such as designating any unrecorded revision lateralities to the same joint when the patient was only known to have had one arthroplasty, or assuming that any unrecorded primary arthroplasties were same side if a patient’s revisions were all on one side. These adjustments increased the proportion of revisions that could be ascribed to a particular joint from 81% to 95%.

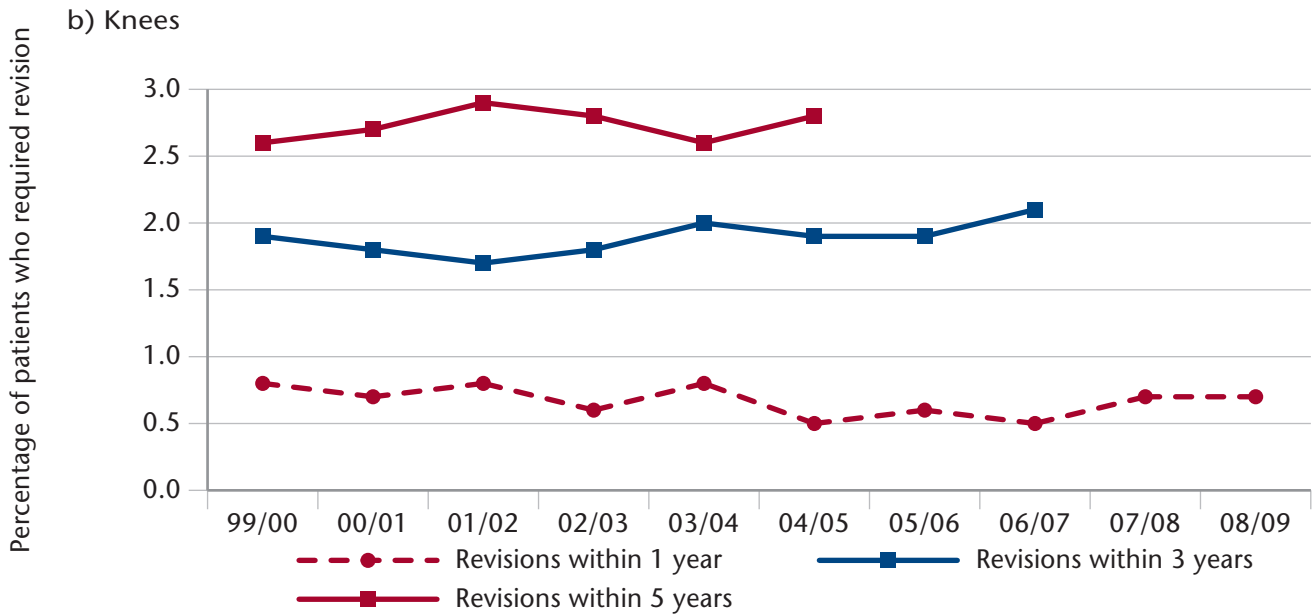
Summary of national trend data

The hip revision rate at 1 year has risen slightly from its lowest rate of 0.6% in 2004/05 to 0.9% in 2008/09. Although we have to go back further to look at years with complete 3- or 5-year follow-up periods, there was little overall trend in 3- or 5-year revision rates, but the most recent 3-year rate appears to be following the increase trend for 1-year rates. We hope to add revision rates to SAP’s clinical governance work in 2010, and this may help encourage practices that reduce the risk of early revision.

The revision rate within 1 year for knee arthroplasties has remained consistent at about 0.7%. There may be evidence for a longer term increase in 3- and 5-year revision rate for knees, and again we would hope that the clinical governance review and feedback process will help counteract this trend.

Fig. 23 National rates for complications since 1999/2000

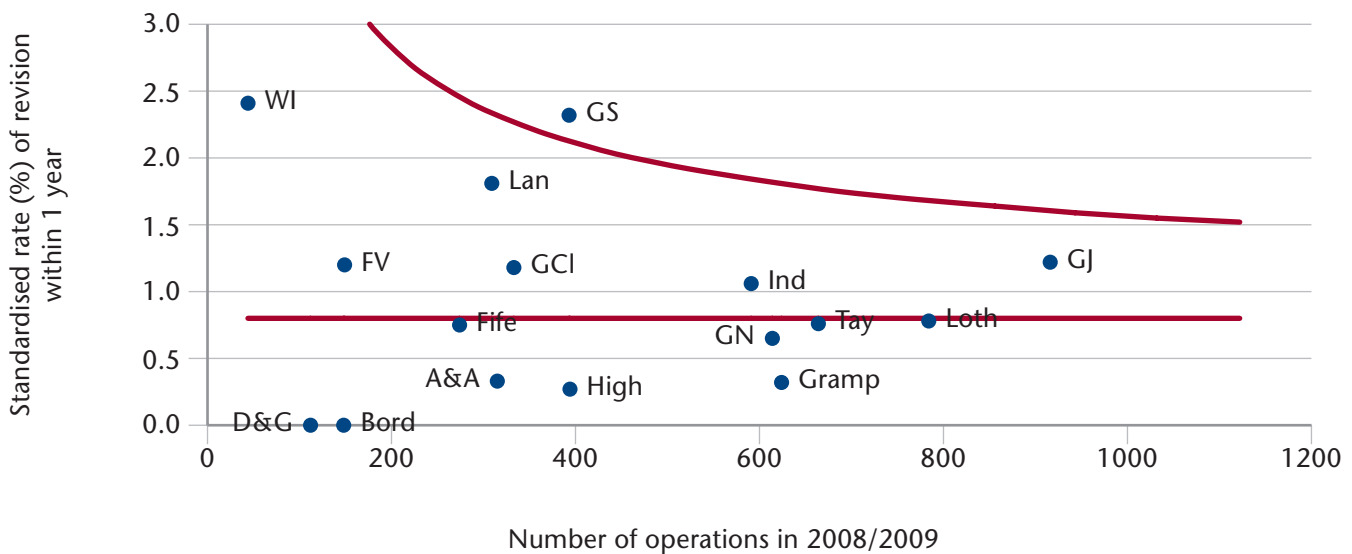




Revision at 1 year—hips

Only one Health Board had a 1-year hip revision rate that fell outside the 99% confidence interval. This may be due to the high number of metal-on-metal hip prostheses previously used in that unit, which are now known to have a higher early revision rate than other hip replacements.

Fig. 24 Percentage of 2008/2009 hip arthroplasty patients who had revision within 1 year of operation by Health Board [Click here to see more detail for Fig 24](#)

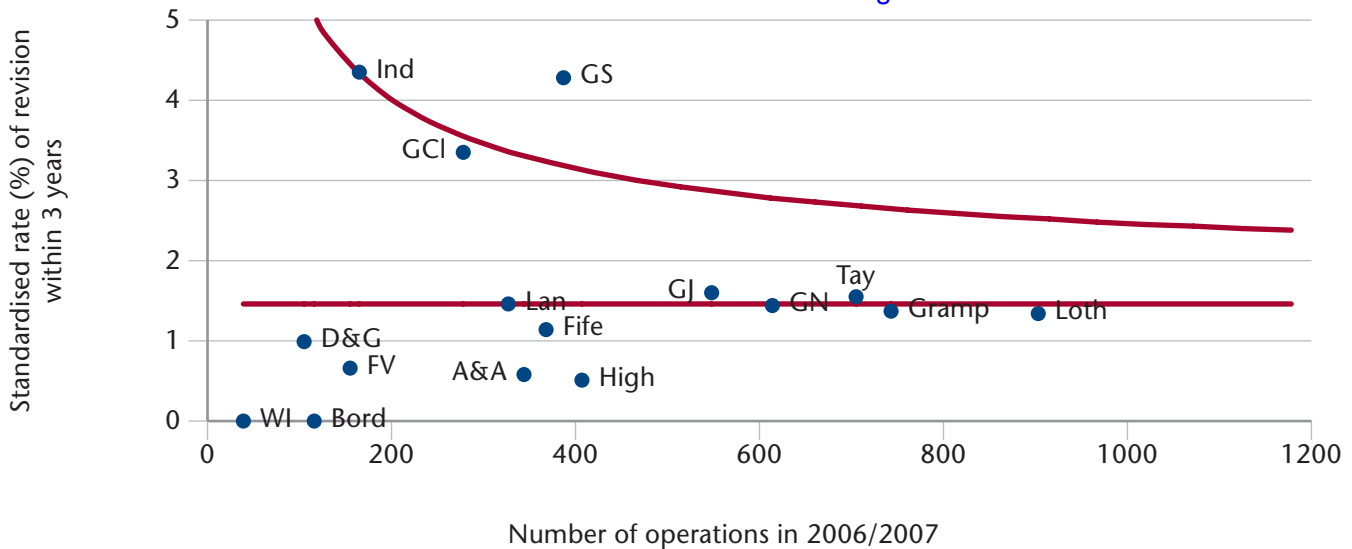


For an explanation of Health Board abbreviations see Fig. 10.

Revision at 3 years—hips

One Health Board had higher revision rates at 3 years than expected in 2006/2007.

Fig. 25 Percentage of 2006/2007 hip arthroplasty patients who had revision within 3 years of operation by Health Board [Click here to see more detail for Fig 25](#)

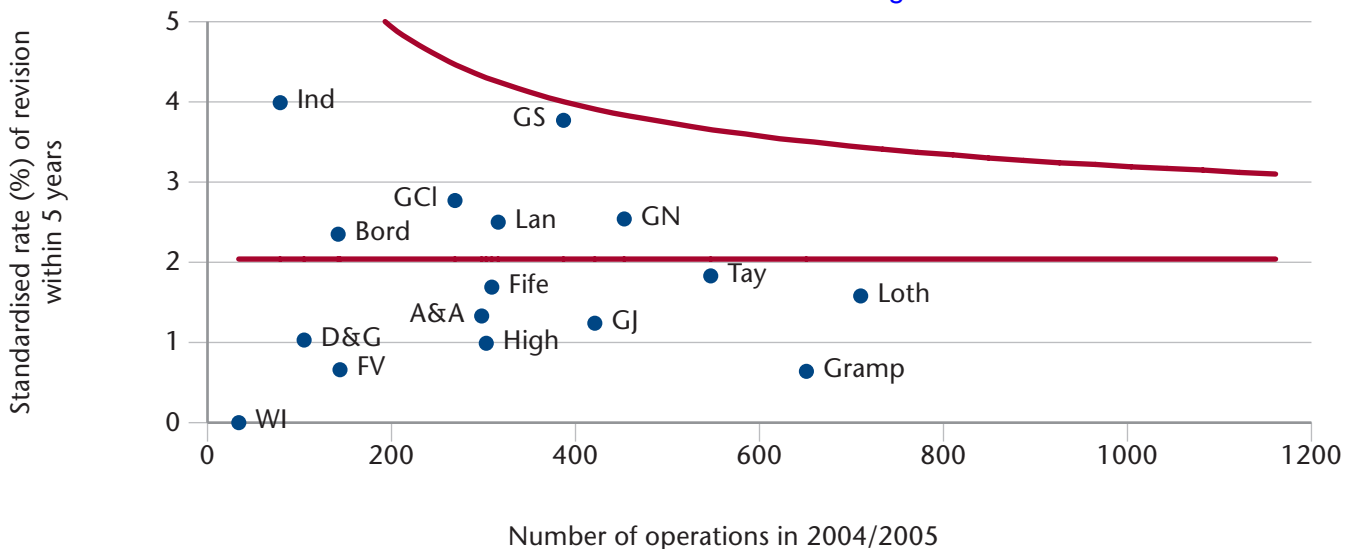


For an explanation of Health Board abbreviations see Fig. 10.

Revision at 5 years—hips

All Health Boards fell within the expected range for 5-year revision rates for hips.

Fig. 26 Percentage of 2004/2005 hip arthroplasty patients who had revision within 5 years of operation by Health Board [Click here to see more detail for Fig 26](#)



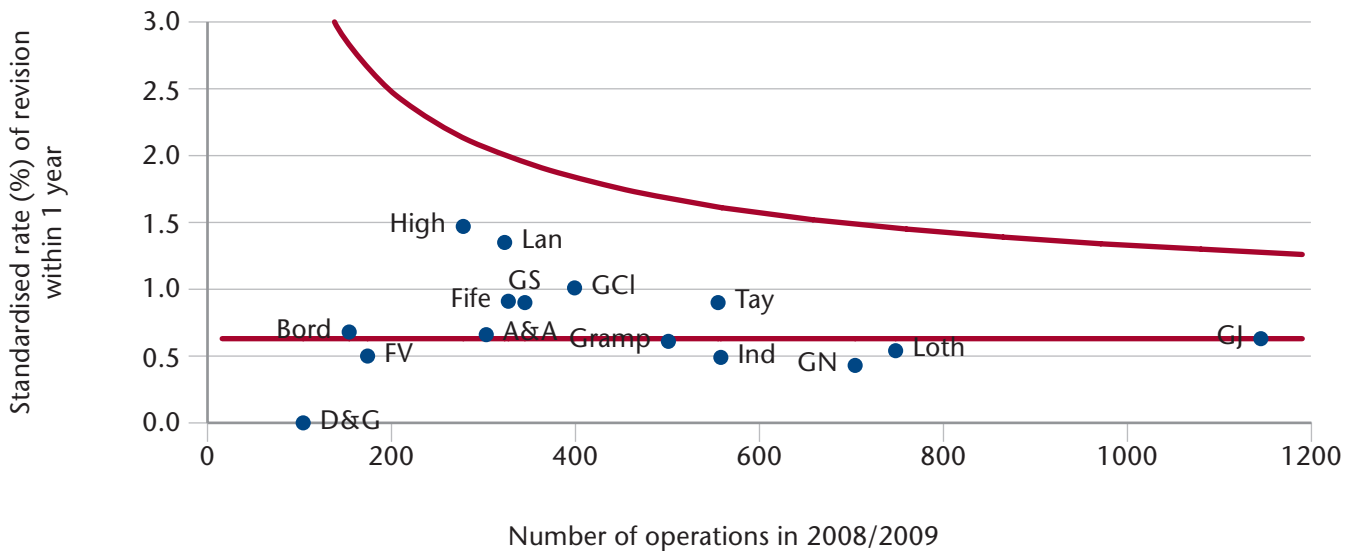
For an explanation of Health Board abbreviations see Fig. 10.

Revision at 1 year—knees

All Health Boards were within the 99% confidence interval for revisions within 1 year of knee arthroplasty.

In 2009, Health Board knee revision rates at 1 year showed little variation between boards, compared to hips revisions at 1 year. This may be due to a more uniform design of knee prostheses compared to hip prostheses.

Fig. 27 Percentage of 2008/2009 knee arthroplasty patients who had revision within 1 year of operation by Health Board [Click here to see more detail for Fig 27](#)

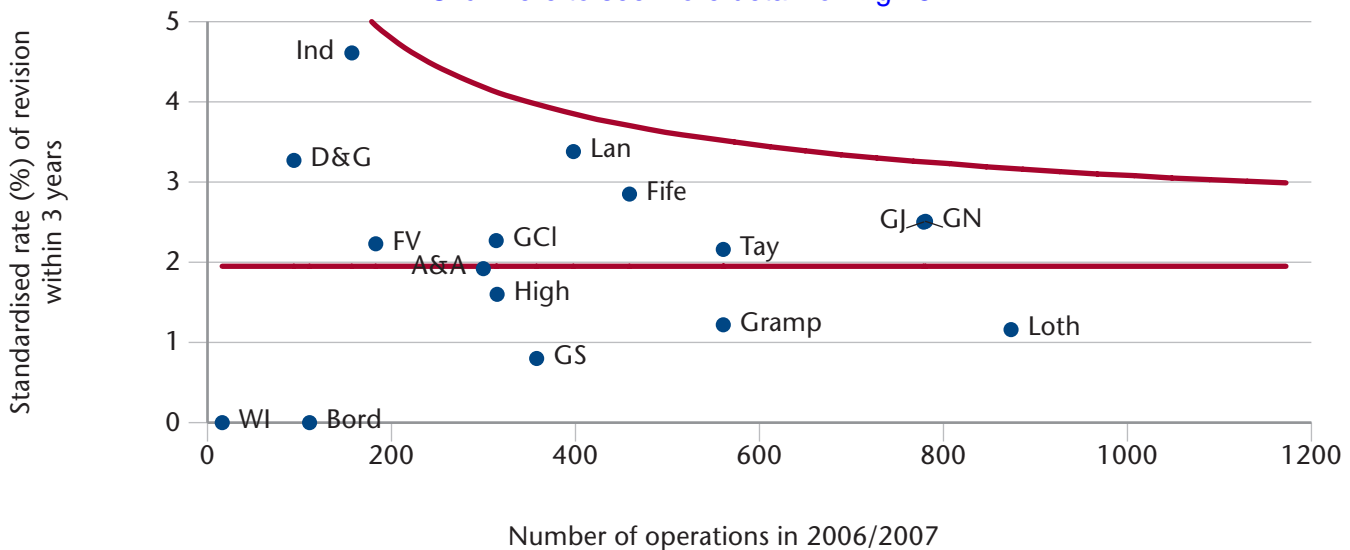


For an explanation of Health Board abbreviations see Fig. 10.

Revision at 3 years—knees

All Health Boards had 3-year revision rates within the 99% confidence interval.

Fig. 28 Percentage of 2006/2007 knee arthroplasty patients who had revision within 3 years of operation by Health Board [Click here to see more detail for Fig 28](#)

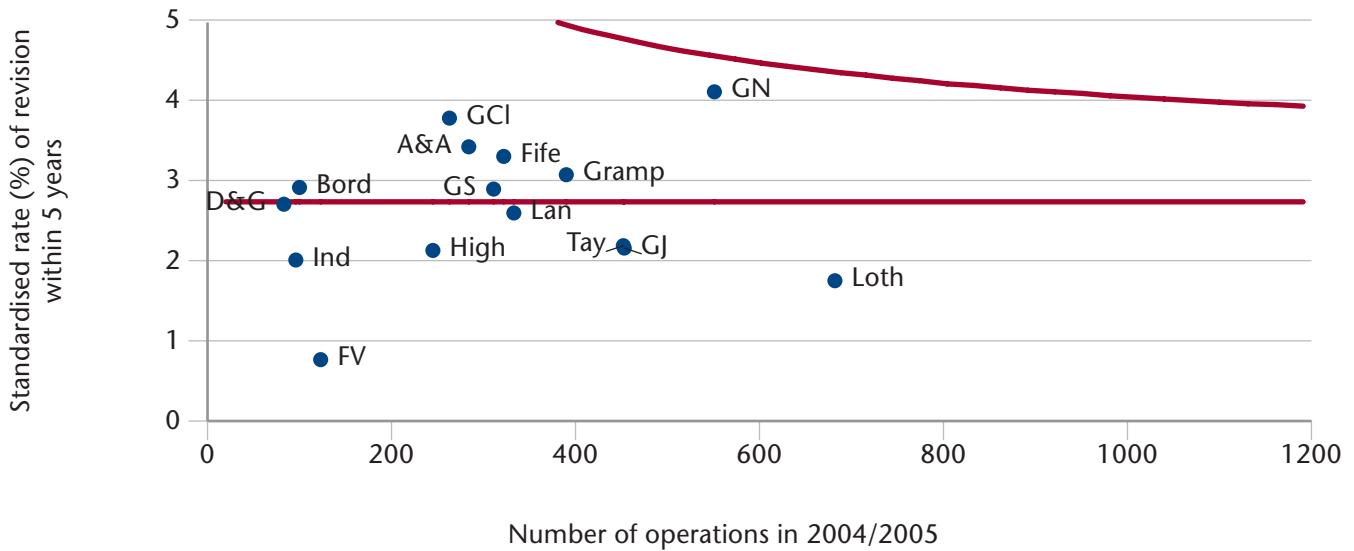


For an explanation of Health Board abbreviations see Fig. 10.

Revision at 5 years—knees

All Health Boards had 5-year revision rates within the 99% confidence interval.

Fig. 29 Percentage of 2004/2005 knee arthroplasty patients who had revision within 5 years of operation by Health Board [Click here to see more detail for Fig 29](#)



For an explanation of Health Board abbreviations see Fig. 10.

CLINICAL GOVERNANCE REVIEWS

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 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, SAP introduced a feedback and review system at NHS Board and Consultant level to look at quality issues. This has been associated with a reduction in some complications (Fig. 9). See our website (www.arthro.scot.nhs.uk/ClinGov/Main.html) for more details of how this process works.

From 2003 to 2009, Shewhart control chart methodology was used to present complication data and identify any unusual variation. In the control charts, the 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, we will again ask Health Boards identified as outlying using control charts to review their cases.

In 2010 we have also started using CUSUM methodology to allow us to identify unusual runs of complications more quickly. CUSUM stands for the CUMulative SUM of outcomes and is a relatively new graphical tracking measure of adverse events. If the CUSUM rises to a Control Limit the NHS Board or Consultant will be alerted to an unusually high complication rate and again asked to review their complications and complete an Action Plan (See Appendix). CUSUM methodology has recently been adopted by SAP because it is able to detect increased complication rates more promptly than our traditional five-year averaging. Future notifications to outliers will occur within just a few months of their latest complications. See www.arthro.scot.nhs.uk/ClinGov/CUSUM_explanation_for_outliers.pdf for more details on how CUSUM works.

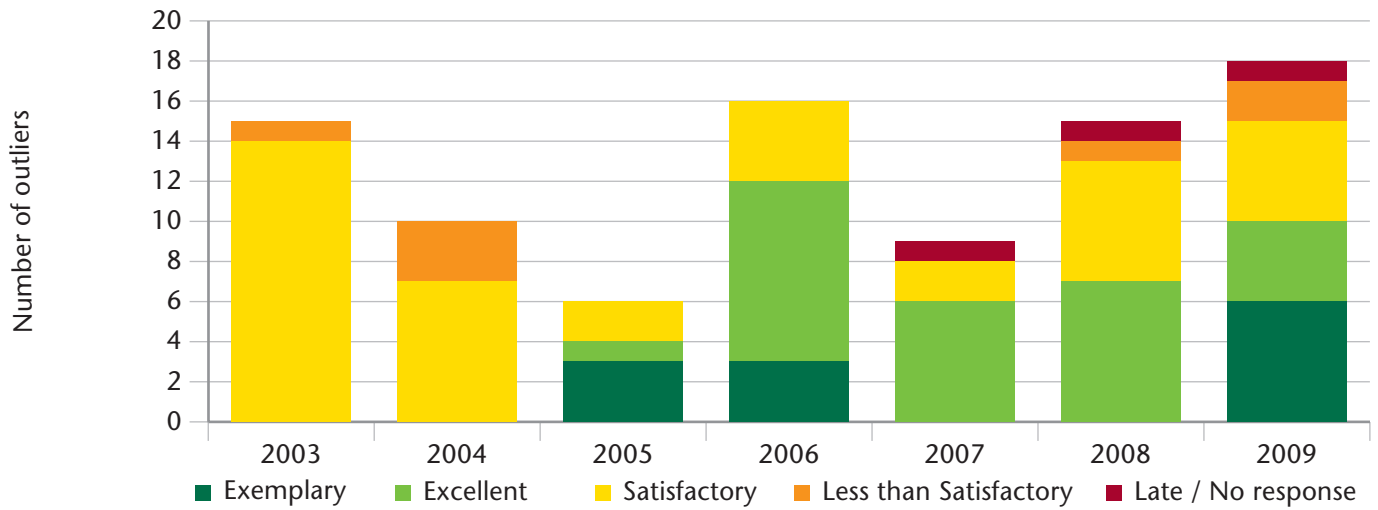
Strategy for change

When outliers are identified, NHS Boards and Consultants are asked to undertake local reviews that investigate the reasons for these results and report back to SAP. The introduction of a new technique, a new implant or particular case mix issues may be identified. The Scottish Arthroplasty Steering Committee (SASC) grades responses as 'Exemplary', 'Excellent', 'Satisfactory' or 'Less than Satisfactory', and provides feedback. If the response is 'Less than Satisfactory', a resubmission addressing any discrepancy is requested. This process is administered by the SAP information analysts throughout to ensure that outliers are not identifiable by members of SASC. SAP continues to monitor performance and will contact outliers again if complication rates remain unusually high.

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.

In 2009, 18 outlying consultants were asked to review and report on their cases. Of these, six were graded as 'Exemplary', the highest number of 'Exemplary' grades since introducing the Clinical Governance process. Two consultants were given a 'Less than Satisfactory' grade and one consultant has not yet responded (Fig. 30).

Fig. 30 Grades given to consultant outlier responses since 2003



The Exemplary and Excellent grades were not introduced until 2005.

APPENDIX

Consent

Consent issues for patients and participants have been discussed and opinion has been widely canvassed. The SMR01 dataset is firmly embedded in the administrative structure of NHSScotland and is used for audit and demographic description. It is important that patients are informed of the use of their data in this kind of project. NHS Boards are already providing generic information to patients explaining how their data are used by NHS Scotland and their rights with respect to this. As part of the process of improving the information available to patients a poster to inform them about the Scottish Arthroplasty Project has been prepared and is being displayed in orthopaedic departments across Scotland. The poster is available to download from www.arthro.scot.nhs.uk/posterforreport2.pdf.

Confidentiality

To date, no identifiable patient data linkable to individual consultant surgeons has been produced or reviewed outside ISD. Only the consultant surgeon concerned has been asked to review these data in order to respect data protection principles. Other than members of ISD staff (and then only for administrative or quality assurance purposes), no-one in the project has access to individually identifiable data and therefore cannot comment on or release information on individuals. While this should reassure participants, it also places considerable responsibilities on consultant surgeons to respond to the data supplied. It must be pointed out that the relatively small size of the consultant orthopaedic community in Scotland may occasionally make absolute anonymity difficult.

This confidentiality brings with it responsibility. The Scottish Arthroplasty Project under the aegis of the Scottish Committee for Orthopaedics and Trauma (SCOT) has developed a process of review to ensure that any results which appear to vary from normal are interpreted at a local level to apply appropriate knowledge and ensure local action. All outlying results are followed up and local review requested.

The advent of the Freedom of Information (Scotland) Act 2002 has led us to consider the confidentiality of our processes. A debate has taken place about the desirability or otherwise of publishing individual-level surgeons' audit results. While publication of named data seems superficially attractive, and has happened in other branches of surgery, it has neither informed the debate nor the individual patient. All surgeons should be aware that they would be informed if they were outliers for complication rates, and can request their own results if these are required to inform the consent process.

Committee Structure

The Project is overseen by the Scottish Committee for Orthopaedics and Trauma (SCOT), who elect a Chair for the Project. The Project is then managed by the Scottish Arthroplasty Steering Committee, whose membership on 1st October 2010 was as follows:

- Mr Ivan Brenkel, Orthopaedic Consultant, Chair
- Mr Colin Howie, Orthopaedic Consultant
- Mr Andrew Kinninmonth, Orthopaedic Consultant
- Mr Paddy Ashcroft, Orthopaedic Consultant

- Dr David Semple, Anaesthetic Consultant
- Dr Penny Bridger, ISD Consultant in Public Health
- Ms Miriam Watts, Independent Hospitals representative
- Ms Hazel Bruce and Ms Katy Green, patient representatives; and
- Lesley Smith (appointed in 2010 by the Arthroplasty Care Practitioner Association).

The Orthopaedic Consultants sitting on the Steering Committee, including the Committee chair, are nominated by the SCOT Committee. The term of office for all nominees is three years, with an option to renew this term once. Other health professionals (e.g. nurses, physiotherapists) will be invited to join the steering committee as outcome indicators develop for areas of care to which these professions directly contribute.

The function of the Steering Committee is to plan SAP's medium and long-term strategy under the direction of SCOT. The Committee also directs the clinical content of the annual report and of any other data analyses produced, and oversees the clinical governance aspect of the Project.

The committee meets approximately three times per year.

Staffing

The project is managed on a day-to-day basis by staff at the Information Services Division, which is a division of NHS National Services Scotland. In 2009, approximately 1.5 whole-time equivalent ISD staff were dedicated to SAP.

Action Plan

SCOTTISH ARTHROPLASTY PROJECT: CASE REVIEW AND ACTION PLAN

Name: XXX	GMC: XXX
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Indicator: *e.g. Hip dislocations within 365 days*
Period of complications: *first comp date to last comp date*
Number of arthroplasties performed in this period: XXX **Number of complications:** XX (XX%)

Comments concerning quality of information received from Scottish Arthroplasty Project relating to data:

Have you arranged for corrections to be made to your SMR01 records at a local level?
 Y / N / Not applicable

If during your investigations you discover the information we have provided is inaccurate, please contact your local Medical Records department who should update their records and pass any amendments to ISD

Review of cases and Action Plan following *(please continue on separate sheet if necessary) Please see accompanying guidance on completion of action plans.*

Signed:	Date:
----------------	--------------

Co-signed: _____ **GMC Number of Co-signatory:** _____

Print Name: _____

(This signatory must be a GMC registered doctor with whom you have discussed this information and who will confirm what actions have been taken. This colleague may be your medical manager, medical director or a senior colleague and need not be employed within your Trust.)

SAP Website

Please visit our website www.arthro.scot.nhs.uk for copies of our previous annual reports, often containing more detailed summaries of arthroplasty-related projects.

Highlights of previous reports

2009

Cross border flow of hip and knee arthroplasty—Analysis describing the number of local Health Board residents receiving treatment in other boards.

2008

Anterior Cruciate Ligament (ACL)—Study showing trend, demographics and outcomes for ACL reconstruction over ten years.

Hip resurfacing—Results of a study reporting the number and outcome of hip resurfacing operations over a 7-year period.

Prolapsed disc—Data was presented comparing the activity and outcomes for orthopaedic and non-orthopaedic consultants performing prolapsed disc surgery.

Elbow arthroplasties—Statistics are presented for patient characteristics and outcomes for elbow arthroplasties over a 15 year period.

2007

Outcomes by deprivation category—Number of dislocations, infections, DVT/PE and deaths in 2006 following hip and knee surgery.

Arthroscopies—Trend and patient characteristics for arthroscopies over nine years.

2006

Investigation into hip operation rates by deprivation category