Scottish Arthroplasty Project

Annual Report 2008

Contents

1 Acknowledgements

The Scottish Arthroplasty Steering Committee would like to thank; Mr Ivan Brenkel, for chairing the committee for the last 2 years; Mr Colin Howie, for chairing the project for the previous three years. Mr Graham Mitchell and Dr Rod Muir have left the project and the Committee thanks them for their valuable contribution to the project since its inception. Dr Margaret MacLeod and Dr Penny Bridger have recently joined the project and the Committee welcomes them and looks forward to their input. In addition, the Committee would like to acknowledge the helpful contributions of Mrs Jennifer Boyd, Mr Tim Norwood, Dr Jamie Pearson, Mr Chris Black and Miss Sally Jones who work as analysts on the project.

2 Key Points

- The number of primary total hip and knee arthroplasty procedures continues to increase (6,009 and 6,291 in 2006/07, respectively). For the first time, primary knee replacement procedures have overtaken primary hip replacement procedures. The number of knee replacements has tripled in the last 15 years (from 1,819 in 1991/92 to 6,291 in 2006/07). See National Trends in Numbers of Operations section on page 12.

- Within the independent sector there are an increasing number of patients who are undergoing hip or knee replacement operations under the waiting list initiative. Records on these are not reliably returned at present so the Annual Report does not contain data on patients treated in the independent sector. See Data from the Independent Sector on page 9

- It is hoped that the introduction of the new web-based system for collecting Scottish Joint Registry data will encourage the continual improvement in data on the quality of care provided to all patients receiving joint replacements. One independent sector hospital has recently submitted data to ISD, and other independent hospitals have expressed an interest in joining the project. It should also allow independent sector hospitals to safely submit their data. See Scottish Joint Registry on page 10.

- The length of stay for hip replacements has decreased from an average of 12.7 days in 1996/97 to 8 days in 2006/07. The length of stay for knee replacements has decreased from 13.2 days in 1996/97 to 7.6 days in 2006/07. See Length of Stay Analysis on page 14.

- Although there has been a 50% increase in the number of primary hip replacements performed since 1998, there has been a 38% reduction in mean length of stay. For primary knee replacements, there has been a 117% increase in number of procedures and a 40% decrease in the mean length of stay. See Length of Stay Analysis on page14.

- Surgeons and NHS Boards are fully engaged in the arthroplasty governance process. The improvement in the content and quality of the reviews of the outliers suggests greater ownership and commitment to the aims of the project. See Clinical Governance Policy and Results section on page28.

- Individual Anaesthetic departments are participating in the audit at a hospital level. Complications such as stroke, acute myocardial infarction, gastro-intestinal bleeding and acute renal failure have been included in the report. This year, all the data have been standardised for age, sex, admission from home or other place of residence (e.g. nursing home), rheumatoid arthritis, and deprivation. See Investigation into Anaesthetic Complications section on page31.

- Death, dislocation and deep vein thrombosis (DVT) following joint replacement have all reduced, in some cases significantly, over the past 4 years. Most markedly, the rate of DVT following hip arthroplasty has reduced (from 0.0214% in 2001/02 to 0.0134% in 2006/07). See Complication Rates For Hip and Knee Replacements on page37.

- This year we have looked at surface replacements, a subgroup of hip replacements. A surface replacement is a metal on metal prosthesis. This procedure was first recorded in 1995, and there has been a large increase in the number of such procedures (from 26 prior to 2002 to 240 in 2007). Of the 940 patients who have undergone this procedure in Scotland since 1995, only 17 have required a revision procedure subsequently, a rate of just 1.8%. It is typically being carried out on younger patients (64% were less than 55 years old; only 4% are 65 or over). See Hip Resurfacing section on page 50.

- This year we have also included data on anterior cruciate ligament (ACL) reconstruction. There has been a large increase in the number of reconstructions performed (307 in 1997/98 to 677 in 2006/07). Reconstructions are more common in males than females (549 versus 128, and also men who are aged between 20 and 40 (424). There is also a large variation in the number of ACL reconstructions done in the different health regions. See Anterior Cruciate Ligament Reconstructions section on page53.

- Data on prolapsed disc surgery has been analysed for the 2008 Annual Report. This includes analyses on age, sex, volumes performed by Orthorpaedic versus Non-Orthorpaedic surgeons, and readmission with a back complaint. There were 1,429 patients admitted with lumbar prolapsed disc problems in 2006/07, a large proportion were aged between 35 and 44 years old (488 admissions). See Prolapsed Disc section on page 58.

3 Introduction

For 2008, we have again produced an abridged report for paper release, the full report (including detailed named NHS Board data) and all previous reports are available on the SAP website at www.arthro.scot.nhs.uk.

We hope that the public will recognise and support the considerable commitment made by the Scottish Orthopaedic community to the governance process resulting in demonstrable improvements. Patients are encouraged to discuss their forthcoming joint replacement and its possible result with their consultant. At that consultation, the patient can be assured that the surgeon is aware of his own results and that the NHS Board results are freely available through this report. This SAP report, as before, includes new analysis. These areas are:

- Analysis on knee anterior cruciate ligament reconstruction
- Details on surface hip replacements
- Prolapsed disc surgery
- Detailed length of stay data
- Detail on elbow replacements

There are a number of areas where there continues to be significant progress. The number of arthroplasties performed in Scotland continues to rise, but the process of care is demonstrably more efficient and the numbers of revisions remain in check. Surgeons and NHS Boards are complying with the arthroplasty governance process. Perhaps most encouraging is that we can continue to detect an overall improvement in some negative outcomes (infection, death and dislocation) and note that individuals who had outlying figures have over time come to lie within the accepted limits. There has been a significant increase in the number of hip and knee replacements done in the last year with no increase in bed capacity and minimal increase in consultant numbers.

4 Data Completeness

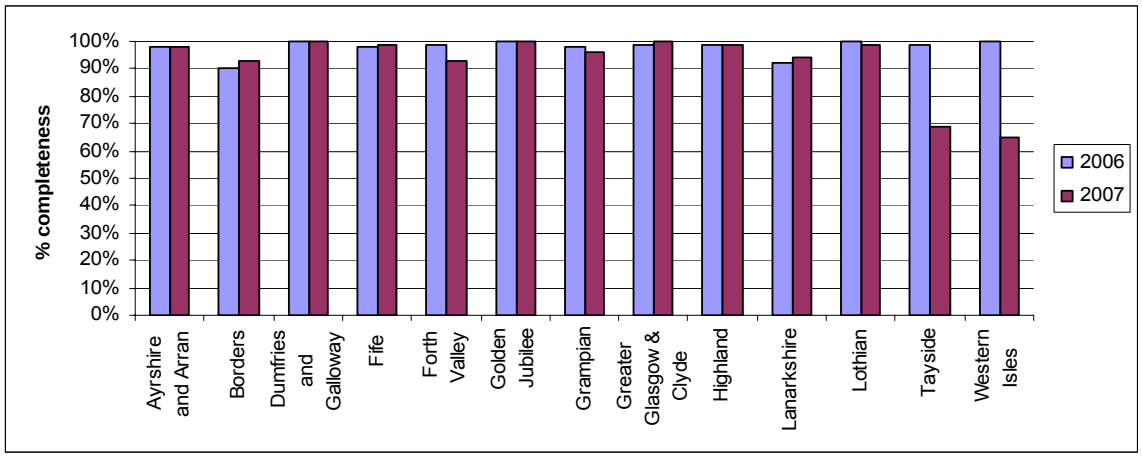
4.1 SMR01 Data Completeness

Hospitals send SMR01 records, used by the Scottish Arthroplasty Project, to the Information Services Division (ISD) retrospectively. SMR01 records (Scottish Morbidity Records) are created every time an individual is treated in hospital as an inpatient or daycase. The national standard states that these records should be sent to ISD within one month of a patient's discharge from hospital. In practice, the majority of SMR01 records are submitted within 6 to 9 months of a patient's discharge. Details about how data completeness is determined can be found in section 4.2 of the 2004 annual report.

The latest data in this report are for patients treated in hospital between 1st April 2006 and 31st March 2007. ISD conducts a routine 2% case note review to assess the quality of coding. We are confident that the record sets that are used are sufficiently complete and accurate to make statistically valid conclusions.

Figure 1 illustrates why more up to date Orthopaedic data cannot be used. ISD have not received all SMR01 forms for Orthopaedic data from April - June 2007 from several NHS Boards, therefore the data set is not yet viable.

Figure 1: Data completeness for April to June 2006, based on SMR01 records received by end March 2007, compared to data completeness for April to June 2007, based on ISD(S1) records received by end March 2008



5 Data from the Independent Sector

Within the independent sector there are an increasing number of patients who are undergoing hip or knee replacement operations, either as an independent-sector patient or as an NHS patient being treated under the waiting list initiative. The NHS Board that contracts out the operations to the independent sector is responsible for submitting the SMR01 records of those patients who are treated under the waiting list initiative. These records are not reliably returned at present. ISD and the National Waiting Times Unit at the Scottish Executive have taken up this issue. ISD has reminded NHS Board Chief Executives of the requirement to submit SMR01 and an updated Health Department Letter (HDL) is planned to restate the requirement on NHS Boards to submit these records. The independent hospitals will be expected to produce routine counts of NHS patients treated in order to enable the volumes of SMR01 forms submitted to ISD to be monitored.

It is important that we are able to monitor results in this growing sector. We believe that independent-sector patients would want to ensure that their surgeon's performance is monitored in the same rigorous way as the NHS monitors performance. Ultimately, patient referral communication from NHS to independent hospitals is likely to become electronic and provide an opportunity to establish direct submission of SMR data from independent hospitals to ISD.

There is the willingness of all independent hospitals in Scotland to submit arthroplasty data to ISD, but this has been hampered by the absence of a safe and cost effective way of transferring data. It is hoped that the introduction of the new web-based system for collecting Scottish Joint Registry data (see below) will enable them to do so.

6 Scottish Joint Registry

In order to encourage the continual improvement in the quality of care provided to all patients receiving joint replacements, Orthopaedic Consultants supported by the Department of Health set up the Scottish Joint Registry (SJR). SJR was set up as part of SAP's Clinical Governance process that monitors complication rates following surgery. The aim of SJR is to monitor the performance of replacement implants, the performance of Orthopaedic surgeons and hospitals carrying out joint replacement procedures, and the clinical outcomes of patients undergoing joint replacement procedures to ensure that patients receiving hip and knee replacements in Scotland obtain the best possible care by:

- improving clinical care through the identification and sharing of best Orthopaedic practice in hospitals;
- increasing awareness of the long-term clinical outcomes of patients receiving hip or knee replacement;
- determining which are the best performing implants, and identifying any implant which is less successful over the longer term.

SJR records supplementary information about hip and knee joint replacement operations to enhance what is routinely collected through SMR01. This includes detailed information about the types of prosthetic joint implants used, extra operative information, including blood loss and type of anaesthetic used, and other information such as surgeons' grade.

One independent hospital and one NHS hospital have been acting as a pilot site for collecting SJR data since 2005. Following the success of the pilot database, the design and build of a new web-based system is currently underway at ISD, which we aim to roll out to all hospitals in Scotland carrying out arthroplasty operations.

The new system will allow hospitals to submit arthroplasty data directly to ISD for analysis, and then compile reports and analyses of their own data. SJR data will be linked to SMR01 to monitor the readmission of arthroplasty patients with complications and the performance of their replacement implant. Providing feedback to hospitals and consultants on the clinical outcomes of their patients will help ensure that patients obtain the best clinical care during their procedure and optimise their clinical outcome.

SJR represents a unique and exciting opportunity for ISD. In addition to collecting information on patients treated in NHS hospitals, we will include information from NHS Waiting List Initiative patients and independent, non-NHS patients treated in independent hospitals, meaning that we will have a more complete picture of hip and knee joint replacements carried out in Scotland. Hospitals

in the independent sector have expressed a keen interest in submitting arthroplasty data to ISD, and are eagerly awaiting the implementation of the new system in their hospitals. Over the coming year, ISD are hoping to recruit NHS hospitals that are also interested in participating in SJR.

7 National Trends in Numbers of Operations

Figure 2 to Figure 5 represent the numbers of combined elective and emergency joint replacement operations (both primary and revision for hip and knee) recorded as performed in NHS Scotland in each of the last 15 years (1992 to 2007). The vast majority of operations were performed as an elective procedure; around 93% of primary hip replacements, 98% of primary knee replacements, 77% of revision hip replacements and 90% of revision knee replacements. All numbers are displayed by financial year ending 31st March.

The number of primary hip and knee replacements has been increasing steadily since 1992, with a marked rise from 2002 onwards. In 2006/07 there were 6009 primary hip replacements and 6291 primary knee replacements. As predicted in the 2007 annual report, primary knee replacement operations have outstripped primary hip replacement operations in the past year. Joint replacements are also performed in the independent sector, with some being paid for by the NHS as part of the waiting list initiative, but we do not have figures for these.

Figure 2: Primary Hip Replacements by year ending March

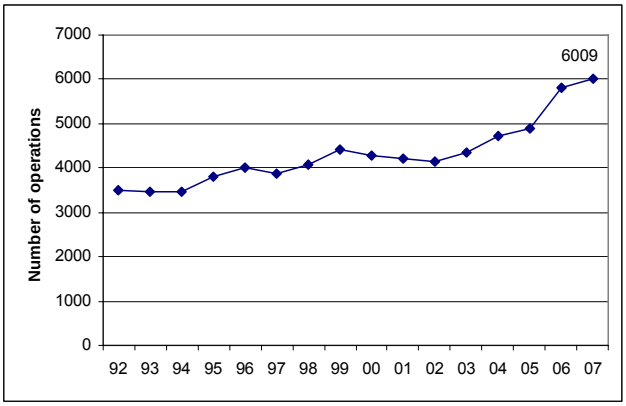


Figure 3: Primary Knee Replacements by year ending March

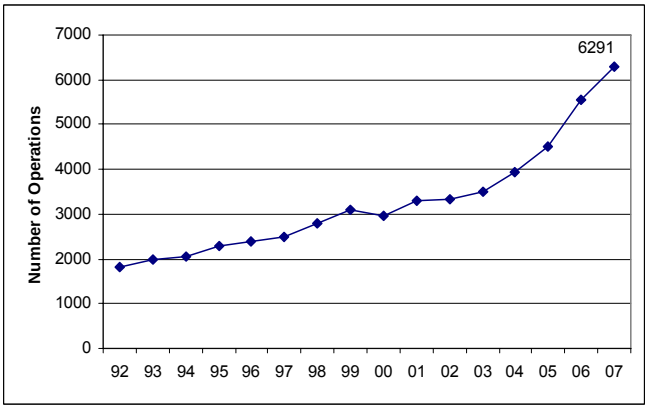


Figure 4: Revision Hip Replacements by year ending March

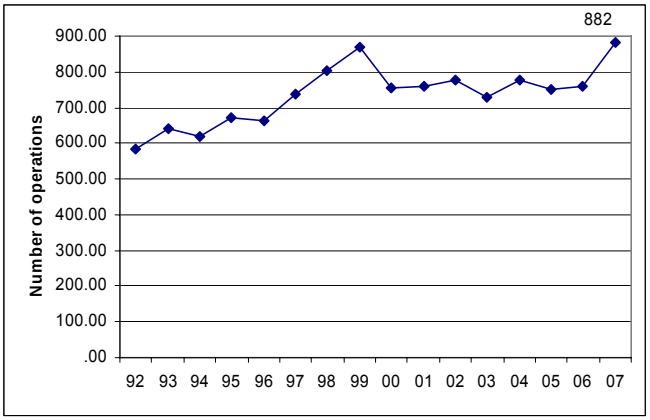
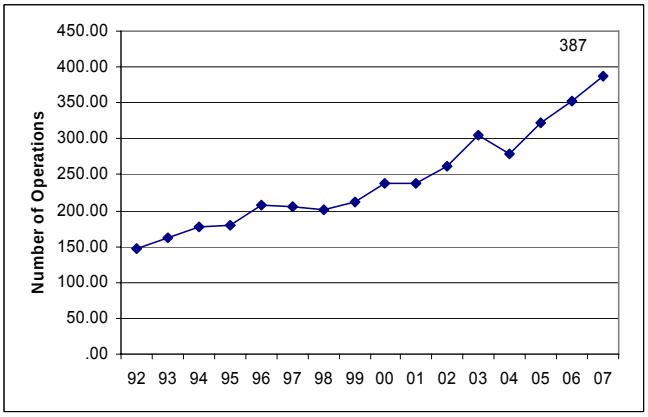


Figure 5: Revision Knee Replacements by year ending March



Further arthroplasty activity trend charts can be found in the Additional National Trends in Numbers of Operations section on page 71.

Table 1 shows the ratios of primary operations to revision operations for hip and knee in Scotland and compared to other countries that perform arthroplasty audits. The figures are based on crude rates and show the revision rate for hips to be highest in Australia (15.2%) and lowest in Sweden with 7.6% of primary hip operations requiring some form of revision. Please note that data may not be comparable due to different coding and data collection methods being employed in different countries.

Knee revision ratios are lowest in Sweden (5.4%) and highest in Australia (9.2%). The lower rate of revision for knee replacements compared with hip replacements reflects the relatively small number of knee replacements carried out 10-20 years ago.

Table 1: International Comparison of primary to revision (for all causes) operation ratios

Hips	Scotland Apr 06 - Mar 07	Australia[1] July 05 - Jun 06	Norway[2] Jan 06 - Dec 06	USA[3] Jan 05 - Dec 05	Sweden[4] Jan 06 - Dec 06
Primary Operations	6009	21050	6285	234625	13942
Revisions	882	3771	997	34503	1158
Primary + Revision	6891	24821	7282	269128	15100
Crude Revision Rate %	12.8%	15.2%	13.7%	12.8%	7.6%

Knees	Scotland Apr 06 – Mar 07	Australia[1] July 05 - Jun 06	Norway[2] Jan 06 - Dec 06	USA[3] Jan 05 - Dec 05	Sweden[5] Jan 06 - Dec 06
Primary Operation	6291	27049	3096	533808	10544
Revision	387	2729	264	36885	605
Primary + Revision	6678	29778	3360	570693	11149
Crude Revision Rate %	5.8%	9.2%	7.9%	6.5%	5.4%

1 AOA National Joint Replacement Registry 2 Norwegian Arthroplasty Register

3 American Academy of Orthopaedic Surgeons 4 Swedish Hip Arthroplasty Register 5 Swedish Knee Arthroplasty Register

8 Length of Stay Analysis

Table 2 and Table 3 show the mean length of stay per continuous inpatient stay in each NHS Board for each of the eleven years between 1996/97 and 2006/07 for elective primary hip and elective primary knee replacements respectively.

Over the course of the last eleven years, there has generally been a steady drop in the mean length of stay for patients having hip replacements. The largest decrease is to 6.6 days in NHS Lanarkshire. However, there has been a slight increase in the mean length of stay from 12.3 days in 1996/97 to 13.2 days 2006/07 for the Western Isles NHS Board. It should be noted that this was the only NHS Board where a rise was seen and could be insignificant due to the relatively small number of hip replacements carried out here.

With knee replacements there was again a general downward trend in mean length of stay over the eleven years across the NHS Boards. The greatest drop on the mean was again seen in NHS Lanarkshire, where the mean decreased from 17.4 days to 8.4 days.

At the beginning of financial year 2006/07, NHS Argyll & Clyde was dissolved and split between NHS Greater Glasgow and NHS Highland. The tables throughout this chapter have been adapted to accommodate this change and therefore no value is shown for Argyll & Clyde in 2006/07. North Glasgow, South Glasgow, and Clyde are now part of Greater Glasgow & Clyde NHS Board.

Table 2: Mean Length of Stay per Continuous Inpatient Stay for Hip Replacements

	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Scotland	12.7	12.8	11.9	11.7	10.3	10.3	10.2	9.7	9.2	8.7	8.0
Argyll & Clyde	14.1	15.2	13.5	12.6	11.8	10.5	10.0	8.9	8.8	8.9	-
Ayrshire & Arran	12.5	12.8	13.0	12.2	10.7	10.6	10.6	10.1	9.9	9.8	9.3
Borders	12.0	12.2	11.3	10.2	10.4	9.9	10.2	9.4	9.4	10.0	10.4
Dumfries & Galloway	14.5	12.3	12.6	12.3	11.0	11.6	11.0	11.4	11.1	10.8	10.2
Fife	11.2	10.7	10.6	10.2	8.9	9.4	9.6	9.7	9.6	9.4	8.4
Forth Valley	12.3	12.8	13.7	14.7	12.3	12.0	12.3	11.8	10.7	9.4	9.6
Golden Jubilee National Hospital	-	-	-	-	-	-	9.8	9.0	7.6	7.6	7.0
Grampian	12.9	14.2	13.0	14.1	11.8	11.5	11.4	10.1	9.9	9.1	7.7
Highland	14.1	13.0	13.0	10.4	9.1	8.6	9.6	8.8	8.9	7.7	7.2
Lanarkshire	16.0	15.0	13.1	13.0	12.0	10.7	11.3	10.7	11.0	10.8	9.4
Lothian	10.9	10.5	8.9	9.2	8.4	7.9	8.4	8.1	8.0	7.4	7.0
Greater Glasgow & Clyde											
- North Glasgow	11.4	12.2	10.9	9.4	9.7	10.0	9.2	9.8	9.0	7.9	7.0
- South Glasgow	13.9	12.5	11.2	11.3	10.0	11.4	12.3	10.2	9.5	8.7	7.6
- Clyde	-	-	-	-	-	-	-	-	-	-	8.9
Tayside	13.0	13.7	12.5	12.7	10.6	11.3	9.9	9.5	8.6	8.3	8.8
Western Isles	12.3	11.8	11.2	13.5	14.9	13.8	14.2	15.2	14.9	19.1	13.2

Table 3: Mean Length of Stay per Continuous Inpatient Stay for Knee Replacements

	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Scotland	13.2	12.6	11.8	11.3	10.5	10.0	9.7	9.2	8.8	8.2	7.6
Argyll & Clyde	14.0	13.3	12.3	11.6	10.3	9.9	9.8	8.2	8.9	8.6	-
Ayrshire & Arran	12.8	12.7	12.2	11.6	11.2	10.8	9.7	9.5	10.1	9.5	9.0
Borders	15.1	14.8	13.8	11.7	11.5	10.4	9.8	9.5	9.4	10.7	9.8
Dumfries & Galloway	13.7	13.0	13.1	11.5	12.2	11.0	11.2	12.1	12.2	11.8	9.9
Fife	10.5	11.0	10.0	9.4	9.7	8.6	9.1	9.9	9.7	8.6	7.6
Forth Valley	13.1	12.4	13.3	13.6	12.6	11.4	11.2	10.6	10.0	9.2	8.0
Golden Jubilee Hospital	-	-	-	-	-	-	9.8	8.7	8.1	7.8	7.5
Grampian	13.8	15.5	13.6	13.3	12.0	11.1	10.8	10.4	9.8	8.6	7.4
Highland	14.4	14.0	13.7	10.5	9.4	8.7	9.7	8.6	7.6	7.6	7.1
Lanarkshire	17.4	15.1	13.9	13.8	11.4	10.6	9.8	9.4	9.4	8.9	8.4
Lothian	12.1	10.4	9.1	9.3	8.5	7.8	7.8	7.0	7.2	6.6	6.4
Greater Glasgow & Clyde											
- North Glasgow	11.9	10.8	10.7	10.2	9.8	10.0	9.4	8.8	8.4	7.9	7.0
- South Glasgow	13.5	12.1	11.6	11.0	10.7	12.0	11.6	9.8	9.4	8.1	7.5
- Clyde	-	-	-	-	-	-	-	-	-	-	8.3
Tayside	14.1	13.4	12.4	11.8	11.0	10.4	9.6	9.1	8.1	7.6	7.7
Western Isles	12.3	11.9	14.4	9.7	11.5	9.6	13.5	13.1	15.0	14.9	12.1

Figure 6 and Figure 7 show the average length of stay for elective primary hip and elective primary knee replacements respectively in each of the last eleven years (1996/97 to 2006/07).

Figure 6: Average Length of Stay per Continuous Inpatient Stay for Hip Replacements by year ending March

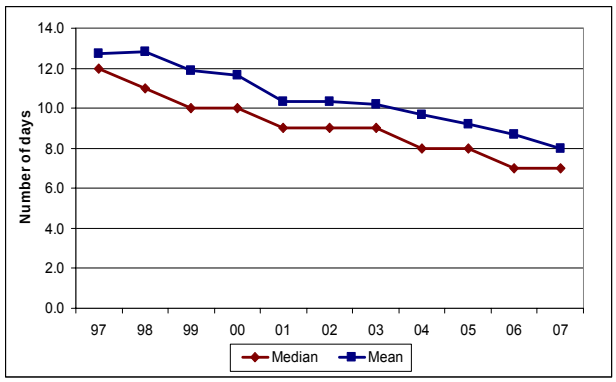


Figure 7: Average Length of Stay per Continuous Inpatient Stay for Knee Replacements by year ending March

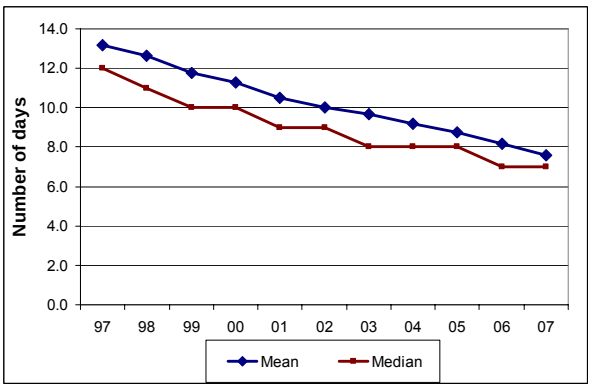


Table 4 shows the median length of stay per continuous inpatient stay for hip replacements by age group.

Table 4: Median Length of Stay per Continuous Inpatient Stay for Hip Replacements by age group

	Age group							
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	80 +
Scotland	5.0	5.6	6.6	6.7	6.5	7.1	8.5	11.4
Ayrshire & Arran	5.0	.	16.0	7.3	8.2	8.6	9.5	12.2
Borders	.	.	.	8.0	7.2	9.2	10.1	16.2
Dumfries & Galloway	.	.	8.0	7.8	7.4	8.0	13.3	10.6
Fife	.	.	5.0	6.6	6.4	7.3	9.0	12.5
Forth Valley	.	.	8.0	7.4	6.5	7.3	11.4	14.1
Golden Jubilee Hospital	.	.	5.7	6.2	5.8	6.0	7.4	9.3
Grampian	.	8.0	10.6	6.2	6.5	6.9	7.9	10.5
Highland	.	7.0	5.8	5.1	6.5	6.3	7.4	9.8
Lanarkshire	.	6.0	5.9	8.0	7.4	9.0	9.9	15.5
Lothian	.	5.1	6.3	6.4	6.0	6.1	7.5	9.9
Greater Glasgow & Clyde								
- North Glasgow	.	4.8	5.3	5.6	5.7	6.5	7.7	9.9
- South Glasgow	.	6.0	7.0	5.2	6.2	6.7	9.3	10.0
- Clyde	.	.	.	15.8	6.6	8.3	8.7	12.2
Tayside	.	6.5	6.0	9.0	7.5	7.4	8.6	13.6
Western Isles	.	-	-	-	7.3	9.9	15.4	22.0

Table 5 shows the median length of stay for hip and knee replacement operations broken down by age group and NHS Board for financial year 2006/07

Table 5: Median Length of Stay per Continuous Inpatient Stay for Knee Replacements by age group

	Age group							
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	80 +
Scotland	.	7.7	7.3	6.4	6.3	6.8	8.0	10.1
Ayrshire & Arran	.	.	.	8.2	8.1	8.3	8.9	13.0
Borders	.	.	.	8.0	7.2	9.4	10.2	11.9
Dumfries & Galloway	.	.	.	6.0	9.4	8.8	10.8	11.0
Fife	.	.	7.0	7.0	6.8	7.0	8.1	9.0
Forth Valley	.	.	.	6.0	6.4	7.5	8.9	9.8
Golden Jubilee Hospital	.	7.0	5.0	5.8	6.8	6.8	7.5	10.8
Grampian	.	.	12.3	6.1	6.4	6.9	7.7	9.1
Highland	.	.	.	5.0	6.3	6.5	7.6	8.7
Lanarkshire	.	.	5.0	6.0	6.3	7.4	8.8	14.2
Lothian	.	5.0	5.3	6.3	5.7	5.5	6.7	8.9
Greater Glasgow & Clyde								
- North Glasgow	.	11.0	.	5.4	5.5	6.1	7.8	8.7
- South Glasgow	.	.	.	6.1	6.2	6.8	8.4	9.7
- Clyde	.	.	5.0	8.4	7.5	7.1	8.4	11.9
Tayside	.	.	7.0	5.3	6.4	6.8	8.1	10.2
Western Isles	.	.	.	.	8.0	7.8	17.2	13.3

Table 6 and Table 7 show the proportion of patients undergoing a hip or knee replacement by the day of operation in relation to the day of admission for 2006/07.

Table 6: Hip Replacement Operations

	Mean Length of Stay	% operations on day of admission	% operations day after admission	% operations two days after admission	% operations three or more days after admission
Scotland	8.0	14.5	82.4	1.5	1.6
Ayrshire & Arran	9.3	10.2	88.9	0.0	0.9
Borders	10.4	2.9	93.3	0.0	3.8
Dumfries & Galloway	10.2	0.0	93.2	4.1	2.7
Fife	8.4	11.7	87.2	0.7	0.4
Forth Valley	9.6	22.4	73.3	2.6	1.7
Golden Jubilee Hospital	7.0	0.0	98.3	0.7	1.0
Grampian	7.7	8.9	82.9	5.2	2.9
Highland	7.2	16.2	81.8	1.3	0.7
Lanarkshire	9.4	45.5	52.5	1.2	0.8
Lothian	7.0	25.2	73.4	0.6	0.8
Greater Glasgow & Clyde					
- North Glasgow	7.0	1.7	97.1	0.5	0.7
- South Glasgow	7.6	19.0	71.6	3.4	6.0
- Clyde	8.9	32.6	66.3	0.0	1.2
Tayside	8.8	3.8	93.8	1.0	1.5
Western Isles	13.2	89.3	7.1	0.0	3.6

Table 7: Knee Replacement Operations

	Mean Length of Stay	% operations on day of admission	% operations day after admission	% operations two days after admission	% operations three or more days after admission
Scotland	7.6	15.7	80.9	1.3	2.1
Ayrshire & Arran	9.0	9.3	87.7	1.0	2.0
Borders	9.8	1.0	99.0	0.0	0.0
Dumfries & Galloway	9.9	1.4	98.6	0.0	0.0
Fife	7.6	15.4	84.0	0.7	0.0
Forth Valley	8.0	28.7	69.7	0.8	0.8
Golden Jubilee Hospital	7.5	0.7	97.6	0.7	0.9
Grampian	7.4	15.1	74.9	5.3	4.7
Highland	7.1	12.4	81.4	2.5	3.7
Lanarkshire	8.4	43.7	55.0	1.0	0.3
Lothian	6.4	25.3	73.3	0.9	0.6
Greater Glasgow & Clyde					
- North Glasgow	7.0	0.5	99.3	0.0	0.2
- South Glasgow	7.5	24.7	57.5	1.6	16.2
- Clyde	8.3	38.9	60.2	0.0	0.8
Tayside	7.7	7.2	89.7	1.9	1.2
Western Isles	12.1	85.7	14.3	0.0	0.0

43.7% and 45.5% of patients undergoing knee and hip replacements respectively, in NHS Lanarkshire are now admitted on the day of surgery, which may explain why this region has the largest drop in length of stay.

9 Patient Characteristics

This section gives more detailed information on patients who underwent either a total hip replacement operation or total knee replacement operation in 2006/07. The information in this section is contained in a number of tables broken down as follows:

- Sex and average age
- Carstairs deprivation quintile
- Laterality of procedure
- Number of operations by age and NHS Board
- Principal diagnosis of patient at time of operation

Table 8 to Table 12, and Figure 8 to Figure 23, shows the above information for patients who have undergone a primary hip replacement. Table 13 to Table 17, and Figure 24 to Figure 39 shows data for primary knee replacement patients.

9.1 Hip Replacements

Table 8: Number of patients who have undergone a hip replacement in 2006/07 split by sex

Sex	Number of Patients	Mean Age
Male	2186	67
Female	3778	69
Total	5964	68

Table 9: Deprivation category of patients

Deprivation Category	Number of Patients
1 Most affluent	1252
2	1406
3	1272
4	1127
5 Least affluent	872
Deprivation Category Not Known	35
Total	5964

The smaller number of treated patients in the Least Affluent category may represent the reduced life expectancy in these deprivation categories such that they may die before they require a joint replacement. Previous work in the 2006 report suggests that these deprivation categories are being treated.

Table 10: Laterality of hip replacement

Laterality	Number of Patients
Unknown	1185
Right	2584
Left	2145
Bilateral	45
Unilateral	5
Total	5964

Table 11: Number of hip replacements split by NHS Board

NHS Board	Number of Operations
Ayrshire and Arran	323
Borders	131
Dumfries and Galloway	95
Fife	391
Forth Valley	185
Golden Jubilee	536
Grampian	673
Greater Glasgow and Clyde	
- Clyde	186
- North Glasgow	605
- South Glasgow	284
Highland	546
Lanarkshire	400
Lothian	956
Independent hospitals	109
Tayside	540
Western Isles	49
Total	6009

Figure 8: Age Group Rate of Hip Replacements for Scotland

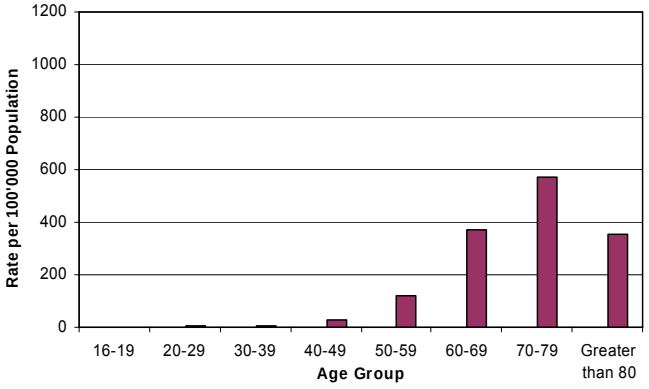


Figure 9: Age Group Rate of Hip Replacements for Ayrshire and Arran

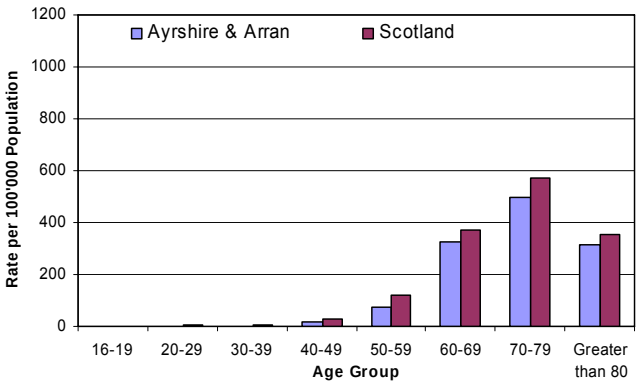


Figure 10: Age Group Rate of Hip Replacements for Borders

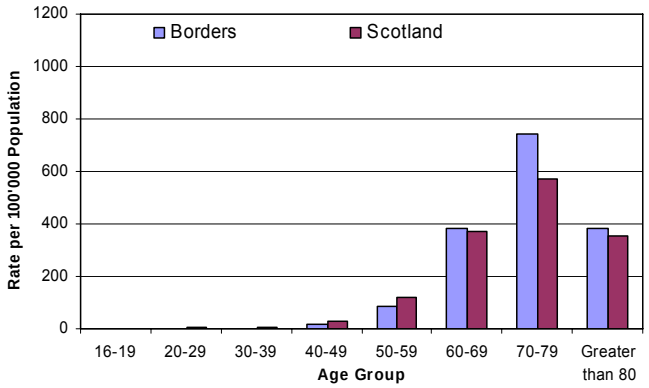


Figure 11: Age Group Rate of Hip Replacements for Dumfries and Galloway

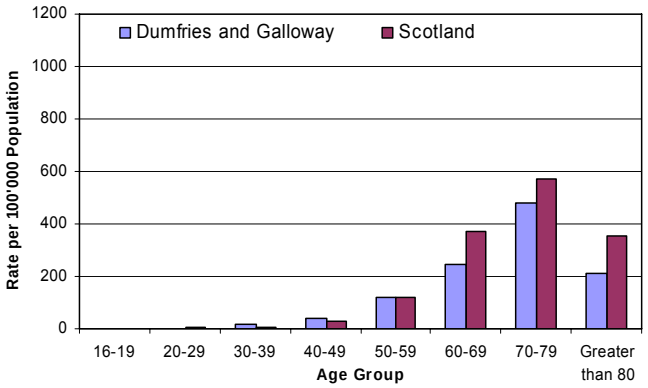


Figure 12: Age Group Rate of Hip Replacements for Fife

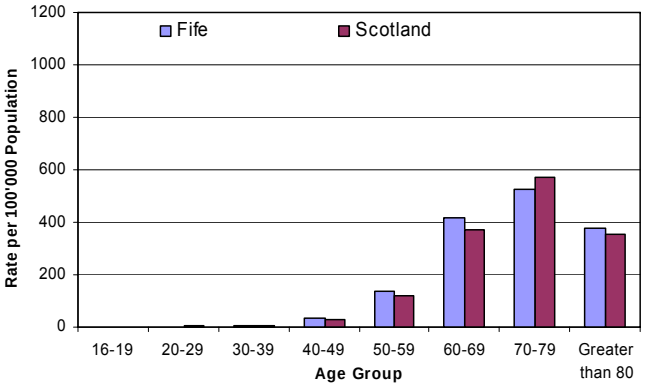


Figure 13: Age Group Rate of Hip Replacements for Forth Valley

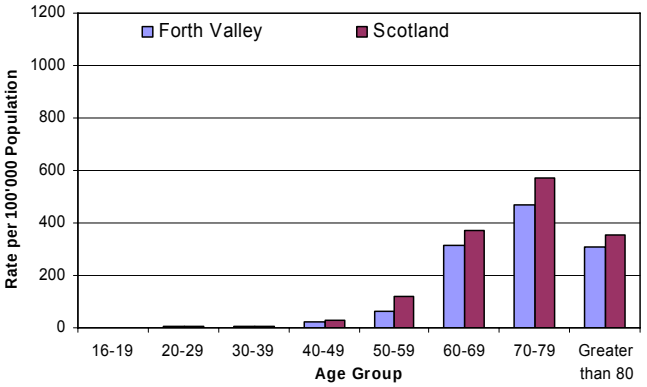


Figure 14: Age Group Rate of Hip Replacements for Glasgow

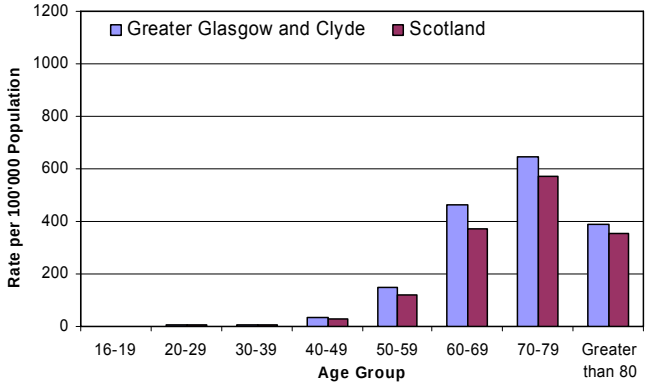


Figure 15: Age Group Rate of Hip Replacements for Grampian

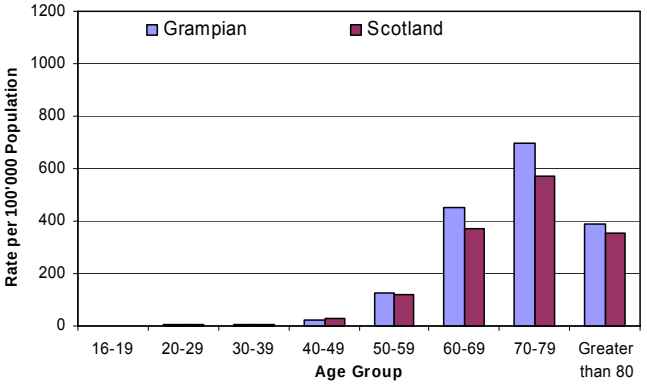


Figure 16: Age Group Rate of Hip Replacements for Highland

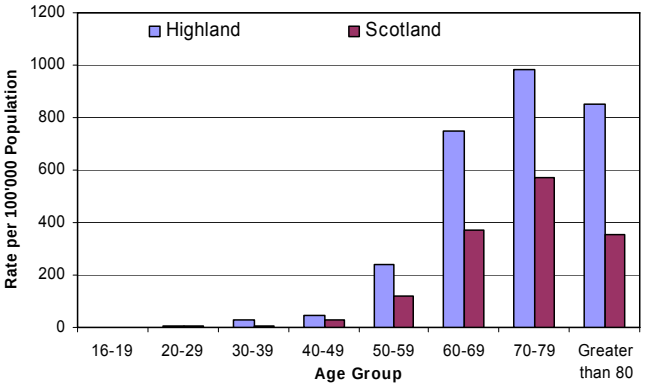


Figure 17: Age Group Rate of Hip Replacements for Lanarkshire

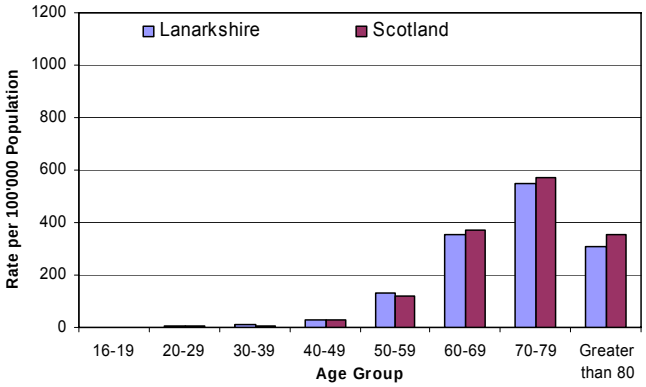


Figure 18: Age Group Rate of Hip Replacements for Lothian

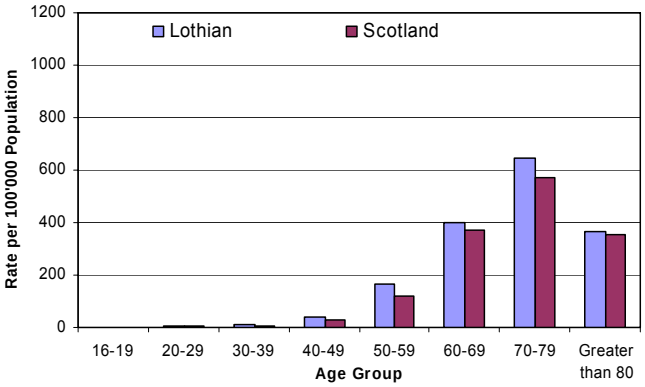


Figure 19: Age Group Rate of Hip Replacements for Orkney

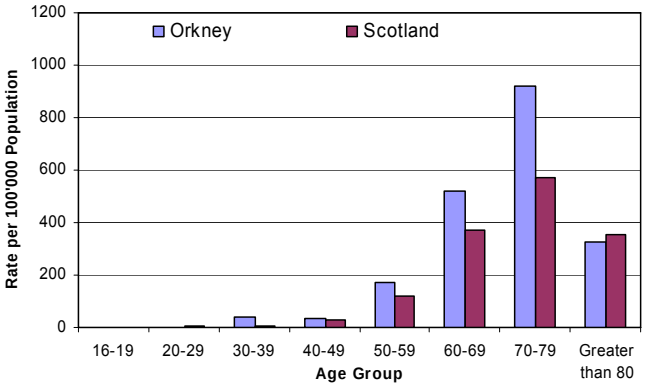


Figure 20: Age Group Rate of Hip Replacements for Shetland

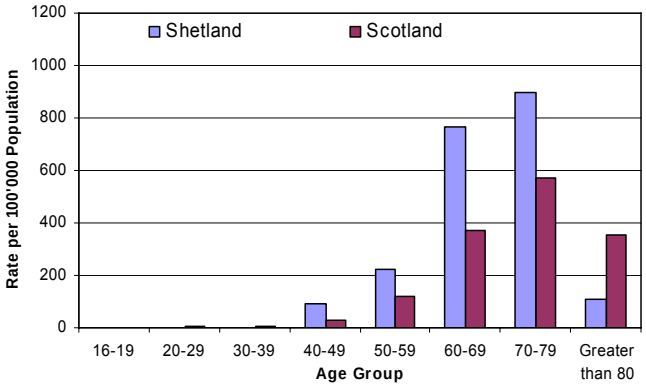


Figure 21: Age Group Rate of Hip Replacements for Tayside

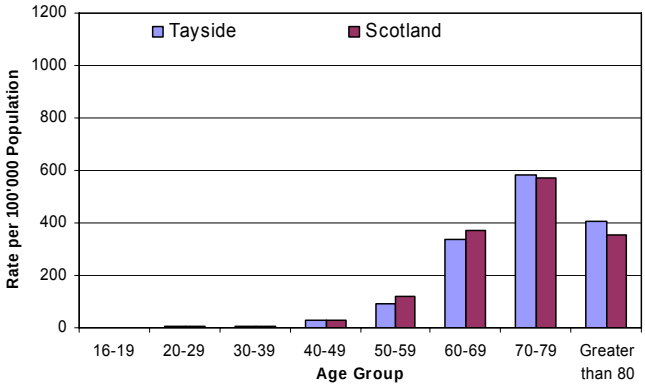


Figure 22: Age Group Rate of Hip Replacements for Western Isles

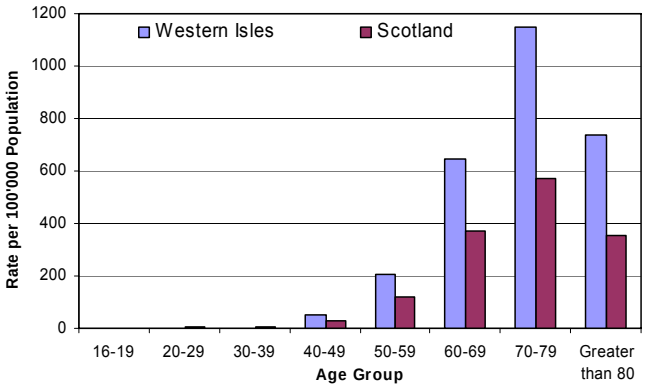
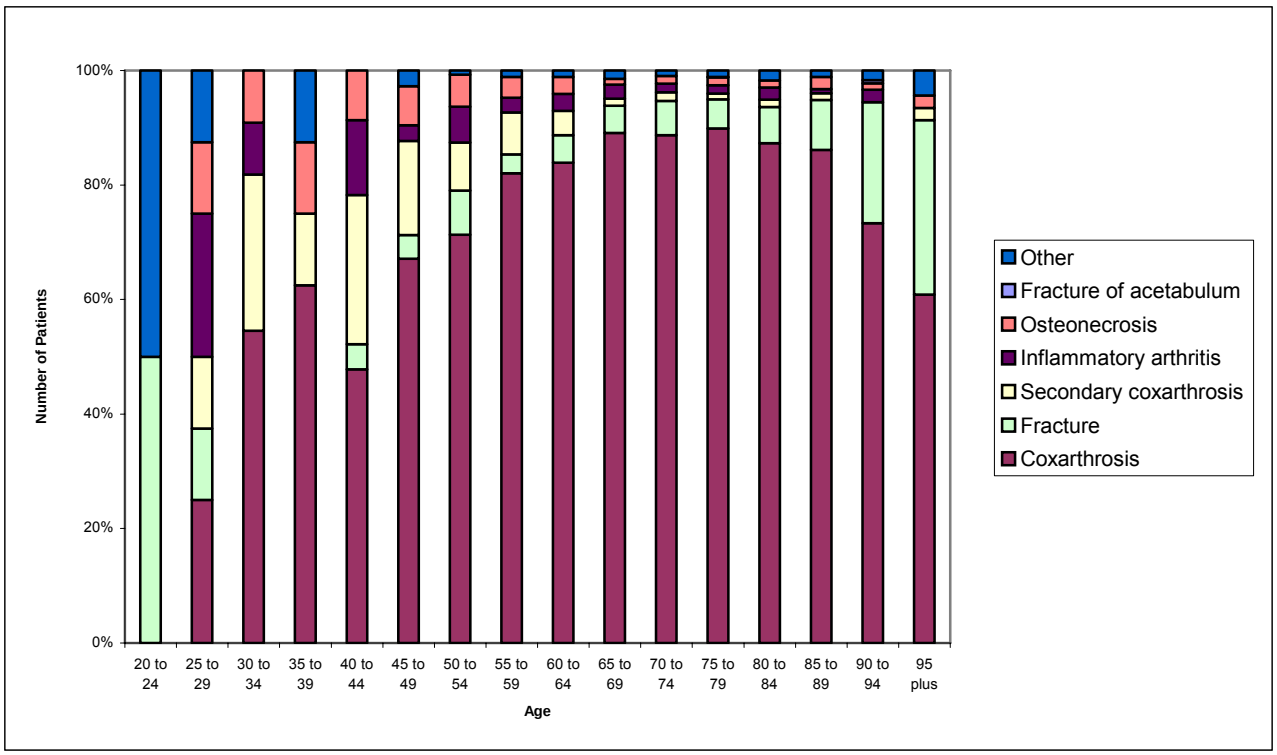


Table 12: Principal diagnosis of hip replacement patients

Diagnosis Group	Number of Patients
Coxarthrosis	5123
Fracture	380
Secondary Coxarthrosis	143
Inflammatory arthritis	126
Osteonecrosis	111
Fracture of acetabulum	2
Other	79
Total	5964

It should be noted that the relatively low number of rheumatoid arthritis cases probably reflects coding issues. Many patients with well-treated rheumatoid arthritis go on to develop secondary osteoarthritis and will be coded as such.

Figure 23: Principal diagnosis of hip replacement patients split by age group



9.2 Knee Replacements

Table 13: Number of patients who have undergone a knee replacement in 2006/07 split by sex

Sex	Number of Patients	Mean Age
Male	2578	69
Female	3603	69
Total	6181	69

Table 14: Deprivation category of patients

Deprivation Category	Number of Patients
1 Most Affluent	1231
2	1319
3	1263
4	1204
5 Least Affluent	1133
Deprivation Category not Known	31
Total	6181

Table 15: Laterality of knee replacement

Laterality	Number of Patients
Unknown	1475
Right	2407
Left	2186
Bilateral	110
Unilateral	3
Total	6181

Table 16: Number of knee replacements split by NHS Board

NHS Board	Number of Operations
Ayrshire and Arran	293
Borders	121
Dumfries and Galloway	89
Fife	446
Forth Valley	188
Golden Jubilee	715
Grampian	560
Greater Glasgow and Clyde	
- Clyde	268
- North Glasgow	786
- South Glasgow	319
Highland	444
Lanarkshire	431
Lothian	924
Independent hospitals	124
Tayside	566
Western Isles	17
Total	6291

Figure 24: Age Group Rate of Knee Replacements for Scotland

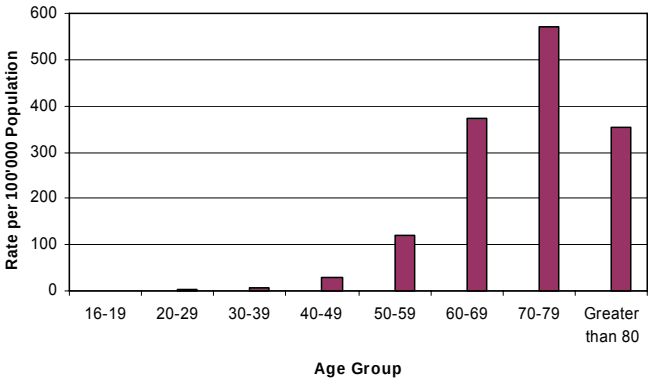


Figure 25: Age Group Rate of Knee Replacements for Ayrshire and Arran

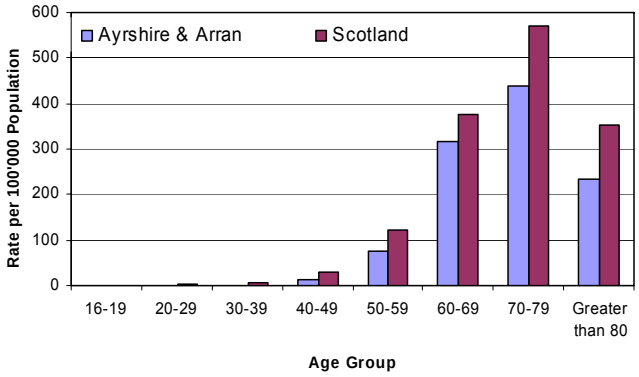


Figure 26: Age Group Rate of Knee Replacements for Borders

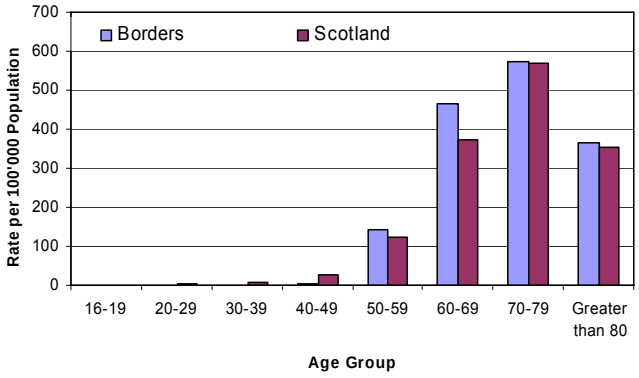


Figure 27: Age Group Rate of Knee Replacements for Dumfries and Galloway

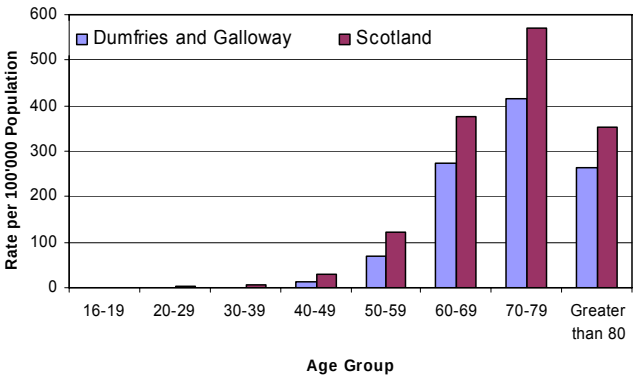


Figure 28: Age Group Rate of Knee Replacements for Fife

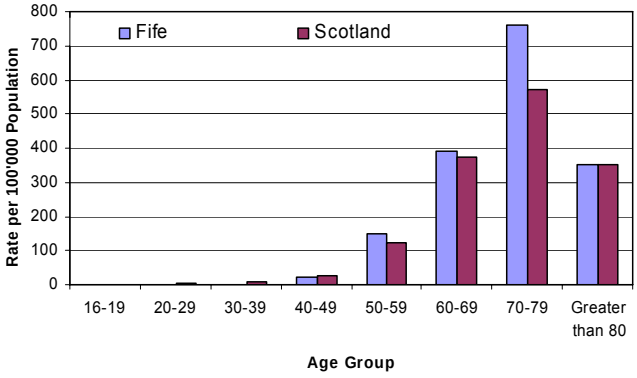


Figure 29: Age Group Rate of Knee Replacements for Forth Valley

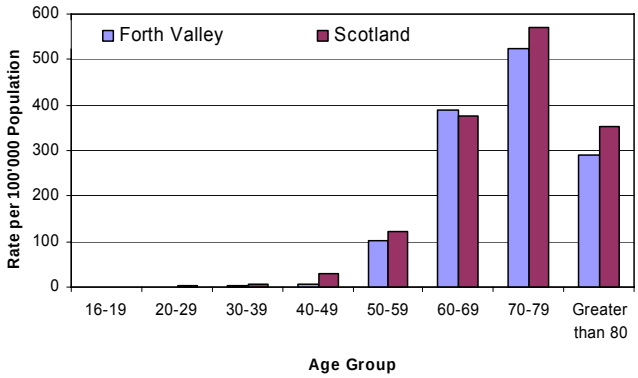


Figure 30: Age Group Rate of Knee Replacements for Glasgow

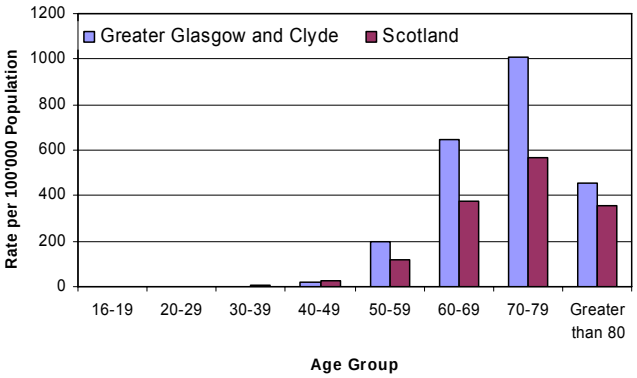


Figure 31: Age Group Rate of Knee Replacements for Grampian

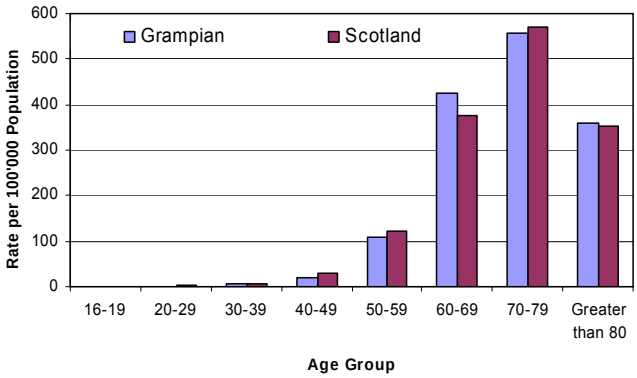


Figure 32: Age Group Rate of Knee Replacements for Highland

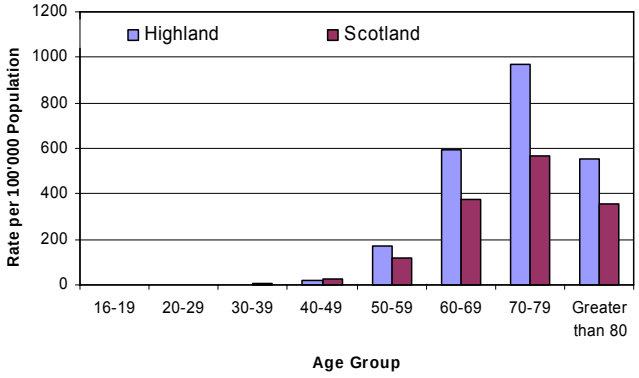


Figure 33: Age Group Rate of Knee Replacements for Lanarkshire

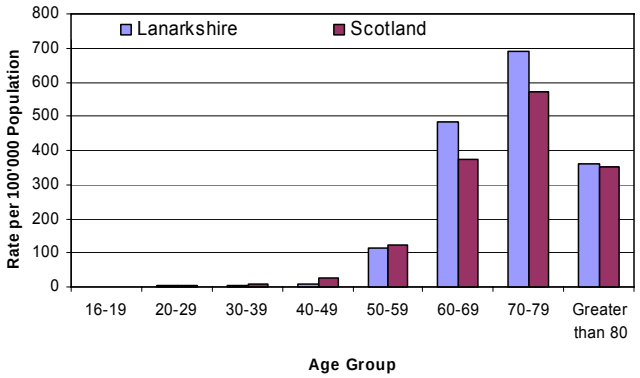


Figure 34: Age Group Rate of Knee Replacements for Lothian

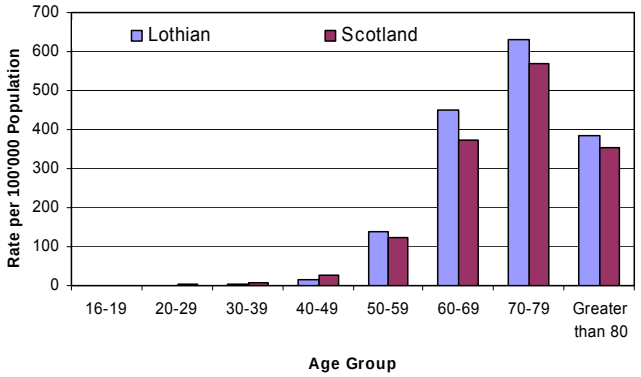


Figure 35: Age Group Rate of Knee Replacements for Orkney

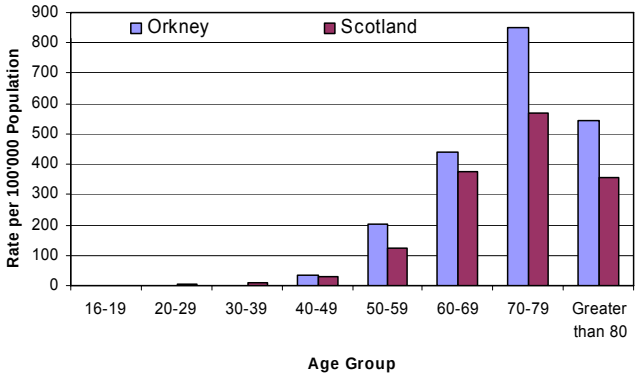


Figure 36: Age Group Rate of Knee Replacements for Shetland

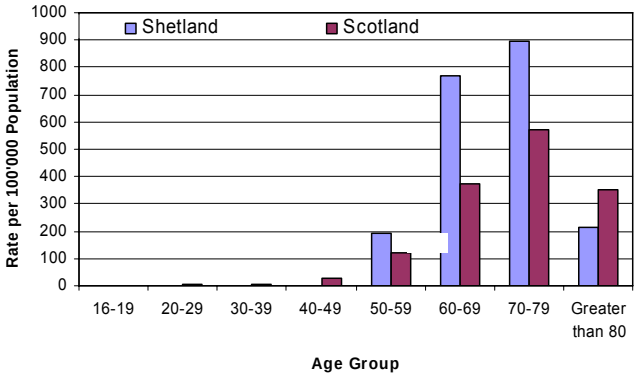


Figure 37: Age Group Rate of Knee Replacements for Tayside

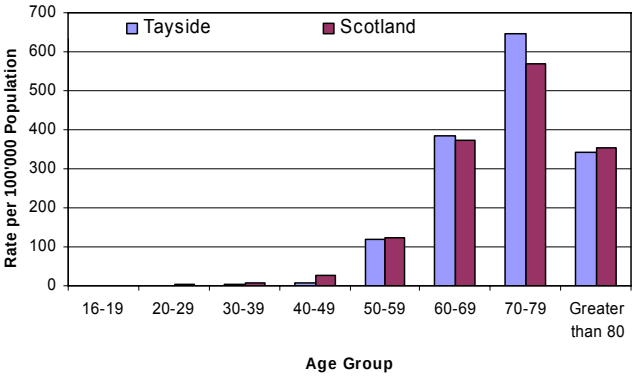


Figure 38: Age Group Rate of Knee Replacements for Western Isles

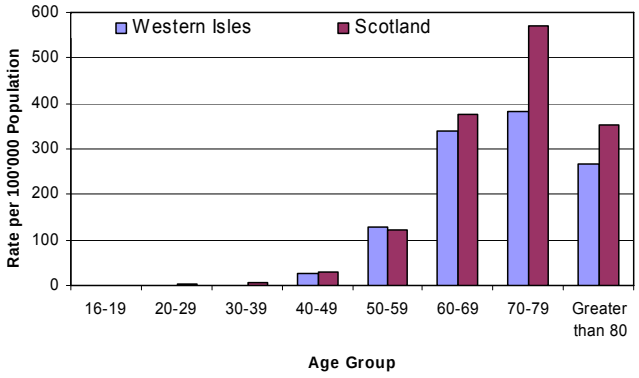
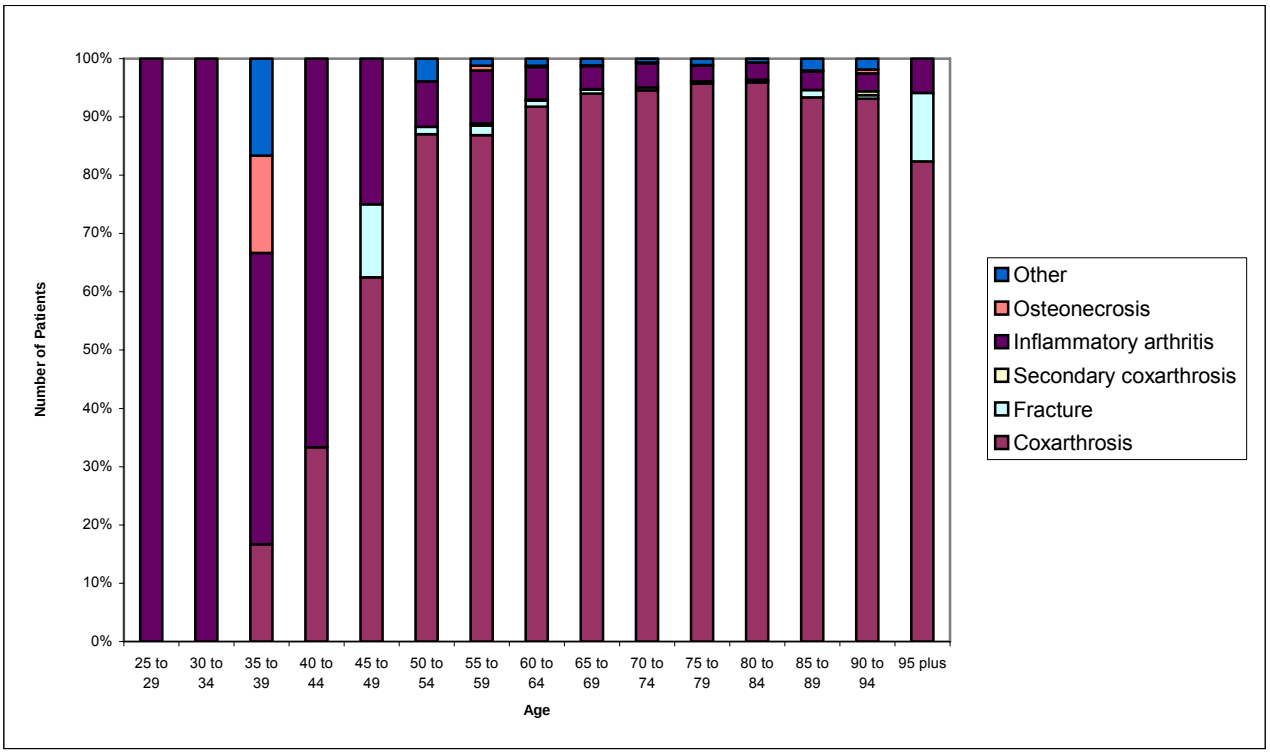


Table 17: Principal diagnosis of patients

Diagnosis Group	Number of Patients
Coxarthrosis	5799.00
Inflammatory arthritis	254.00
Fracture	45.00
Osteonecrosis	10.00
Secondary Coxarthrosis	5.00
Other	68.00
Total	6181

Figure 39: Principal diagnosis of knee replacement patients split by age group



10 Clinical Governance Policy and Results

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."

Scally G. & Donaldson L.J. BMJ 1998:317 61-65.

Since its inception, the policy of the Scottish Arthroplasty Project has been to provide high quality data on activity and complications, which can be used at a local level to promote change and assist Consultant appraisal. 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 a feedback and review system was introduced at NHS Board and consultant level to look at quality issues, which appeared to vary from national standards. A full account of the process and definitions can be found in last year's report.

10.1 Consultant Outliers

Every consultant outlier is requested to investigate the accuracy of the data and the clinical features of each case. They are asked to comment on their cases and provide an action plan if any issues are found.

The introduction of a new technique, a new implant or particular case mix issues may be identified. It is essential that the completed response be co-signed by a Consultant colleague as verification. The response is then assessed by the committee anonymously and scored as to its relevance. If the response is unsatisfactory then a resubmission addressing any discrepancy is requested. The process is anonymous with no members of the committee knowing the source of any response or recipient of the review.

Table 18: Summary of Consultant Outliers

Report Year	5 Year Time Period	New Outliers	Outlying for 2 years	Outlying for 3 years	Outlying for 4 years	Outlying for 5 years	Total Outlying Consultants
2003	April 1996 - March 2001	15	-	-	-		15
2004	April 1997 - March 2002	10	4	-	-		14
2005	April 1998 - March 2003	6	6	2	-		14
2006	April 1999 - March 2004	14	3	2	1		20
2007	April 2000 - March 2005	8	6	1	1		16
2008	April 2001 - March 2006	15	4	4	1	1	25

For statistical accuracy, the figures are derived over five years. It is therefore inevitable that some outliers continue to be identified until their five-year average returns to within normal variation. In 2008, 15 new outliers, four three-year outliers and one five-year outlier, currently in practice in NHS Scotland, will be invited to respond in the coming year. They will be notified in June 2008 and will be expected to respond by September 2008.

Table 19: Summary of outlier responses for outliers

Report Year	Consultant numbers	Response	Exemplary	Excellent	Satisfactory	Less than satisfactory	Late response, awaiting review	Referred to Chief Executive
2003	15	15	N/A	N/A	14	1	-	-
2004	10	10	N/A	N/A	7	3	-	-
2005	6	6	3	1	2	-	-	-
2006	16	16	3	9	4	-	-	-
2007	9	8	-	6	2	-	-	-

In 2007, there were eight new Consultant outliers and one Consultant who was outlying for three years. The majority of the outlier responses were graded as excellent, two were satisfactory and none were less than satisfactory. There was complete compliance with the process and the improvement on the content and quality of the outlier reviews suggests greater ownership and commitment of the aims of the project. The responses for 2003 & 2004 were only graded as being 'Better than satisfactory' or 'Less than satisfactory'.

10.2 NHS Board Outliers

A similar process occurs with NHS Board data, where the information is sent to the Chief Executive. Following an appropriate investigation the Action Plan is co-signed by the Chief Executive and the appropriate Clinical Director (further information can be found in the 2004 Annual Report – section 6.2.2).

Table 20: Summary of NHS Board Outliers

Report Year	5 Year Time Period	Outlying Boards	New Outliers	Outlying for 2 years	Outlying for 3 years	Outlying for 4 years	Outlying for 5 years	Outlying for 6 years
2003	April 1996 - March 2001	4	4	-	-	-		
2004	April 1997 - March 2002	5	2	3	-	-		
2005	April 1998 - March 2003	4	1	-	3	-		
2006	April 1999 - March 2004	4	2	-	-	2		
2007	April 2000 - March 2005	5	2	1	-	-	2	
2008	April 2001 - March 2006	6	3	-	1	-	-	2

The initial response to the 2003 data was disappointing; with only one NHS Board responding within the time frame, and one has not responded to date. In keeping with the previous structure created to deal with non-compliance the Chief Executive was informed and action taken. Two of the three responses were regarded as less than satisfactory. In 2004, both NHS Boards responded and they were classified as satisfactory. In 2005 all NHS Boards responded satisfactorily. In 2006, both NHS Boards responded; one response was satisfactory and the other was deemed to be excellent. In keeping with the SAP policy all outlying NHS Boards for three consecutive years were asked to review the data. In 2007, all NHS Boards responded and were scored as satisfactory or greater.

10.2.1 Evidence of Care Improvement.

It is difficult to confirm that observation and report change practice, indeed any change is likely to be multifactorial. However, elsewhere in this report there are charts showing improvement in the outcomes for DVT, death and dislocation since the inception of the project and its feedback process. The Scottish Surveillance of Healthcare Associated Infection Programme (SSHAIP) has independently shown a significant and beneficial change in the infection rates following total hip replacement since the inception of the project. The numbers of procedures carried out by low volume surgeons has decreased and the revision rate for hip surgery has remained static.

11 Investigation into Anaesthetic Complications

The Royal College of Anaesthetists Board in Scotland agreed to participate in the Scottish Arthroplasty Project. A multidisciplinary approach to the perioperative care of patients undergoing joint replacement is instrumental to their optimal management. Perioperative complications are usually multi-factorial but there is no doubt that pre operative assessment of risk and anaesthesia make a key contribution to outcome.

Many patients are rightly concerned about serious medical problems that may be associated with major operations – these range from those perceived as common (heart attacks, etc) or permanently disabling (stroke, etc) or both. Pre-operative assessment of patients undergoing Orthopaedic surgery may be very difficult due to the patients inability to exercise (due to their musculo-skeletal problems). This makes assessment of the individual patients' cardio-respiratory status difficult for the anaesthetist and subsequent discussion of risk with patients potentially misleading. The Scottish Arthroplasty Project provides the most accurate, available information for anaesthetists and their patients undergoing such procedures in Scotland.

All primary hip and knee replacements carried out in Scotland between 1st April 2001 and 31st March 2006 were extracted from the Scottish Morbidity Records (SMR). All patients who were admitted to hospital with a complication following surgery were also extracted from the SMR within the same date range. The final analysis for this report is based on patients who developed a complication within 30 days of surgery.

11.1 Changes to 2008 reports

As in 2007, complications investigated reflected the major concerns for patients and anaesthetists alike. The analysis was based on patients who were admitted to hospital 30 days after their hip or knee replacement. The complications monitored were:

- Acute myocardial infarction
- CVA/stroke
- Acute renal failure
- Gastro-intestinal haemorrhage

The control charts in the Complication Rates For Hip and Knee Replacements section on page 37 showing standardised rates for mortality and DVT/PE are also relevant to the investigations of anaesthetic complications

For many of the complications investigated there will be a spectrum of severity of the condition investigated (especially in renal failure). This may lead to slight variations in coding between hospitals and regions but the important factor is the rate for the individual regions and how this may affect patient selection and perioperative management in these hospitals.

For each of these outcomes, control charts are presented for both elective primary hip and elective primary knee replacements. The upper control limit is taken to be 3 standard deviations above the expected complication rate. Further work has now been done to adjust for case mix and the standardised data are now presented as complication rates, not as actual numbers of complications.

This year, all the data have been standardised for;

- age;
- sex;
- admission from home or other place of residence (e.g. nursing home);
- rheumatoid arthritis; and
- deprivation.

NHS Board specific reports were sent out to the Clinical Directors of Anaesthesia of every hospital performing joint replacements in April 2008. The report contains information on their NHS Board's observed and expected rates for the above complications following primary hip and knee replacement. It is important to emphasize that reviewing the complication rates is undertaken on a Departmental basis. Because such complications are relatively infrequent and relatively large numbers of anaesthetists undertake arthroplasty procedures, meaningful analysis of events would not necessarily be possible for individual anaesthetists. In addition some complications may occur after the patient has left the care of the anaesthetist and they may be unaware of the problem

It is apparent that very few anaesthetic departments are "outliers" for any of the complications investigated. Although this is at face value reassuring for patients and anaesthetists, it does not alter the fact that the local investigation of those patients suffering complications may identify potential areas for improvement.

The incidence of gastro-intestinal haemorrhage remains low in almost all regions of Scotland. This is reassuring as there was a degree of concern that the widespread use of aspirin for thrombo-prophylaxis may cause significant stomach ulceration post-operatively (in addition to its many other positive potential benefits).

Figure 40 to Figure 47 show the results of the analysis. The reported rates are reassuring and within published international complication rates.

11.1.1 Key to NHS Board Ciphers

A:	Ayrshire and Arran	B:	Borders	C:	Argyll and Clyde
D:	Golden Jubilee National Hospital	F:	Fife	H:	Highland
L:	Lanarkshire	N:	Grampian	NG:	North Glasgow
S:	Lothian	SG:	South Glasgow	T:	Tayside
V:	Forth Valley	W:	Western Isles	Y:	Dumfries and Galloway

Figure 40: Standardised Rate for AMI within 30 days of a hip operation

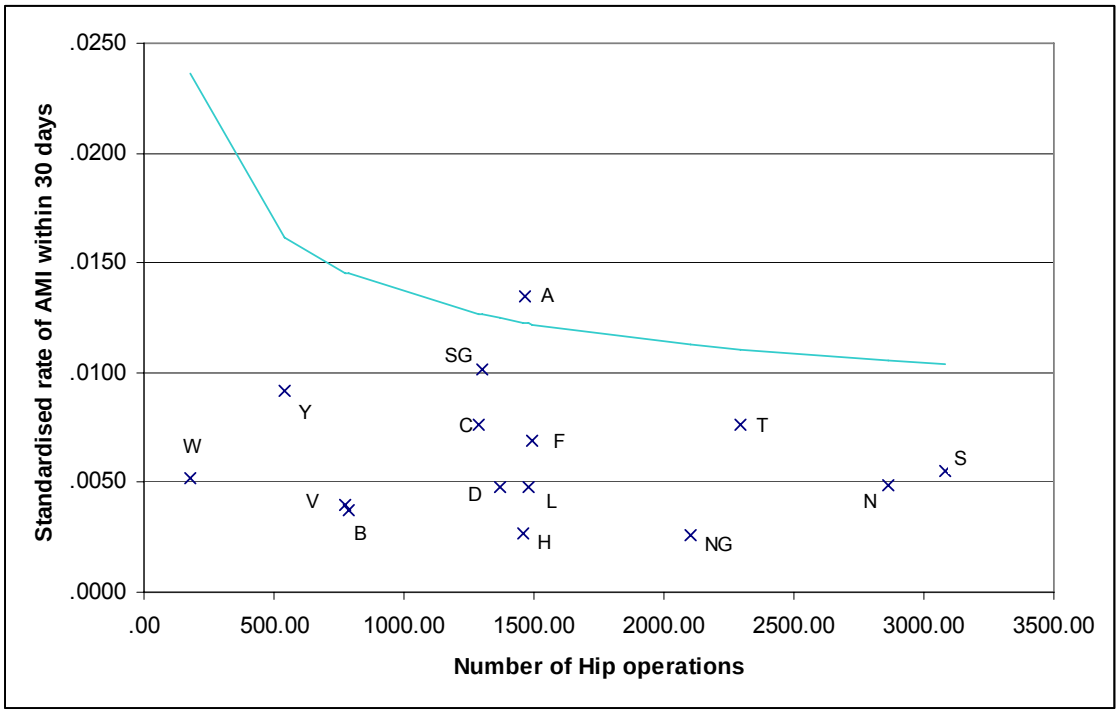


Figure 41: Standardised Rate for AMI within 30 days of a knee operation

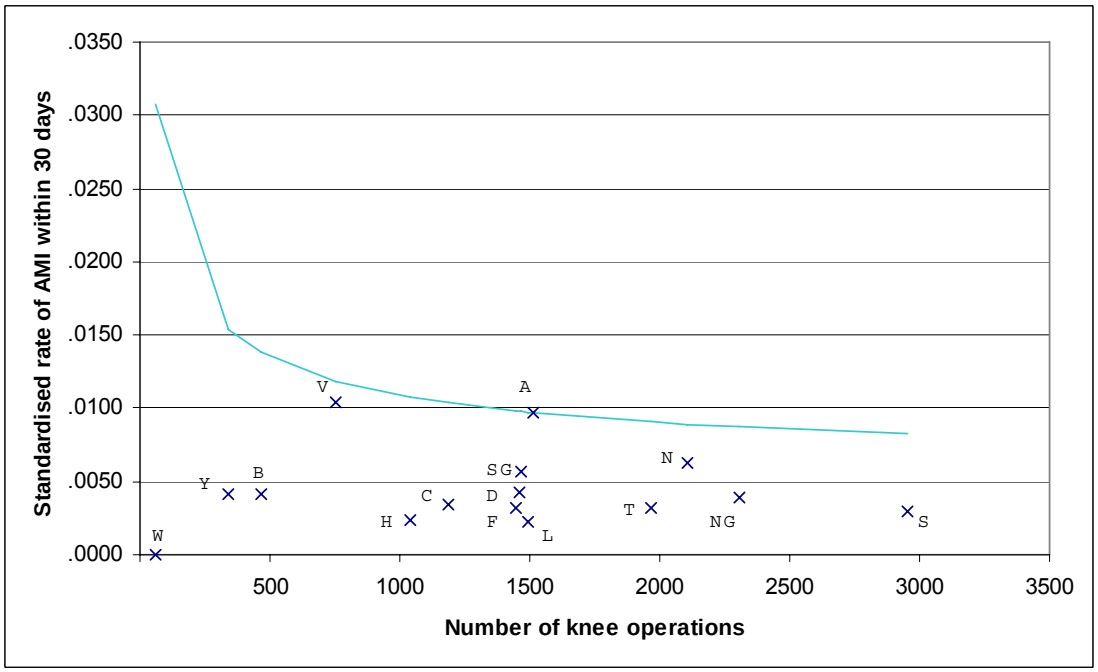


Figure 42: Standardised Rate for GI Bleed within 30 days of a hip operation

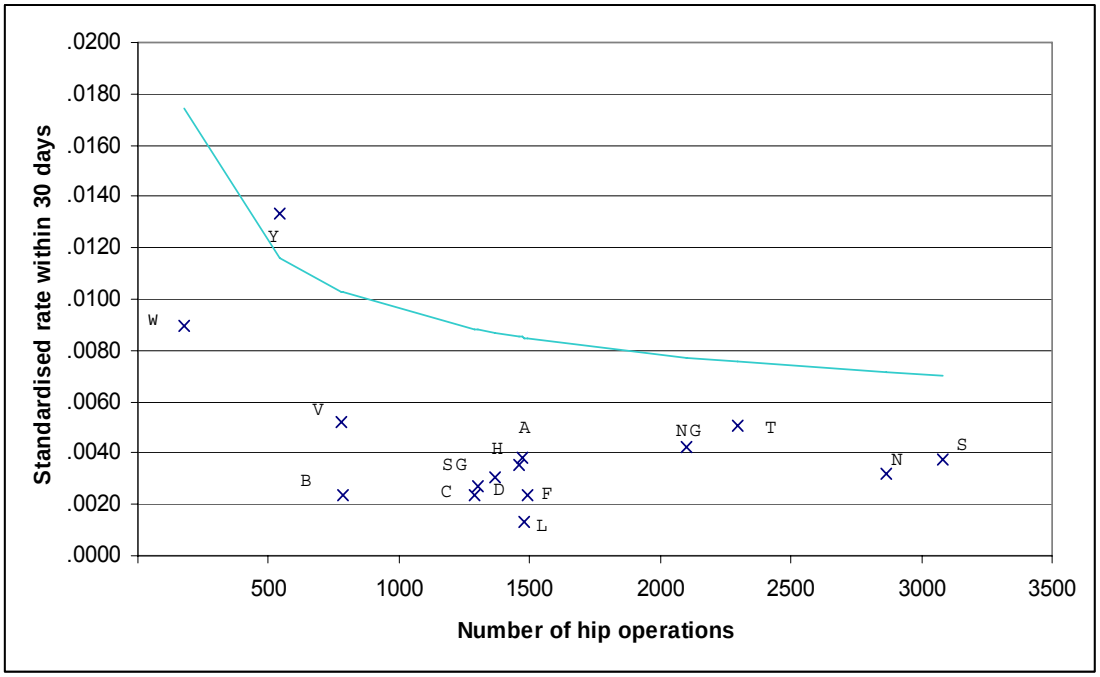


Figure 43: Standardised Rate for GI Bleed within 30 days of a knee operation

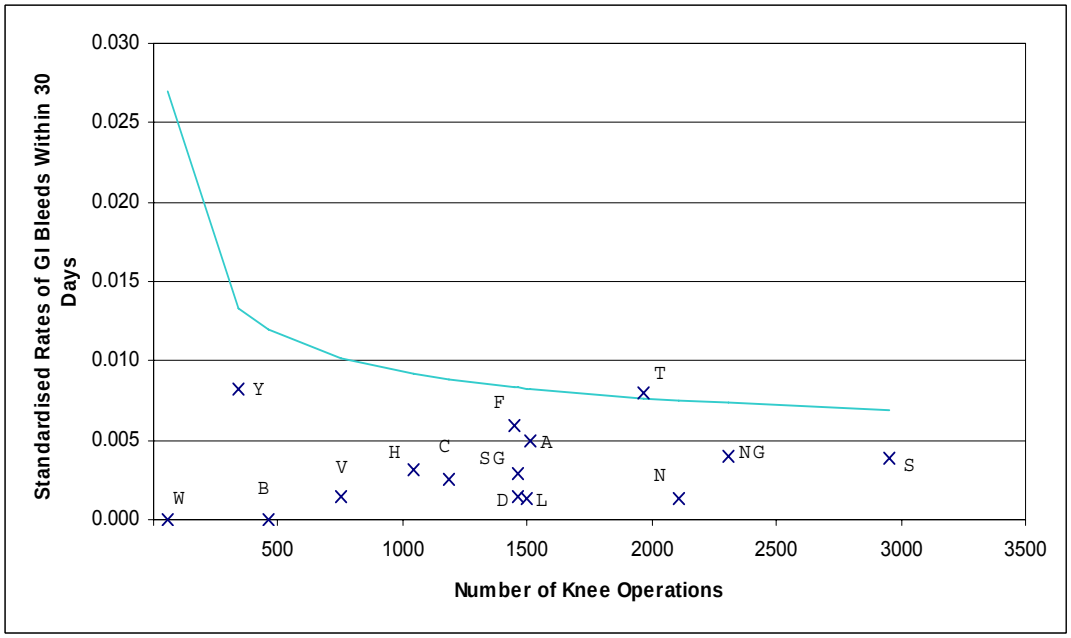


Figure 44: Standardised Rate for stroke within 30 days of a hip operation

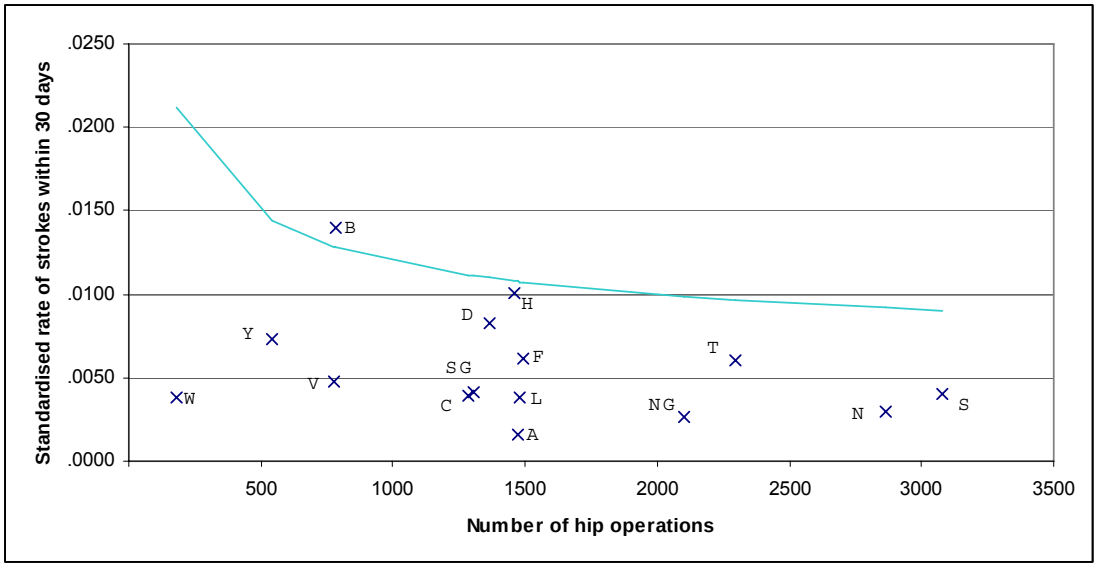


Figure 45: Standardised Rate for stroke within 30 days of a knee operation

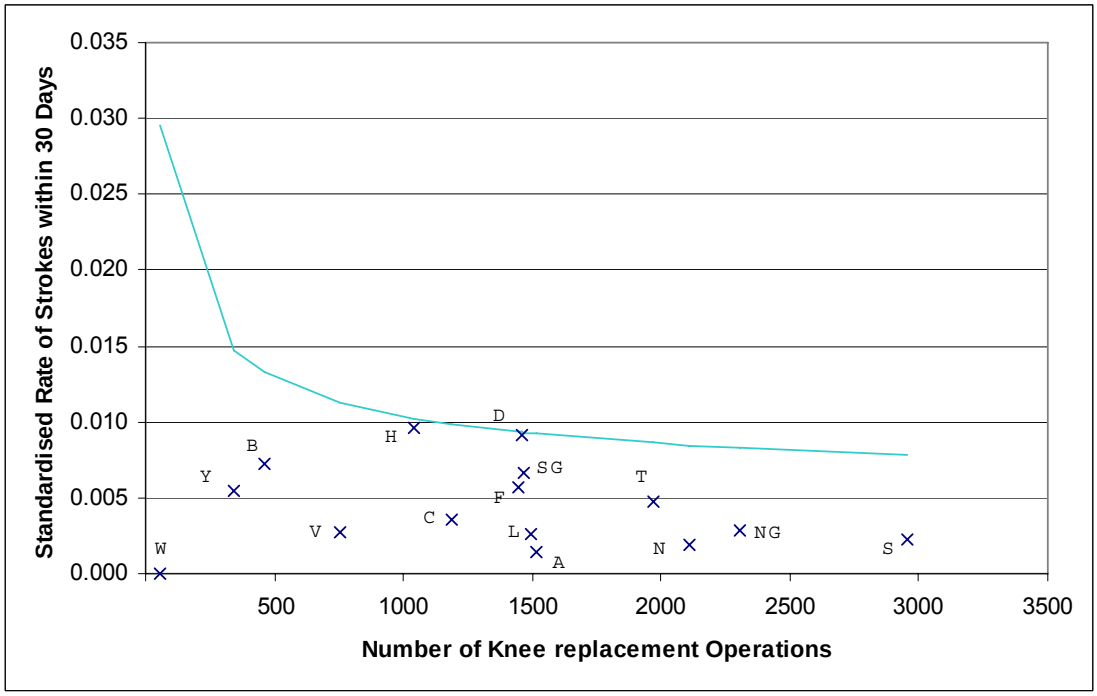


Figure 46: Standardised Rate for acute renal failure within 30 days of a hip operation

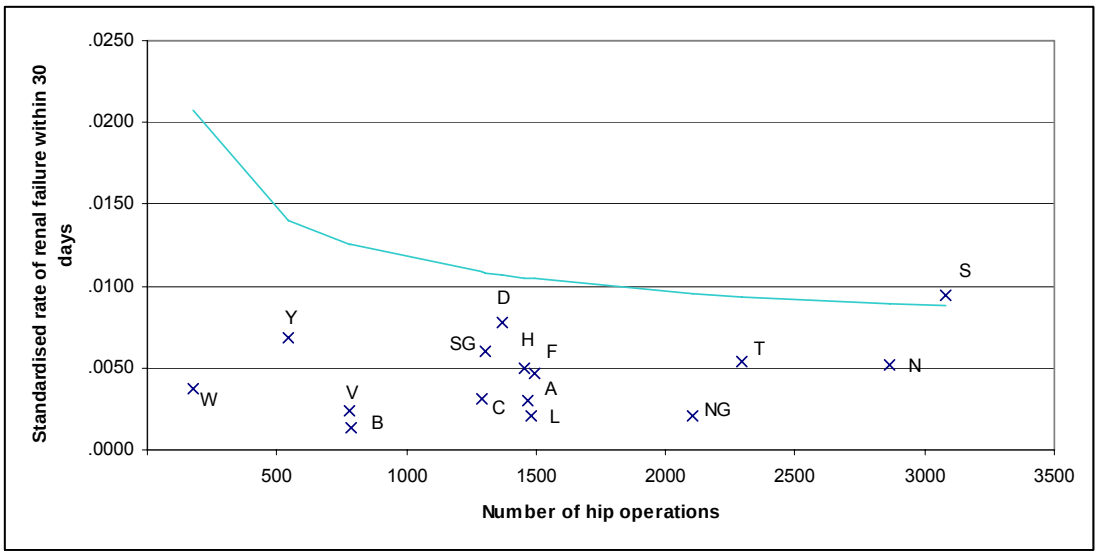
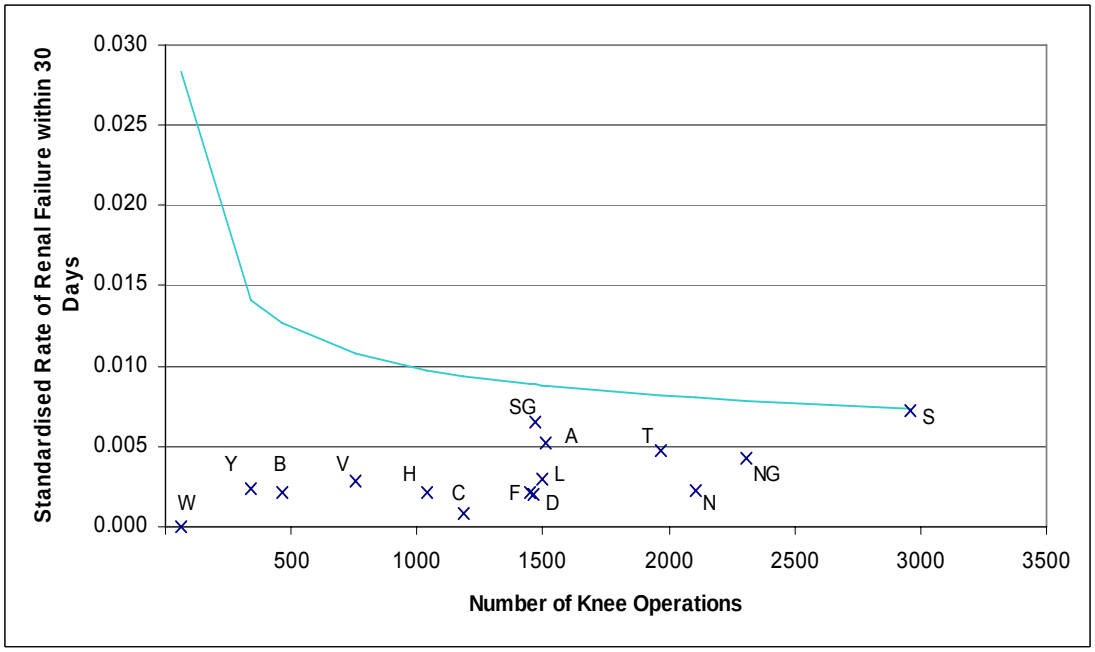


Figure 47: Standardised Rate for acute renal failure within 30 days of a knee operation



12 Complication Rates For Hip and Knee Replacements

For the fifth year, complication data are presented for four different outcomes following elective primary hip or knee replacement:

- dislocation of the joint within 365 days following surgery (for hips only);
- infection (both superficial and deep) of the joint within 365 days following surgery;
- death within 90 days following surgery; and
- deep vein thrombosis/pulmonary embolism (DVT/PE) within 90 days following surgery.

The diagnostic code used to identify an infected prosthesis does not differentiate between deep and superficial infection. This can often be difficult to determine clinically. The International Classification of Diseases (ICD-10) codes used to code medical records do not distinguish the severity of an infection.

In previous years, these data have been presented using control charts (see section 5.1.3. 2004 Annual Report) that displayed the complication data simply by plotting the number of complications against the number of procedures performed. It was decided to develop this analysis by standardising the data for case mix, using all the possible variables available on the national dataset. This year, all the data have been standardised for:

- age;
- sex;
- admission from home or other place of residence (e.g. nursing home);
- rheumatoid arthritis; and
- deprivation.

The standardised data are now presented as complication rates, not as actual numbers of complications. This results in control charts that have a funnel shape to them (funnel plots).

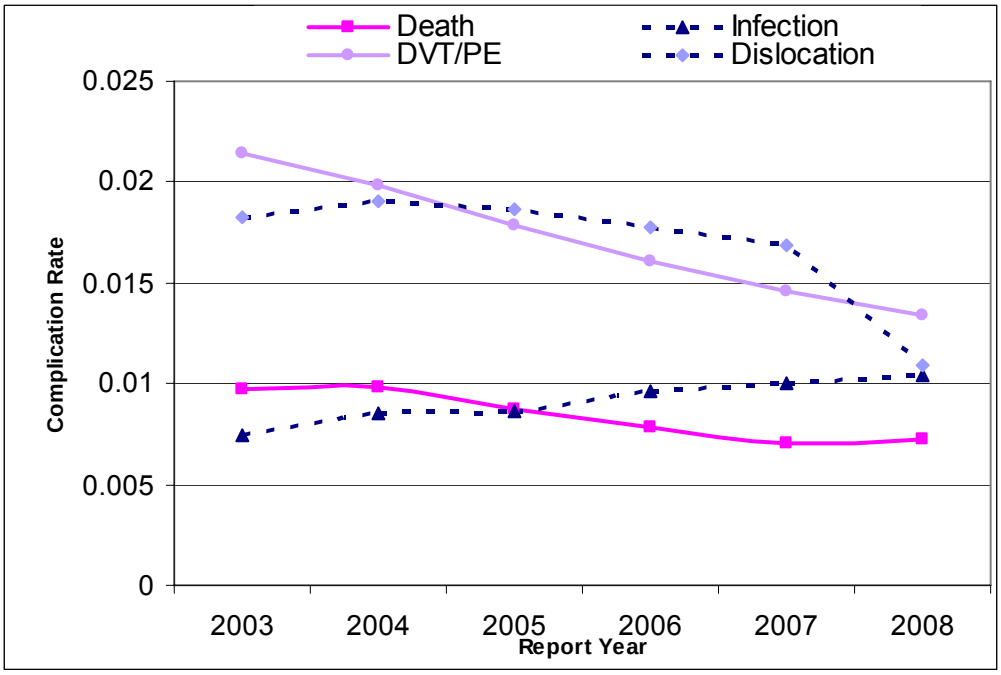
This year, those consultants and NHS Boards that lie outside the upper control limit for the first time (three standard deviations above the expected complication rate) and those who have been outlying for three or five years in a row will be invited to participate in a review of the cases making up this year's outlying number. The purpose of this is to review these figures under the umbrella of clinical governance, with the emphasis on quality improvement and not on attributing blame. Indeed, although we appear to analyse to a surgeon level, the data represents the whole process

of care not just the actions of one individual. In many cases, the cause may be in the accuracy of the data, for example, coding problems, but it is still important to investigate this.

12.1 NHS Board Data for Complications Following Elective Primary Hip Replacement

Figure 48 shows the national complication rates following total hip replacement for NHS Boards from 2003 to 2008 for deaths, dislocations, infections and DVT/PE. There has been a steady decrease in the complication rates for deaths, dislocations and DVT/PE whilst the rate for infections has slightly increased.

Figure 48: National rates for complications following elective primary hip replacements from report year 2003 to 2008



The decrease in the national complication rate for hip dislocations in 2008 is due to change in methodology for identifying hip dislocations.

12.2 NHS Board Data for Complications Following Elective Primary Hip Replacement (April 2001 – March 2006)

Figure 49 to Figure 52 represent the complication rates for patients following elective hip replacement between April 2001 and March 2006. Each data point represents the complication rate for an NHS Board in Scotland (for the label key and explanation of features see page 39). Those NHS Boards that are outlying for the first time, third year in a row or fifth year in a row will be contacted to explore the reasons for these complication rates. Due to the historical nature of the

data and the fact that the data is aggregated over 5 years, it will take some time to show change in complication rates. Because of this, NHS Boards that are outlying for a second year will not be asked to reinvestigate the data, but will be monitored over the forthcoming years

NHS Boards that were outlying both last year and this year have been marked with a circle and will not be asked to repeat the governance process. Also, the NHS Boards that were outlying last year, but not this year, have been marked with a square. NHS Boards that have been outlying for three years have been marked with a diamond, those that have been outlying for 4 years have been marked with a triangle, NHS Boards outlying for 5 years have been marked with a cross whilst NHS Boards which have been outlying for 6 years have been marked with a solid diamond.

12.2.1 Key to NHS Board Ciphers

A:	Ayrshire and Arran	B:	Borders	C:	Argyll and Clyde
D:	Golden Jubilee National Hospital	F:	Fife	H:	Highland
L:	Lanarkshire	N:	Grampian	NG:	North Glasgow
S:	Lothian	SG:	South Glasgow	T:	Tayside
V:	Forth Valley	W:	Western Isles	Y:	Dumfries and Galloway

12.2.2 Key to the Features of the Control Charts – this applies to all Funnel Plots in this report

——— Upper and Lower Control Limits

——— Scottish Mean

X NHS Board or Consultant

□ NHS Board or Consultant outlying last year, but not this year

⊗ NHS Board or Consultant outlying for a second year in a row

◊ NHS Board or Consultant outlying for a third year in a row

△ NHS Board or Consultant outlying for four years in a row

✦ NHS Board or Consultant outlying for five years in a row

◆ NHS Board or Consultant outlying for six years in a row

Figure 49: Observed and expected standardised rates of deaths within 90 days

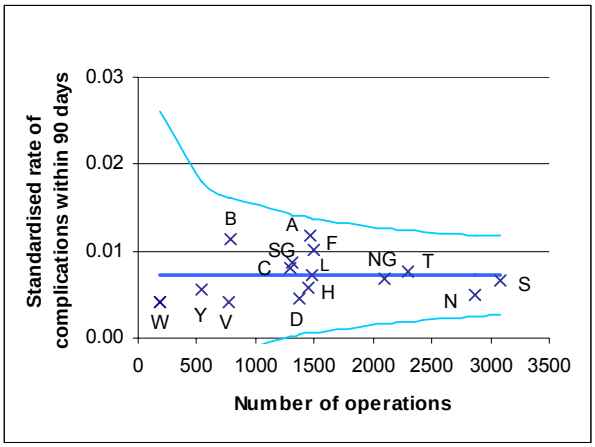


Figure 50: Observed and expected standardised rates of hip dislocations within 365 days

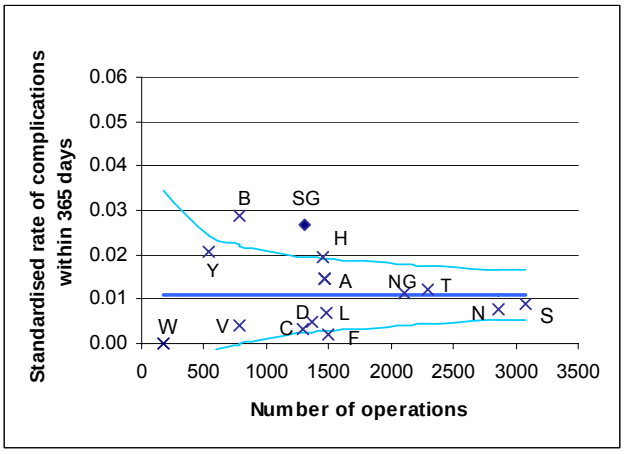


Figure 51: Observed and expected standardised rates of joint infections within 365 days

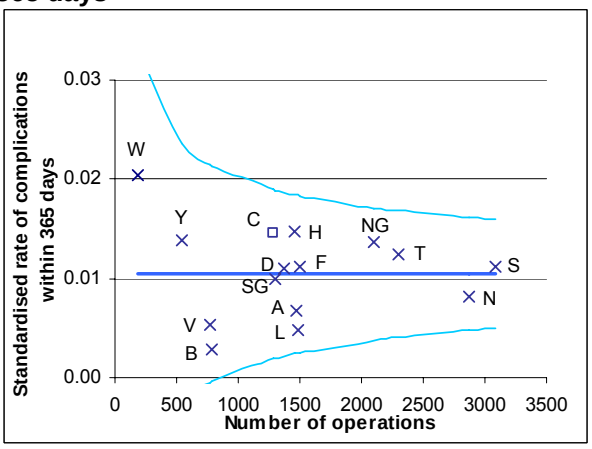
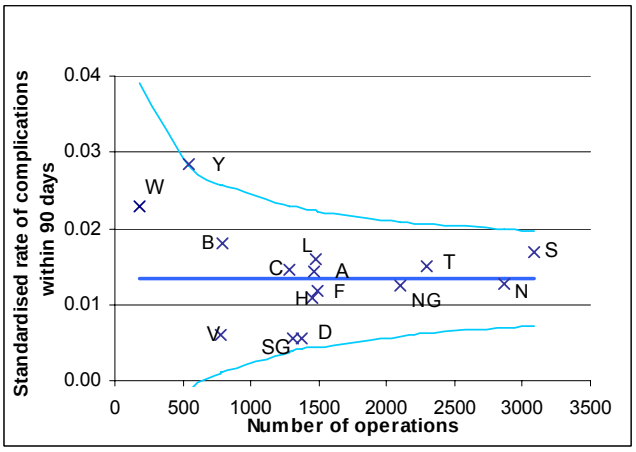


Figure 52: Observed and expected standardised rates of DVT/PE within 90 days



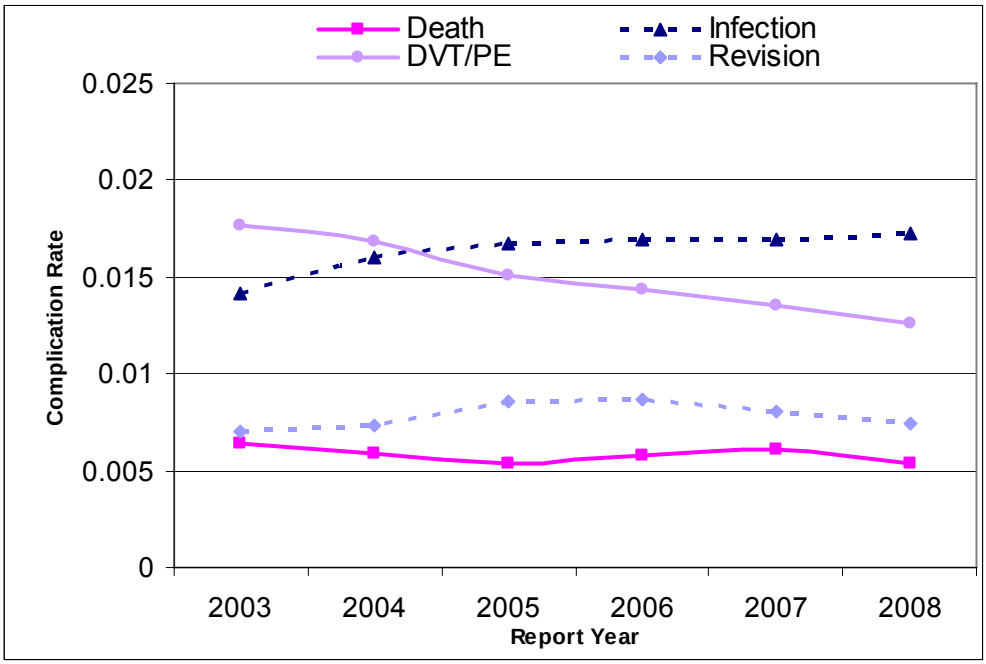
Orkney and Shetland are not included as their patients undergo elective arthroplasty surgery in Grampian NHS Board and are included in the Grampian data.

12.3 NHS Board Data for Complications Following Elective Primary Knee Replacement

Figure 53 compares the national complication rates following knee replacement for NHS Boards for report years 2003 to 2008 (includes data from 1st April 1996 to 31st March 2006), for deaths, knee revisions, infections and DVT/PE. Complication rates for DVT/PE, revisions and deaths have decreased, however rates for infections has slightly increased.

Figure 54 to Figure 57 represent the complication rates for patients following elective knee replacement between April 2001 and March 2006. Each data point represents the complication rate for an NHS Board in Scotland (for the label key and explanation of features see page 39). The NHS Boards that are outlying for the first time and those outlying for a third year or fifth year in a row will be contacted to explore the reasons for these complication rates. Those NHS Boards that are outlying for a second, fourth or sixth year in a row will not be asked to reinvestigate the data, but will be monitored over the forthcoming years. This is due to the historical nature of the data and the fact that it is 5 years aggregated data that would take some time to show change in complication rates.

Figure 53: National rates for complications following elective primary knee replacements from report year 2003 to 2008



12.3.1.1 NHS Board Data for Complications Following Elective Primary Knee Replacement (April 2001 – March 2006)

NHS Boards that were outlying both last year and this year have been marked with a circle and will not be asked to repeat the governance process. Also, the NHS Boards outlying last year but not this year have been marked with a square. NHS Boards that have been outlying for three years have been marked with a diamond, those that have been outlying for 4 years have been marked with a triangle, NHS Boards who have been outlying for 5 years have been marked with a cross, whilst NHS Boards who have been outlying for 6 years have been marked with a solid diamond.

Figure 54: Observed and expected standardised rates of deaths within 90 days

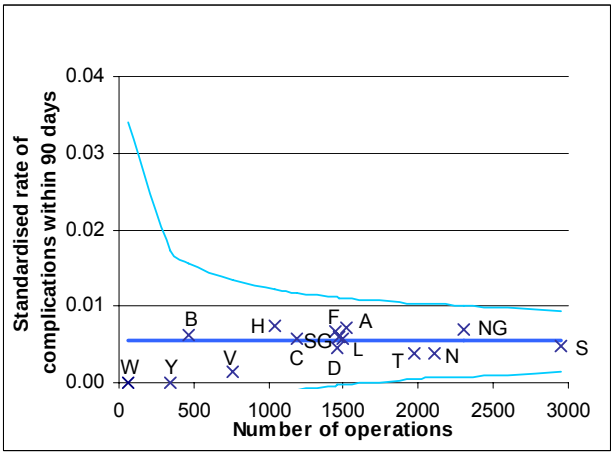


Figure 55: Observed and expected standardised rates of knee revisions within 365 days

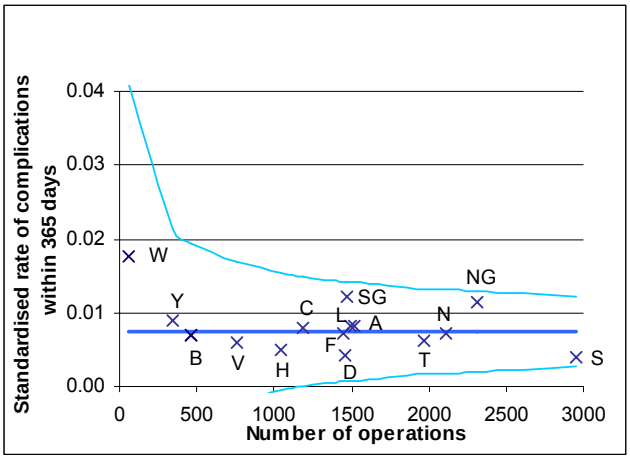


Figure 56: Observed and expected standardised rates of joint infections within 365 days

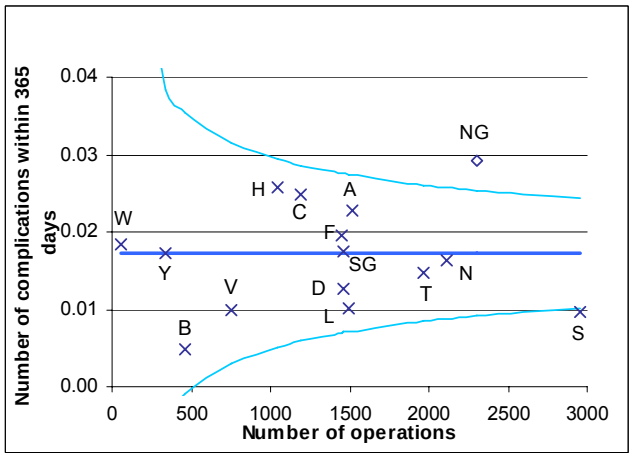
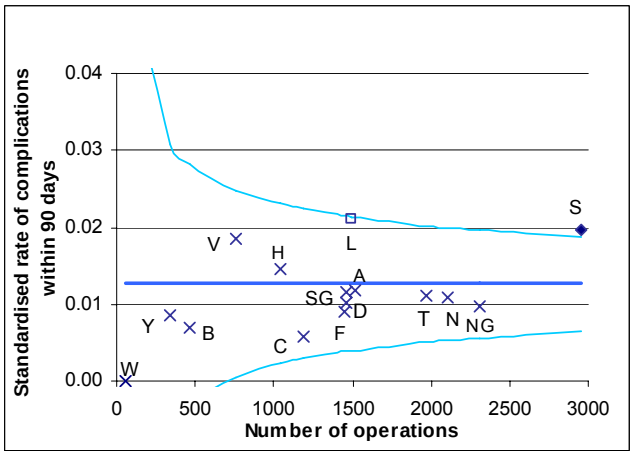


Figure 57: Observed and expected standardised rates of DVT/PE within 90 days



12.4 Consultant Surgeon Data for Complications Following Elective Primary Hip Replacement

Figure 58 to Figure 65 represent the complication rates for patients following elective hip replacement between April 2001 and March 2006. Each data point represents the complication rate for each Consultant in Scotland. For a key to the features of the charts please see page 39. Those Consultants who are outlying for the first time and those outlying for a third or fifth year in a row will be contacted to explore the reasons for these complication rates. The consultants who are outlying for a second or fourth year in a row will not be asked to reinvestigate the data, but will be monitored over the forthcoming years. This is due to the historical nature of the data and the fact that it is 5 years aggregated data, which would take some time to show change in complication rates.

Because the charts show standardised rates of complications, those surgeons with low numbers of index procedures may have only one complication but this causes a high rate. To account for this the charts show control limits within which variation is likely to be statistical due to low numbers rather than a problem with care. All surgeons (and hospitals), particularly those with low numbers and high complication rates, should pay particular attention to each individual case.

12.4.1 Consultant Surgeon Data for Complications Following Elective Primary Hip Replacement (April 2001 – March 2006)

Consultants who were outlying both last year and this year have been marked with a circle and will not be asked to repeat the governance process. Also, the Consultants who were outlying last year, but not this year, have been marked with a square, Consultants who have been outlying for three years have been marked with a diamond, Consultants who have been outlying for four years have been marked with a triangle, Consultants who have been outlying for 5 years have been marked with a cross and Consultants who have been outlying for 6 years have been marked with a solid diamond.

The distribution of complication rates (y axis) on our charts are strongly skewed towards zero. As such, the complication rates are also presented on a logarithmic scale. Presenting the complication rates on a logarithmic scale has the effect of reducing skewness, making the distribution more normal. The data points have not changed, only the scale on the chart, making interpretation easier.

Figure 58: Observed and expected standardised rates of deaths within 90 days

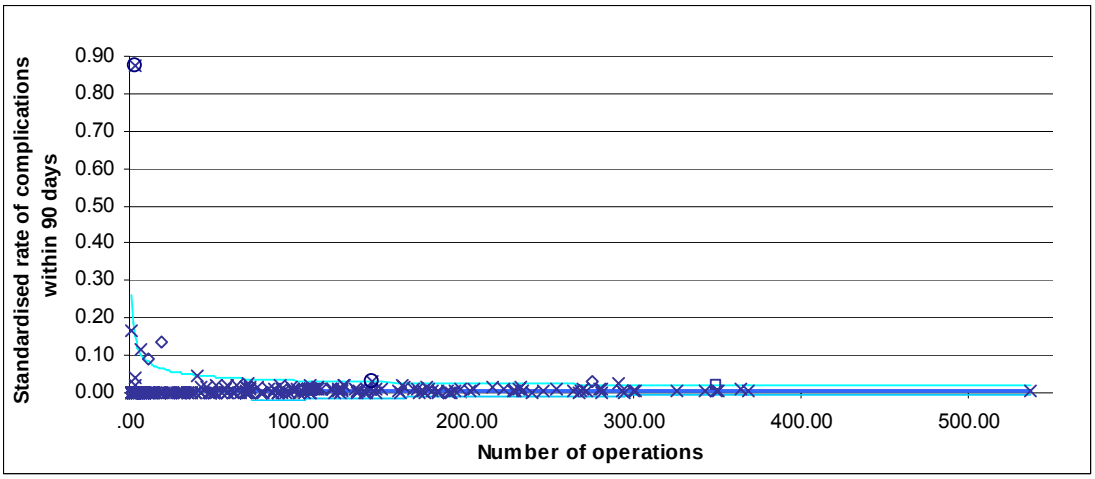


Figure 59: Observed and expected standardised rates of deaths within 90 days (logarithmic scale)

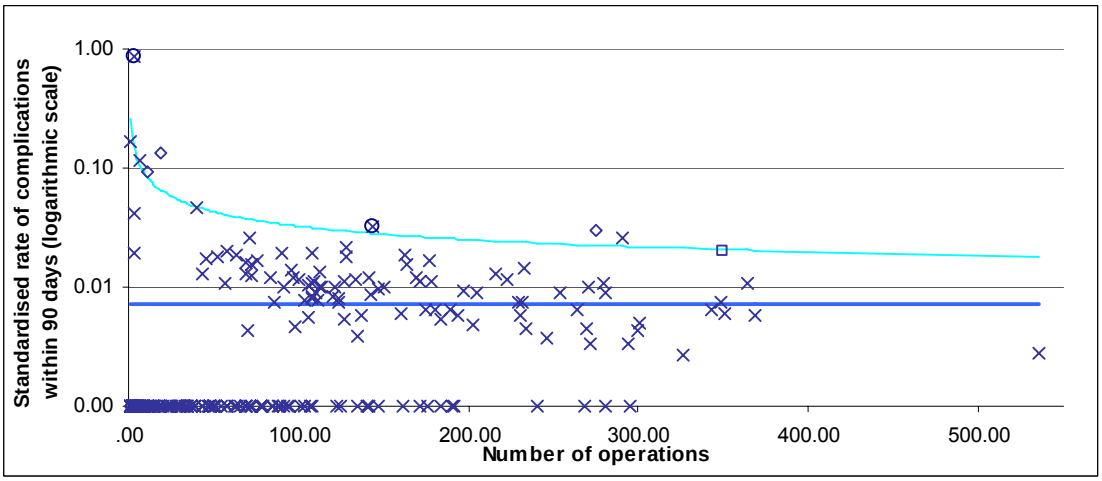


Figure 60: Observed and expected standardised rates of hip dislocations within 365 days

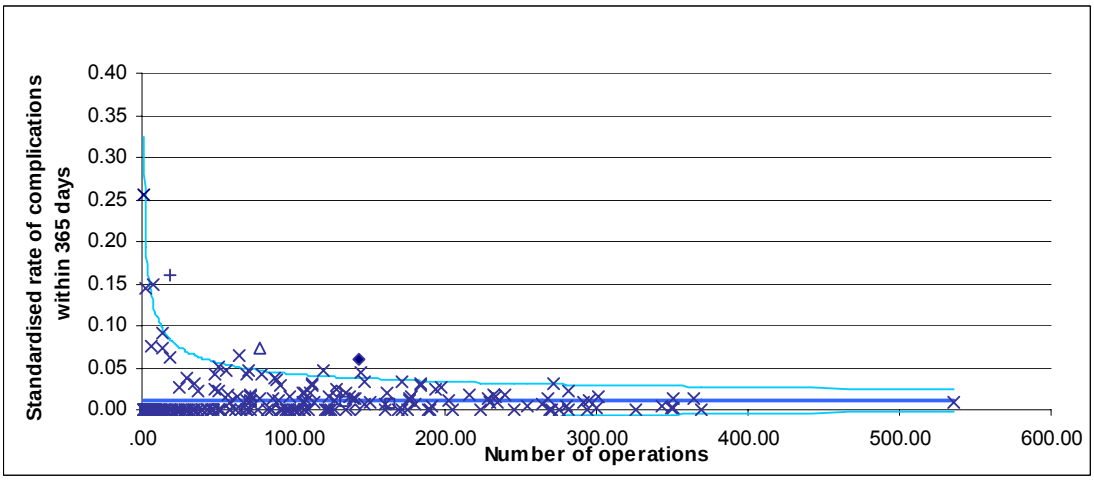


Figure 61: Observed and expected standardised rates of hip dislocations within 365 days (logarithmic scale)

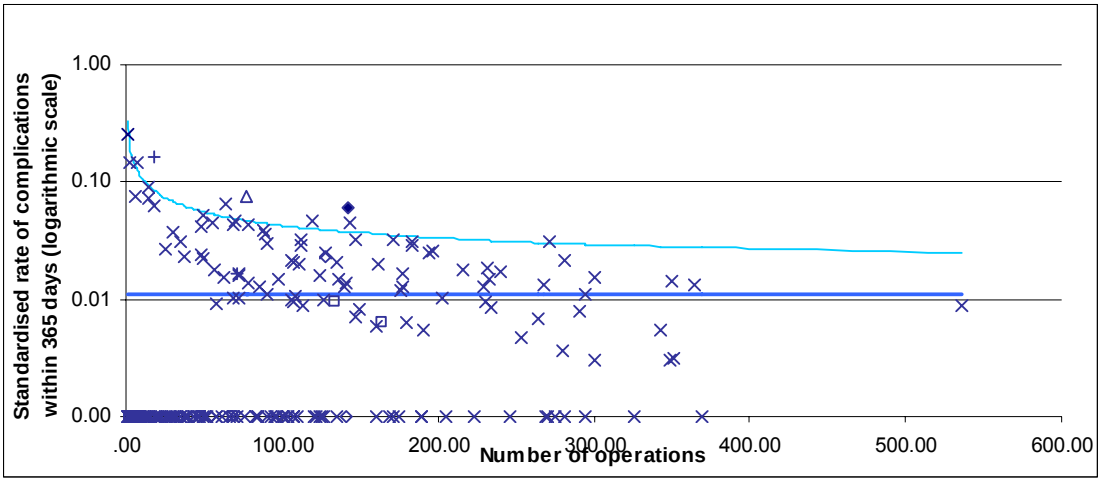


Figure 62: Observed and expected standardised rates of joint infections within 365 days

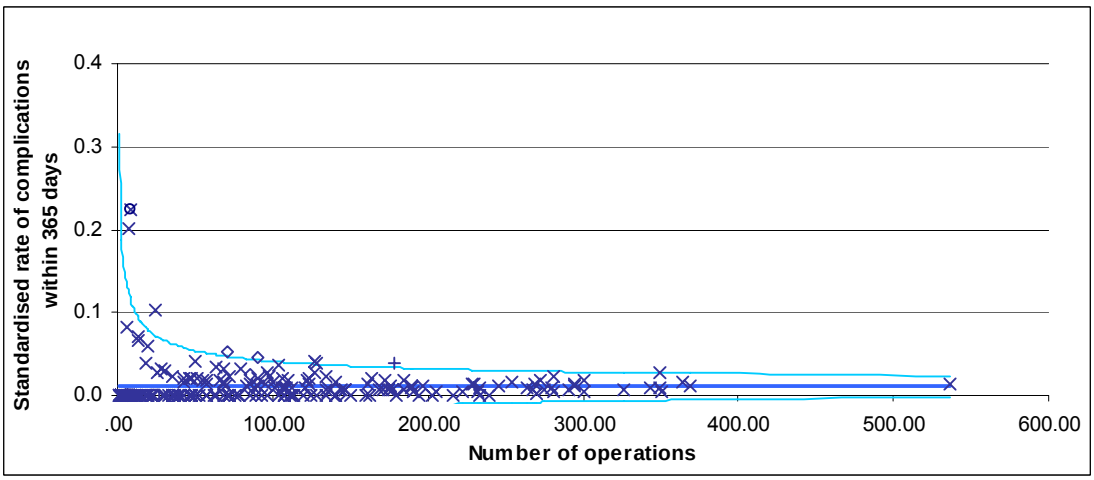


Figure 63: Observed and expected standardised rates of joint infections within 365 days (logarithmic scale)

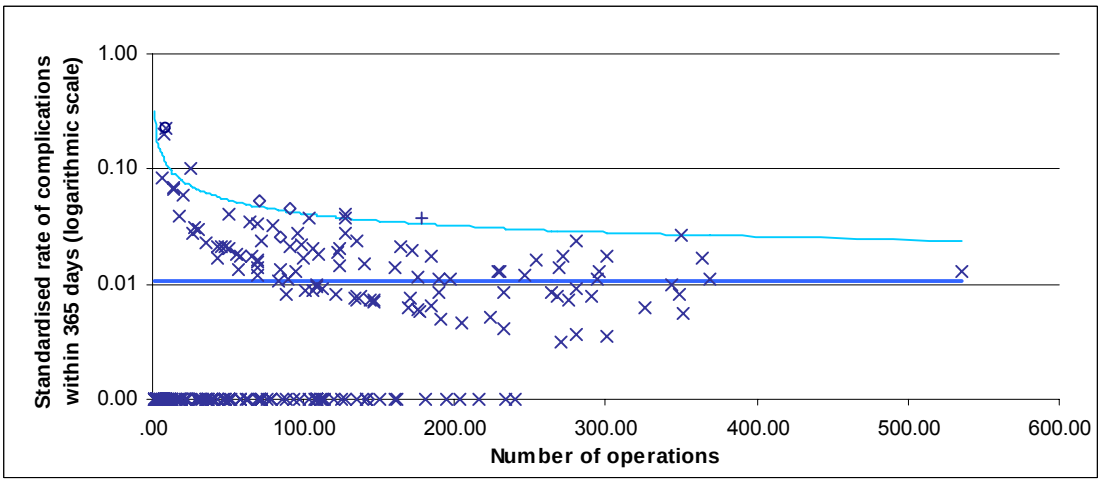


Figure 64: Observed and expected standardised rates for DVT/PE within 90 days

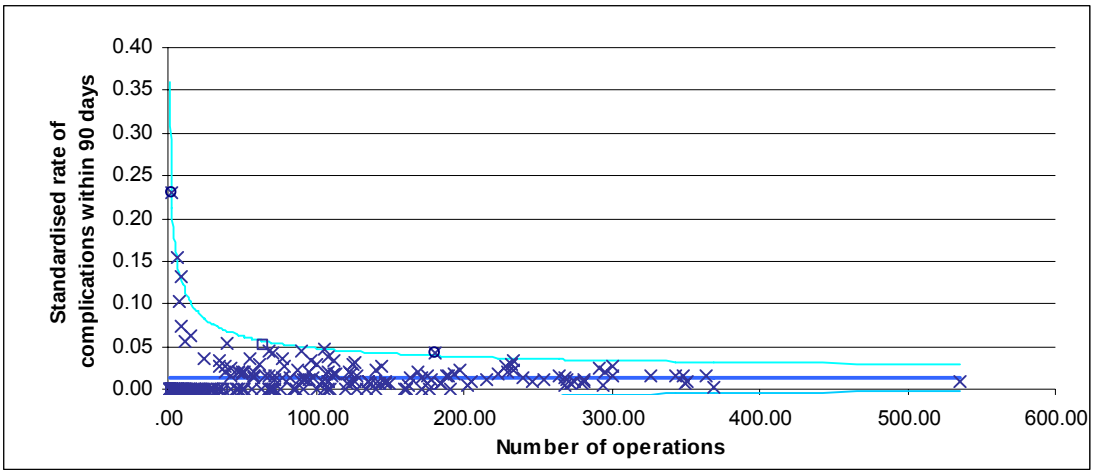
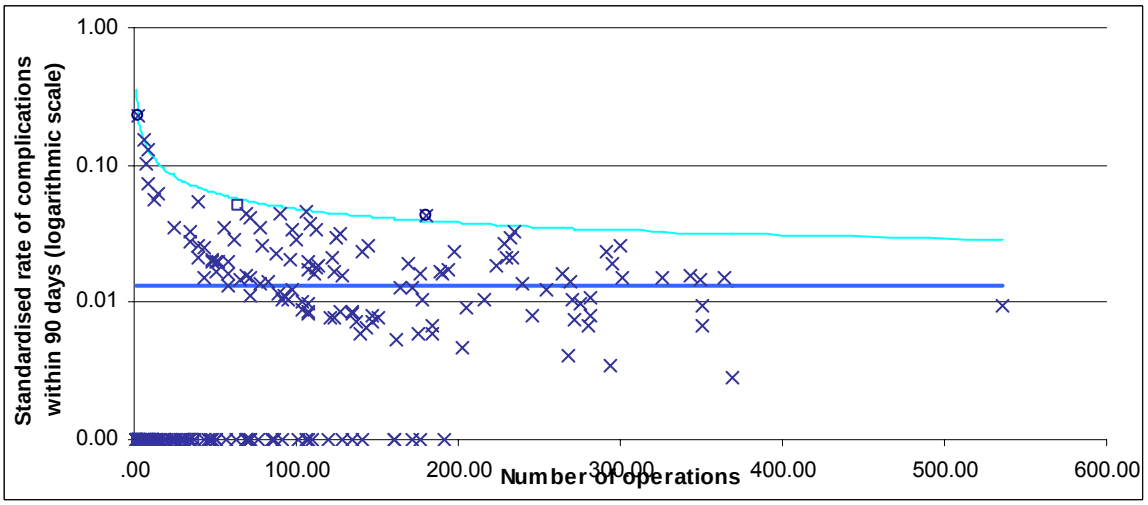


Figure 65: Observed and expected standardised rates for DVT/PE within 90 days (logarithmic scale)



12.5 Consultant Surgeon Data for Complications Following Elective Primary Knee Replacement

Figure 66 to Figure 71 represent the complication rates for patients following elective knee replacement between April 2001 and March 2006. Each data point represents the complication rate for a Consultant in Scotland. For a key to the features of the charts please see page 39. Those Consultants who are outlying for the first time and those outlying for a third or fifth year in a row will be contacted to explore the reasons for these complication rates. The consultants who are outlying for a second, fourth or sixth year in a row will not be asked to investigate the data, but will be monitored over the forthcoming years. This is due to the historical nature of the data and the fact that it is 5 years aggregated data, which would take some time to show change in complication rates.

12.5.1 Consultant Surgeon Data for Complications Following Elective Primary Knee Replacement (April 2001 – March 2006)

Consultants who were outlying both last year and this year have been marked with a circle and will not be asked to repeat the governance process. Also, the Consultants who were outlying last year, but not this year, have been marked with a square, Consultants who have been outlying for three years have been marked with a diamond, and Consultants who have been outlying for four years have been marked with a triangle, and Consultants who have been outlying for 5 years have been marked with a cross.

The distribution of complication rates (y axis) on our charts are strongly skewed towards zero. As such, the complication rates are also presented on a logarithmic scale. Presenting the complication rates on a logarithmic scale has the effect of reducing skewness, making the distribution more normal. The data points have not changed, only the scale on the chart, making interpretation easier.

Figure 66: Observed and expected standardised rates of deaths within 90 days

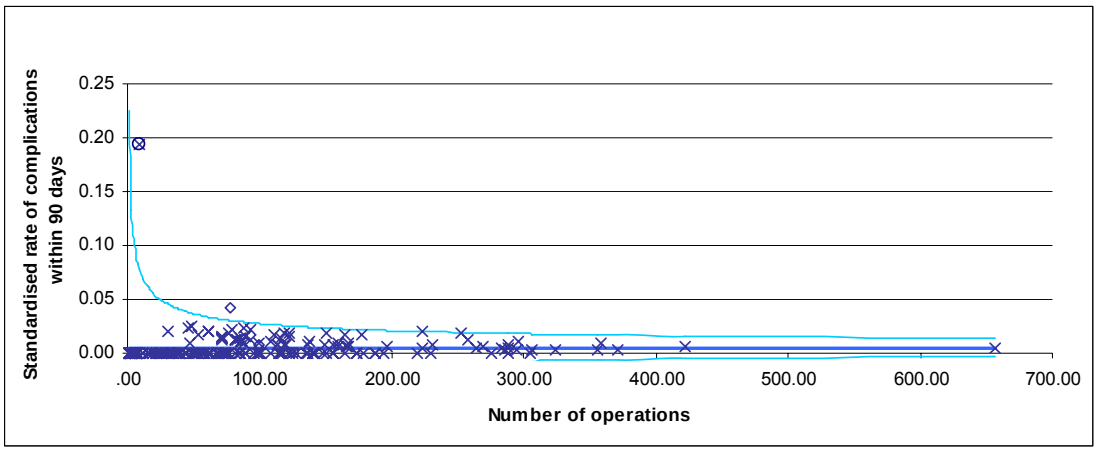


Figure 67: Observed and expected standardised rates of deaths within 90 days (logarithmic scale)

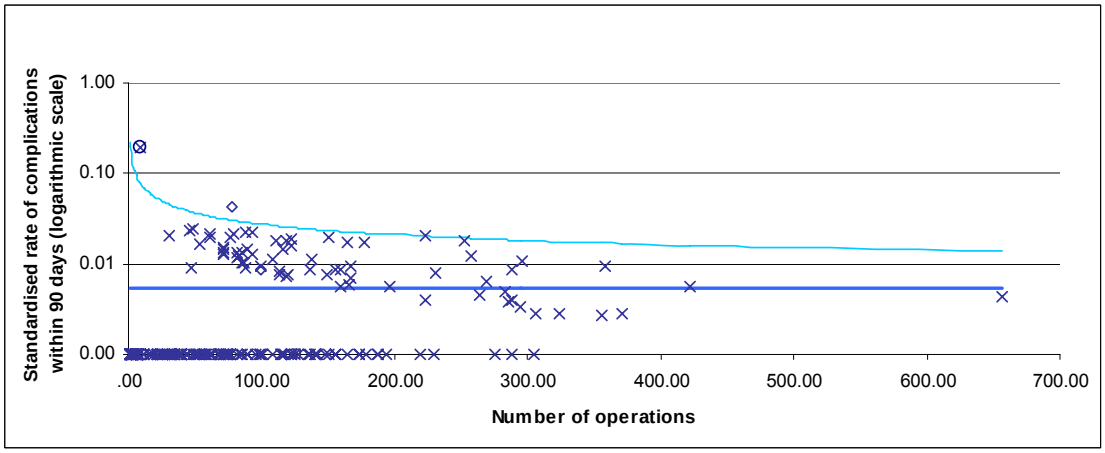


Figure 68: Observed and expected standardised rates of joint infections within 365 days

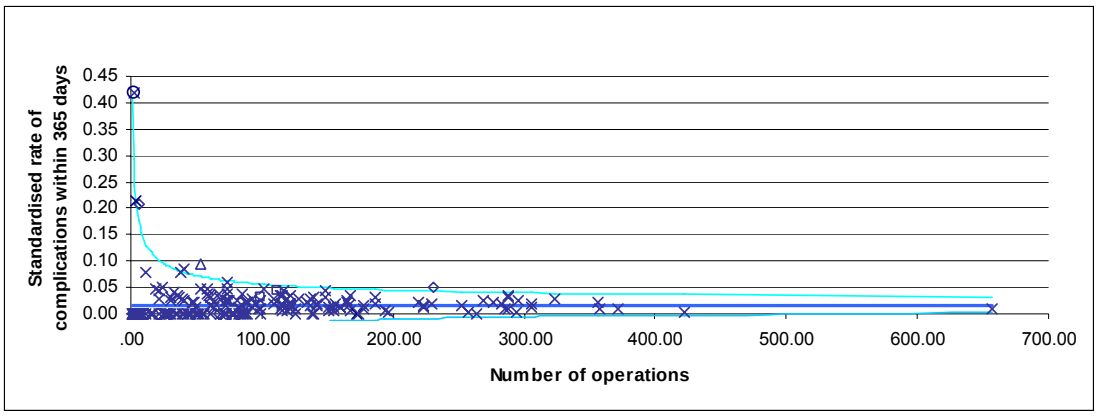


Figure 69: Observed and expected standardised rates of joint infections within 365 days (logarithmic scale)

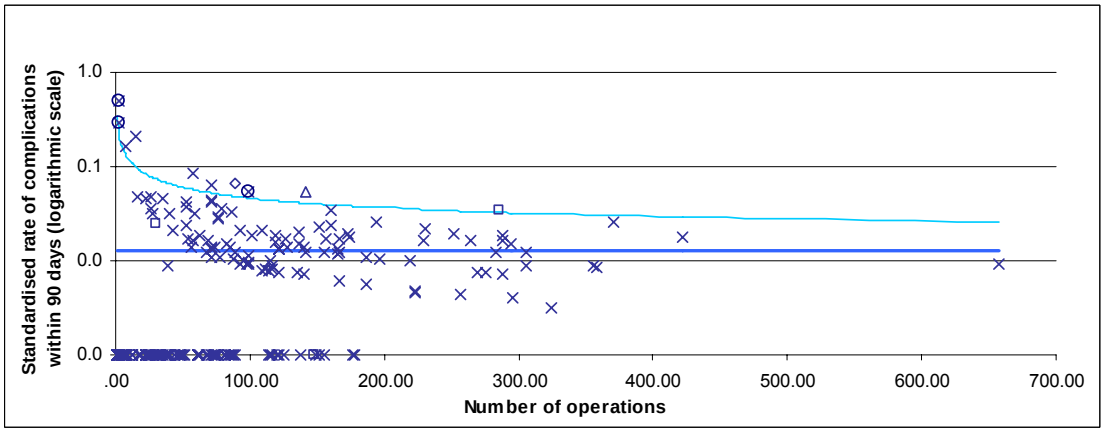


Figure 70: Observed and expected standardised rates of DVT/PE within 90 days

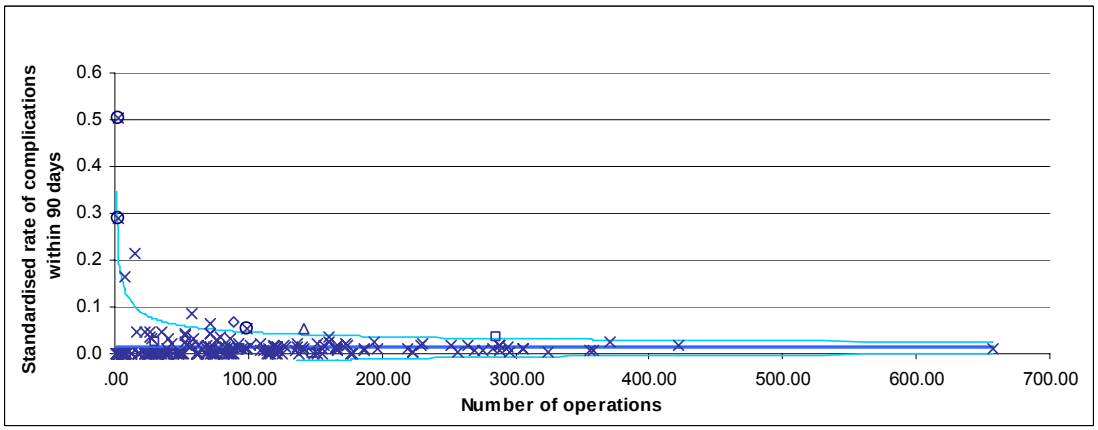
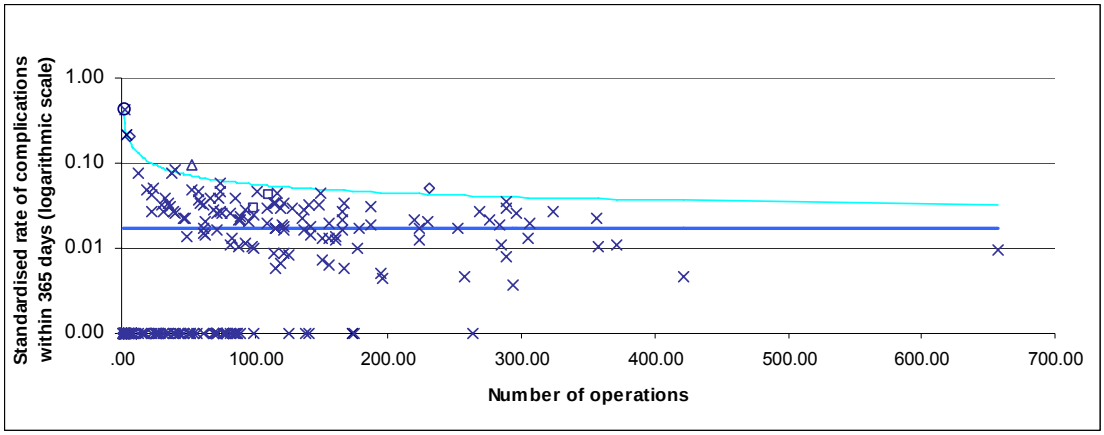


Figure 71: Observed and expected standardised rates of DVT/PE within 90 days (logarithmic scale)



13 Hip Resurfacing

For the last 7 years, a distinct OPCS operation code has been used to highlight hip resurfacing procedures (though we do not gather implant detail). Table 21 shows the number of patients in Scotland who have had a hip resurfacing operation. In 2007, there were 240 operations carried out in Scotland (resurfacings were 3.9% of THR's carried out; 10% in England NJR 4th Annual report www.njrcentre.org.uk). Each year the number of hip resurfacing procedures carried out in Scotland have increased for both males and females.

Table 21: Hip Resurfacing Patients by gender and calendar year of first procedure.

	pre 2002	2002	2003	2004	2005	2006	2007	Total
Male	17	35	71	81	111	150	161	626
Female	9	12	34	37	66	77	79	314
Total	26	47	105	118	177	227	240	940

Table 22 shows that the age distribution was also different with the proportion of under 55's much greater in Scotland in both sexes (the sex distribution being similar (67%:33% Male:Female). These differences may highlight a more conservative approach to resurfacing thus far in Scotland.

Table 22: Percentage patients by gender and calendar year of first procedure.

	pre 2002	2002	2003	2004	2005	2006	2007	Total
Male	65%	74%	68%	69%	63%	66%	67%	67%
Female	35%	26%	32%	31%	37%	34%	33%	33%

A survivalship curve (Figure 72) is included for comparison with other national registers. However, the difference in survival at 5 years for Scotland is not statistically significant (0.948 for resurfacing).

937 hip resurfacing patients were included in this study over a nine-year period between 1st January 1999 and 1st January 2008. 911 of these patients survived to the end point of the study.

Although this study looks at hip resurfacing over a nine-year period, many of the patients enter the study later in that time period. Therefore the mean follow up period for this analysis is 806.4 days (2.2 years), the shortest time any patient spent in the study was just 1 day and the longest was 3150 days (8.6 years).

Figure 72: Kaplan Meier Survival chart showing time to revision of hip resurfacing procedure.

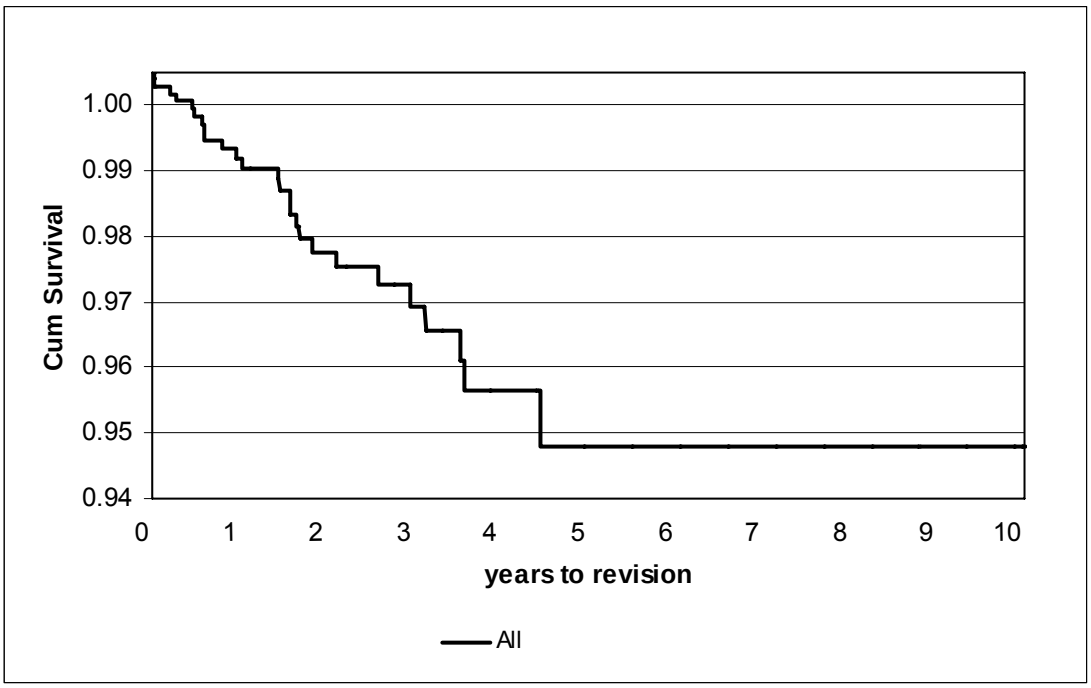


Table 23 shows the number of hip resurfacing procedures carried out per surgeon. Perhaps of most note are the high number of surgeons undertaking less than 5 of these highly technical procedures in the 7 years under review. Reassuringly, 78% of the resurfacings were undertaken by surgeons who have performed more than 20 during this period.

Table 23: Number of hip resurfacing procedures carried out per surgeon

	Surgeons	Total Operations	Number of Revisions	%
under 5	26	35	1	2.9%
5 - 9	3	23		
10 - 19	12	165	1	0.6%
20 - 29	7	167	6	3.6%
30 - 39	2	63	1	1.6%
40 - 49	3	134	7	5.2%
50 - 59				
60 - 69	1	60		
70+	3	354	1	0.3%

13.1 Resurfacing Revision Patients

There have been 940 patients who have undergone hip resurfacing procedures in Scotland since the first recorded episode in 1995 until 31st Dec 2007. Only 17 resurfacings have been revised to date, a rate of 1.8% (see Table 25). Because of the relatively small number it is difficult to derive any firm conclusions. However, an individual review of these cases is underway. The low numbers

of patients in the older age groups preclude producing a percentage breakdown by age of the revision rates. The revision burden overall of 1.8% thus far (1.6% for males 2.2% for females as noted in other registers) may partly explain the apparent reluctance to proceed with surface replacement in women. This should not be confused with the survivalship, which suggests that 5% have been revised by 5 years (see Figure 72 above).

Table 24: Patients who have undergone hip resurfacing revision procedures by age group and sex

	Under 55	55 to 64	65 to 74	75+	Total
Male	7	3	0	0	10
Female	4	2	0	1	7
Total	11	5	0	1	17

Table 25:Percentage of hip resurfacing patients in each age group

	Under 55	55 to 64	65 to 74	75+	Total
Male	1.8%	1.4%	0.0%	0.0%	1.6%
Female	1.8%	2.3%	0.0%	33.3%	2.2%
Total	1.8%	1.6%	0.0%	16.7%	1.8%

As well as being a procedure that is carried out predominantly on males it appears that the younger age groups are more likely to undergo hip resurfacing. Of the patients who have a hip resurfacing procedure the majority (64%) are under the age of 55, 33% are in the 55 to 64 age bracket and only 4% are 65 or over.

Table 26: Number of patients who have undergone hip resurfacing procedures

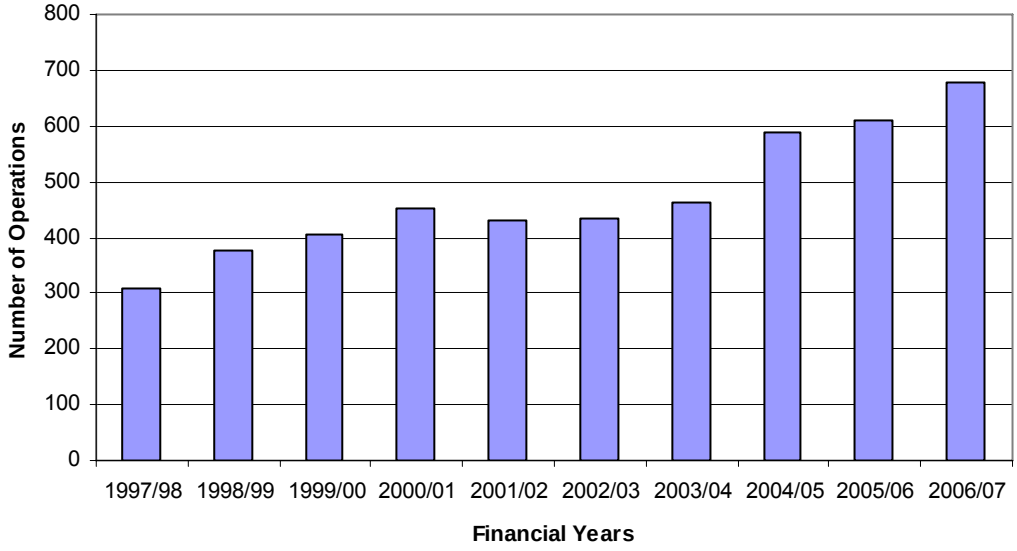
	Under 55	55 to 64	65 to 74	75+	Total
Male	381	220	22	3	626
Female	220	86	5	3	314
Total	601	306	27	6	940

14 Anterior Cruciate Ligament Reconstructions

The Anterior Cruciate Ligament (ACL) is one of four ligaments important to the stability of the knee joint. ACL injury is one of the most common injuries involving the knee joint. In most cases the ligament is injured during athletic activity. As sports have become an increasingly important part of day to day life over the last decade, the number of ACL injuries has increased.

As techniques for ACL repair have improved over the last few years, more and more ACL reconstructions have been done. The Scottish Arthroplasty Project therefore looked at ACL reconstructions done over the last ten years. Although the numbers have steadily increased, there has been a significant increase in the last three years. Figure 73 shows the in number of ACL Reconstructions over the past ten years.

Figure 73: Number of ACL reconstructions in Scotland



There is a large variation in the number of ACL reconstructions done in the different health regions (see Figure 74). Note that NHS Board configuration has been back mapped following the dissolution of Argyll & Clyde NHS Board.

Figure 74: Rates per 100,000 of population for NHS Board of Residence where patients have undergone an ACL reconstruction for 10 years ending March 2007

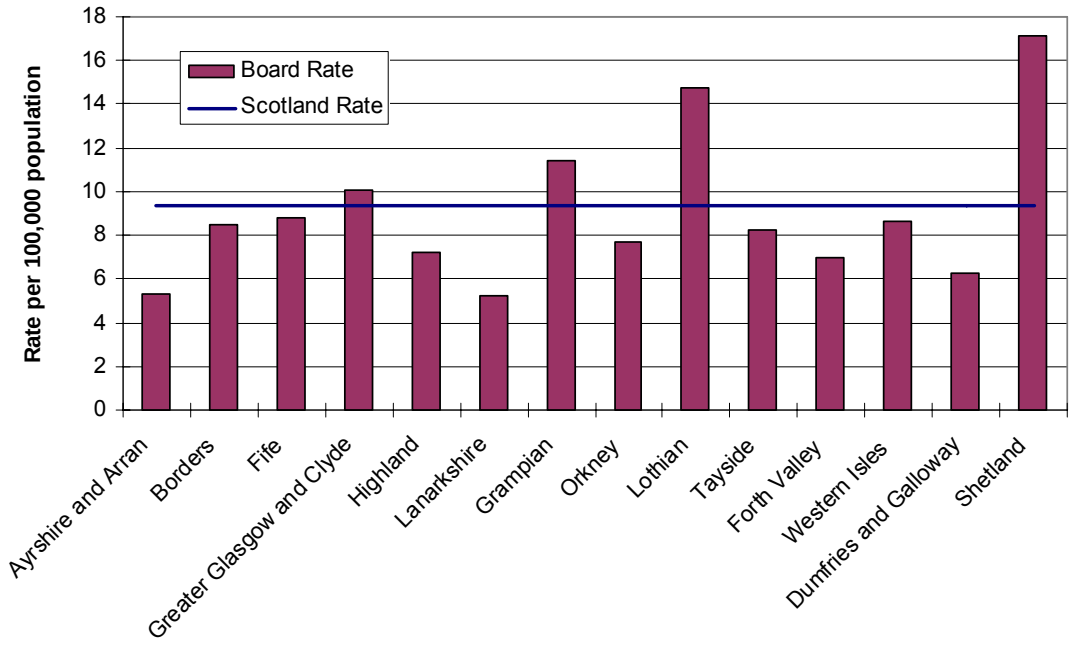


Table 27 below shows that a significant number of operations are done by surgeons performing less than 5 operations per year, with eight surgeons performing more than 20 operations.

Table 27: Number of Surgeons by annual volume of operations between April 1997 and March 2007

Number of Operations	Count
1 to 5	138
6 to 10	15
11 to 20	11
21 plus	8

Figure 75 below shows that ACL reconstructions are more common in males than females, and also men who are aged between 20 and 40.

Figure 75: Number of ACL reconstructions by age and sex for year ending March 2007

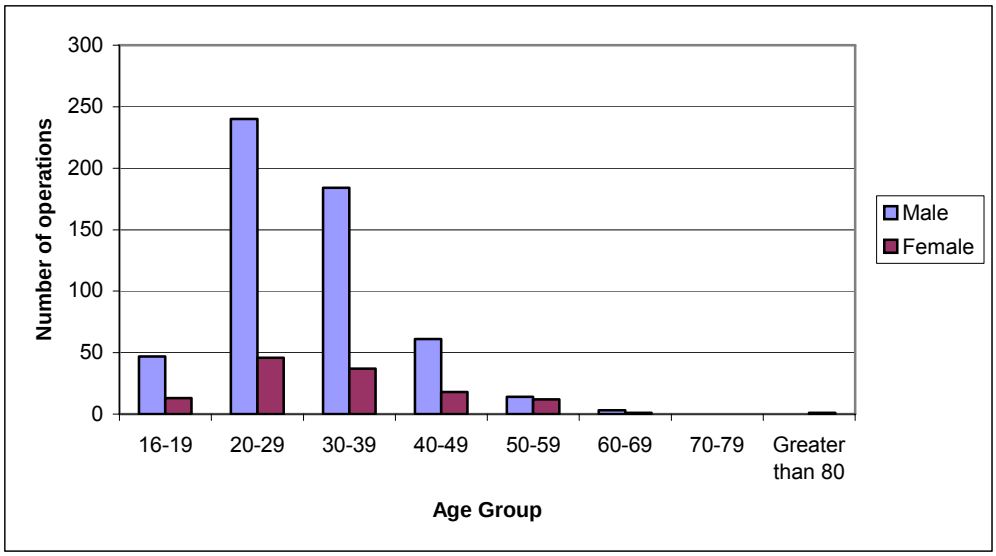


Figure 76 and Figure 77 show the split between the number of patients admitted as inpatients and daycases. From 2000/01 there has been a marked increase in the number of patients treated as daycases. For the last 3 years, just over 30% of ACL reconstructions have been performed as day cases compared to inpatients. Figure 78 shows the mean and median length of stay for inpatients. The median length of stay has reduced from three days in 1997/98 to one day in 2006/07.

Figure 76: Number of daycases and inpatients for financial years 1997/97 to 2006/07

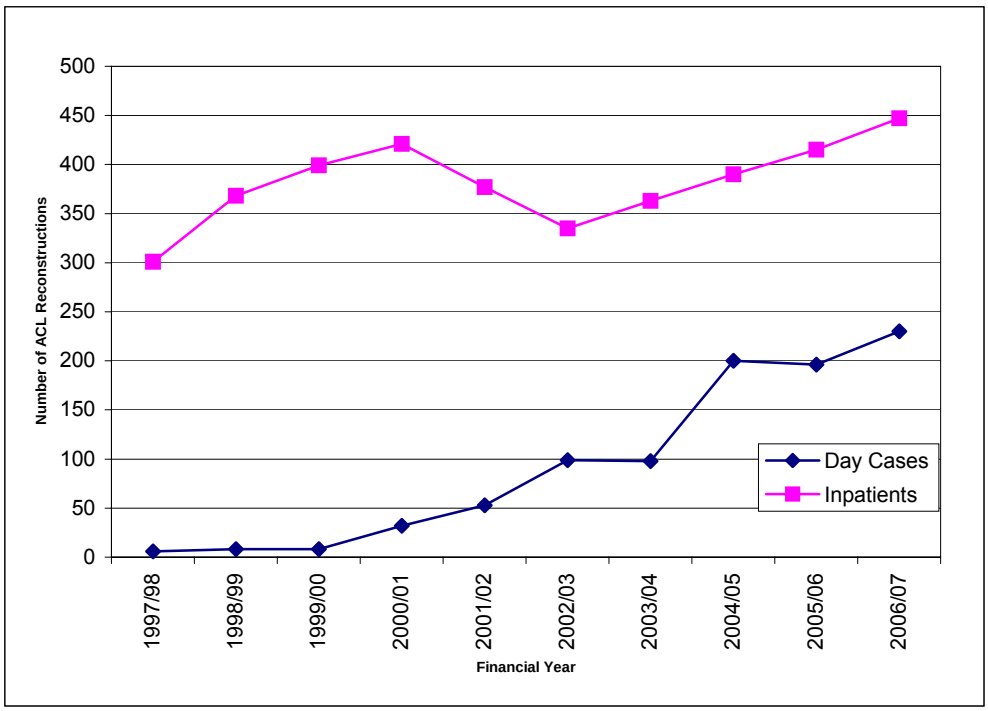


Figure 77: Percentage change of daycases and inpatients for financial years 1997/98 to 2006/07

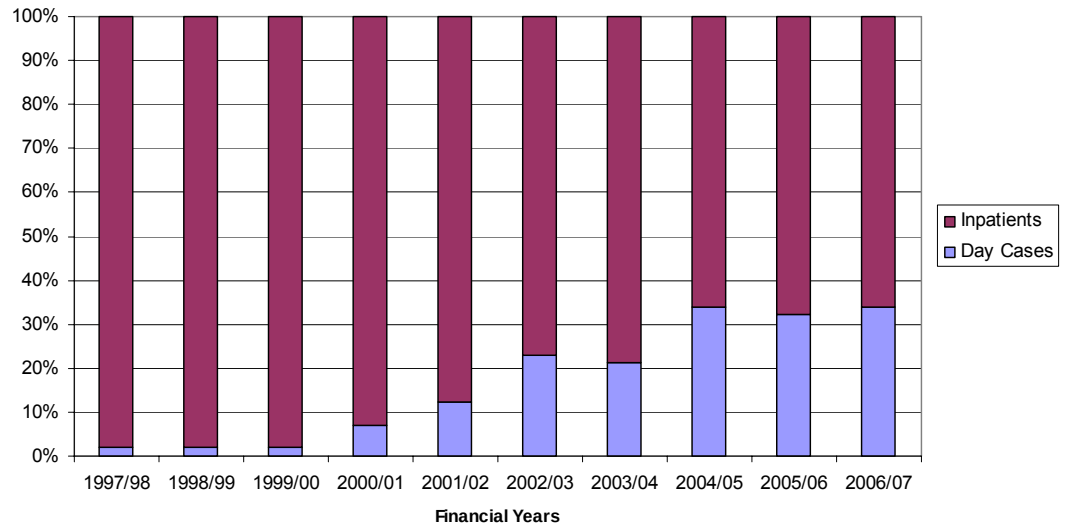


Figure 78: Average length of stay for inpatients undergoing an ACL reconstruction

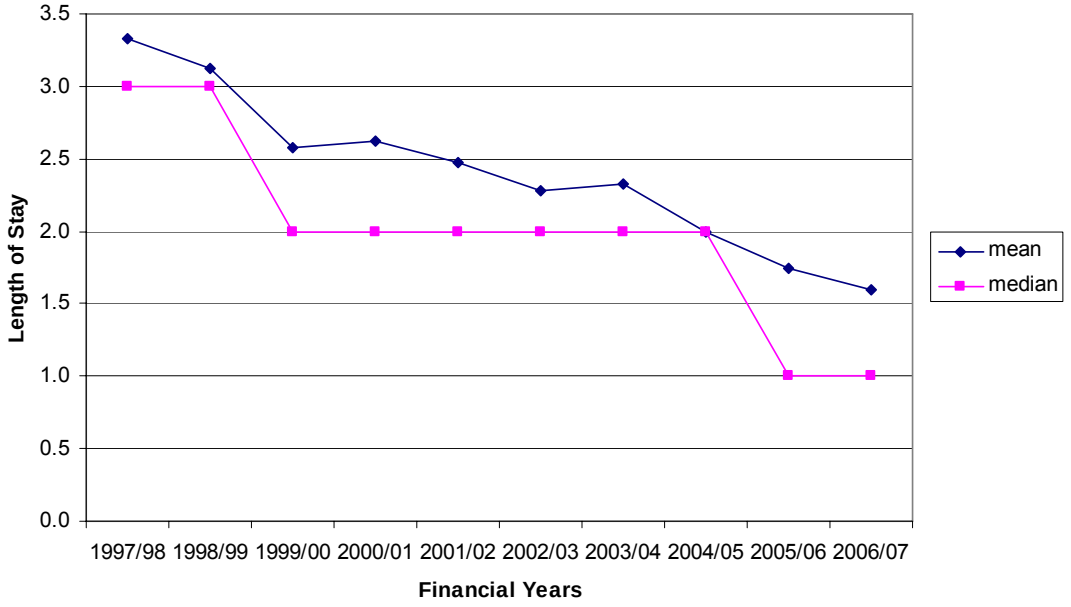
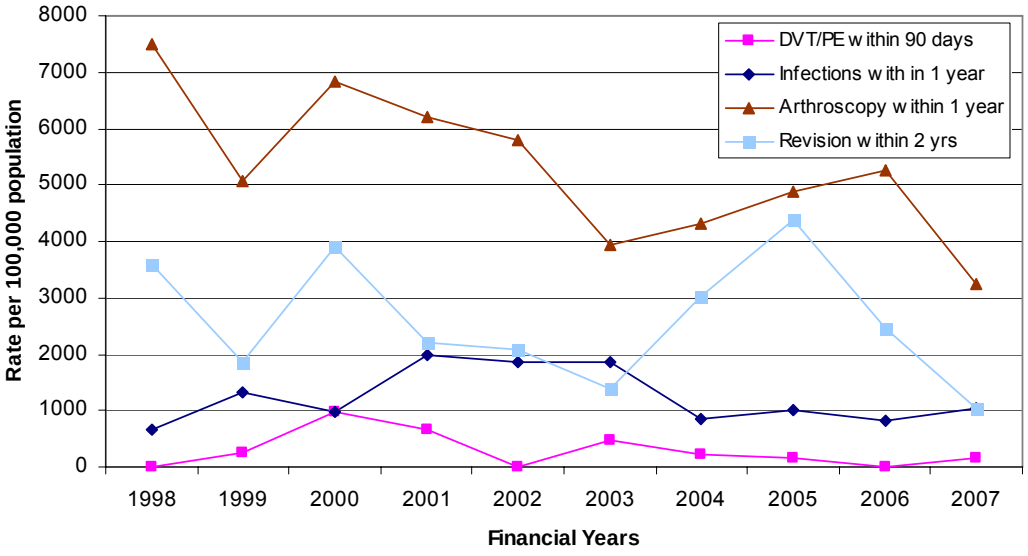


Figure 79 shows outcomes for patients after ACL reconstruction. 55.5% of patients have a repeat arthroscopy within 1 year of surgery and 2.5% have a repeat ACL reconstruction within 1 year.

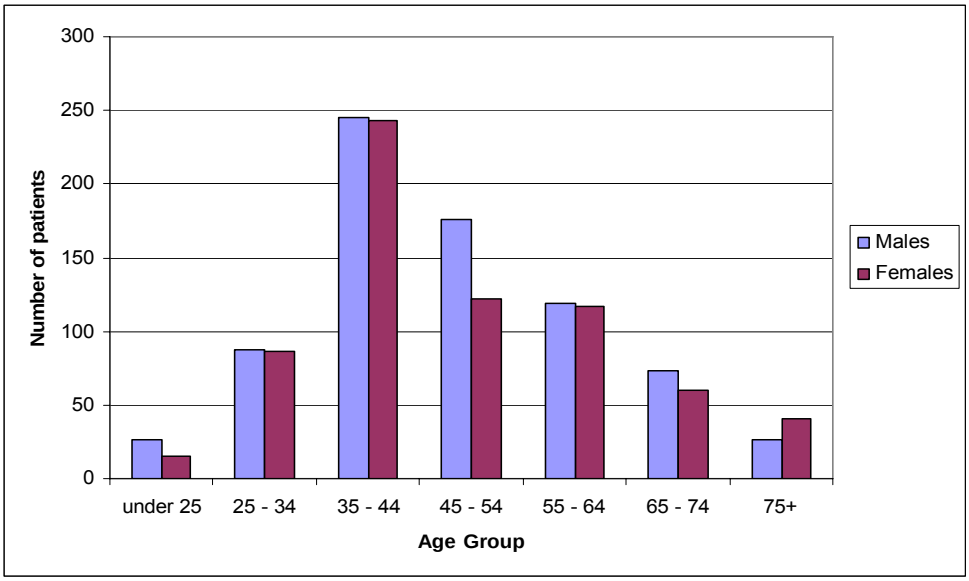
Figure 79: Outcomes after ACL reconstruction year ending March



15 Prolapsed Disc

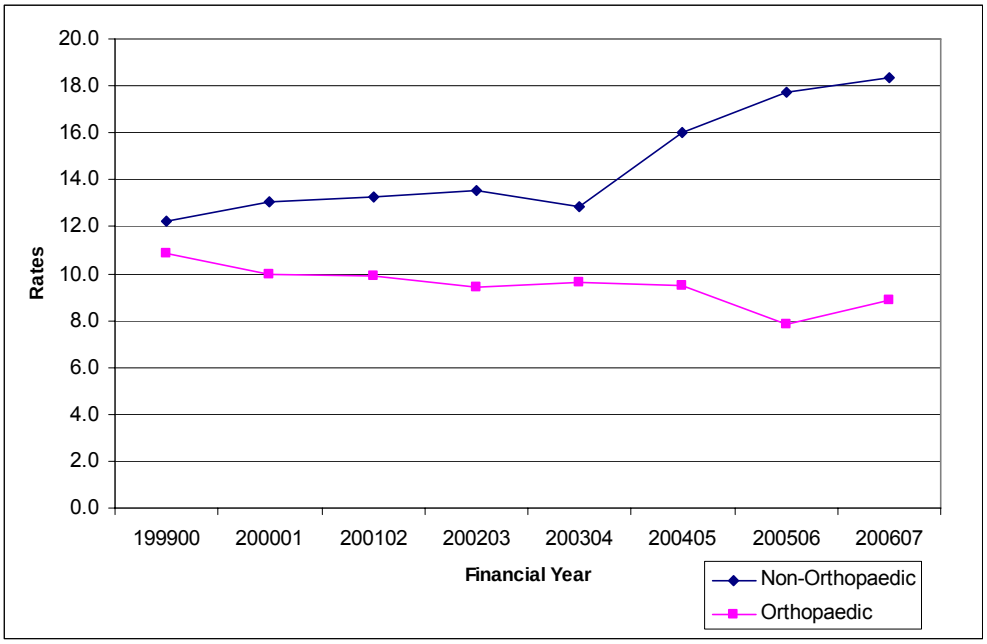
In Scotland, there were 1,429 admissions for lumber prolapsed disc problems in 2006/07. Figure 80 shows the number of patients admitted with a prolapsed disc split by age group and sex. The majority of admissions are for both males and females aged between 35-44.

Figure 80: Age and sex split of patients admitted with diagnosis of prolapsed disc (both Orthopaedic and Non Orthopaedic) 2006/07



Both Orthopaedic Consultants and non-Orthopaedic Consultants carry out operations on prolapsed disc. Figure 81 shows the rate per 100,000 population of these lumbar prolapsed disc admissions in Scotland for the financial years 1999/2000 to 2006/07. A recent trend since 2003/04 shows the rate of this surgery carried out by Orthopaedic Consultants is generally gradually declining, but has been increasing for non-Orthopaedic Consultants from 2004/05.

Figure 81: Rate of lumbar prolapsed disc admissions in Scotland who have a procedure recorded per 100,000 population



The number of operations (Figure 82) appears to follow the same trend as the rates chart. Figure 81, suggests that any change in population does not appear to have affected the rates. Instead, the trend is due to increasing numbers of prolapsed disc procedures being carried out by non-Orthopaedic Consultants and a comparatively lower number being carried out by Orthopaedic Consultants.

Figure 82: Number of lumbar prolapsed disc admissions who have a procedure recorded in Scotland per 100,000 Population

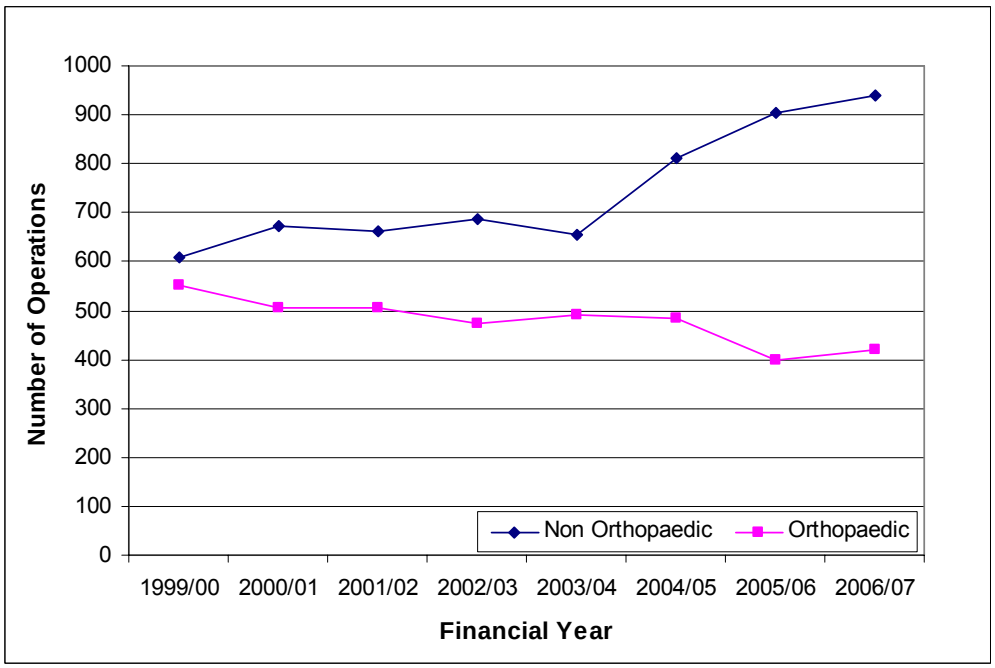


Figure 83 shows that a larger number of Orthopaedic Consultants carry out lumbar prolapsed disc operations, compared to the non-Orthopaedic Consultants. The majority of Orthopaedic Consultants (52 out of 59) carried out less than 20 prolapsed disc procedures in 2006/07, whereas of the majority of non-Orthopaedic Consultants (16 out of 20) have carried out more than 21 disc operations each in the same year.

Figure 83: Number of Consultants in each operation grouping, split into Orthopaedic and non-Orthopaedic Consultants

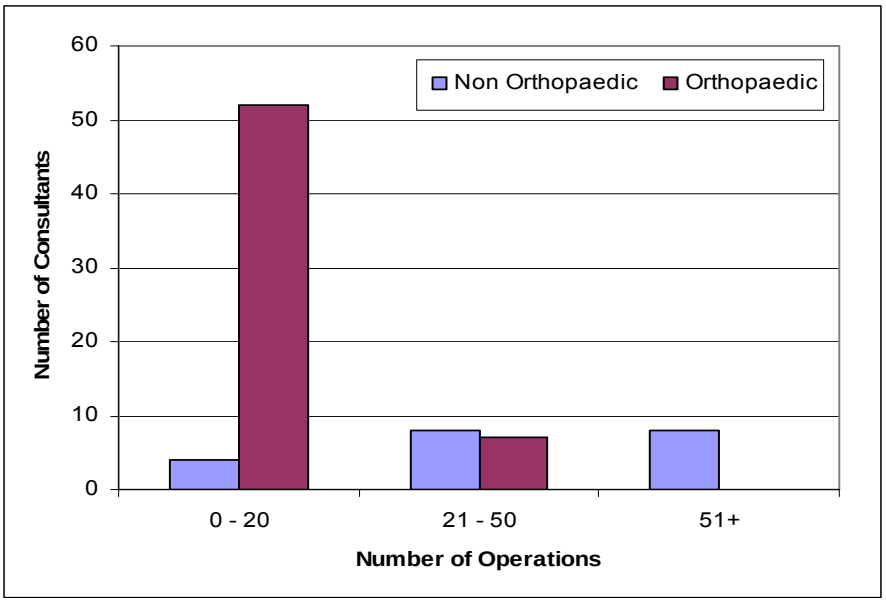


Figure 84 shows the proportion carried out the two groups of Consultants in Scotland for the past 8 financial years. The proportion of operations performed by an Orthopaedic Consultants has declined slightly over the years. It was more than 50% for all NHS Scotland in 1999/2000 but there has been approximately a 15% shift towards non-Orthopaedic Consultants in 2006/07 carrying out the procedure. This can also be seen in Figure 85.

Figure 84: Number of Consultants performing prolapsed disc operations in Scotland between 1999/00 and 2006/07

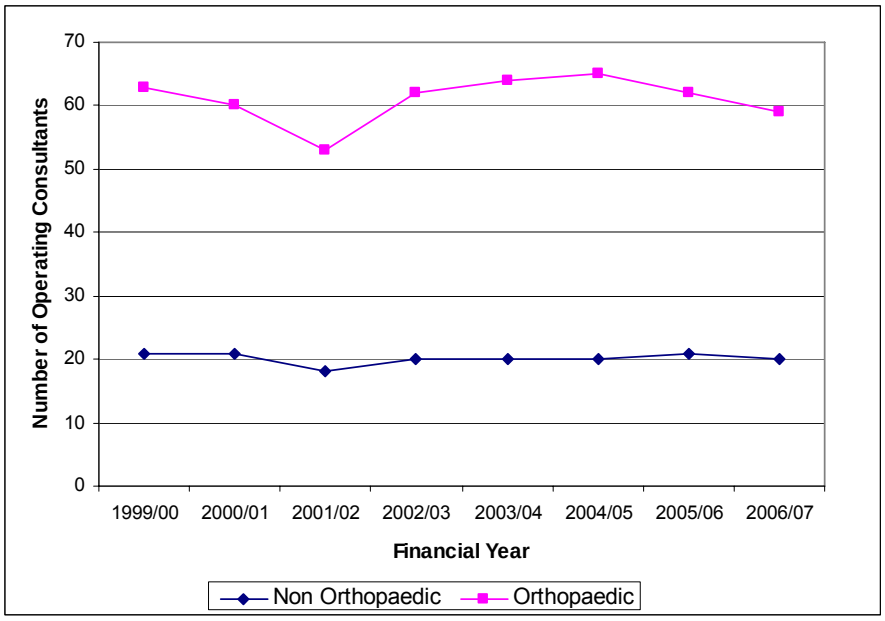


Figure 85: Percentage of lumbar prolapsed disc surgery performed by Non-Orthopaedic Consultant and Orthopaedic Consultant

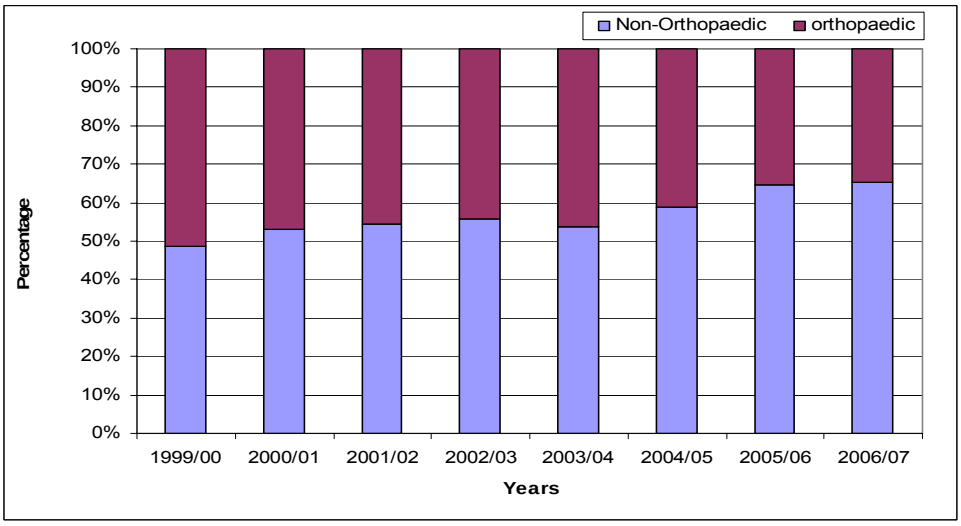
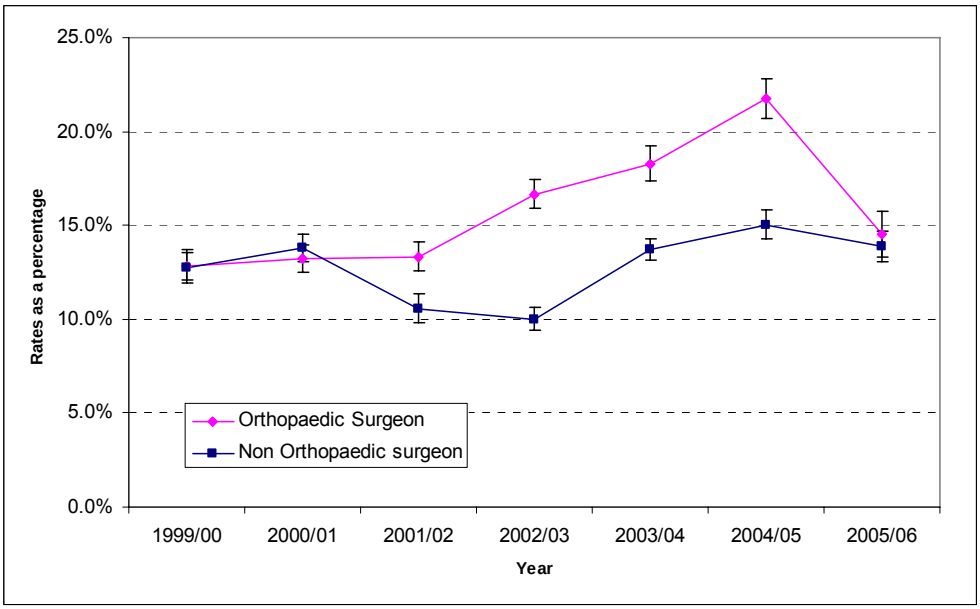


Figure 86 shows the rate at which patients who underwent prolapsed disc surgery are readmitted for back complaints within 365 days, split by Orthopaedic and non-Orthopaedic Consultants that performed the procedure. The readmission rate for Orthopaedic Consultants has been higher than that for non-Orthopaedic Consultants since 2001/02, however this dropped to a level more in line with the non-Orthopaedic Consultants in 2005/06.

Figure 86: Rates of readmission for back complaints since April 1999 of patients whose surgery was originally performed by Orthopaedic or non-Orthopaedic Consultants (with 95% confidence intervals)



16 Shoulder and Elbow Arthroplasties

Figure 87 to Figure 90 show the numbers of elective and emergency joint replacement operations, (both primary and revision for shoulder and elbow) recorded as performed in NHS Scotland in each of the last 15 years (1992 to 2007). All numbers are displayed by year ending March. The number of primary shoulder arthroplasties has risen steadily from 1991/92 to 2006/07 (130 to 331). There was also an increase in the volume of revision shoulder arthroplasties carried out between 1992 and 2007 (2 to 12).

The volume of primary elbow arthroplasties has remained fairly stable with 75 procedures in 2006. The number of revision elbow replacements has also remained fairly stable with eight in 2006. Most elbow arthroplasties are performed for rheumatoid arthritis. The revision burden for elbow arthroplasty is higher than for shoulders at 9.6%.

Figure 87: Primary elbow replacements by year ending March

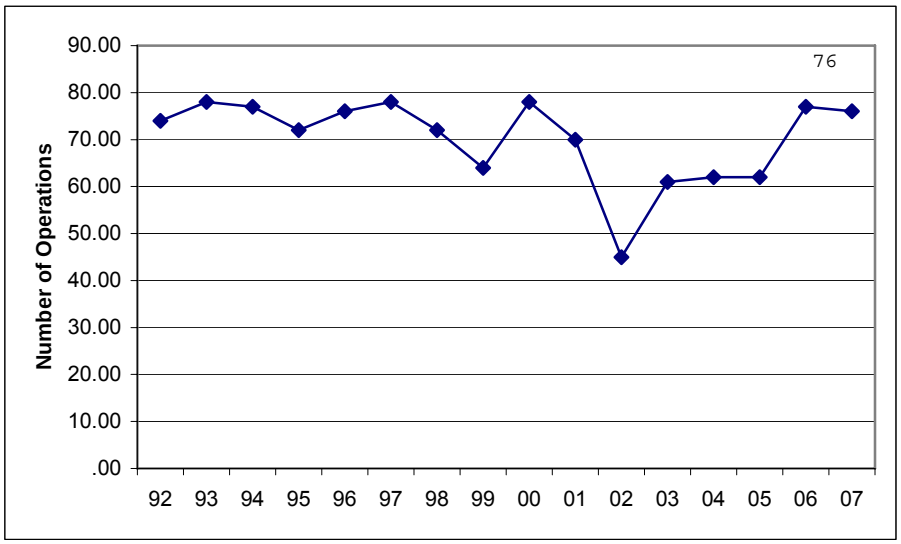


Figure 88: Revision elbow replacements by year ending March

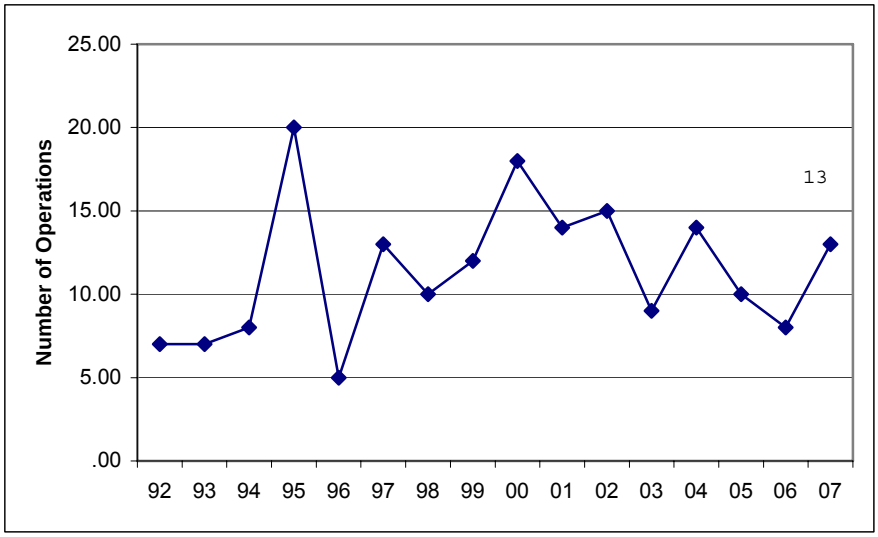


Figure 89: Primary shoulder replacements by year ending March

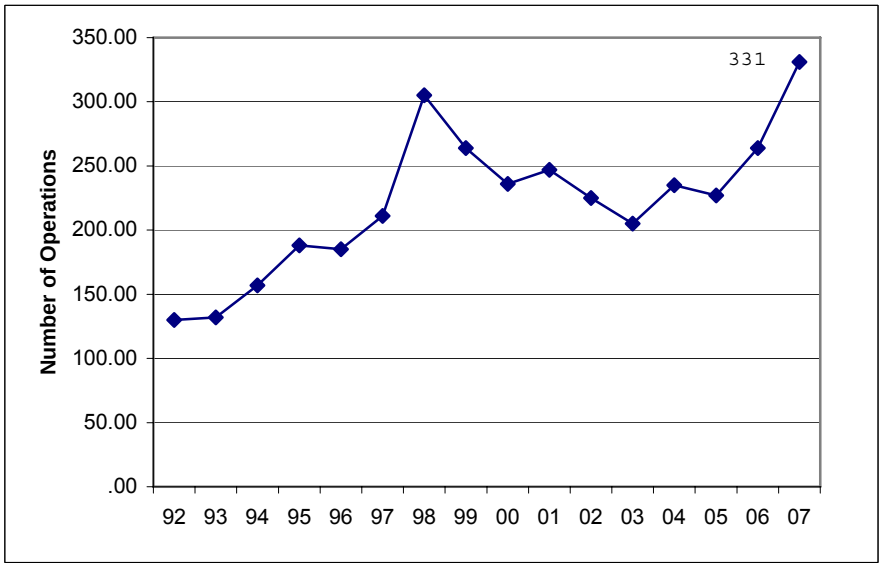
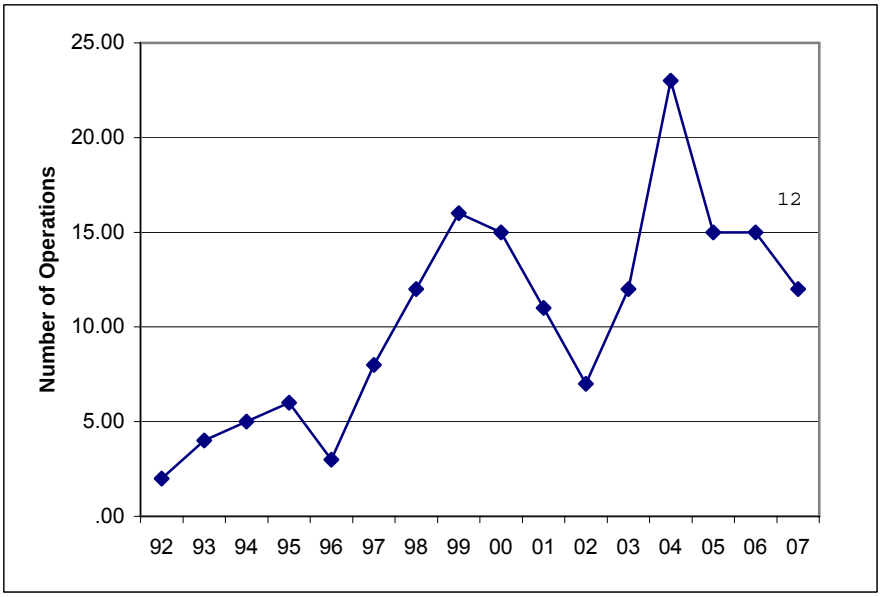


Figure 90: Revision shoulder replacements by year ending March



16.1 Elbow arthroplasty in more detail

The development of total elbow arthroplasty (TEA) has received less interest than arthroplasty for hip and knee joints. The indications for TEA are less numerous, there is a paucity of literature, and training in the techniques of elbow arthroplasty is sporadic. As a result, few Orthopaedic surgeons undertake this procedure. The most common indication is inflammatory arthropathy, in particular rheumatoid arthritis, but other indications include acute trauma and post-traumatic arthropathy. The Souter-Strathclyde (Stryker Howmedica Osteonics, Allendale, New Jersey)[1] and the Coonrad-Morrey (Zimmer Inc.)[2] elbow prostheses are the most frequently used implants in Scotland, although other designs are available with acceptable long-term follow-up data (Kudo, Biomet[3]; GSBIII, Allo Pro Ag[4]). New designs have recently come on to the market (Discovery, Biomet), the outcomes of which should become clear with time.

16.1.1 Demographics and Sociology – Primary TEA

During the 15 years from 1st January 1991 to 31st December 2006, 1036 primary TEA procedures were performed in Scottish hospitals. The average rate of approximately 65 procedures per annum fluctuated little over this period. In 828 of the 1036 (80%) procedures, the primary diagnosis was recorded as inflammatory arthroplasty (Figure 92 shows the percentage of principle diagnosis for elbow arthroplasty patients). The other major indications were osteoarthritis (post-traumatic or idiopathic) (93 procedures (9%)) and acute trauma (65 procedures (6%)). In 50 patients (5%) the procedure was performed for assorted other indications or the diagnostic coding was not accurate enough to assign a diagnosis. Since 1999, the number of procedures performed for inflammatory arthroplasty has fallen, possibly as a result of improvements in medical management of this disease. This has occurred at the same time that the number of TEA procedures for osteoarthritis

and acute trauma has increased. The mean age of patients at the time of surgery was 62 years with a range from 18 to 94 years. 932 procedures (90%) were performed on patients between the age of 40 and 79 years. Three-quarters of the individuals undergoing TEA were female (762 of 1036). 80 of the procedures (18%) were performed during an emergency rather than a planned admission. Of these, 64 (80%) were done for acute trauma and 14 (18%) were performed on patients with a primary diagnosis of inflammatory arthroplasty.

Figure 91: Number of total elbow replacements performed per year in Scotland from calendar year 1991 to 2006.

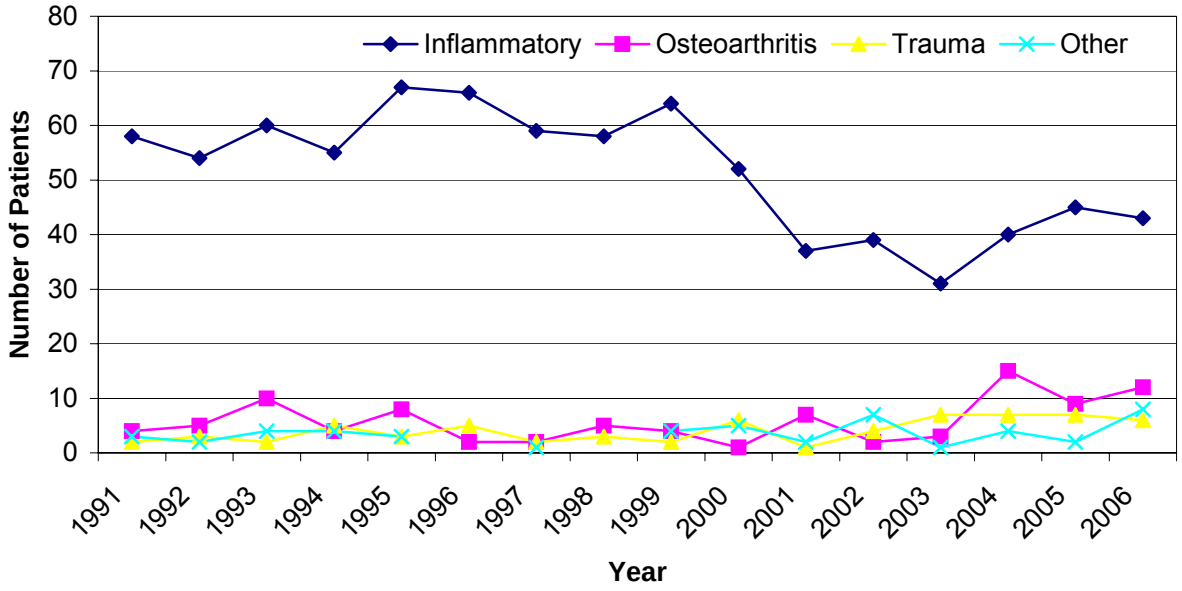


Figure 92: Principle diagnosis of patients undergoing total elbow arthroplasty

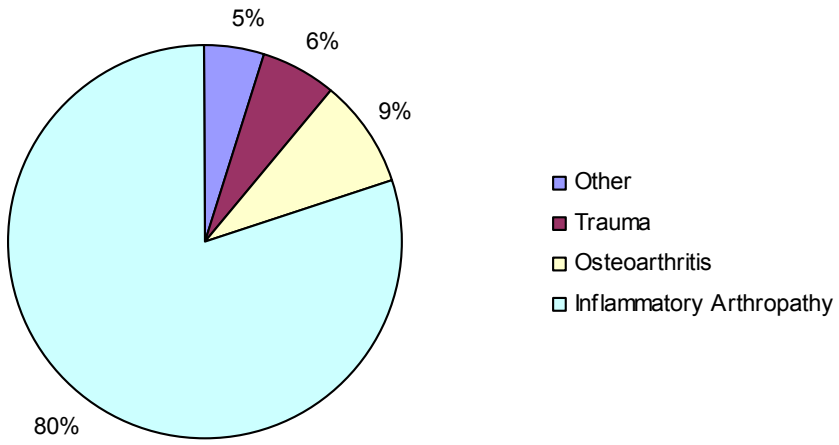
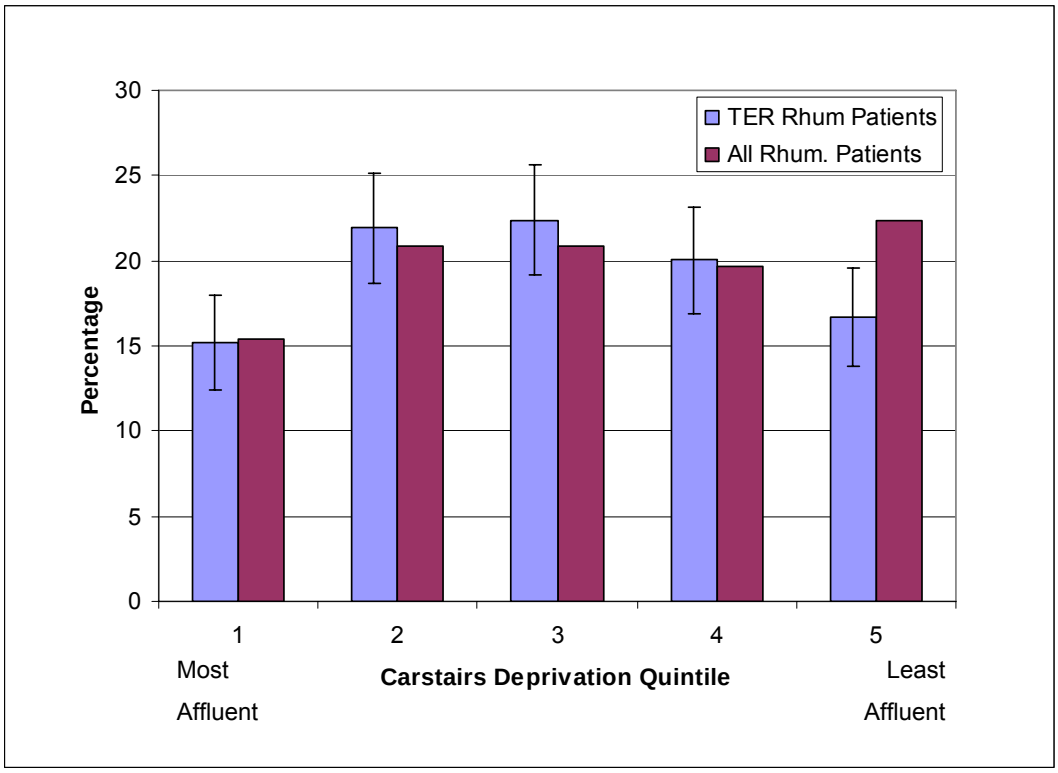


Figure 93 below shows the Carstairs Deprivation Quintiles for all patients in Scotland diagnosed with inflammatory arthritis compared with patients who have been diagnosed with this disease, but have also received a TEA. When comparing the difference in the proportion of patients who have received a TER in the least affluent group (5) to the people in Scotland who have this disease within same group, this difference is greater than in the other deprivation quintiles. This suggests that patients who live in the least affluent areas in Scotland are having fewer TERs than patients who live in more affluent areas.

Figure 93: Carstairs deprivation for people diagnosed with inflammatory arthritis compared with TER patients diagnosed with inflammatory arthritis, for calendar years 1991 to 2006



16.1.2 Complications

Within 90 days of surgery, the rate of venous thromboembolism (deep vein thrombosis or pulmonary embolism) was 0.2%, the death rate was 0.4%, (Table 28:). Peri-prosthetic fracture occurred within 365 days in 2.7% of patients. The rate of infection within 365 days of primary TEA was 3.1%. After one year the rate of revision for infection was at approximately 1% per annum. These complication rates are comparable to previously published series[5,6,7].

Table 28: Percentage of complications split by volume

Average Annual volume	Infection within 365 days (%)	Periprosthetic # within 365 days (%)	DVT/PE within 90 days (%)	Death within 90 days (%)
1 to 4	3.6	3.9	-	-
5 to 9	3.5	3.4	0.3	0.5
10 or more	2.3	2.1	0.3	0.5
Total	3.1	2.7	0.2	0.4

16.1.3 Outcome

For implant survival analysis, only those 744 patients undergoing primary TEA in the 11 years between 1991 and 2001, were included to ensure a minimum 5 year follow up. The demographic for this group was not statistically different from that described above. The overall five-year survival, with failure defined as revision of the implant, was 93.4% with a survival to ten years of 84.1% which is comparable to previously published series[2,8]. This does not include patients who had the implant removed without re-implantation. It also does not include those with implant loosening or dislocation without revision. The 24 patients whose implants were inserted for acute trauma had a lower five-year implant survival (81%), but with the low numbers involved this did not reach statistical significance. Other demographic factors such as age and gender did not appear to influence implant survival. The number of revision elbow arthroplasty procedures performed annually in Scotland has remained constant at an average of 11 procedures per annum.

16.1.4 Surgeon Volume

The only factor identified that had a significant impact on survival of the implant was the annual rate of the operating surgeon. Those prostheses implanted by surgeons performing less than five procedures per annum have a significantly lower five-year survival than those implanted by surgeons performing more than ten TEA procedures on average annually. The rate of significant complications such as infection and peri-prosthetic fracture was also greater in the group of patients whose operation was performed by a surgeon performing less than five procedures per year. The 1036 procedures reported here were carried out by forty-eight surgeons. Two surgeons performed more than ten TEA on average per year. Twenty-four (50%) surgeons performed less than five during the period of the study.

17 Additional National Trends in Numbers of Operations

17.1 Number of Arthroplasty Procedures Performed per Surgeon

Figure 94 and Figure 95 show the number of hip and knee replacements (primary and revision) recorded, as performed by each consultant surgeon operating in NHS Scotland. Each consultant and hospital has a unique work pattern and arthroplasty represents only a small part of that workload. These figures should therefore not be seen as total workload figures. It should also be noted that consultants commencing or retiring from their post during the year may well appear to be performing low volumes of procedures if they were not working for the whole year.

In previous years the number of operations have been grouped into categories of 5 operations up to a total of 54 operations, e.g. 0-4, 5-9. These categories then changed depending on whether they related to hip or knee arthroplasty operations. Primary hip replacements continued being grouped into categories of 5 operations with the exception of the last category which was 80-120. However, the remainder of the primary knee replacements were grouped into the following categories 55-64, 65-74, 75-105.

This year the categories have been altered in order to provide more useful information and are the same for both primary hip and knee operations. The new categories are 0-20, 21-50 and 51+.

A total number of 193 consultant surgeons are recorded as having performed primary hip replacements in 2007 in NHS Scotland. There were 84 consultant surgeons who performed less than 21 primary hip replacements. There were 178 consultant surgeons who performed primary knee replacements in 2007.

Previous reports (Scottish Arthroplasty Project 2003) have highlighted that performing low volumes of procedures can result in higher rates of deep vein thrombosis (DVT), infected prosthesis and dislocation of prosthesis, but not in higher rates of revision surgery.

In an attempt to make the data more understandable (and to observe change) annualised figures for the percentage of arthroplasty surgery carried out by surgeons performing less than a specific number of procedures have been reported in the Operations Performed by Surgeons Carrying Out Small Volumes of Procedures section on page 70. This provides another perspective on surgery being carried out by surgeons performing low numbers. However, both this analysis and the charts following are confounded by the turnover of consultant surgeons and locums noted above.

Figure 94: Primary hip replacements for year ending March 2007

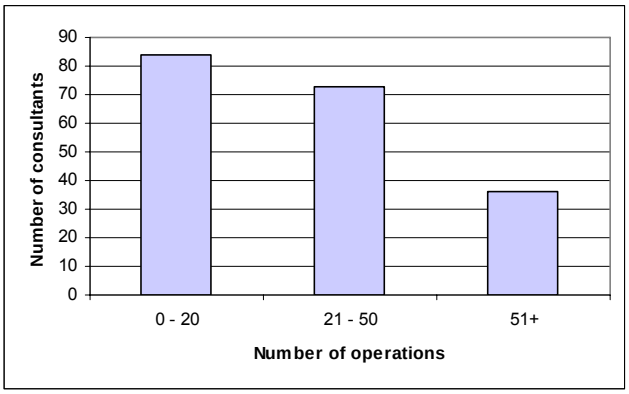
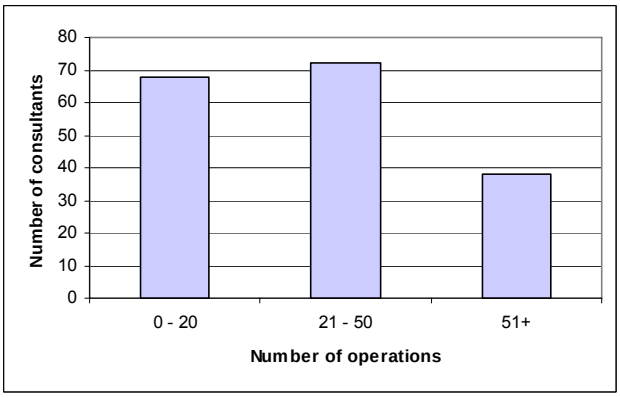


Figure 95: Primary knee replacements for year ending March 2007



17.2 Operations Performed by Surgeons Carrying Out Small Volumes of Procedures

Figure 96 and Figure 97 represent the number of primary and revision operations carried out by a surgeon doing less than a specified number of operations. This year the limits are 20 and under for primary hip and knee replacements, 10 and under for revision hip replacements and 5 and under for revision knee replacements. All numbers are displayed by financial year ending 31st March.

Figure 96: % of hip replacements by surgeons carrying out small volumes of procedures per year

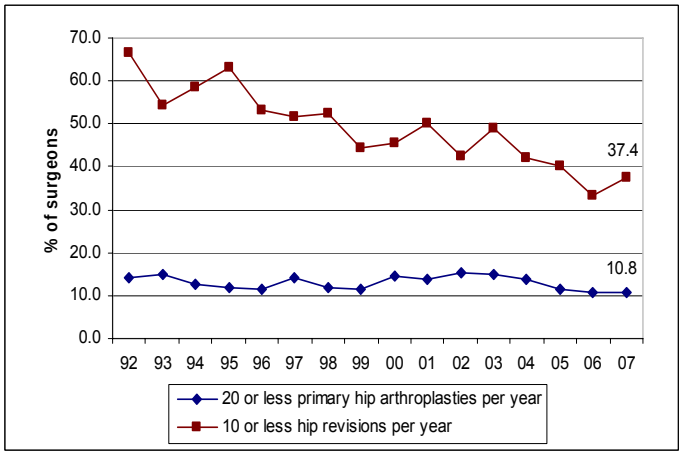
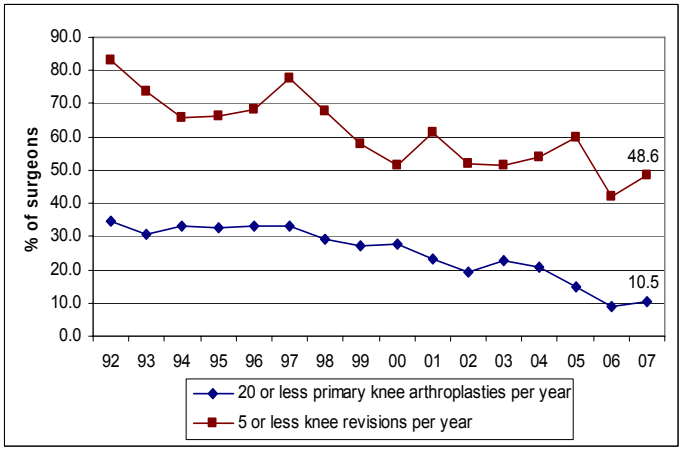


Figure 97: % of knee replacements by surgeons carrying out small volumes of procedures



17.3 Additional National Trends in Numbers of Operations

Figure 98 to Figure 104 show the numbers of finger, wrist,, thumb, toe and ankle arthroplasties (primary or revision). All numbers are displayed by financial year ending 31st March.

The number of elective and emergency joint replacement operations (for both primary and revision for hip and knee) can be seen in the National Trends in Numbers of Operations section on page 12 and corresponding information for shoulders and elbows is in the Shoulder and Elbow Arthroplasties section on page 63.

Figure 98 shows that the number of primary finger arthroplasties has remained relatively stable at between 40 and 60 procedures from 1991/92 – 2006/07. Since 1991/92, there has also been little change in the number of finger revisions with only 8 recorded in 2006/07 (see Figure 99.)

There has been an increase in the number of primary wrist arthroplasties performed from 10 operations in 1991/92 to 27 operations in 1995/96. Between 1999/00 and 2003/04, the volume of wrist arthroplasties has remained static at around 10 operations per year. However, there has been a decrease from 23 operations in 2005/06 to 15 operations in 2006/07 (see Figure 100). The number of wrist revisions has remained relatively low over the time period (see Figure 101).

The number of thumb arthroplasties carried out each year increased from 6 to 52 operations between 1991/92 and 2006/07 (see Figure 102).

The number of toe arthroplasties has slowly decreased over time. There were 46 toe procedures recorded in 1991/92, however 38 were recorded in 2006/07 (see Figure 103).

From 1991/92 to 1997/98 the number of ankle arthroplasties remained relatively constant with only 1 or 2 occurring. Since 1997/98, however, there has been a steady increase in the number of ankle arthroplasties carried out. The number of procedures has risen from 1 in 1997/98 to 43 in 2006/07 (see Figure 104).

Figure 98: Primary Finger Arthroplasties by year ending March

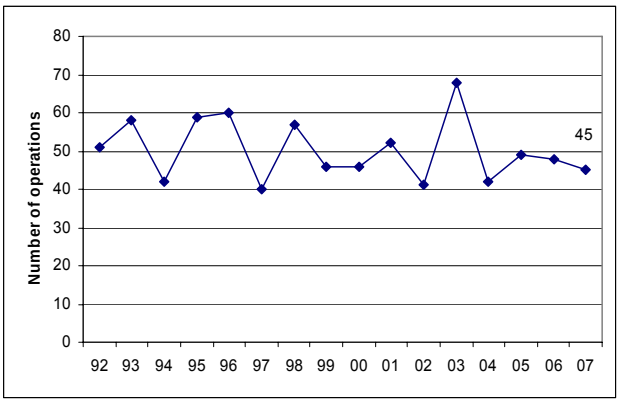


Figure 99: Revision Finger Arthroplasties by year ending March

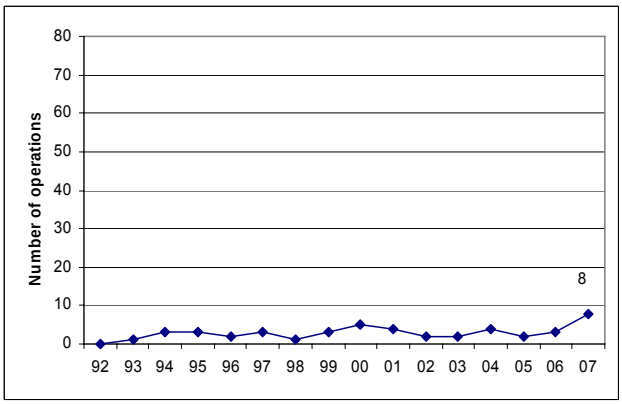


Figure 100: Primary Wrist Arthroplasties by year ending March

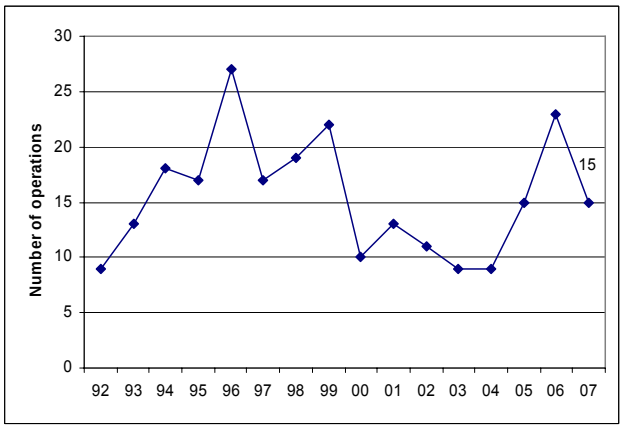


Figure 101: Revision Wrist Arthroplasties by year ending March

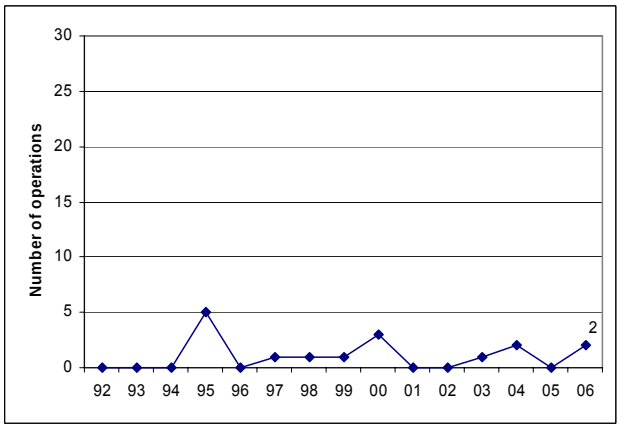


Figure 102: Thumb Arthroplasties by year ending March

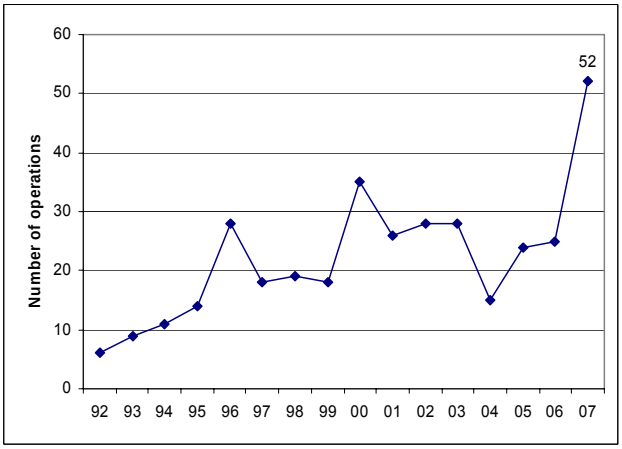


Figure 103: Toe Arthroplasties by year ending March

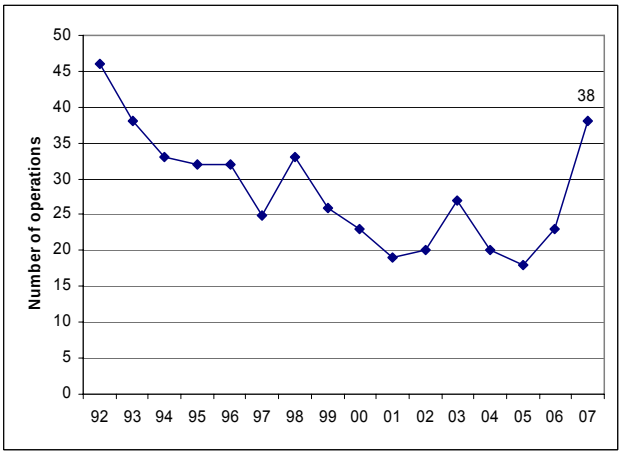
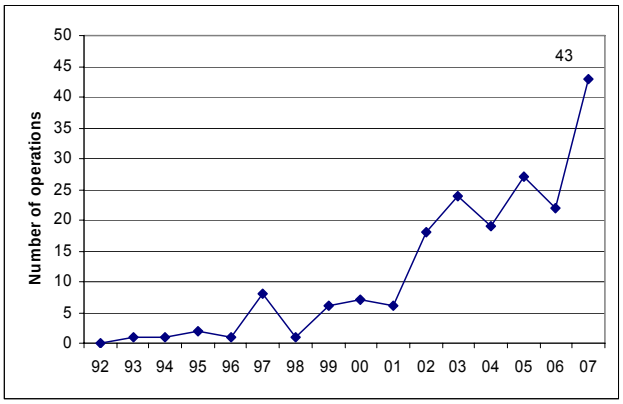


Figure 104: Ankle Arthroplasties by year ending March



18 Kaplan-Meier Survival of Hip and Knee Replacements

It is possible to use the routine SMR01 data to graphically illustrate the survival of both hip and knee joint replacements. The type of survival analysis used in this section is known as Kaplan-Meier survival analysis. The graphs are constructed by selecting a particular group of patients, following them over a set period of time and monitoring if and when they have their joint revised.

At day 0, no patients have had their joint revised and hence the survival is always 1. When a patient has a joint revised, the survival rate drops. In this case, a higher survival rate is better.

Figure 105 for example, shows that patients aged over 75, who have had a hip replacement will on average find that there is a longer time before they need their joint revised than a patient aged less than 55 years.

For the analyses, we used the Log-rank test to see if there was a difference in survival between the groups of patients (Bland et al 2004). This test has showed that age (hip and knee) and diagnosis (hip only) are significant (p-value variable < 0.05) when predicting the survival time of the implant.

18.1 Hip Arthroplasty

Table 29: Revision of Primary Hip replacements for operations performed between April 1997 – March 2007

Grouping	Total Primary hip Replacements	Surviving to end point/dying before end point	Log-rank Statistic	p-value
Age of patient			61.8002	<0.001
<55 years	3939	3758		
55 – 75 years	22688	22010		
>75 years	11185	10953		
Volume of procedures performed by surgeons			0.5429	0.4612
0-20 hips per year	11517	11197		
21+ hips per year	26295	25524		
Diagnosis			8.117	<0.005
Osteoarthritis	31531	30676		
Rheumatoid arthritis	1055	1008		

Figure 105: Revision after Primary Hip Replacement; April 1997 - March 2007

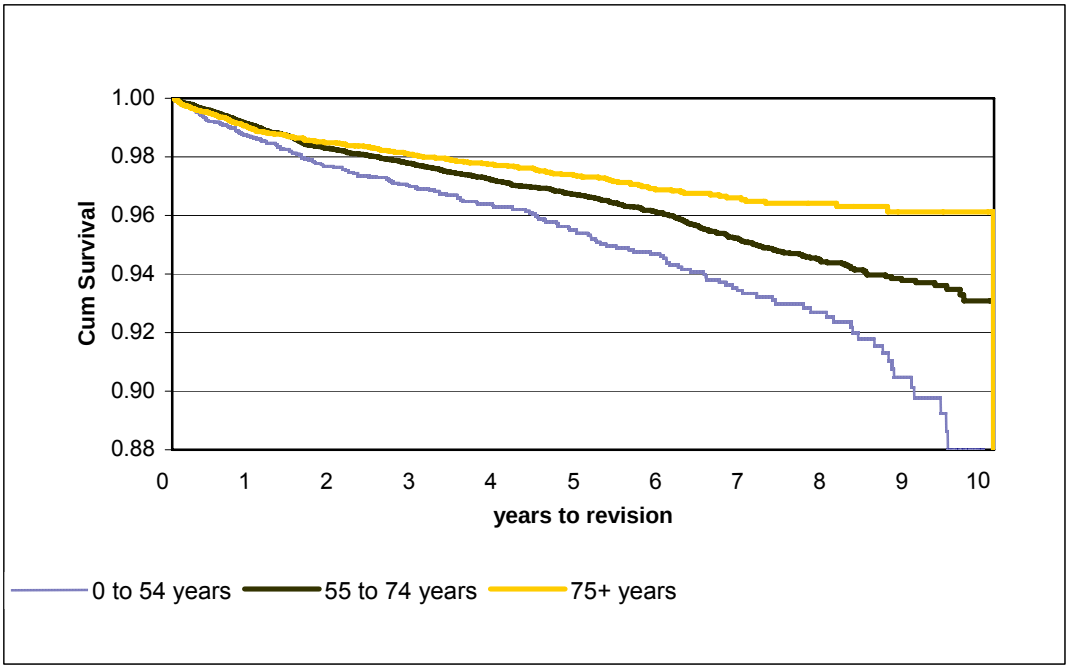


Figure 106: Revision after Primary Hip Replacement; April 1997 - March 2007

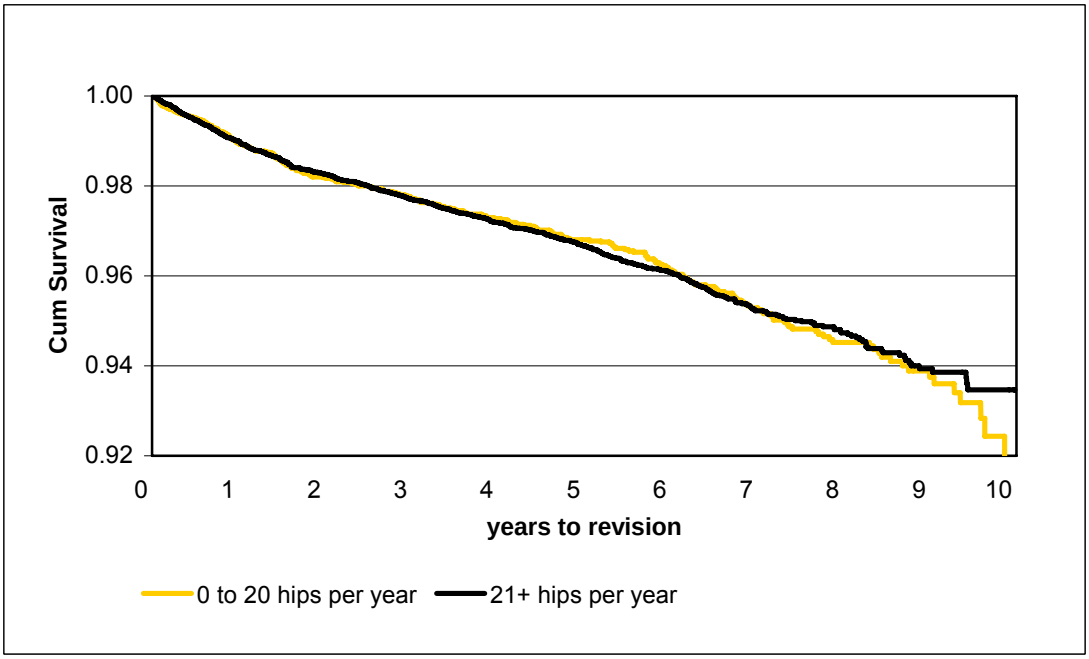
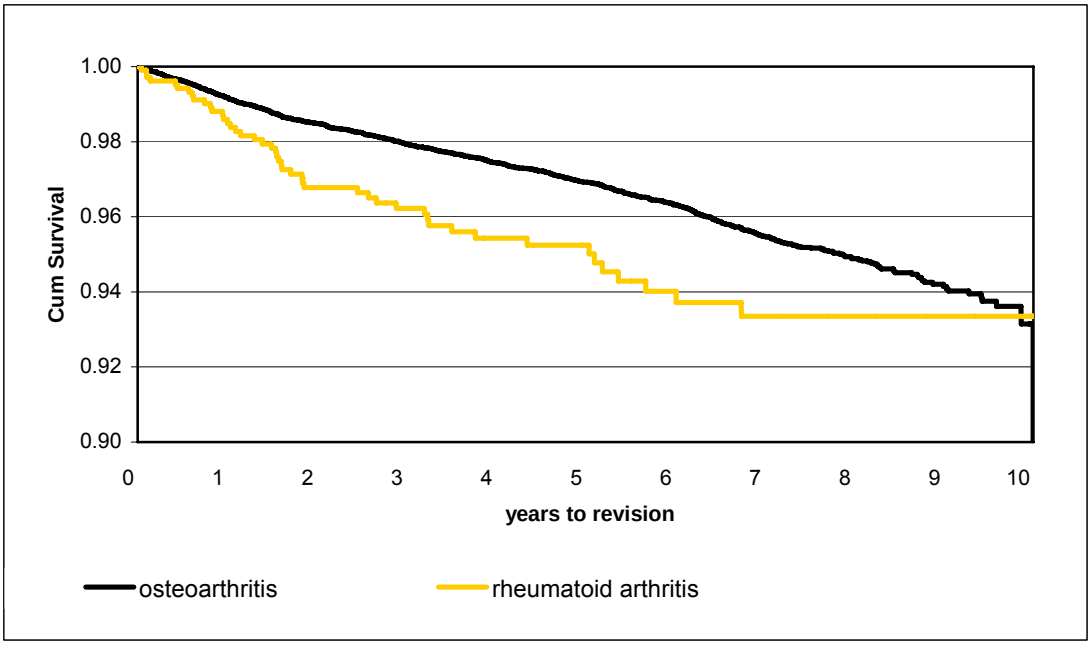


Figure 107: Revision after Primary Hip Replacement; April 1997 - March 2007



18.2 Knee Arthroplasty

Table 30: Revision of Primary Knee replacements for operations performed between April 1997 – March 2007

Grouping	Total Primary hip Replacements	Surviving to end point/dying before end point	Log-rank Statistic	p-value
Age of patient			72.574	<0.001
<55 years	1552	1469		
55 – 75 years	17503	16906		
>75 years	8809	8659		
Volume of procedures performed by surgeons			0.044	0.834
0-20 hips per year	4597	4466		
21+ hips per year	23267	22568		
Diagnosis			0.616	0.432
Osteoarthritis	24900	24171		
Rheumatoid arthritis	1481	1435		

Figure 108: Revision after Primary Knee Replacement; April 1997 - March 2007

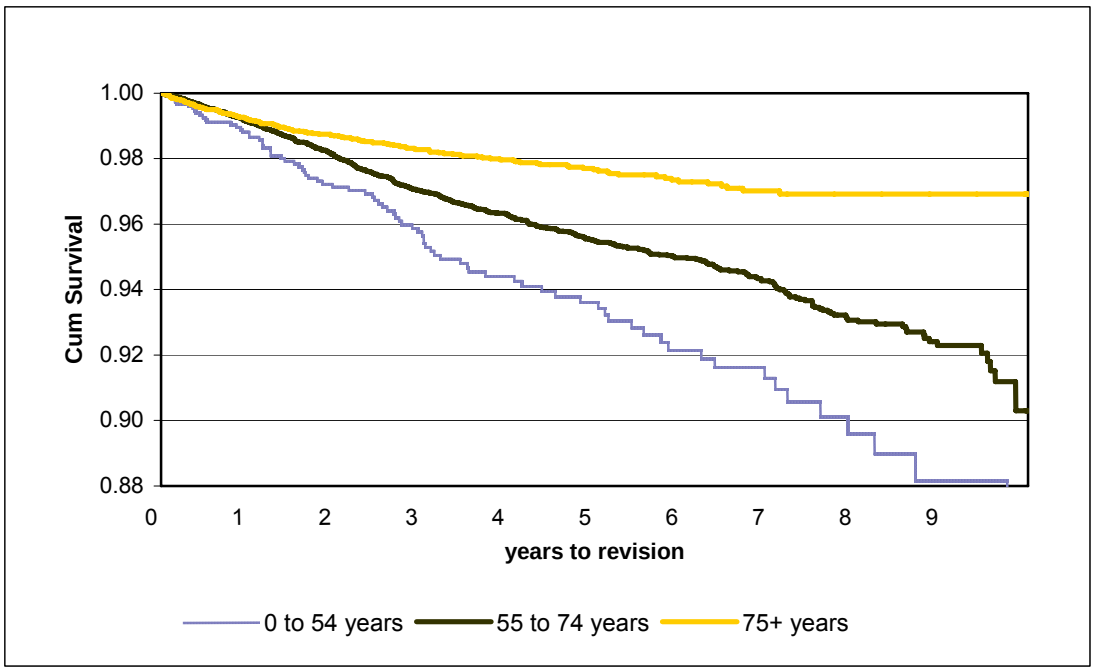


Figure 109: Revision after Primary Knee Replacement; April 1997 - March 2007

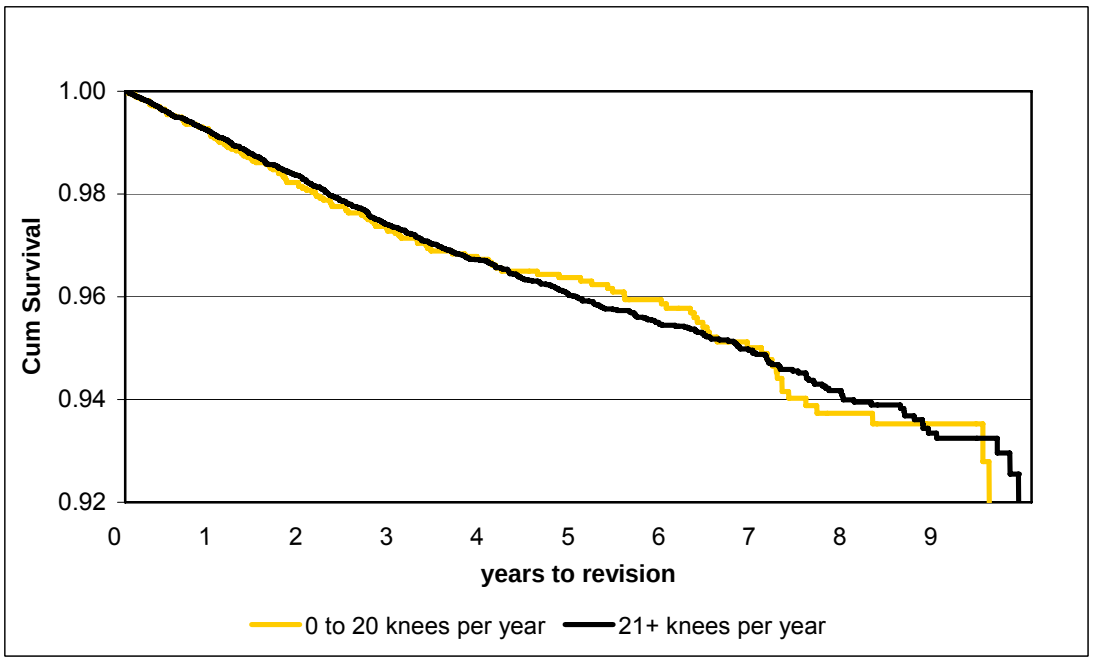
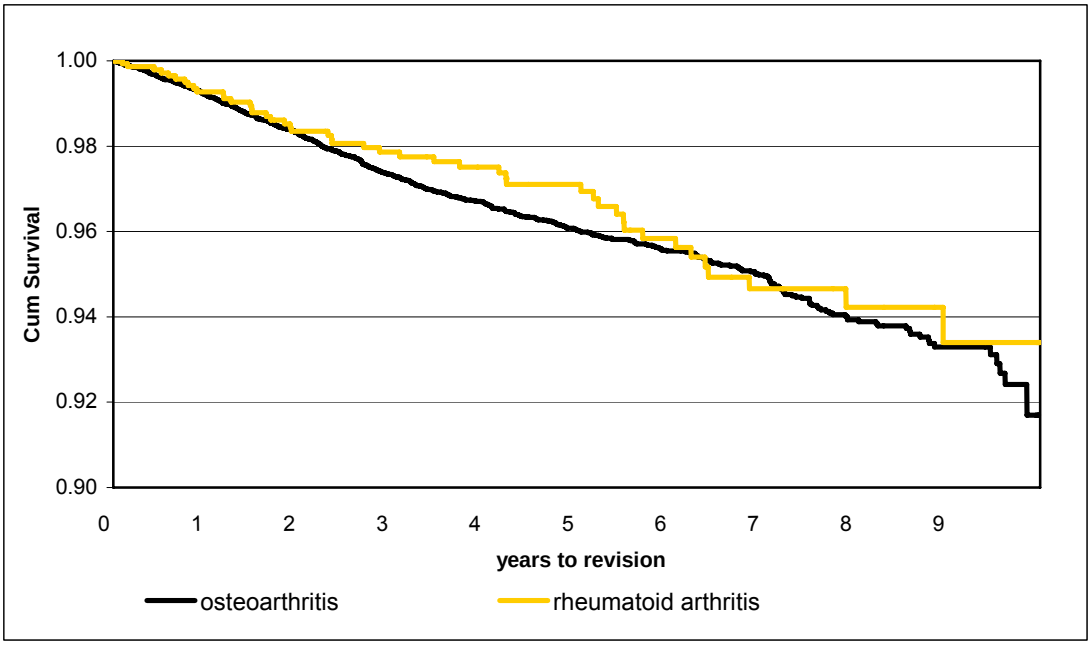


Figure 110: Revision after Primary Knee Replacement; April 1997 - March 2007



19 Appendix

19.1 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 NHSScotland 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).

19.2 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 (that apply equally to the patient and consultant surgeon). Other than one member of the ISD staff (and then only for administrative 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 Arthroplasty Project under the aegis of the Orthopaedic community (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. We provide all surgeons with their own results which can be used to inform the consent process. To date we have been successful in providing information which is useful and would inform the decision making process when a patient is considering joint replacement. Individual surgeons results will require local interpretation at the time of interview between patient and surgeon.

Consent is the process of two parties agreeing together. The risks and benefits of surgery are unique to the health, lifestyle and expectations of the patient taken together with the knowledge and experience of the surgeon. We have informed the surgeon of their overall results to use in this process. It would be appropriate if patients ask for these figures during the consent process.

19.3 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 is as follows;

- Mr Ivan Brenkel, Orthopaedic Consultant, Chair
- Mr Colin Howie, Orthopaedic Consultant
- Mr Andrew Kinninmonth, Orthopaedic Consultant
- Mr Paddy Ashcroft, Oththopedic Consultant
- Dr David Semple, Anaesthetic Consultant (Appointed by the Royal College of Anaesthetists Board in Scotland)
- Mrs Jennifer Boyd, ISD project co-ordinator
- Mr Graham Mitchell, ISD senior programme lead
- Dr Rod Muir, ISD Consultant in Public Health
- Dr Margaret MacLeod, Quality Improvement Programme Manager
- Dr Penny Bridger, ISD Consultant in Public Health
- Ms Louise Spencer, Independent Hospitals representative
- Ms Hazel Bruce and Ms Katy Green, patient representatives; and representative of the Scottish Association of Medical Directors acting in advisory capacity where necessary.

The Orthopaedic Consultants sitting on the Steering Committee, including the Committee chair, are nominated by the SCOT Committee and the organisational representative is nominated by the Scottish Association of Trust Medical Directors. The term of office for all nominees is 3 years, with an option to renew this term once. This does not apply to committee members who are not nominated, i.e. ISD staff.

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 the medium and long-term strategy of the Project under the direction of SCOT. The Committee also directs the clinical content of the annual report and of any other data analyses produced and manages the clinical governance aspect of the Project.

19.4 Staffing

The project is managed on a day-to-day basis by staff at the Information Services Division, which is a division of the NSS. Approximately 1.5 whole-time equivalent ISD staff are dedicated to SAP. The clinical lead and chair of the project is a consultant Orthopaedic surgeon and three further consultant Orthopaedic surgeons and an anaesthetic consultant sit on the Steering Committee, which meets three times per year. A member of the public and a representative from the independent hospitals sector also contribute by sitting on the Steering Committee.

19.5 Action Plan

Scottish Arthroplasty Project:

Action Plan resulting from the identification of data outwith normal variation

GMC 9999999

Name: A N Other

Outlier Indicator: dislocations within 365 days following hip arthroplasty

Number of hip arthroplasties that you performed: 40

Number of expected dislocations for 40 cases: 1 +/- 2.33

Action Plan following review of cases (please continue on separate sheet if necessary).

Signed:

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.)

19.6 References and links

AOA National Joint Replacement Registry Annual report

Bland JM, Altman DG. The logrank test. BMJ.;328(7447):1073, 2004

Delivering for Health, Scottish Executive, Edinburgh 2005

Harley M. Mohammed MA. Hussain S. Yates J. Almasri A. Was Rodney Ledward a statistical outlier? Retrospective analysis using routine hospital data to identify gynaecologists' performance. BMJ.;330(7497):929, 2005

Norwegian Arthroplasty Register Annual report

American Academy of Orthopaedic Surgeons

Swedish National Hip Arthroplasty Register Annual report

Swedish Knee Arthroplasty Register Annual Report 2004

Reference List for Elbow Arthroplasty in more detail section:

1. Khatri, M. and Stirrat, A. N. Souter-Strathclyde total elbow arthroplasty in rheumatoid arthritis: medium-term results. J.Bone Joint Surg.Br. 2005;87:950-954.

2. Gill, D. R. and Morrey, B. F. The Coonrad-Morrey total elbow arthroplasty in patients who have rheumatoid arthritis. A ten to fifteen-year follow-up study. J.Bone Joint Surg.Am. 1998;80:1327-1335.

3. Tanaka, N., Kudo, H., Iwano, K., Sakahashi, H., Sato, E., and Ishii, S. Kudo total elbow arthroplasty in patients with rheumatoid arthritis: a long-term follow-up study. J.Bone Joint Surg.Am. 2001;83-A:1506-1513.

4. Gschwend, N., Scheier, N. H., and Baehler, A. R. Long-term results of the GSB III elbow arthroplasty. J.Bone Joint Surg.Br. 1999;81:1005-1012.

5. Duncan, S. F., Sperling, J. W., and Morrey, B. F. Prevalence of pulmonary embolism after total elbow arthroplasty. J.Bone Joint Surg.Am. 2007;89:1452-1453.

6. Morrey, B. F. and Bryan, R. S. Infection after total elbow arthroplasty. J.Bone Joint Surg.Am. 1983;65:330-338.

7. Sanchez-Sotelo, J., Sperling, J. W., and Morrey, B. F. Ninety-day mortality after total elbow arthroplasty. J.Bone Joint Surg.Am. 2007;89:1449-1451.

8. Ikavalko, M., Belt, E. A., Kautiainen, H., and Lehto, M. U. Revisions for aseptic loosening in Souter-Strathclyde elbow arthroplasty: incidence of revisions of different components used in 522 consecutive cases. Acta Orthop.Scand. 2002;73:257-263.

19.6.1 Previous Scottish Arthroplasty Project Annual Reports

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2007

http://www.arthro.scot.nhs.uk/Reports/Scottish_Arthroplasty_Project_Report_2007.pdf

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2006

http://www.arthro.scot.nhs.uk/Reports/Arthro_Report_2006.pdf

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2005

http://www.arthro.scot.nhs.uk/Reports/Scottish_Arthroplasty_Final_Report_2005_Web.pdf

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2004

http://www.show.scot.nhs.uk/arthro/Reports/Scottish_Arthroplasty_Project_Report_2004.pdf

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2003

http://www.show.scot.nhs.uk/arthro/Reports/Scottish_Arthroplasty_Report_2003.pdf

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2002

http://www.show.scot.nhs.uk/arthro/Reports/Scottish_Arthroplasty_Report_2002.pdf

19.6.2 Other Websites

Scottish Audit of Surgical Mortality

http://www.sasm.org.uk