



# **Scottish Arthroplasty Project**

## **Annual Report 2007**

# **Scottish Arthroplasty Project Annual Report 2007**

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## **Acknowledgements**

The Scottish Arthroplasty Steering Committee would like to thank; Mr Ivan Brenkel, for chairing the committee this year, and also Mr Colin Howie, for chairing the project for the previous three years. The Committee also acknowledges the contributions of Mr David Allen and Mr Ian Maclean, who resigned from the Committee this year.

In addition, the Committee would like to acknowledge the helpful contributions of Mrs Jennifer Boyd, Mr Peter Hampton and Dr Jamie Pearson who work as analysts on the project.

### Key Points

- Data completeness continues to improve with only a few health boards not reaching 100%. (Page 7: Data Completeness)
- A large number of NHS patients are being treated in the private sector. The Murrayfield Hospital in Edinburgh has recently submitted data. This has been analysed. Other private hospitals have expressed an interest in joining the project (Page 8: Data from Private Hospitals)
- There has been a significant increase in the number of primary total hip and knee arthroplasties performed in 2006. (Page 11: National trends)
- Surgeons and health boards are now fully engaged in the governance process. There is evidence of individual and group change for the better. (Page 17: Clinical Governance Policy and Results)
- Surgeon responses to being an outlier have been included this year. (Page 21: Improvements made to clinical practice)
- Individual anaesthetic departments are participating in the audit at a hospital level. Complications such as stroke, acute myocardial infarct, gastro-intestinal bleed and acute renal failure have been included in the report. (Page 23: Investigation into Anaesthetic Complications)
- This year we have not only included the number of joint replacements done according to deprivation category, we have also included the outcomes split by deprivation (Page 29: Outcomes by deprivation category)
- Death, dislocation and DVT following joint replacement have all reduced, in some cases significantly, over the past 4 years. (Page 31: Hip replacements. Page 34 Knee replacements)
- This year we have included data on keyhole surgery of the knee. (Arthroscopy) (Page 41). There is a large variation in the number of arthroscopies done in the different health regions.
- This year we have again reported on the length of stay of hip and knee replacements. We have included the number of hospitals admitting patients on the day of surgery. We have also included the length of stay according to age groups. (Page 56: Length of Stay Analysis)
- Efficiency improvements. Although there has been a 42% increase in primary hip replacements since 1996 there has been a 36% reduction in mean length of stay for hip replacement. For primary knee replacements, there has been a 131% increase in number of procedures and a 41% decrease in mean length of stay. (Page 56: Length of Stay Analysis).

## **1. Introduction**

For 2007 we have produced an abridged report for paper release, the full report (including detailed named health board data) and all previous reports are available on the SAP website at ([www.arthro.scot.nhs.uk](http://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 hospital results are freely available through this report.

This SAP report, as before, includes new analysis. These areas are:

- Analysis on knee arthroscopies
- Investigations into renal failure as a complication following surgery
- Analysis on outcomes by deprivation category
- Survival rates for hip and knee replacements
- More detailed length of stay data
- Improvements made to clinical practice

There are a number of areas where there continues to be significant progress. Data completeness is much better, the number of arthroplasties continues to rise, but the process of care is demonstrably more efficient and the numbers of revisions remain in check. Surgeons and boards are complying with the governance process. Perhaps most encouraging is that we can now detect an overall improvement in some 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.

## **2. Data Analysis**

### **2.1 Data Completeness**

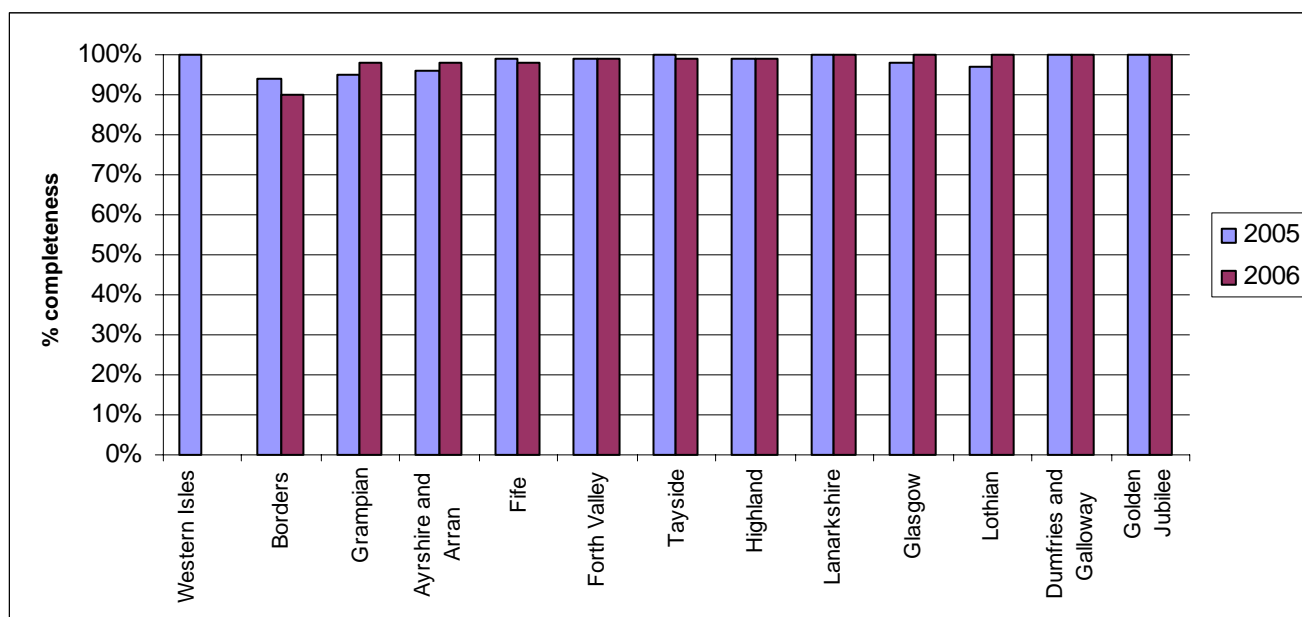
#### **2.1.1 SMR01 Data Completeness**

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 3 months of a patient's discharge from hospital. In practice, the majority of SMR01 records are submitted within 6 – 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 1<sup>st</sup> April 2005 and 31<sup>st</sup> March 2006. 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 2006 from several NHS Boards, therefore the data set is not yet viable.

**Figure 1: Data completeness for April to June 2005, based on SMR01 records received by end February 2006 compared to Data completeness for April to June 2006, based on S1 records received by end February 2007**



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### 2.1.2 Data from the Independent Sector

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.

Table 1 illustrates that the submission of hip and knee arthroplasty SMR01 episodes up to September 2006, where an independent hospital is the place of treatment does not appear to be happening routinely. The figures in the brackets represent the number of submission when this table was last updated in September 2005.

**Table 1: Submitted SMR01 Hip and knee arthroplasty procedures up to September 2006 where a private facility is the place of treatment. The figures in the brackets represent the number of submissions up to September 2005**

| Provider of Care     | Hospital Of Treatment     | 2003/04    |            |          | 2004/05    |            |          | 2005/06     |             |          |
|----------------------|---------------------------|------------|------------|----------|------------|------------|----------|-------------|-------------|----------|
|                      |                           | Hip        | Knee       | Knee Rev | Hip        | Knee       | Knee Rev | Hip         | Knee        | Knee Rev |
| NHS Ayrshire         | Carrick Glen Hospital     |            | 2<br>(2)   |          | 6<br>(4)   | 11<br>(7)  |          | 32          | 34          |          |
| NHS Ayrshire & Arran | Ross Hall Hospital        |            | 1<br>(1)   |          | 4<br>(4)   | 14<br>(14) |          | 1<br>(1)    | 3<br>(3)    |          |
| NHS Borders          | Glasgow Nuffield Hospital |            |            |          | 4<br>(4)   | 2<br>(2)   |          |             |             |          |
| NHS Borders          | Murrayfield Hospital      | 6<br>(6)   | 4<br>(4)   |          |            |            |          |             |             |          |
| NHS Borders          | Fernbrae Hospital         |            |            |          |            | 2          |          |             | 1           |          |
| NHS Fife             | Murrayfield Hospital      |            |            |          | 18         | 17         |          | 25          | 12          |          |
| NHS Fife             | Fernbrae Hospital         |            |            |          |            |            |          |             | 1           |          |
| NHS Greater Glasgow  | Ross Hall Hospital        | 23<br>(22) | 23<br>(23) |          |            | 5<br>(5)   |          | 9           | 1           |          |
| NHS Grampian         | Albyn Hospital            | 10<br>(10) | 15<br>(15) |          | 18<br>(8)  | 14<br>(8)  |          | 38<br>(21)  | 41<br>(27)  | 1        |
| NHS Grampian         | Fernbrae Hospital         |            |            |          | 1<br>(1)   | 1<br>(1)   |          | 22<br>(21)  | 9<br>(9)    |          |
| Total                |                           | 39<br>(38) | 45<br>(45) |          | 51<br>(21) | 66<br>(37) |          | 127<br>(43) | 102<br>(39) | 1        |

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



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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.

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. 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 have decided to set up the Scottish Joint Registry (SJR). The SJR will record information on primary hip and knee replacement operations carried out in the independent sector.

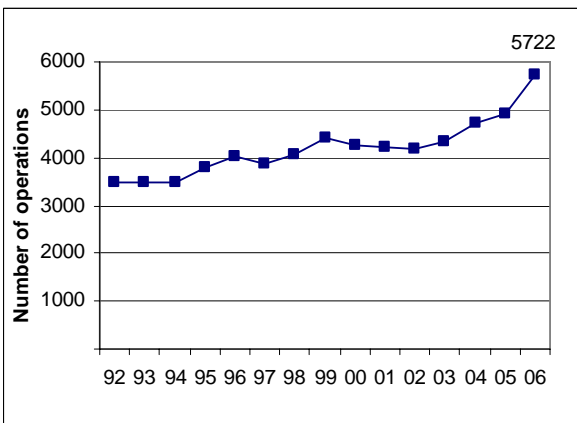
Hospitals in the independent sector are keen to routinely submit arthroplasty data to the ISD. As a first step towards this, one independent hospital, together with a NHS hospital, has been acting as a pilot site for collecting SJR data from July 2005. This data has been sent to the SJR team at ISD for analysis. A web-based system is to be rolled out across all independent hospitals in Scotland within the year, meaning that independent hospitals will be able to submit SJR data electronically, direct to ISD. This dataset will provide a fuller picture of patients undergoing hip or knee replacements, as either an independent-sector patient or NHS patient, ensuring that patients obtain the best clinical care during their operation and optimise their clinical outcome.

**2.2 National Trends in Numbers of Operations**

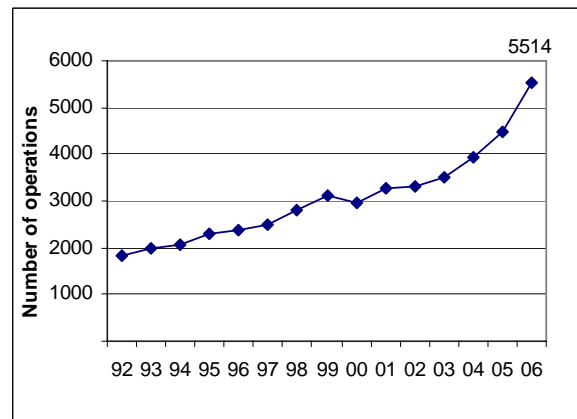
Figure 2 to 5 represent the numbers of combined elective and emergency joint replacement operations (both primary and revision for hip and knee) recorded as performed in NHS Scotland in each of the last 14 years (1992 to 2006). The vast majority of operations were performed as an elective procedure. (Around 94% of primary hip replacements, 99% of primary knee replacements, 78% of revision hip replacements and 90% of revision knee replacements). All numbers are displayed by year ending 31<sup>st</sup> March.

The number of primary hip and knee replacements has been increasing steadily since 1992 with a marked rise from 2002 onwards. In 2005/2006 there were 5722 primary hip replacements and 5514 primary knee replacements. We expect knee replacement to outstrip hip replacement in the near future as happened in Australia in 2002-3. The recent rise in the number of hip and knee replacement operations could partly be attributed to Scottish Executive Waiting Times Initiatives.

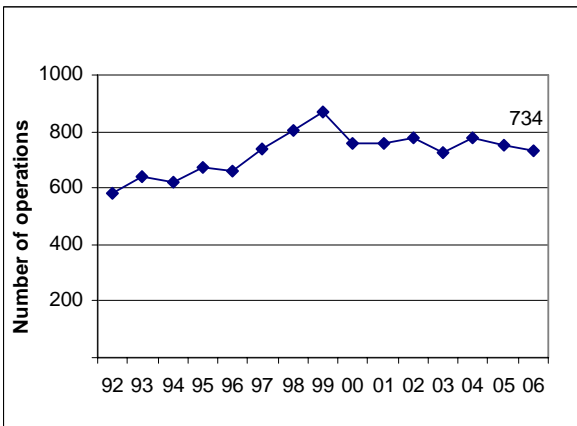
**Figure 2: Primary Hip Replacements by year ending March**



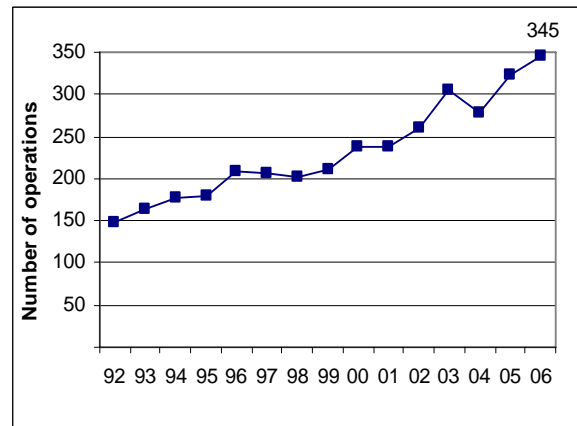
**Figure 3: Primary Knee Replacements by year ending March**



**Figure 4: Revision Hip Replacements by year ending March**



**Figure 5: Revision Knee Replacements by year ending March**



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Many more joint replacements have been performed in the private sector (paid for by the NHS as part of the waiting list initiative) but we do not have figures for these.

Further arthroplasty activity trend charts can be found in Appendix 1 (shoulders and elbows) and Appendix 3 (fingers, wrists, thumbs, toes and ankles) at ([www.arthro.scot.nhs.uk](http://www.arthro.scot.nhs.uk)).

Table 2 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 (15.5%) and lowest in Scotland with 11.4% of primary hip operations requiring some form of revision.

Knee revision ratios are lowest in Scotland (5.9%) and highest in Australia (9.7%). 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 2: International Comparison of primary to revision (for all causes) operation ratios**

| Hips                  | Scotland<br>April 05 - March 06 | Australia <sup>1</sup><br>July 04 - Jun 05 | Norway <sup>2</sup><br>Jan 05 - Dec 05 |
|-----------------------|---------------------------------|--|--|
| Primary Operations    | 5722                            | 20683                                      | 6566                                   |
| Revisions             | 734                             | 3791                                       | 1052                                   |
| Primary + Revision    | 6456                            | 24474                                      | 7618                                   |
| Crude Revision Rate % | 11.4                            | 15.5                                       | 13.8                                   |

| Knees                 | Scotland<br>April 05 - March 06 | Australia <sup>1</sup><br>July 04 - Jun 05 | Norway <sup>2</sup><br>Jan 05 - Dec 05 |
|-----------------------|---------------------------------|--|--|
| Primary Operation     | 5514                            | 25428                                      | 3242                                   |
| Revision              | 345                             | 2744                                       | 250                                    |
| Primary + Revision    | 5859                            | 28172                                      | 3492                                   |
| Crude Revision Rate % | 5.9                             | 9.7  | 7.2                                    |

1 Source: AOA National Joint Replacement Registry

2 Source: Norwegian Arthroplasty Register

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### **2.3 Patient Characteristics**

This section gives more detailed information on patients who underwent either a total hip replacement operation, or total knee replacement operation in 2005/2006. The information in this section is contained in a number of tables broken down as follows:

- Sex and average age
- Deprivation category (quintile) of patients -Carstairs rating
- Laterality of procedure
- Number of operations by Health Board of Treatment
- Principal diagnosis of patient at time of operation

It should be noted that some patients underwent more than one hip replacement in 2005/06. There were 5687 patients and 5722 hip replacement operations.

#### **2.3.1 Hip Replacements**

**Table 3: Number of patients who have undergone a hip replacement in 2005/06 split by sex**

|        | Number of patients | Average Age |
|--------|--------------------|-------------|
| Male   | 2194               | 66          |
| Female | 3493               | 68          |
| Total  | 5687               | 67          |

**Table 4: Deprivation category of patients**

| Deprivation Category         | Number of patients |
|------------------------------|--------------------|
| 1                            | 1226               |
| 2                            | 1284               |
| 3                            | 1207               |
| 4                            | 1050               |
| 5                            | 906                |
| Deprivation Category unknown | 14                 |
| Total                        | 5687               |

Smaller number of treated patients in deprivation categories 4 and 5 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.

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**Table 5: Laterality of hip replacement**

| Laterality | Number of patients |
|------------|--------------------|
| Unknown    | 1257               |
| Right      | 2465               |
| Left       | 1928               |
| Bilateral  | 35                 |
| Unilateral | 2                  |
| Total      | 5687               |

**Table 6: Number of hip replacements split by Health Board of Treatment**

| Health Board of Treatment | Number of Operations |
|---------------------------|----------------------|
| Ayrshire and Arran        | 336                  |
| Borders                   | 135                  |
| Argyll and Clyde          | 291                  |
| Golden Jubilee            | 514                  |
| Fife                      | 331                  |
| Highland                  | 345                  |
| Lanarkshire               | 333                  |
| Grampian                  | 724                  |
| North Glasgow             | 610                  |
| Lothian                   | 888                  |
| South Glasgow             | 294                  |
| Tayside                   | 592                  |
| Forth Valley              | 176                  |
| Western Isles             | 43                   |
| Dumfries and Galloway     | 103                  |
| Total                     | 5722                 |

**Table 7: Principal diagnosis of hip replacement patients**

| Diagnosis                             | Number of patients |
|---------------------------------------|--------------------|
| Coxarthrosis                          | 4697               |
| Gonarthrosis                          | 79                 |
| Fracture of neck of femur             | 174                |
| Osteonecrosis                         | 98                 |
| Rheumatoid arthritis                  | 85                 |
| Dysplasia                             | 59                 |
| Nonunion of fracture [pseudarthrosis] | 21                 |
| Other                                 | 474                |
| Total                                 | 5687               |

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.

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### **2.3.2 Knee Replacements**

**Table 8: Number of patients who have undergone a knee replacement in 2005/06 split by sex**

|        | Number of patients | Average Age |
|--------|--------------------|-------------|
| Male   | 2291               | 69          |
| Female | 3140               | 69          |
| Total  | 5431               | 69          |

This difference reflects the sex distribution profile of this elderly group of patients.

**Table 9: Deprivation category of patients**

| Deprivation Category         | Number of patients |
|------------------------------|--------------------|
| 1                            | 1049               |
| 2                            | 1172               |
| 3                            | 1107               |
| 4                            | 1067               |
| 5                            | 1024               |
| Deprivation Category unknown | 12                 |
| Total                        | 5431               |

**Table 10: Laterality of knee replacement**

| Laterality | Number of patients |
|------------|--------------------|
| Unknown    | 1408               |
| Right      | 2057               |
| Left       | 1878               |
| Bilateral  | 83                 |
| Unilateral | 5                  |
| Total      | 5431               |

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**Table 11: Number of knee replacements split by Health Board of Treatment**

| Health Board of Treatment | Number of operations |
|---------------------------|----------------------|
| Ayrshire and Arran        | 356                  |
| Borders                   | 95                   |
| Argyll and Clyde          | 327                  |
| Golden Jubilee            | 602                  |
| Fife                      | 331                  |
| Highland                  | 294                  |
| Lanarkshire               | 337                  |
| Grampian                  | 569                  |
| North Glasgow             | 644                  |
| Lothian                   | 828                  |
| South Glasgow             | 367                  |
| Tayside                   | 497                  |
| Forth Valley              | 167                  |
| Western Isles             | 9                    |
| Dumfries and Galloway     | 80                   |
| Total                     | 5514                 |

**Table 12: Principal diagnosis of patients**

| Diagnosis            | Number of patients |
|----------------------|--------------------|
| Coxarthrosis         | 61                 |
| Gonarthrosis         | 4879               |
| Rheumatoid arthritis | 170                |
| Secondary arthritis  | 120                |
| Other                | 201                |
| Total                | 5431               |

### **2.4 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 board and consultant level to look at quality issues, which appeared to vary from national standards.

Volume and type of activity data are supplemented by rates for complications including death, revision, venous thrombo-embolism, infection and dislocation; outcomes which reflect patient concerns. For the last five years each consultant and health board has been sent their own activity and complication data set in the context of the national picture. All participants are encouraged to review their own figures, as part of a robust local clinical governance system, even if they are not identified as outliers. Statistical limits on performance are set and any data points outlying normal variation are subject to a confidential review. The information is provided as funnel plots with a national average and limits of three standard deviations. It is important to emphasise that the techniques to identify outlying results are statistical and despite some standardisation do not imply poor performance (Harley M et al, 2005).

The consultant and health board outlier process has evolved over the last four years. Outliers are required to initiate local review and report the results of that review to the arthroplasty committee. Failure to do so is reported back to the unit concerned for any local action. Deaths are not reviewed as the Scottish Audit of Surgical Mortality deals with each individual death in detail. ([www.sasm.org.uk](http://www.sasm.org.uk))

#### **2.4.1 Consultant Outliers**

Every consultant outlier is requested to investigate the accuracy of the data and the clinical features of each case. They are asked for general comments and an action plan if any issues are found.



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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 13: Summary of Consultant Outliers**

| Report Year | 5 Year Time Period      | New Outliers | Outlying for 2 years | Outlying for 3 years | Outlying for 4 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 | 10           | 6                    | 1                    | 1                    | 18                         |

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. 10 new outliers, and two three-year outliers, currently in practice in NHS Scotland will be invited to respond in the coming year. They will be notified in June 2007 and will be expected to respond by September 2007.

The format for assessment and scoring of the outlying consultant and health board responses is as follows:

### **Assessment of Response by Outlying Consultants:**

- Promptness of Response
- Presence of:
  - Assessment of Data quality
  - Informed criticism of results through local audit
  - Appropriate action plan to address issues arising from analysis.
  - Document co-signed by consultant colleague (essential for a satisfactory response)

### **Scoring of Response by Outlying Consultants:**

- Exemplary                      Constructive Response with evidence of progress
- Excellent                      Constructive Response (evidence of reflective practice)
- Satisfactory                    Minimum response (document co-signed by a qualified colleague)
- Less than satisfactory        Unacceptable

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The new assessment and scoring system has proven more flexible and constructive for consultant appraisal.

**Table 14: Summary of outlier responses for outliers**

| Report Year | Consultants | 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            | -                      | -                              | -                           |

In 2006 there were 14 new consultant outliers and 2 consultants that were outlying for 3 years. This was the first year that consultants outlying for 3 years were asked to participate in the clinical governance process again. The responses were graded as exemplary or excellent in the majority, with four being satisfactory and none less than satisfactory. There was complete compliance with the process and the improved grades over previous years suggest greater acceptance and understanding of the aims of the project. The responses for 2003 & 2004 were only graded as being 'Better than satisfactory' or 'Less than satisfactory'.

### **2.4.2 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 in the 2004 Annual Report – section 6.2.2).

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**Table 15: Summary of NHS Board Outliers**

| Report Year | 5 Year Time Period      | Outlying Boards | New Board Outliers | Also Outliers in previous year | Also outlier in previous years | an in 2 | Also outlier for previous 3 | an outlier for the previous 5 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                                   |

The initial response to the 2003 data was disappointing; with only one 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 boards responded and they were classified as satisfactory. In 2005 all boards responded satisfactorily. In 2006, both Boards responded; one response was satisfactory and the other was deemed to be excellent.

### 2.4.3 Evidence of change

The aim of the governance process was to encourage change through feedback. We have reviewed the results of the first four years using the Institute of Healthcare Improvement Boston Mass matrix.

#### “Burden of Improvement”: Illustration

##### **Four Stages of Facing Reality – Outliers Response**

- Stage 1 - “The data are wrong”
- Stage 2 - “The data are right, but it’s not a problem”
- Stage 3 - “The data are right; it is a problem; but it’s not my problem.”
- Stage 4 - “I accept the burden of improvement”

(Institute of Healthcare Improvement Boston Mass)

### **Committee Process.**

The Arthroplasty committee found that initial interpretation of the responses was difficult with considerable clinical argument over detail regarding individual treatments (stage one: the information is wrong). It became apparent that the key issues were local responsibility (evidence of sign off) and reflective practice, both now embedded in the rankings. Scoring system change and simplification represents the committee’s learning process and a move away from detailed

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clinical discussions best carried out by SIGN, NICE or other professional bodies. Now all members of the committee, including patient representatives, mark responses. A recent audit of scoring has shown high inter rater reliability.

### **Individual responses.**

Receiving notification of an outlying result is stressful. Most recipients pore over the data to identify data errors, of which there are usually several.

Stage 1 "The data are wrong" remains a common response. In most cases the problems are generic (coding) and a local (often management) responsibility. These responses, if comprehensive and signed off locally receive a satisfactory score. Participants are reminded that it is their duty to correct the errors locally.

Stage 2 "The data are right, but it's not a problem" is also common, relating to case mix issues. Where these have been raised they have formed the basis for analysis the following year and included, where significant, in subsequent case mix adjustments. These also receive a satisfactory score.

Stage 3 has been difficult to identify. However there are now many responses which include not just detailed review (an excellent grade) but evidence of change (exemplary), both can be regarded as stage 4 "I accept the burden for improvement".

Tables 14 and 15 show that all participants have progressed in their responses.

### **Individual changes taken from previous submissions.**

There are now many responses, including:

#### **General improvements:**

- Ensuring medical records and codings are correct
- Verifying complications locally.
- Dictation of discharge letters giving the diagnosis for coding.

#### **Alterations to technique:**

- Close monitoring of ambient temperature and mixing technique [of cement] is now undertaken and stems are introduced at 4 minutes.
- Installation of laminar flow systems in theatres.
- Reduction in bilateral hips.
- Cessation of aspirin at pre-admission clinic.

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- Cessation of LMWH if an NSAID and or Aspirin within 1 week of admission.
- MRSA screening and isolation policy.
- Introduction of rigorous wound assessment protocols.

### **Unit reviews:**

- Monitoring of DVT/PE as a unit and audit compliance.
- Review of infection in joint replacements.
- Care of high-risk patients regarding their heels.
- Formal review and implementation of a unified unit policy including detailed risk assessment.

### **Personal responses to the review process.**

A number of outlying participants respond to identifying data errors only to criticise coding. However, a recent audit has shown that, surprisingly, many have appreciated the process.

“Gives the surgeon insight”.

“Useful for appraisal”.

“Good method for highlighting problems”.

“Identifies performance relative to others”.

“Should be applied to all areas of practice”.

Most surgeons include the data in the appraisal process and use the data in the consent process with patients.

### **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. 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 surgeries carried out by low volume surgeons has decreased and the revision rate for hip surgery has remained static.

### **3. Investigation into Anaesthetic Complications**

The Royal College of Anaesthetists Board in Scotland has 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.

The anaesthetic assessment of patients undergoing joint replacement may be very difficult. The nature of their orthopaedic problems (and resultant limitations in mobility) may render accurate assessment of their cardio-respiratory function impossible. This makes the pre-operative discussion of "risk" for the individual patient difficult and potentially confusing. It is in the area of risk assessment and perioperative cardiovascular health that the influence of the anaesthetist is greatest. At present there are no reliable figures for cardiovascular complication rates (one of the commonest serious perioperative problems) following orthopaedic surgery for Scotland as a whole or for individual units.

All primary hip and knee replacements carried out in Scotland between the 1<sup>st</sup> April 2000 and 31<sup>st</sup> March 2005 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.

The control charts in Chapter 5 showing standardised rates for mortality and DVT/PE are also relevant to the investigations of anaesthetic complications.

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### **Changes to the 2007 report**

The analysis of complication rates in this report and previous reports has mainly concentrated on complications arising from the actual type of surgery undertaken (dislocation, infection or revision). This year complications which may be more closely associated with pre-operative assessment or peri-operative care have been investigated. We have concentrated on the following conditions following hip or knee replacement:

- acute myocardial infarction (AMI) within 30 days following surgery;
- stroke within 30 days following surgery;
- gastro-intestinal bleeds within 30 days following surgery; and
- Acute renal failure within 30 days following surgery.

A new complication type that has been investigated in the 2007 report is the occurrence of acute renal failure (ICD10 codes N17 and N19) within 30 days of surgery.

The development of acute renal failure is a serious perioperative event with significantly increased mortality and longer-term morbidity rates. The successful treatment of this condition depends on specialist referral and therapies, which are potentially distressing for the patient, and expensive in both time and resources. Many orthopaedic patients are at increased risk of this complication for a number of reasons – age, drug therapy (ACE inhibitors, non-steroidal anti-inflammatory drugs, etc) and the potential for unrecognised blood and fluid loss postoperatively. Conversely with the appropriate early recognition of problems and treatment, it may be possible to prevent some cases of acute renal failure occurring.

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. The use of Shewhart charts may be especially useful in the discussion of risks pre-operatively with patients. 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.

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This year, all the data have been standardised for;

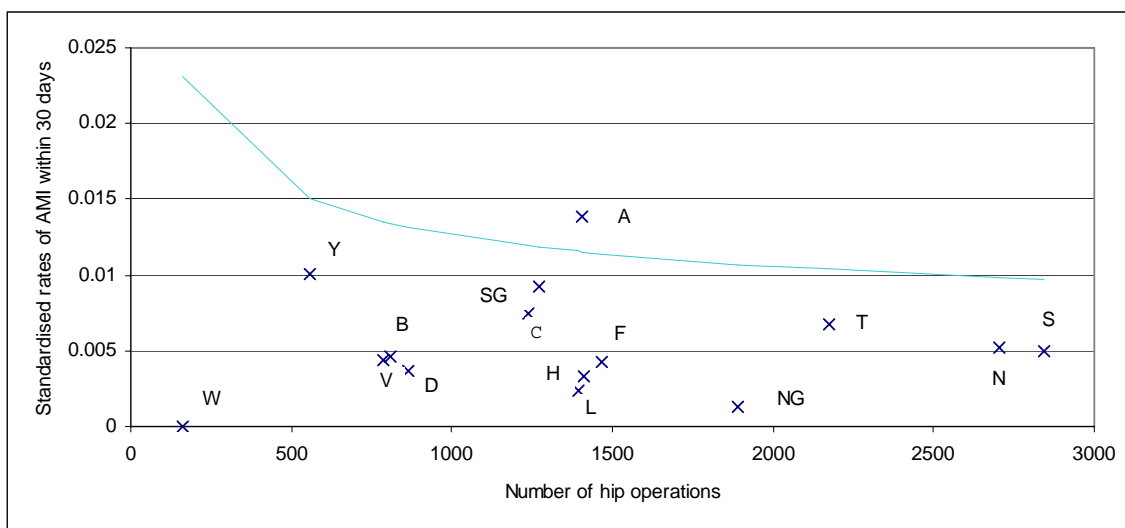
- age;
- sex;
- admission from home or other place of residence (e.g. nursing home);
- rheumatoid arthritis; and
- deprivation.

A health board specific report was sent out to the Clinical Directors of Anaesthesia of every hospital performing joint replacements in January 2006. The report contained information on their health board's observed and expected rates for AMI following hip replacement along with a run chart for the same. Responses were invited from the Anaesthetic Departments to determine if they found the data useful. At the time of print, no responses have so far been received.

Figure 6 to 13 show the results of the analysis. The reported rates are reassuring and within published international complication rates.

|                                     |                   |                     |
|-------------------------------------|-------------------|---------------------|
| 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  |                     |

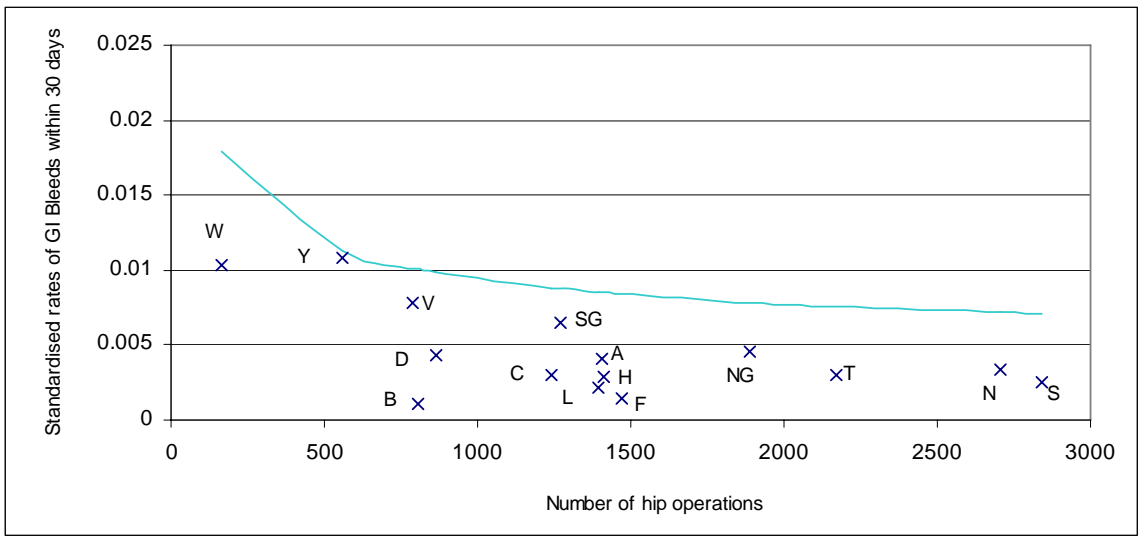
**Figure 6: Standardised Rate for AMI within 30 days of a hip operation**



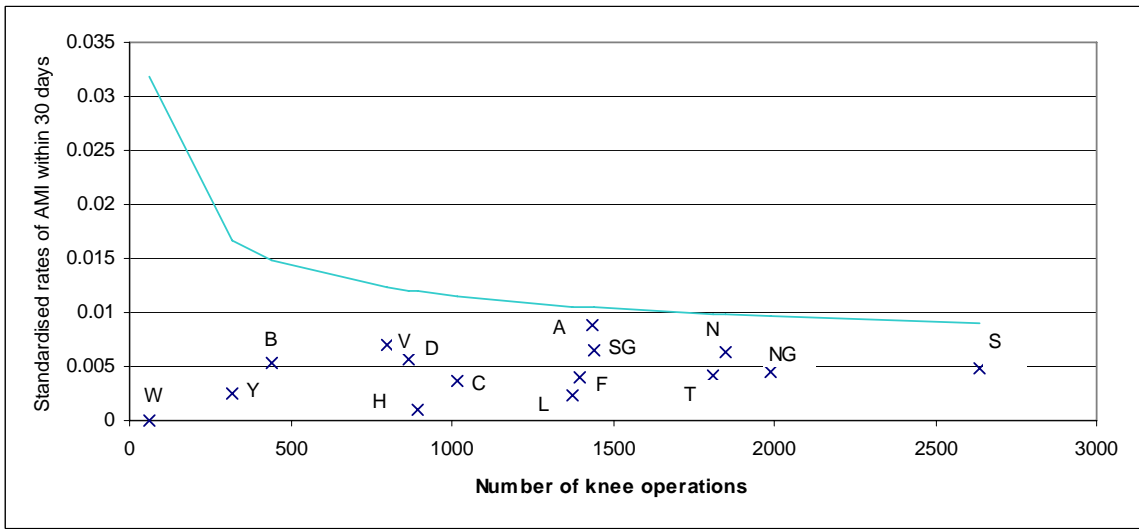


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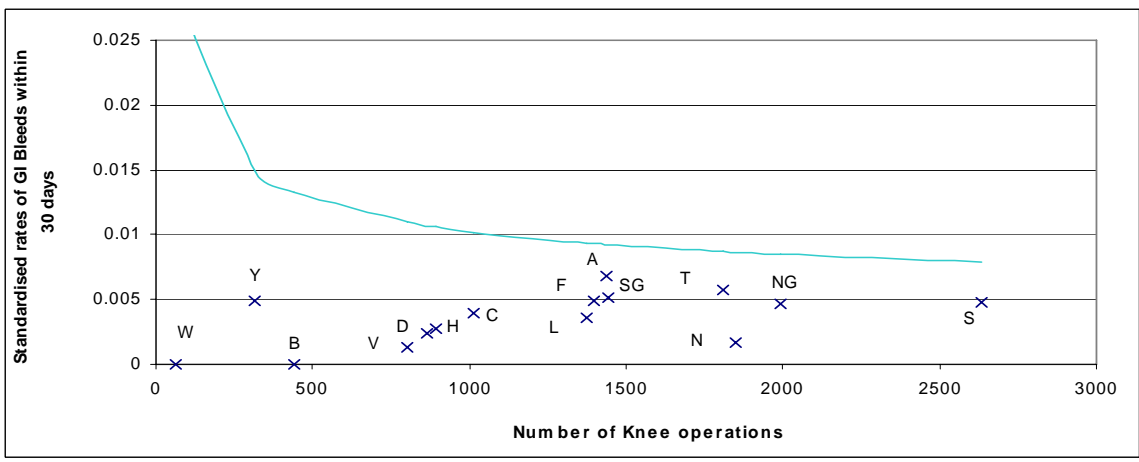
**Figure 7: Standardised Rate for AMI within 30 days of a knee operation**



**Figure 8: Standardised Rate for GI Bleed within 30 days of a hip operation**

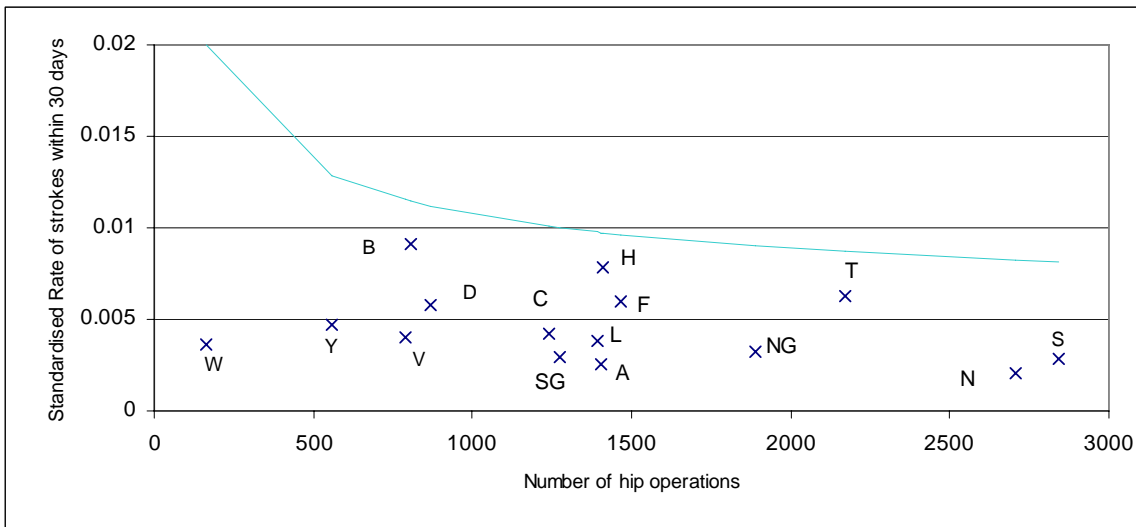


**Figure 9: Standardised Rate for GI Bleed within 30 days of a knee operation**

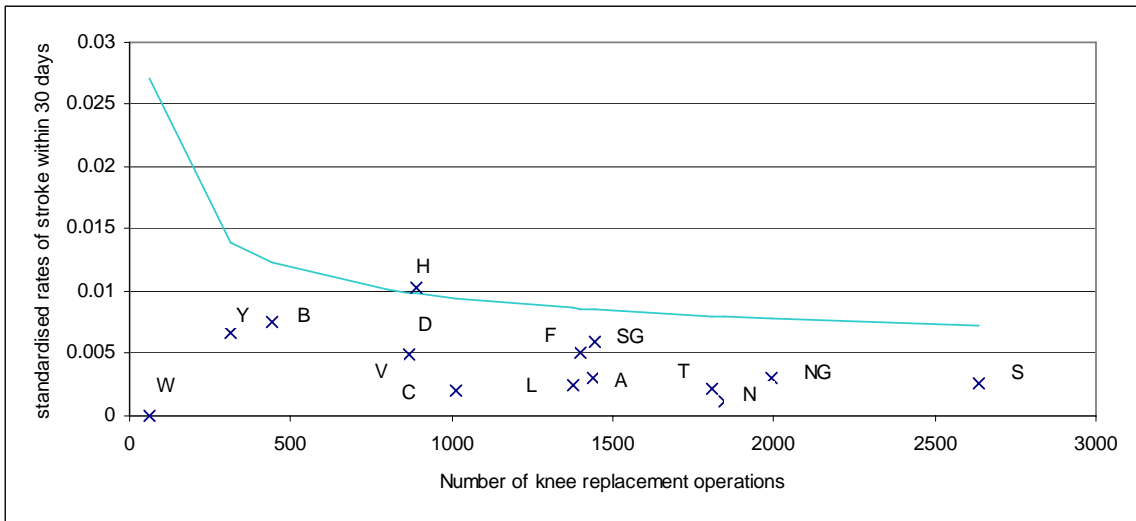


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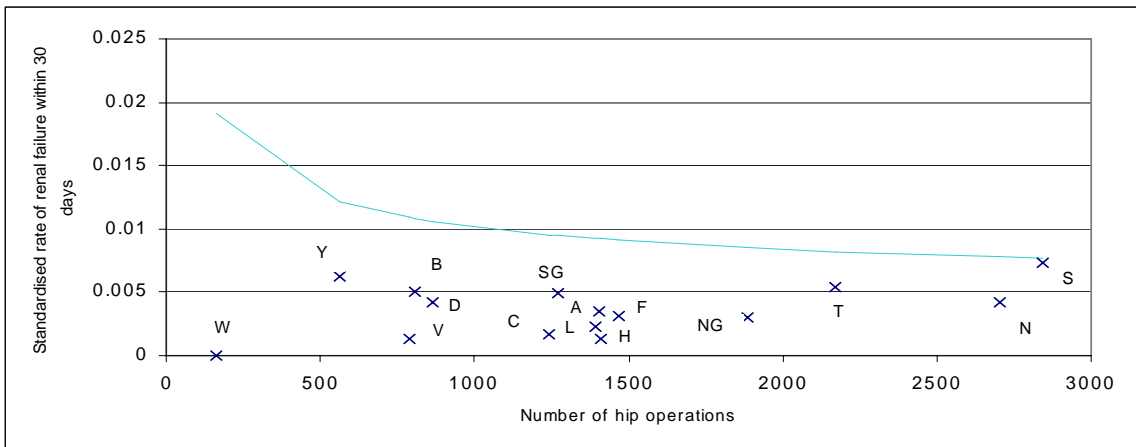
**Figure 10: Standardised Rate for stroke within 30 days of a hip operation**



**Figure 11: Standardised Rate for stroke within 30 days of a knee operation**

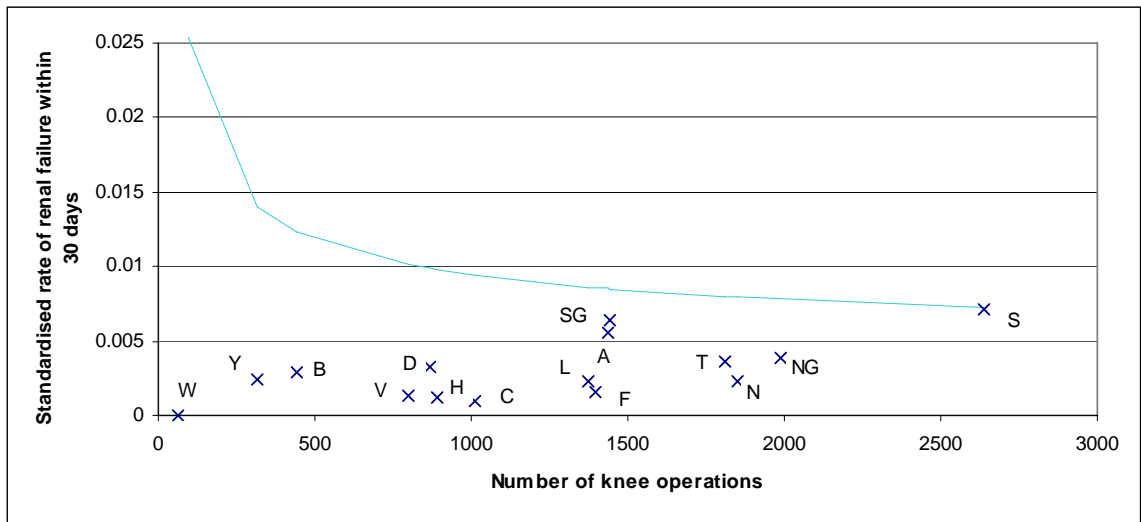


**Figure 12: Standardised Rate for acute renal failure within 30 days of a hip operation**



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Figure 13: Standardised Rate for acute renal failure within 30 days of a knee operation



## **4. Outcomes by deprivation category**

The Carstairs deprivation index is composed of four indicators at postcode sector level that were judged to represent material disadvantage in the population (Lack of car ownership, Registrar General Social Class, Overcrowded households and male unemployment). Patients are divided into quintiles (five equally-sized population groups). Deprivation quintile 1 is the least deprived group. Deprivation quintile 5 is the most deprived group.

Table 16 shows the number of complications for dislocations, infections and DVT/PE following total hip replacement by patient's deprivation category during 2006.

Table 17 shows the number of complications for infections and DVT/PE following total knee replacement by patient's deprivation category during 2006.

**Table 16: Deprivation category of patients with a complication following hip surgery**

|                             | (least deprived) | Deprivation quintile |          |          |          | (most deprived) | Total |
|-----------------------------|------------------|----------------------|----------|----------|----------|-----------------|-------|
| Complication                | 1                | 2                    | 3        | 4        | 5        |                 |       |
| Dislocation within 365 days | 65 (18%)         | 87 (25%)             | 93 (26%) | 60 (17%) | 49 (14%) | 354             |       |
| Infection within 365 days   | 45 (21%)         | 60 (29%)             | 42 (20%) | 30 (14%) | 33 (16%) | 210             |       |
| DVT/PE within 90 days       | 57 (19%)         | 81 (26%)             | 78 (26%) | 53 (17%) | 37 (12%) | 306             |       |
| Death within 90 days        | 36 (24%)         | 45 (30%)             | 25 (17%) | 26 (17%) | 17 (11%) | 149             |       |

**Table 17: Deprivation category of patients with a complication following knee surgery**

|                           | (least deprived) | Deprivation quintile |          |          |          | (most deprived) | Total |
|---------------------------|------------------|----------------------|----------|----------|----------|-----------------|-------|
| Complication              | 1                | 2                    | 3        | 4        | 5        |                 |       |
| Infection within 365 days | 58 (21%)         | 59 (21%)             | 52 (18%) | 59 (21%) | 55 (19%) | 283             |       |
| DVT/PE within 90 days     | 41 (17%)         | 56 (23%)             | 50 (21%) | 49 (20%) | 47 (19%) | 243             |       |
| Death within 90 days      | 16 (17%)         | 18 (19%)             | 18 (19%) | 22 (23%) | 22 (23%) | 96              |       |

Early analysis of these tables suggests that there is little difference in the complications following total knee replacement between social categories. However, following hip replacement, patients in deprivation category 3 have the highest rates for all complications. This data has not been case mix adjusted and further analysis is required.

## **5. Complication Rates For Hip and Knee Replacements**

For the fourth 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 (ICD10) 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).

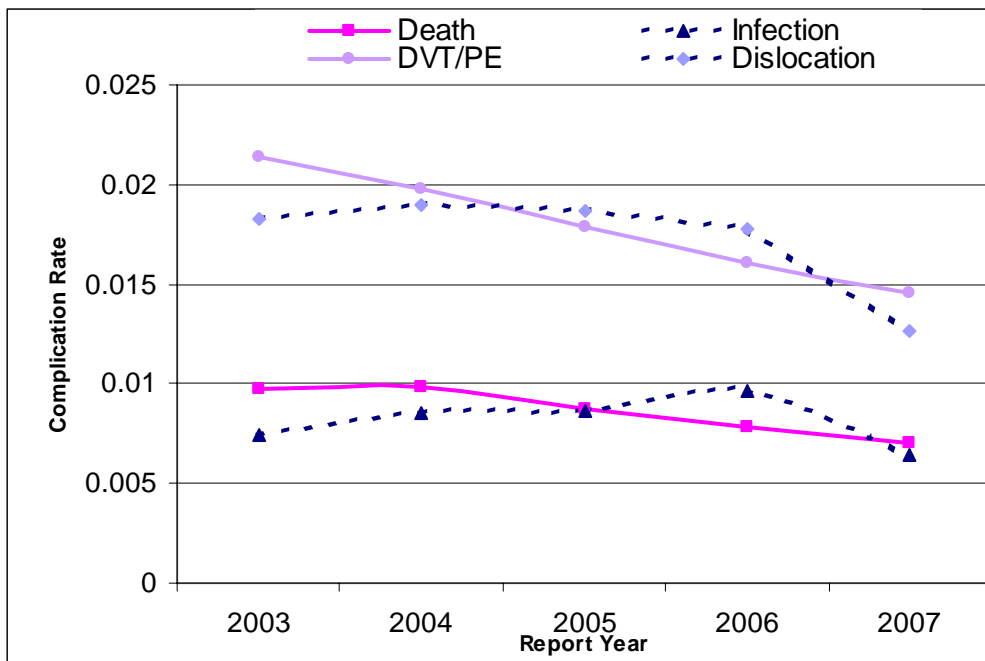
This year, those consultants and NHS Boards that lie outside the upper control limit for the first time (three standard deviations above the expected complication rate) and those who have been outlying for three or five years in a row will be invited to participate in a review of the cases making up 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.

### **5.1 NHS Board Data for Complications Following Elective Primary Hip Replacement**

Figure 14 shows the national complication rates following total hip replacement for NHS Boards from 2003 to 2007 for deaths, dislocations, infections and DVT/PE. There has been a steady decrease in the complication rates for deaths, dislocations and DVT/PE. The upward trend in the complication rate for infections has now decreased and is currently at its lowest level since reporting began.

Figure 15 to 18 represent the complication rates for patients following elective hip replacement between April 2000 and March 2005. Each data point represents the complication rate for an NHS Board in Scotland (for the label key and explanation of features see page 31). Those 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 board complication rates. Because of this, boards that are outlying for a second year will not be asked to reinvestigate the data, but will be monitored over the forthcoming years

**Figure 14: National rates for complications following elective primary hip replacements from report year 2003 to 2007**

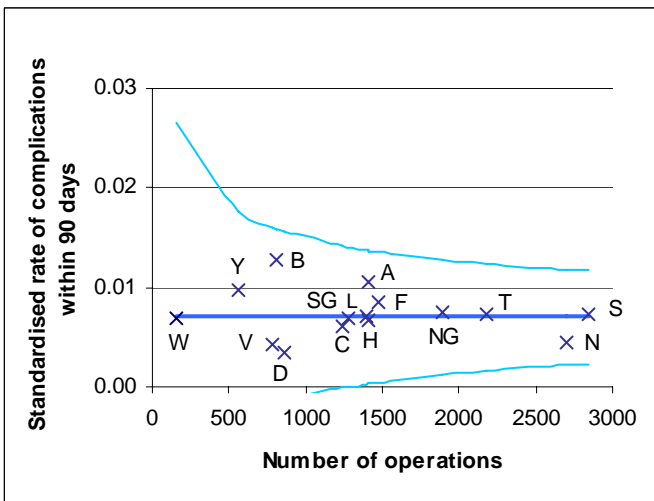


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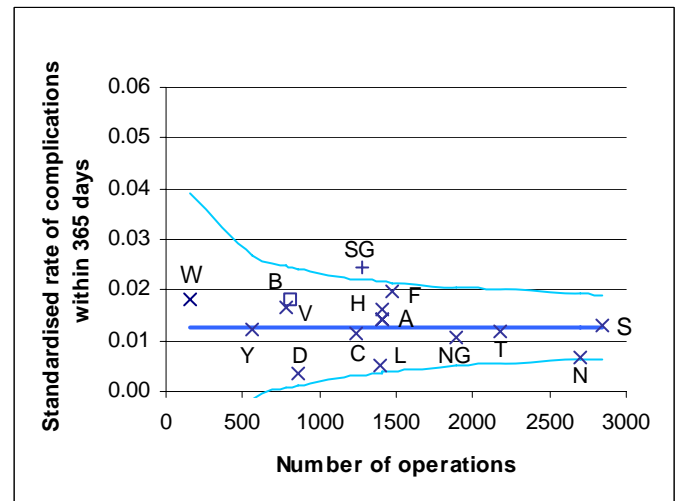
**NHS Board Data for Complications Following Elective Primary Hip Replacement (April 2000 – March 2005)**

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 and those outlying for 5 years have been marked with a cross.

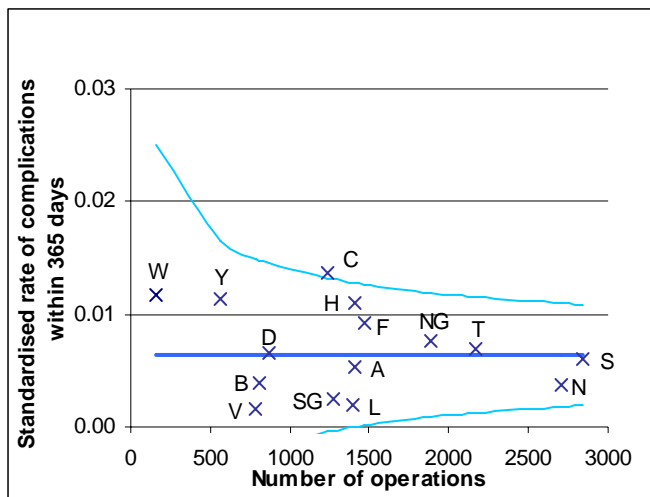
**Figure 15: Observed and expected standardised rates of deaths within 90 days**



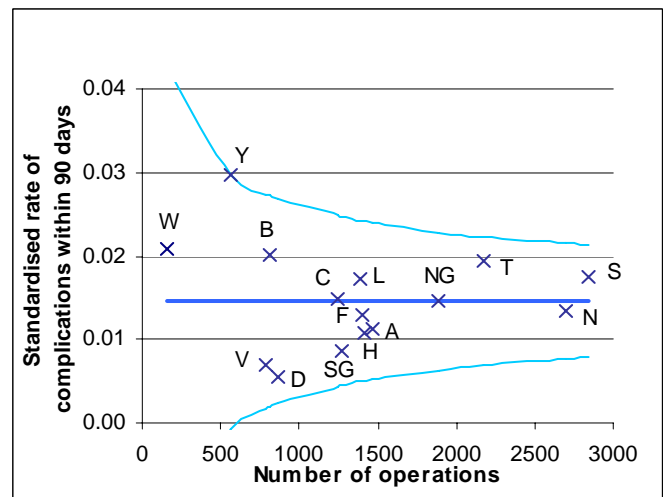
**Figure 16: Observed and expected standardised rates of hip dislocations within 365 days**



**Figure 17: Observed and expected standardised rates of joint infections within 365 days**



**Figure 18: Observed and expected standardised rates of DVT/PE within 90 days**











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### Key to NHS Board Ciphers

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

Orkney and Shetland are not included as their patients undergo elective arthroplasty surgery in Grampian (Aberdeen) and are included in the Grampian data.

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

|   |  |
|---|--|
|    | Upper and Lower Control Limits   |
|    | Scottish Mean  |
|  | NHS Board or Consultant  |
|  | NHS Board or Consultant who were 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               |



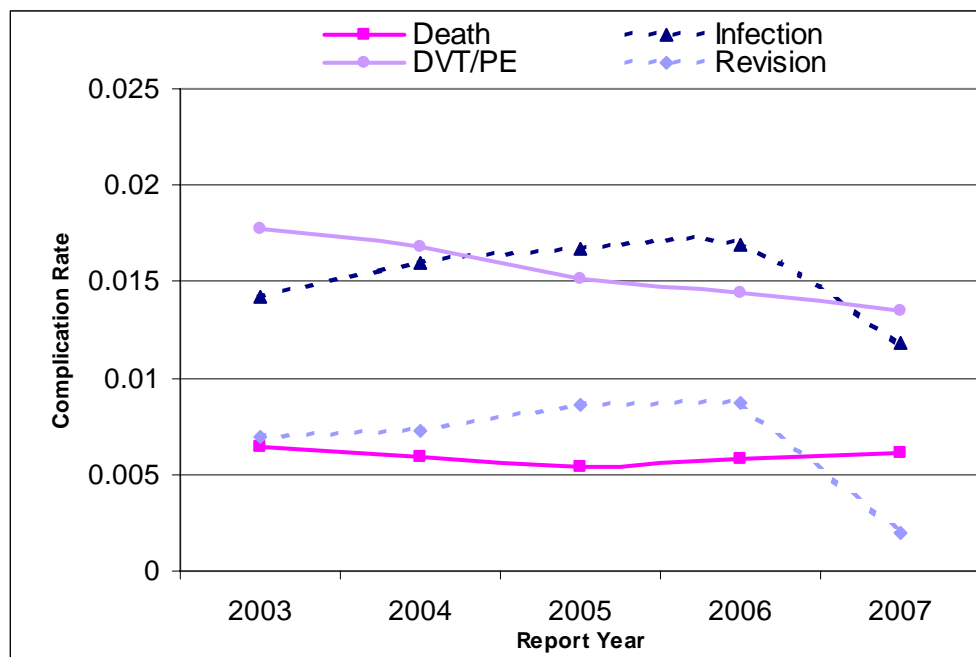
## **5.2 NHS Board Data for Complications Following Elective Primary Knee Replacement**

Figure 19 compares the national complication rates following knee replacement for NHS Boards from 2003 to 2007 for deaths, knee revisions, infections and DVT/PE. Complication rates for DVT/PE, revisions and infections have continued to decline, however rates for deaths has slightly increased.

h a triangle , and Consultants who have been outlying for 5 years have been marked with a cross.

Figure 20 to 23 represent the complication rates for patients following elective knee replacement between April 2000 and March 2005. Each data point represents the complication rate for an NHS Board in Scotland (for the label key and explanation of features see page 31). 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 boards that 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, and Consultants who have been outlying for 5 years have been marked with a cross.

**Figure 19: National rates for complications following elective primary knee replacements from report year 2003 to 2007**

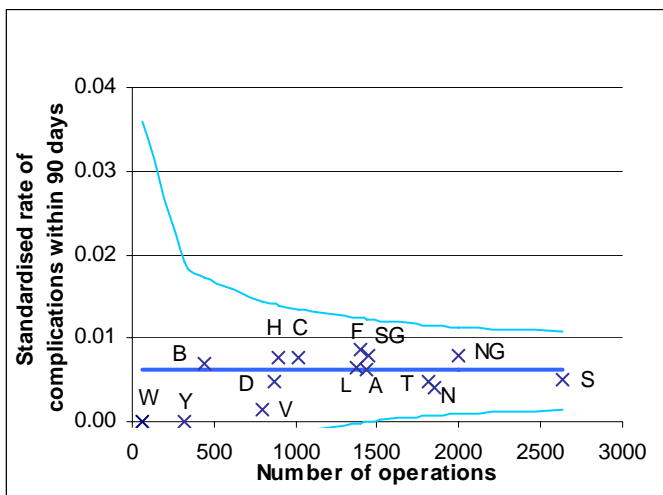


# Scottish Arthroplasty Project Annual Report 2007

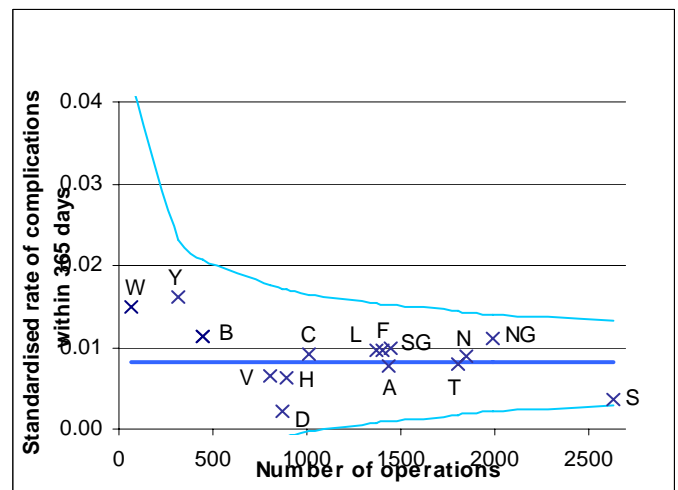
## NHS Board Data for Complications Following Elective Primary Knee Replacement (April 2000 – March 2005)

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, and Consultants who have been outlying for 5 years have been marked with a cross.

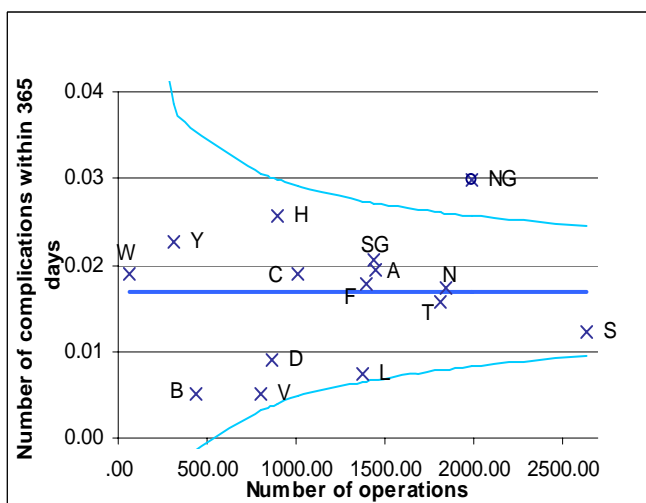
**Figure 20: Observed and expected standardised rates of deaths within 90 days**



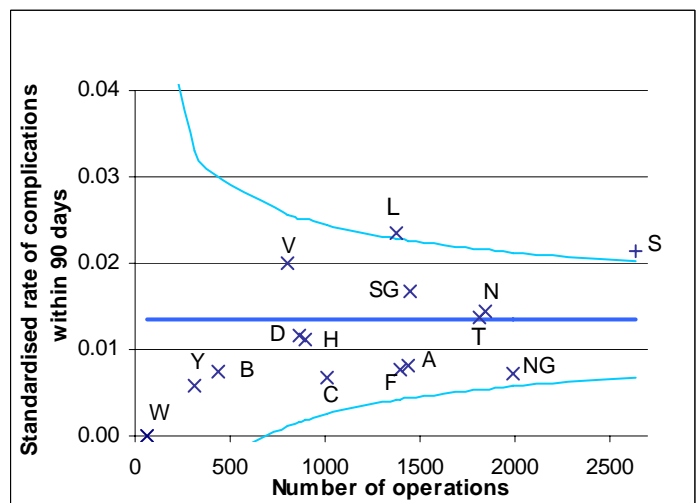
**Figure 21: Observed and expected standardised rates of knee revisions within 365 days**



**Figure 22: Observed and expected standardised rates of joint infections within 365 days**



**Figure 23: Observed and expected standardised rates of DVT/PE within 90 days**



### ***5.3 Consultant Surgeon Data for Complications Following Elective Primary Hip Replacement***

Figure 24 to 27 represent the complication rates for patients following elective hip replacement between April 2000 and March 2005. Each data point represents the complication rate for a consultant in Scotland. For a key to the features of the charts please see page 31. 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. Those 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), but particularly those with low numbers and high complication rates, should pay particular attention to each individual case.

#### **Consultant Surgeon Data for Complications Following Elective Primary Hip Replacement (April 2000 – March 2005)**

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, and Consultants who have been outlying for 5 years have been marked with a cross.

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Figure 24: Observed and expected standardised rates of deaths within 90 days

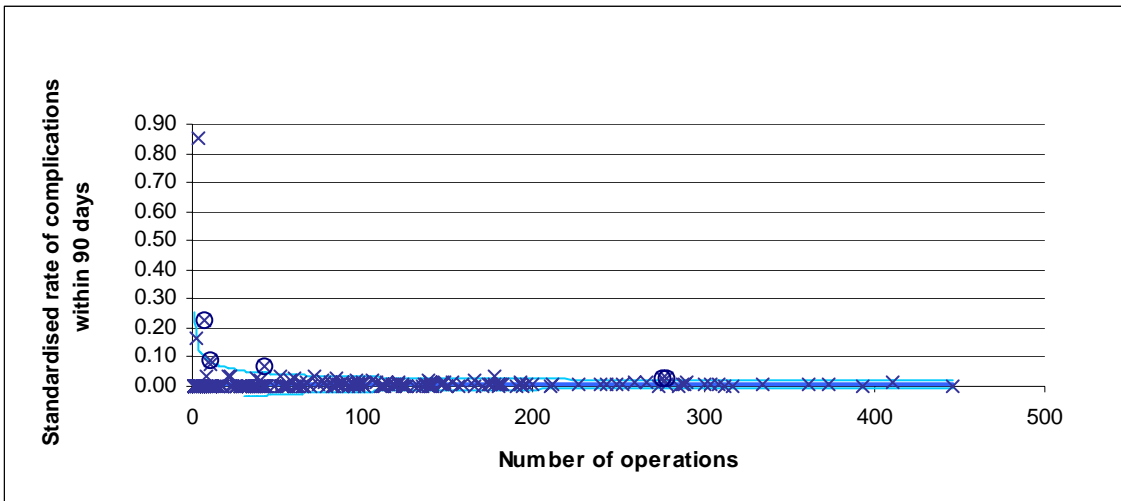


Figure 25: Observed and expected standardised rates of hip dislocations within 365 days

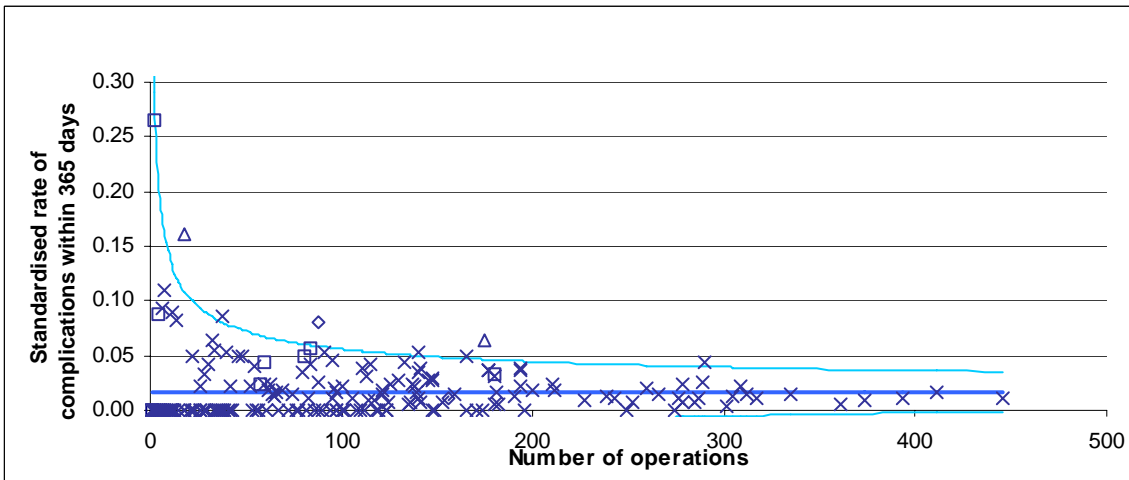
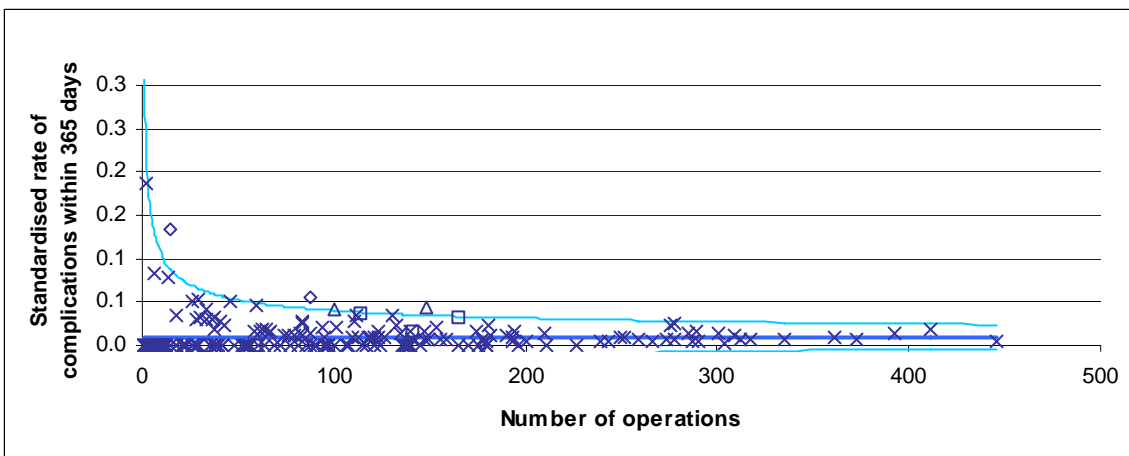
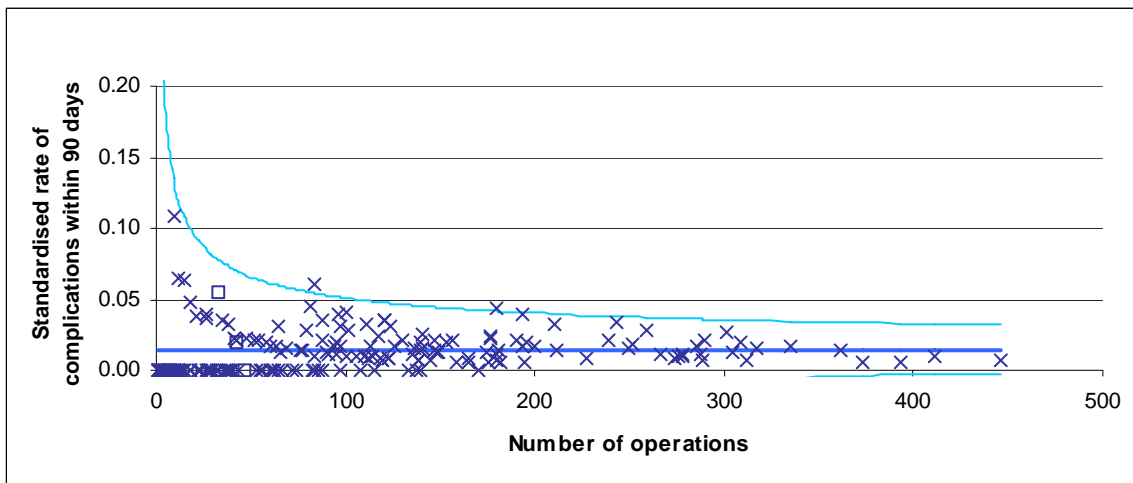


Figure 26: Observed and expected standardised rates of joint infections within 365 days



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Figure 27: Observed and expected standardised rates for DVT/PE within 90 days



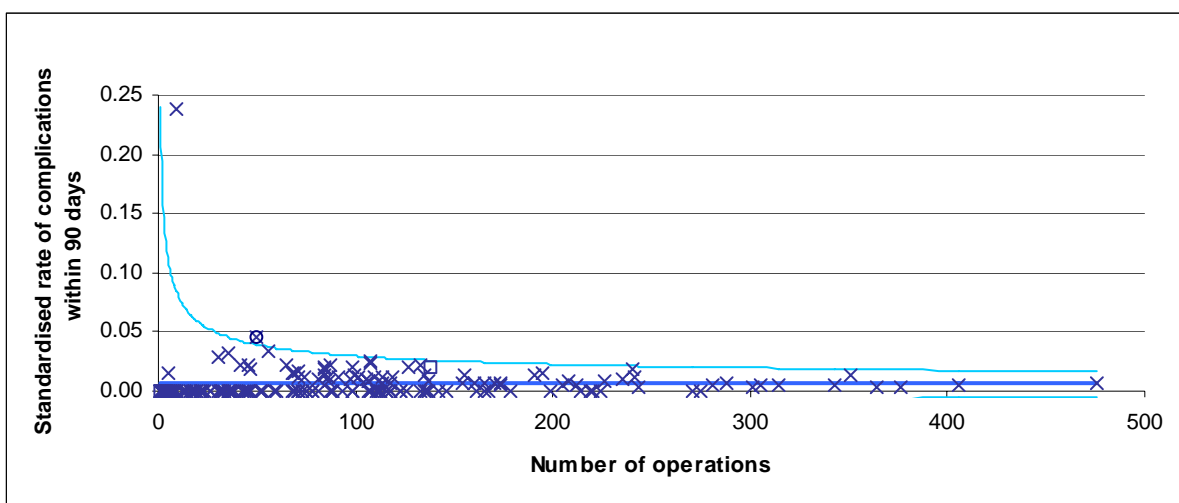
### ***5.4 Consultant Surgeon Data for Complications Following Elective Primary Knee Replacement***

Figure 28 to 30 represent the complication rates for patients following elective knee replacement between April 2000 and March 2005. Each data point represents the complication rate for a consultant in Scotland. For a key to the features of the charts please see page 31. 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. Those consultants who are outlying for a second or fourth 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.

#### **Consultant Surgeon Data for Complications Following Elective Primary Knee Replacement (April 2000 – March 2005)**

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.

**Figure 28: Observed and expected standardised rates of deaths within 90 days**



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Figure 29: Observed and expected standardised rates of joint infections within 365 days

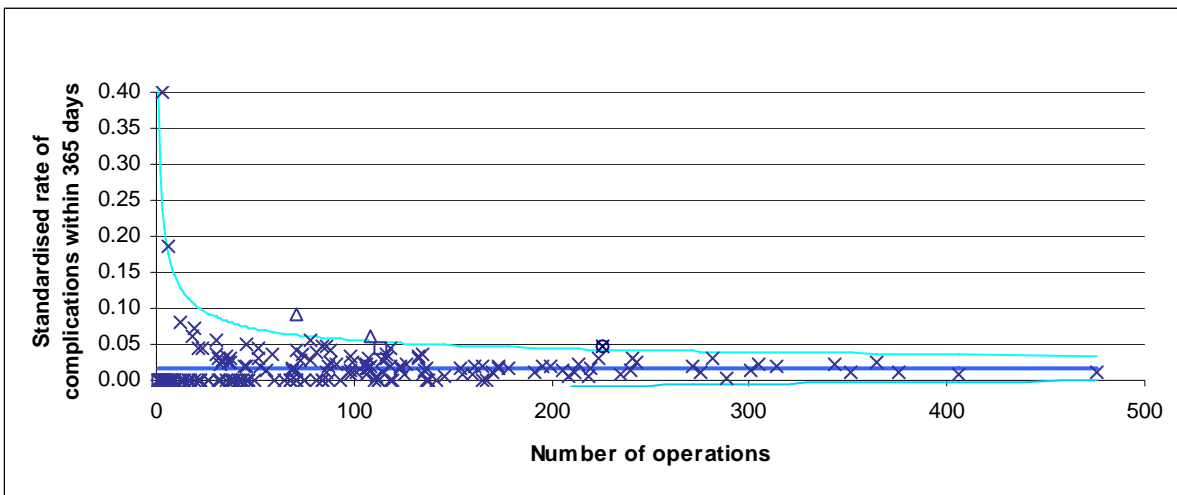
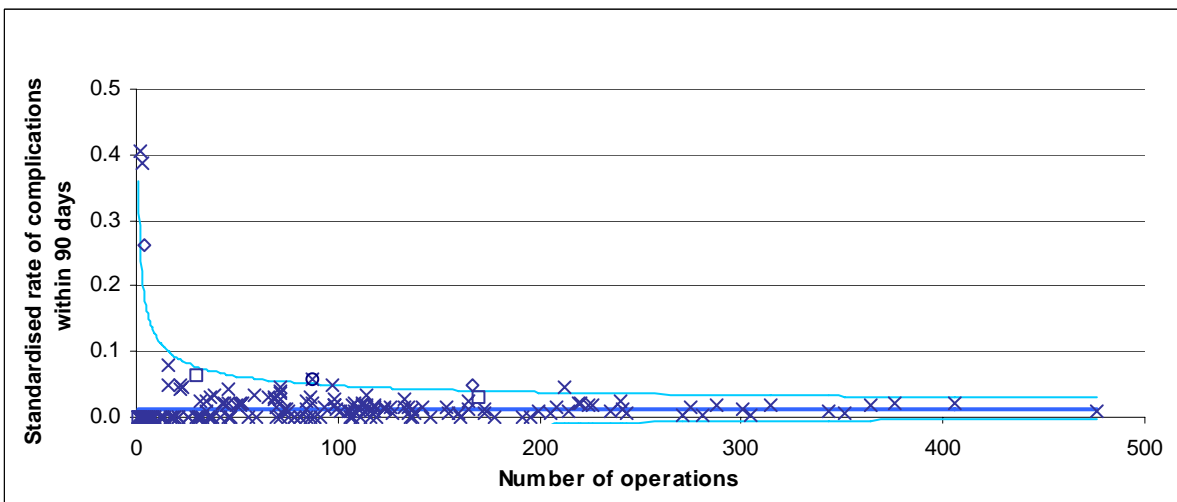


Figure 30: Observed and expected standardised rates of DVT/PE within 90 days



## **6. Arthroscopies**

Investigating the general trends in the number of Arthroscopies being performed is a new area of interest within the Scottish Arthroplasty Project.

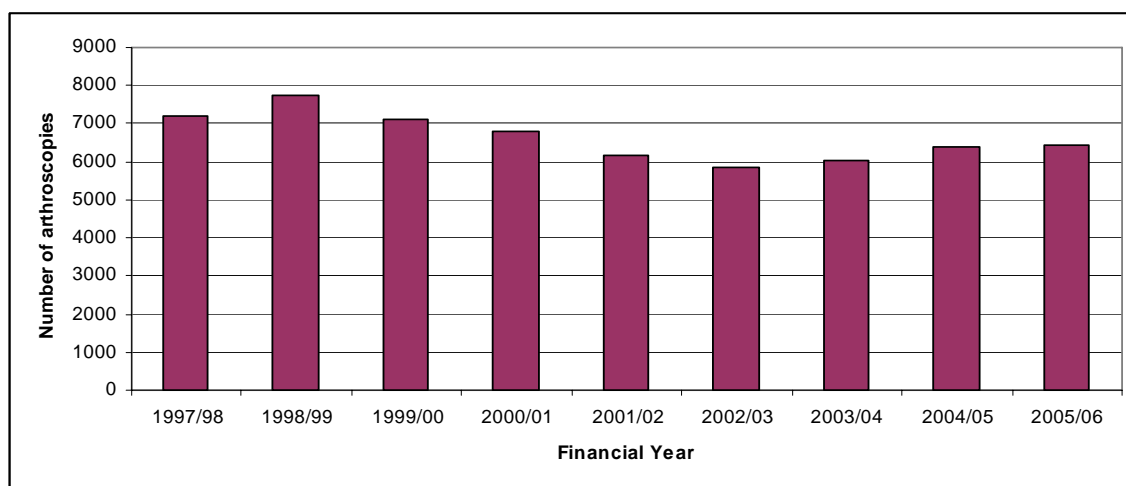
The use of an arthroscopy allows small incisions to be made around the joint. It is then possible to view the interior of the joint through the arthroscope, which can assist in diagnosis of a patient's problem. Other small incisions can be made and surgical instruments can be inserted to remove or repair damaged tissues. An arthroscopy can be performed on most joints. This analysis, however, focuses on the arthroscopy of the knee.

Data from financial years 1997/98 to 2005/06 has been extracted from the SMR01 records. The data has been broken down by: Inpatient/Daycases and age group by Health Board of Residence

In addition, there is also analysis on the number of patients over 60 years of age, who undergo a total and hemi knee replacement within two years of having an arthroscopy.

Figure 31 shows the number of arthroscopies in Scotland from financial year 1997/98 to 2005/06. There was a decrease in the number of arthroscopies from 7725 in 1998/1999 to 5865 in 2002/03. However, the number of arthroscopies has increased since then to 6441 in 2005/06.

**Figure 31: The number of arthroscopies carried out in Scotland from 1997/1998 to 2005/06**

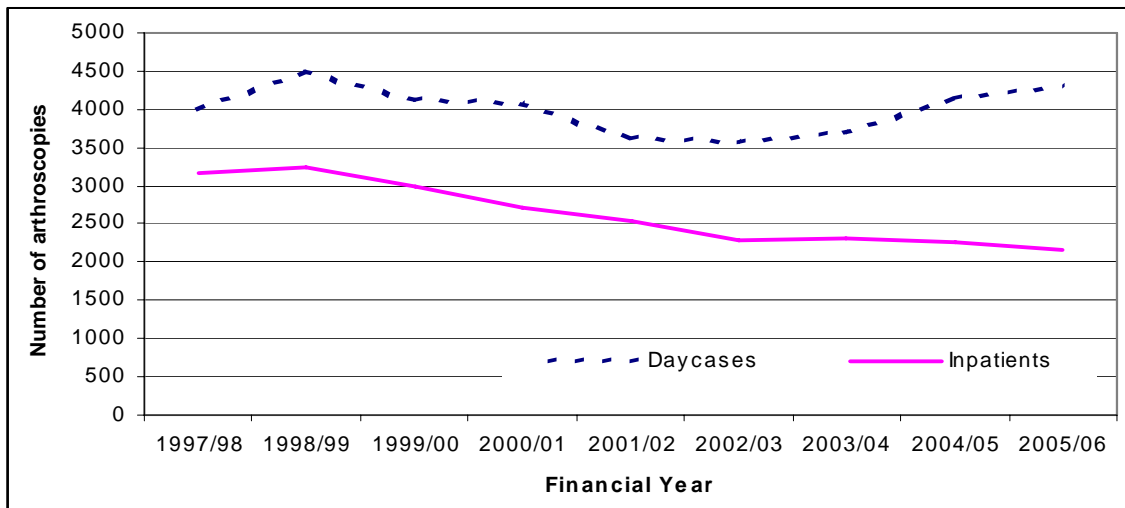


As with a number of common and less complex surgical procedures, it is becoming more common for an arthroscopy to be done as a daycase. Figure 32 below shows the split between the numbers of patients who were treated as a daycase or inpatient from 1997/1998 to 2005/06.

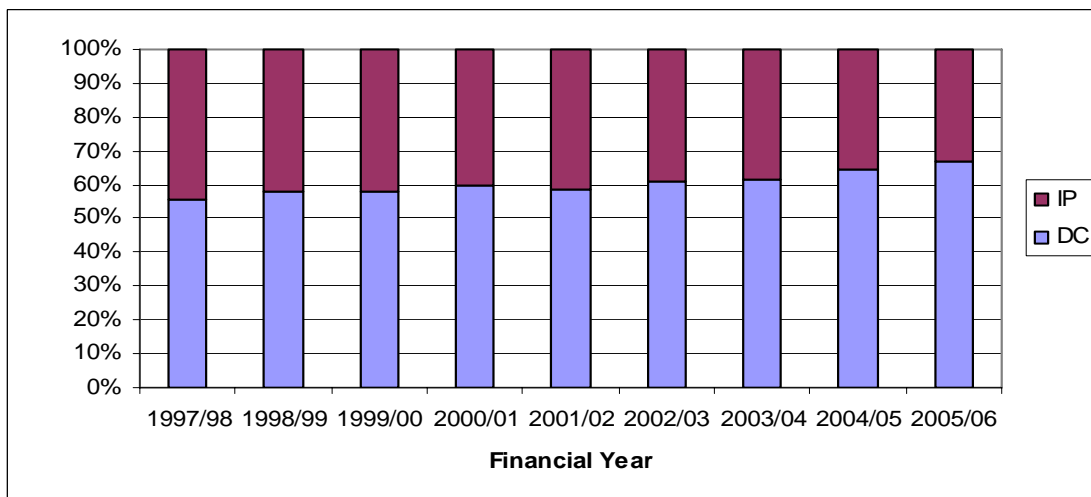


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**Figure 32: The number of daycases and inpatients from 1997/1998 to 2005/2006.**



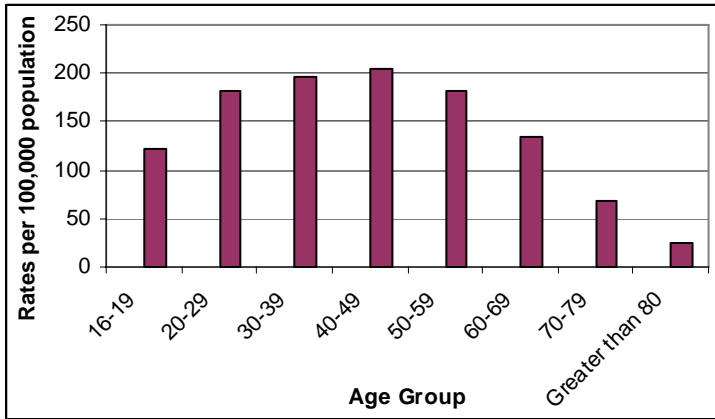
**Figure 33: The percentage change of daycases and inpatients from 1997/98 to 2005/06**



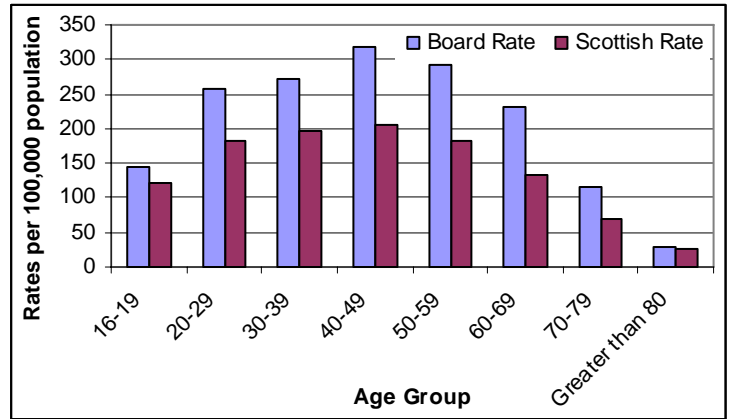
The graphs from Figures 34 to 49 show the rates of arthroscopies at a Scotland level, per 100,000 and each Health Board of Residence. The rates of arthroscopy are shown in 10-year age groups from 1997/98 to 2005/06, and are based on the actual health board population in each age group. Please note that the scales are different on each graph. The average age of a patient undergoing a knee arthroscopy in the nine-year period is 43 years.

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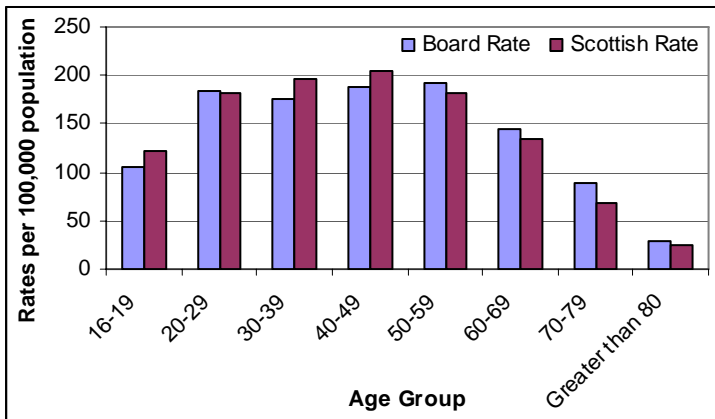
**Figure 34: Age Group Rate of Arthroscopies for Scotland**



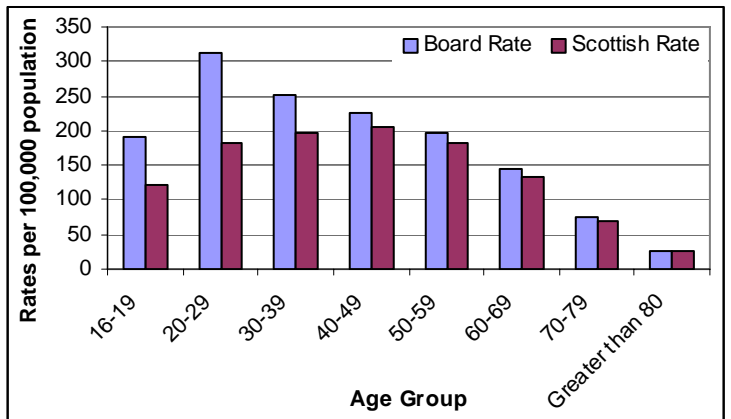
**Figure 35: Age Group Rate of Arthroscopies for Ayrshire and Arran**



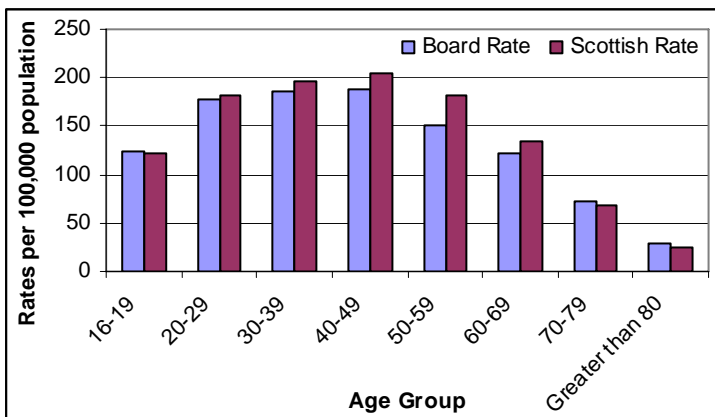
**Figure 36: Age Group Rate of Arthroscopies for Argyll and Clyde**



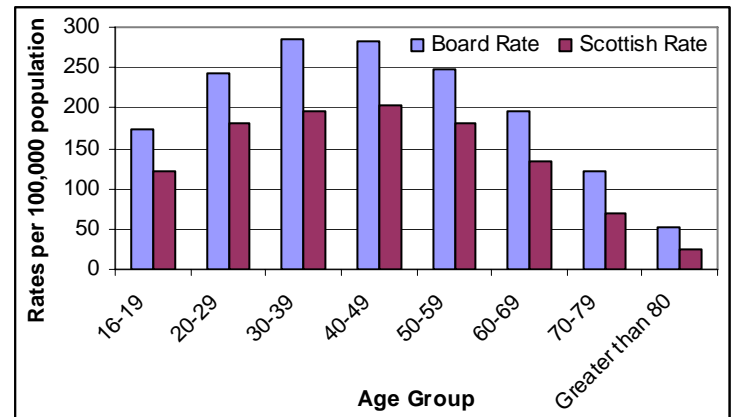
**Figure 37: Age Group Rate of Arthroscopies for Borders**



**Figure 38: Age Group Rate of Arthroscopies for Dumfries and Galloway**

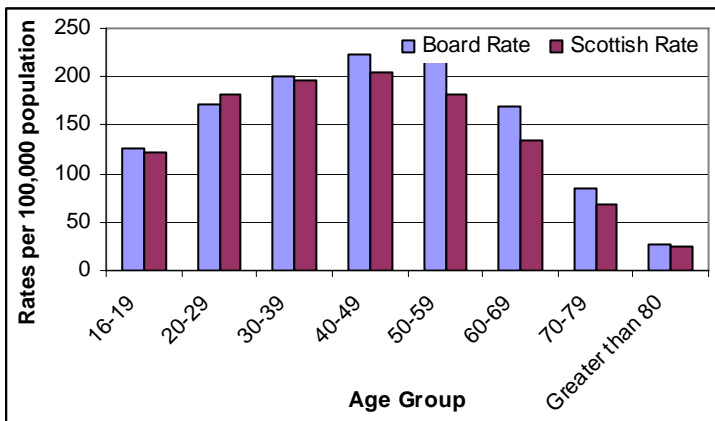


**Figure 39: Age Group Rate of Arthroscopies for Fife**

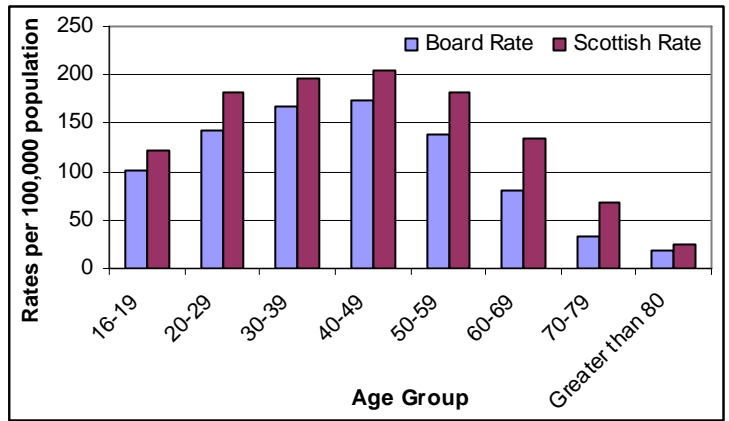


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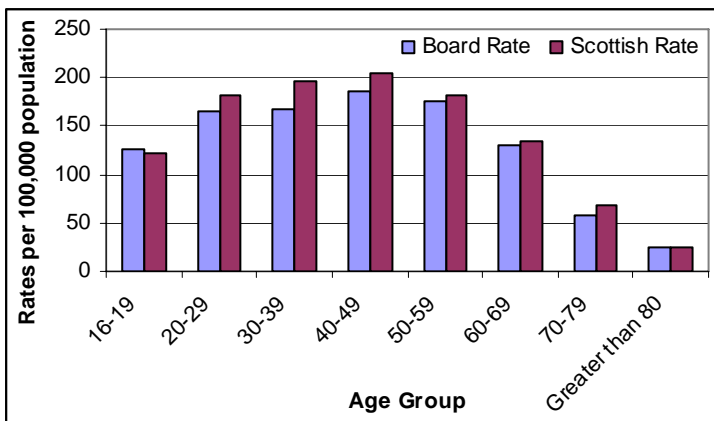
**Figure 40: Age Group Rate of Arthroscopies for Forth Valley**



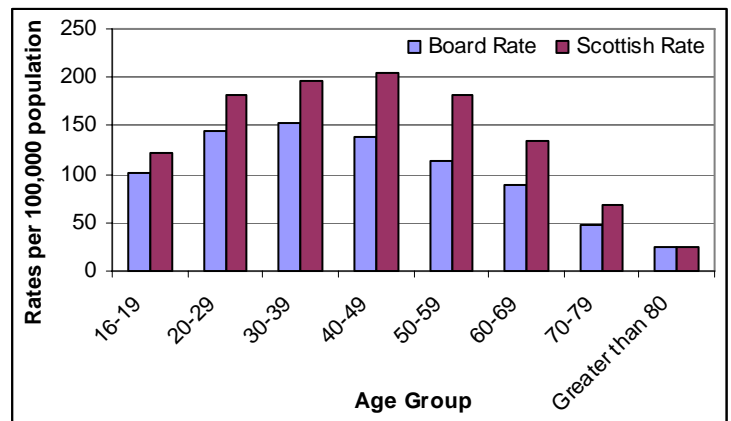
**Figure 41: Age Group Rate of Arthroscopies or Glasgow**



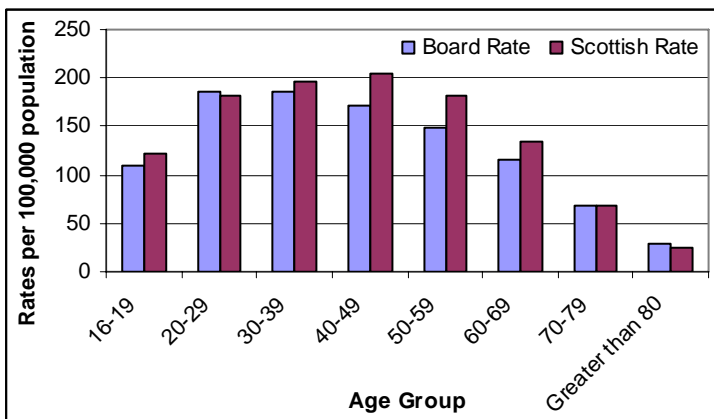
**Figure 42: Age Group Rate of Arthroscopies for Grampian**



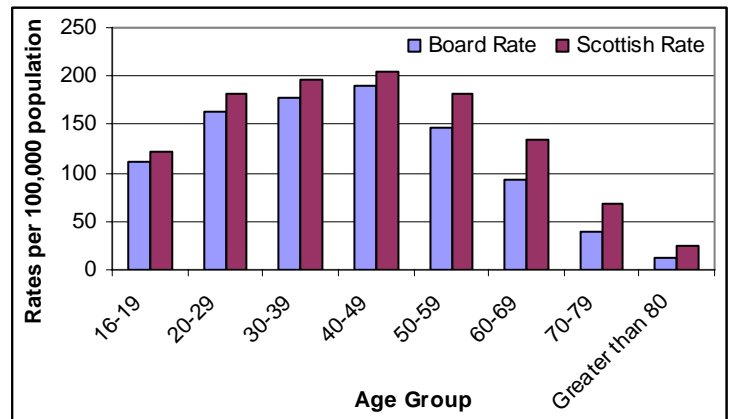
**Figure 43: Age Group Rate of Arthroscopies or Highland**



**Figure 44: Age Group Rate of Arthroscopies for Lanarkshire**

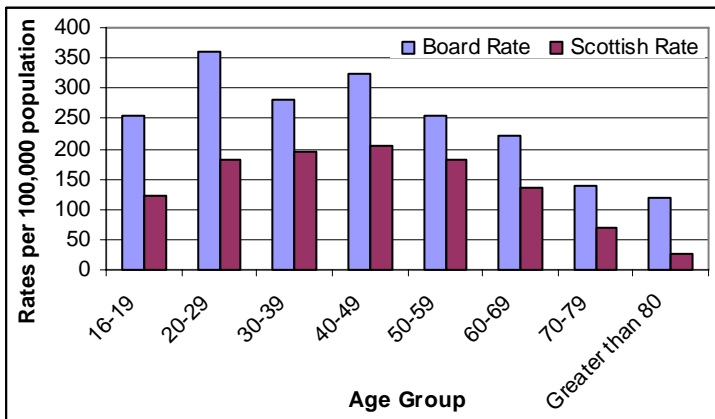


**Figure 45: Age Group Rate of Arthroscopies or Lothian**

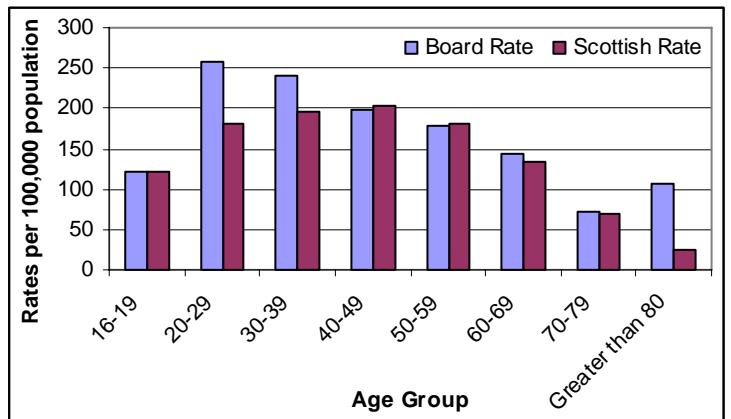


# Scottish Arthroplasty Project Annual Report 2007

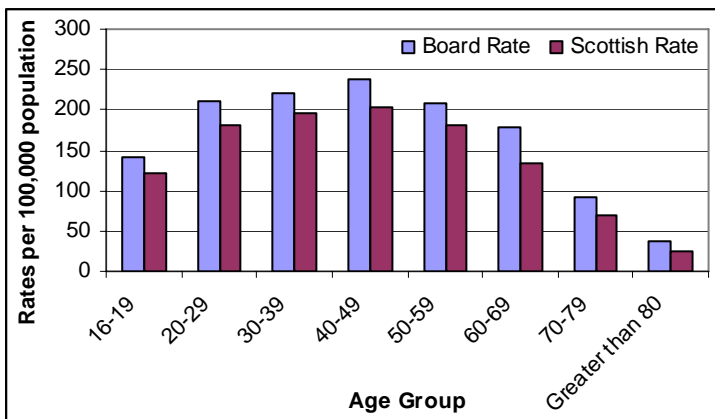
**Figure 46: Age Group Rate of Arthroscopies for Orkney**



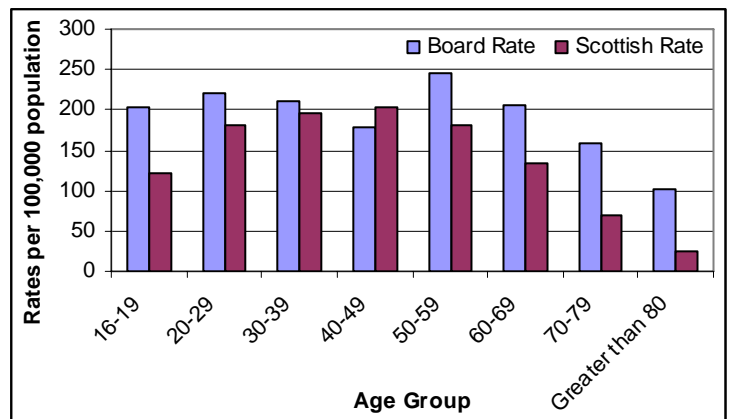
**Figure 47: Age Group Rate of Arthroscopies or Shetland**



**Figure 48: Age Group Rate of Arthroscopies for Tayside**



**Figure 49: Age Group Rate of Arthroscopies or Western Isles**



A further area of interest to the committee was the number of patients over 60 years of age who went on to have a total or hemi knee replacement within 2 years of having an arthroscopy. Figure 50 compares the Scottish and each Health Board of Residence rate (per 100,000 of each Health Board of Residence population) where the patient has undergone a total or hemi knee replacement within two years of having an arthroscopy (for arthroscopies performed between 1<sup>st</sup> April 1997 and 31<sup>st</sup> March 2004). Figure 51 shows the actual number of arthroscopies corresponding to the rates in figure 50.

## Scottish Arthroplasty Project Annual Report 2007

Figure 50: Rates per 100,000 of population aged 60+ for each health board of residence where patients have undergone a primary total or hemi knee replacement within 2 years of an arthroscopy.

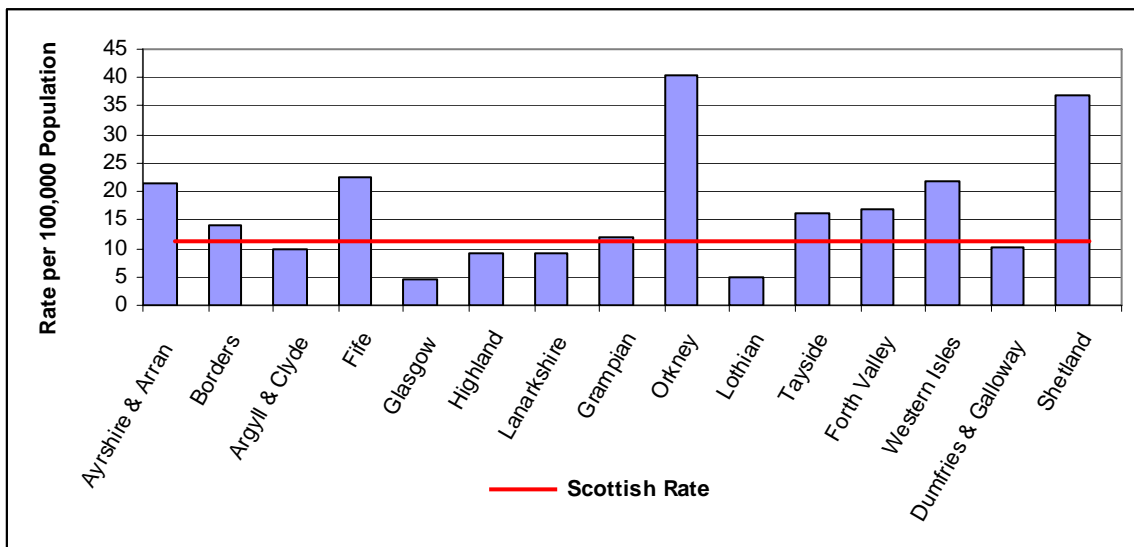
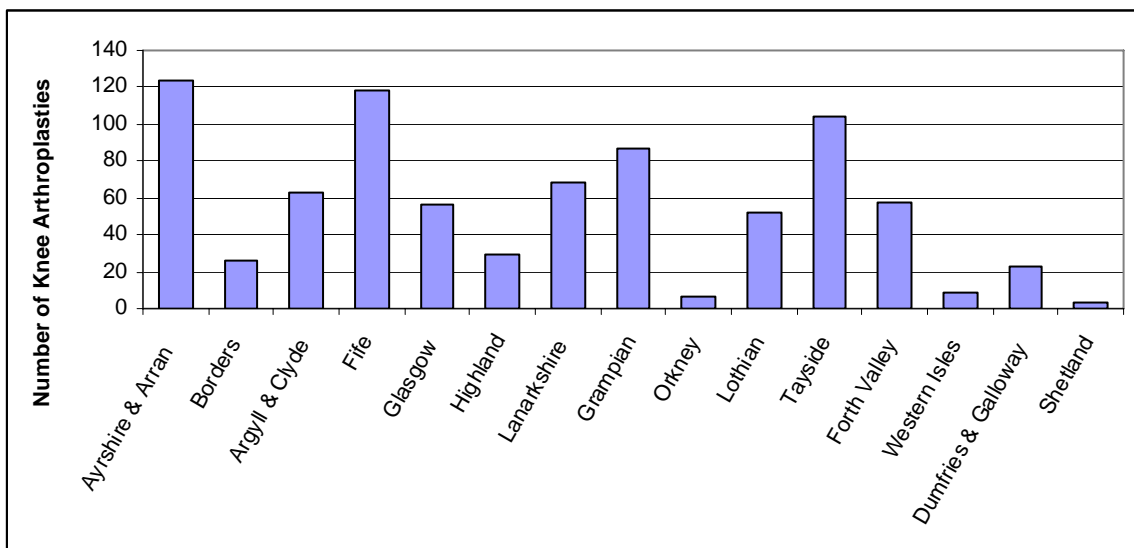


Figure 51: Number of patients aged 60+ having a total or hemi knee replacement within 2 years of a knee arthroscopy by NHS Board of Residence.



Those regions with a high rate of knee arthroscopies tend to have a higher proportion of patients over the age of 60 going on to have a knee replacement within 2 years. This suggests some patients are having unnecessary arthroscopies. Data from the private sector is not available which may alter these figures.

## 7. Appendices

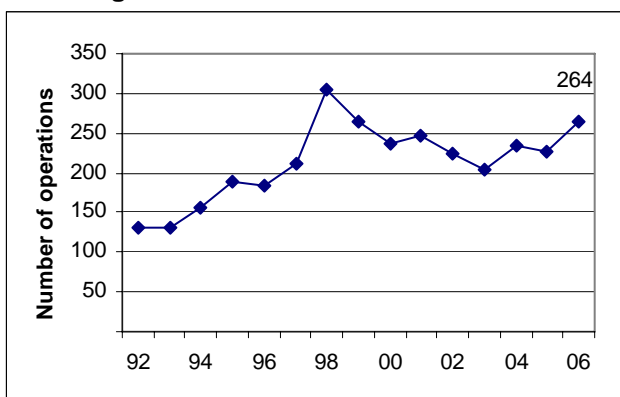
### 7.1 Appendix 1 – Shoulder and Elbow Arthroplasties: Summary

The number of elective and emergency joint replacement operations (for both primary and revision for hip and knee) can be seen in the main report and corresponding information for other upper limb arthroplasties plus toes and ankles in Appendix 3.

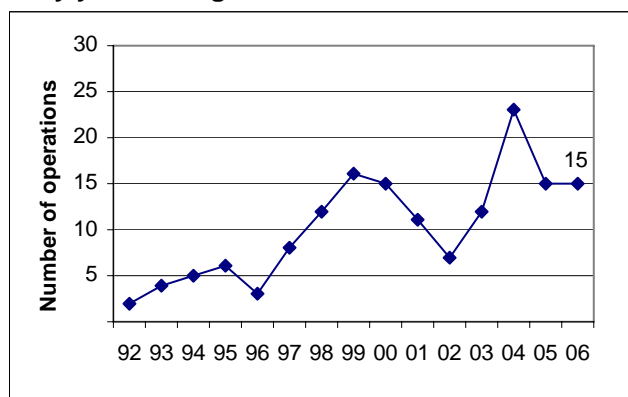
Figure 52 to 55 show the numbers of elective and emergency joint replacement operations, (both primary and revision for shoulder and elbow) recorded as performed in NHS Scotland in each of the last 15 years (1992 to 2006). All numbers are displayed by year ending March. The number of primary shoulder arthroplasties has risen steadily from 1992 to 2006 (130 to 264) with a peak of activity in 1998 (305). There was also an increase in the volume of revision shoulder arthroplasties carried out between 1992 and 2006 (2 to 15). The revision burden (no of revisions expressed as percentage of total) is currently 5.4%.

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 8 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 52: Primary Shoulder Arthroplasties by year ending March**

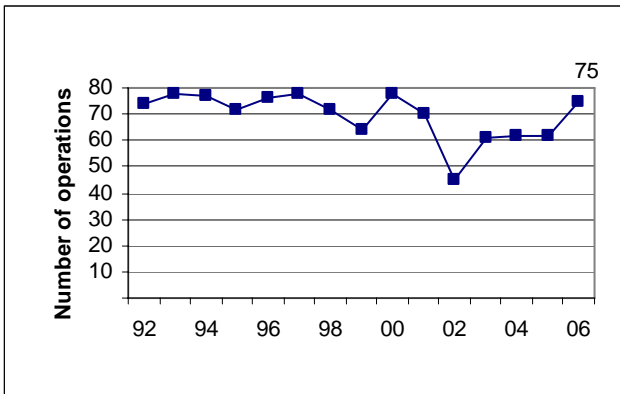


**Figure 53: Revision Shoulder Arthroplasties by year ending March**

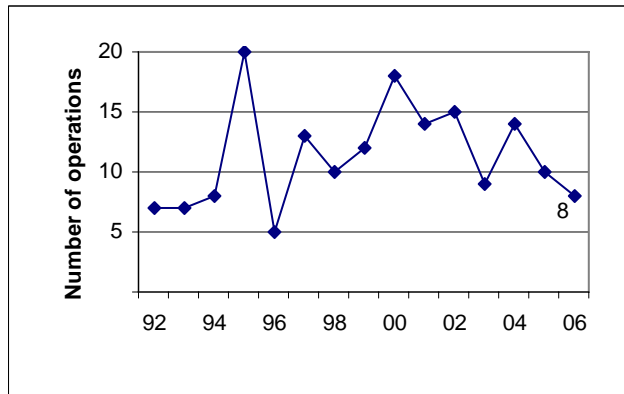


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**Figure 54: Primary Elbow Arthroplasties by year ending March**



**Figure 55: Revision Elbow Arthroplasties by year ending March**



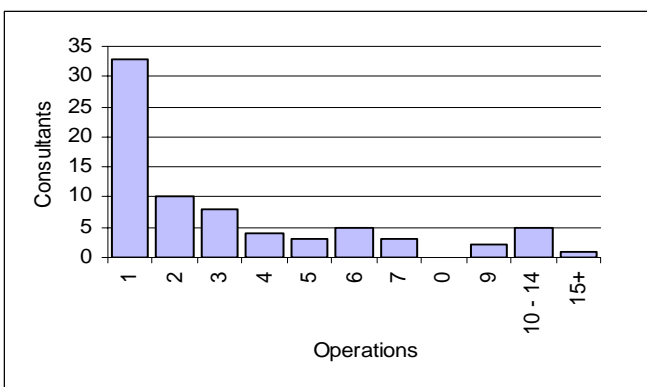
### 7.1.1 Number of Shoulder and Elbow Arthroplasties Performed per Surgeon

Figure 56 and 57 illustrate the number of primary joint replacements for shoulders and elbows 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.

A total of 74 consultant surgeons are recorded as having performed primary shoulder replacements in 2006 in the NHS. There were 55 consultant surgeons (74%) who performed less than 5 primary shoulder replacements. It is probable that the majority of cases performed by small number surgeons were for traumatic rather than elective indications.

Twenty one consultant surgeons performed primary elbow replacements in 2005. Fifteen of these consultant surgeons (71%) performed less than 5 primary elbow replacements. However, 80% of elbow replacements are carried out by surgeons performing 5 or more per year.

**Figure 56: Primary Shoulder Arthroplasties for year ending March 2006**



**Figure 57: Primary Elbow Arthroplasties for year ending March 2006**



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### **7.2 Appendix 2 – Kaplan-Meier Survival of Hip and Knee Replacements**

It is possible to use the 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 and so in Figure 58 for example, patients aged greater than 75 years 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).

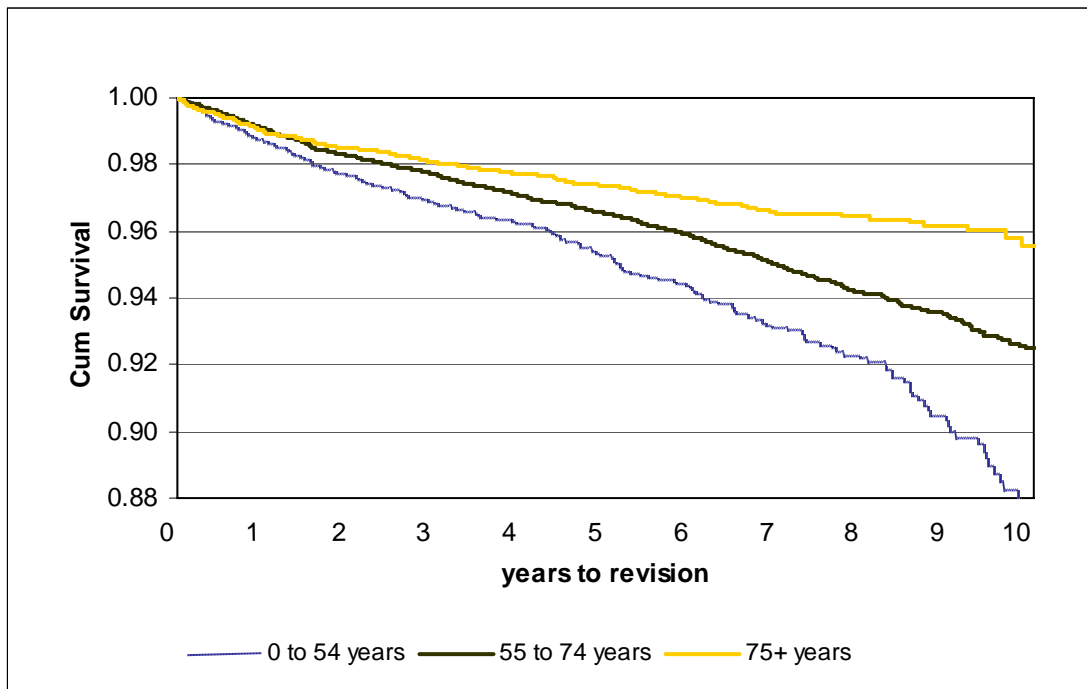
**Table 18: Revision of Primary Hip replacements for operations performed between April 1995 – March 2006**

| Grouping                                   | Total Primary hip Replacements | Surviving to end point/dying before end point | Log-rank Statistic | p-value |
|--|--------------------------------|---|--------------------|---------|
| Age of patient                             |                                |   | 61.800             | <0.0001 |
| <55 years                                  | 4354                           | 4127  |                    |         |
| 55 – 75 years                              | 25104                          | 24268   |                    |         |
| >75 years                                  | 12241                          | 11981   |                    |         |
| Volume of procedures performed by surgeons |                                |   | 0.543              | 0.4612  |
| 0-20 hips per year                         | 13180                          | 12789   |                    |         |
| 21+ hips per year                          | 28519                          | 27589   |                    |         |
| Diagnosis                                  |                                |   | 8.117              | 0.0044  |
| Osteoarthritis                             | 34781                          | 33741   |                    |         |
| Rheumatoid arthritis                       | 1192                           | 1136  |                    |         |

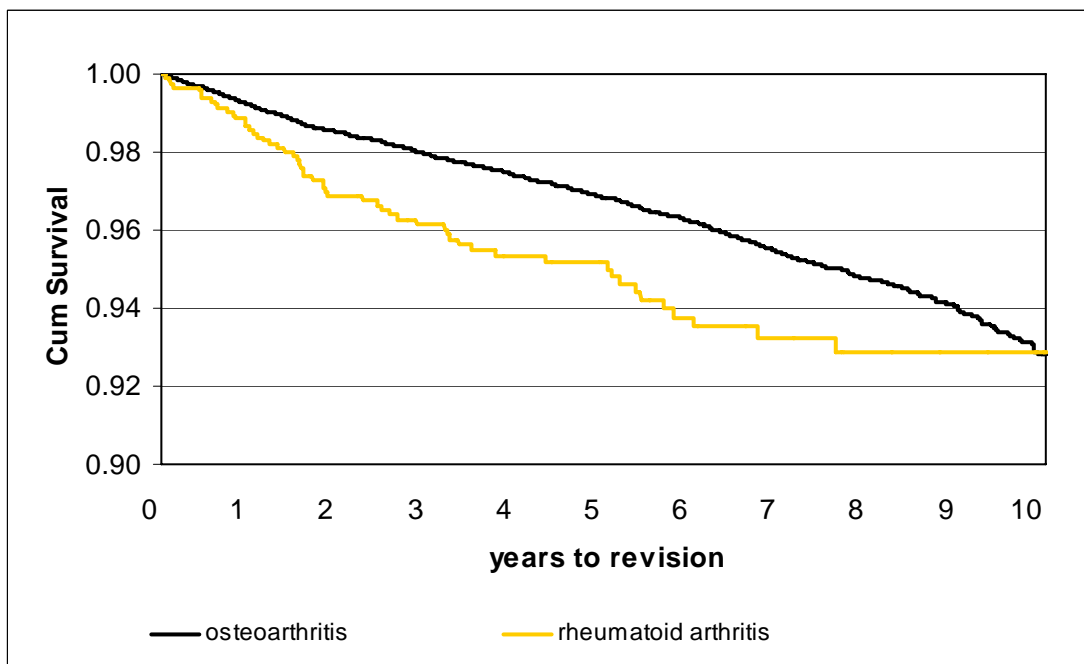


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**Figure 58: Revision of Primary Hip replacements by patient age for operations performed between April 1995 – March 2006**

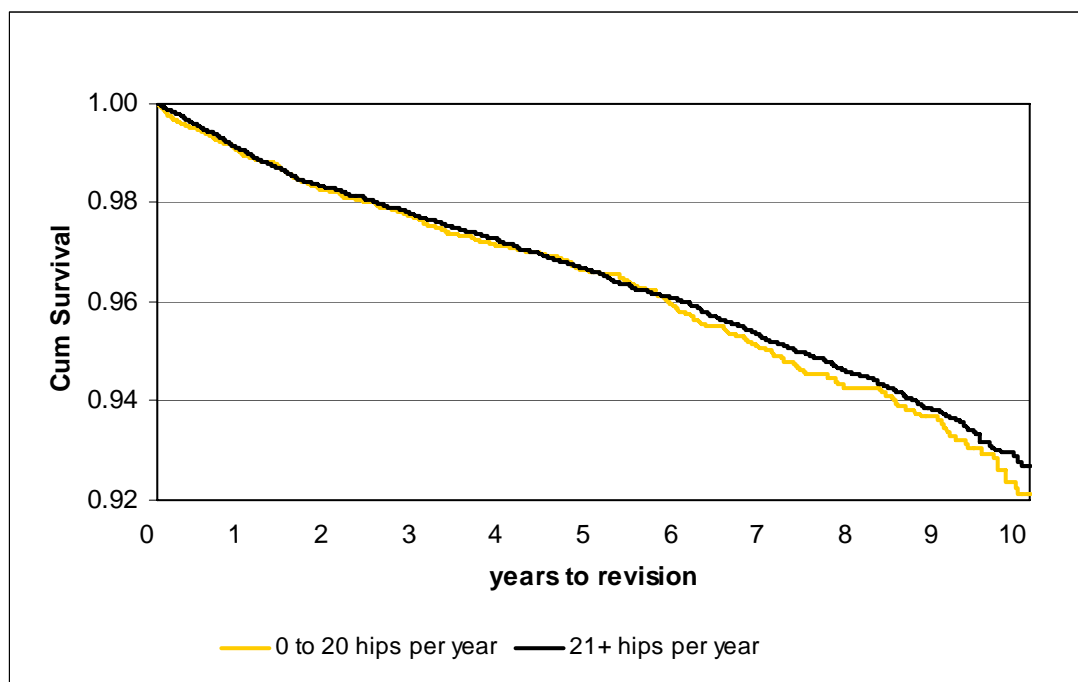


**Figure 59: Revision of Primary Hip replacements by diagnosis type for operations performed between April 1995 – March 2006**



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**Figure 60: Revision of Primary Hip replacements by volume of procedures performed by surgeons for operations performed between April 1995 – March 2006**



**Table 19: Revision of Primary Knee replacements for operations performed between April 1995 – March 2006**

| Grouping                                   | Total Primary hip Replacements | Surviving to end point/dying before end point | Log-Rank Statistic | p-value |
|--|--------------------------------|---|--------------------|---------|
| Age of patient                             |                                |   | 73.932             | <0.0001 |
| <55 years                                  | 1698                           | 1605  |                    |         |
| 55 – 75 years                              | 19247                          | 18566   |                    |         |
| >75 years                                  | 9488                           | 9316  |                    |         |
| Volume of procedures performed by surgeons |                                |   | 0.624              | 0.4294  |
| 0-20 hips per year                         | 13047                          | 12662   |                    |         |
| 21+ hips per year                          | 17386                          | 16825   |                    |         |
| Diagnosis                                  |                                |   | 0.014              | 0.0907  |
| Osteoarthritis                             | 27115                          | 26289   |                    |         |
| Rheumatoid arthritis                       | 1704                           | 1643  |                    |         |

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Figure 61- Revision of Primary Knee replacements by patient age for operations performed between April 1995 – March 2006

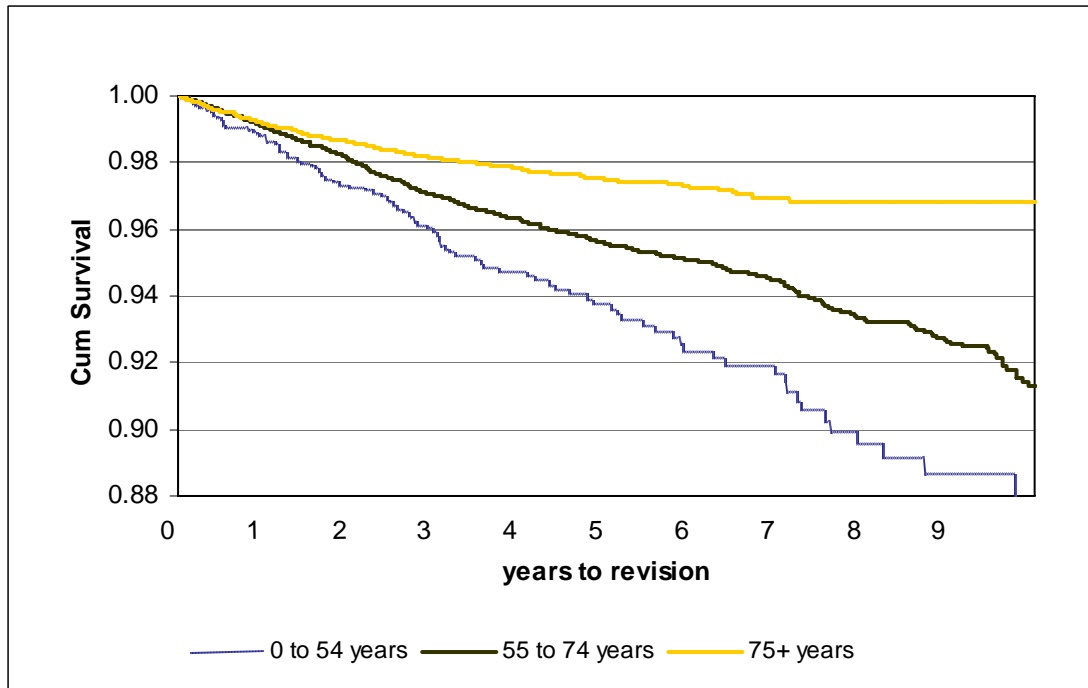
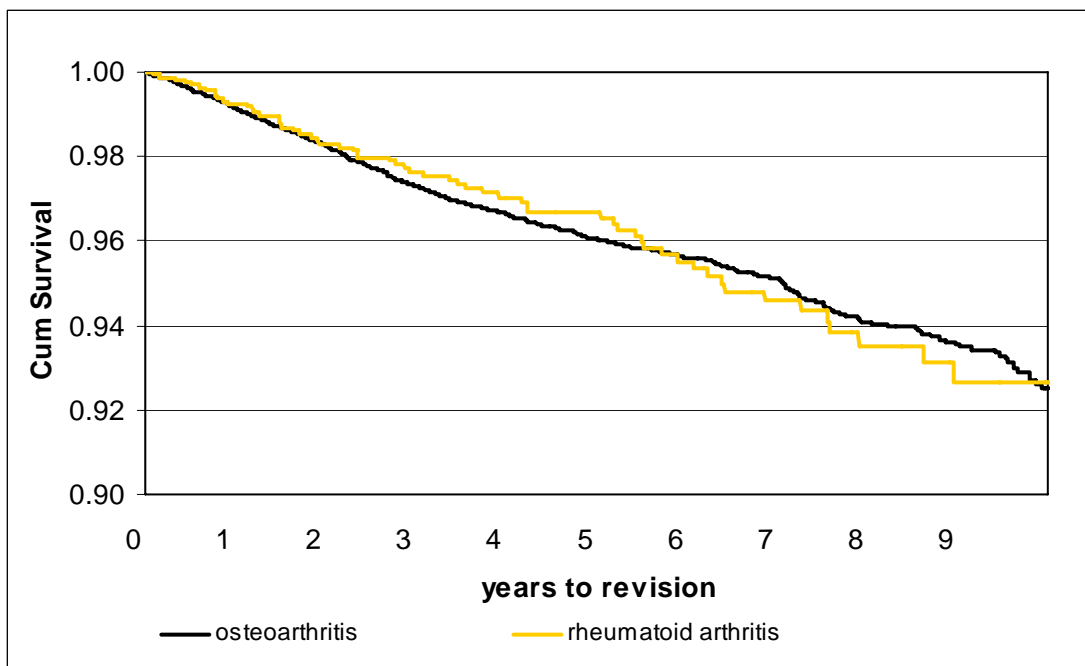
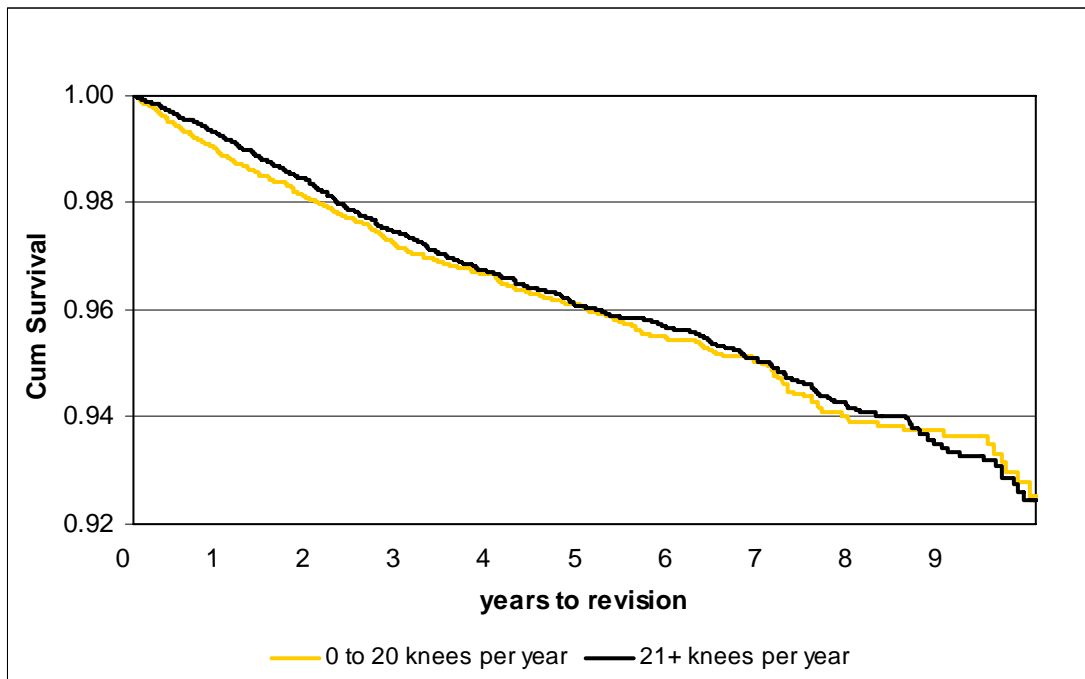


Figure 62: Revision of Primary Knee replacements by diagnosis type for operations performed between April 1995 – March 2006



## Scottish Arthroplasty Project Annual Report 2007

Figure 63: Revision of Primary Knee replacements by volume of procedures performed by surgeons for operations performed between April 1995 – March 2006



**7.3 Appendix 3 – Additional National Trends in Numbers of Operations**

The number of elective and emergency joint replacement operations (for both primary and revision for hip and knee) can be seen in the main report and corresponding information for shoulders and elbows is in Appendix 1.

Figure 64 shows that the number of primary finger arthroplasties has remained relatively stable at between 40 and 60 procedures from 1992 – 2006. Since 1992, there has also been little change in the number of finger revisions with only 3 recorded in 2006.

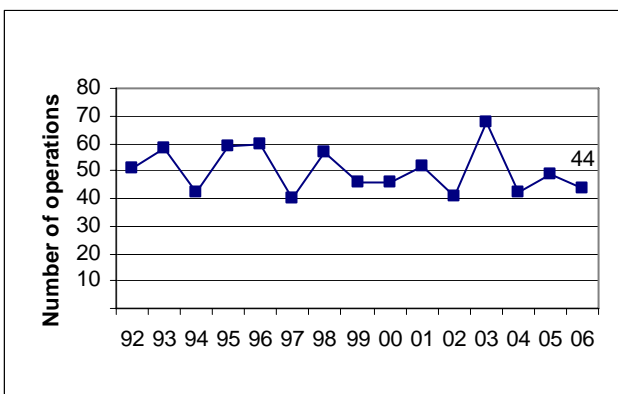
There has been a slight increase in the number of primary wrist arthroplasties performed from 10 operations in 1992 to 27 operations in 1996. Between 2000 and 2004, the volume of wrist arthroplasties has remained static at around 10 operations per year. However, there has been a slight increase to 22 operations in 2006. The number of wrist revisions has remained relatively low over the time period.

The number of thumb arthroplasties carried out each year increased from 6 to 30 operations between 1992 and 2003, thereafter, the number of operations carried out has remained relatively constant (Figure 68).

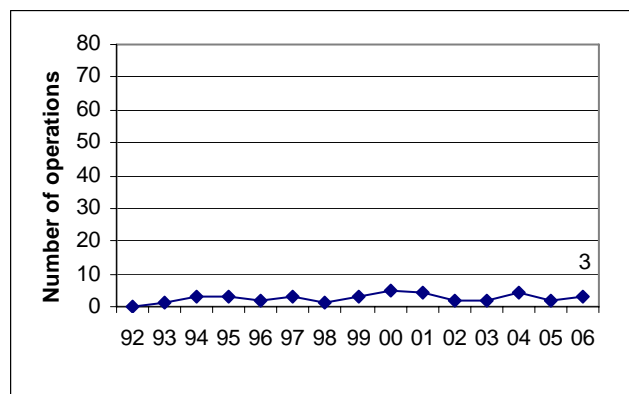
The number of toe arthroplasties has slowly decreased over time. There were 46 toe procedures recorded in 1992, and only 22 recorded in 2006 (Figure 69).

From 1992 to 1998 the number of ankle arthroplasties remained relatively constant with only 1 or 2 occurring. Since 1998, however, there has been a steady increase in the number of ankle arthroplasties carried out. The number of procedures has risen from 1 in 1998 to 22 in 2006.

**Figure 64: Primary Finger Arthroplasties by year ending March**

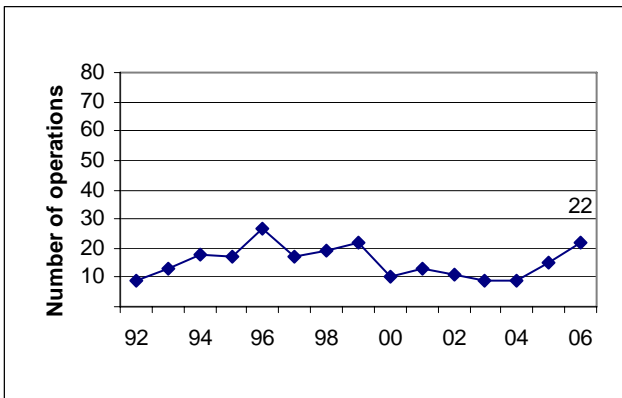


**Figure 65: Revision Finger Arthroplasties by year ending March**

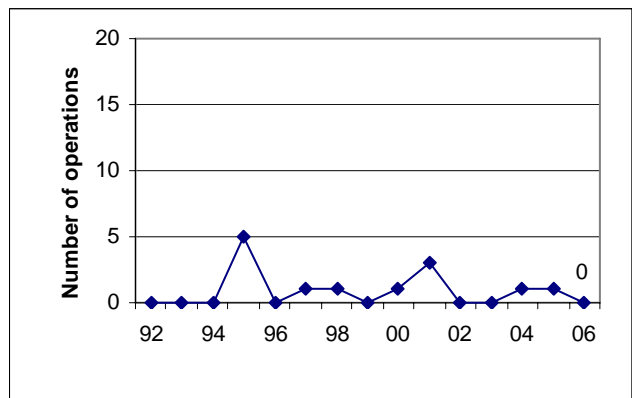


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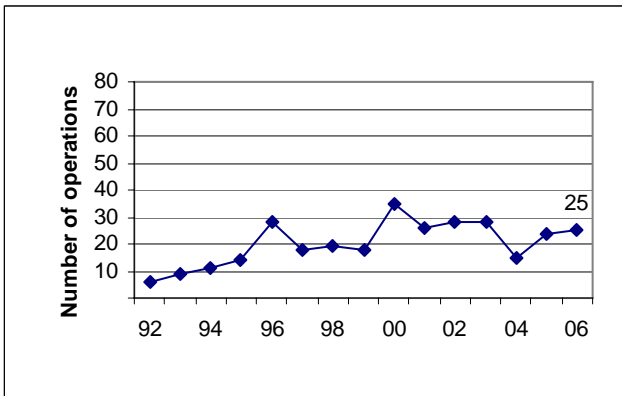
**Figure 66: Primary Wrist Arthroplasties by year ending March**



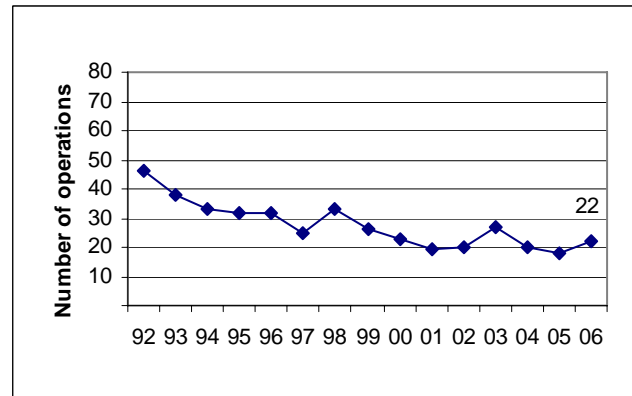
**Figure 67: Revision Wrist Arthroplasties by year ending March**



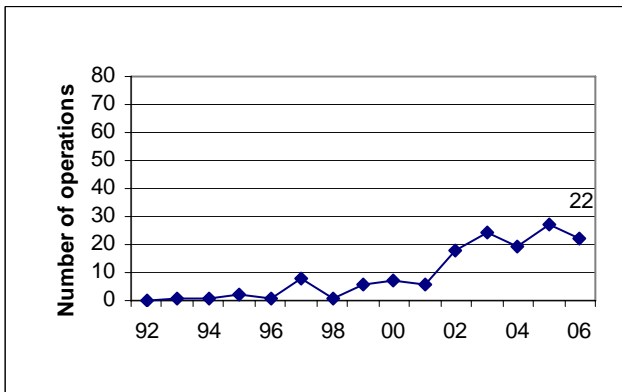
**Figure 68: Thumb Arthroplasties by year ending March**



**Figure 69: Toe Arthroplasties by year ending March**



**Figure 70: Ankle Arthroplasties by year ending March**



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### **7.4 Appendix 4 – Length of Stay Analysis**

Table 20 and 21 show the median length of stay per continuous inpatient stay in each NHS Board for each of the ten years between 1996/97 and 2005/06 for elective primary hip and elective primary knee replacements respectively. The median length of stay is the period within which 50% of patients have gone home. This probably represents custom and practice within the health service in that area. The corresponding mean lengths of stay are also given in Tables 22 and 23.

Over the course of the last ten years, there has been a steady drop in the median length of stay for patients having hip replacements. The largest decrease is 7 days in NHS Lanarkshire. However, there has been a slight increase in the median length of stay from 11 days to 17 days across the decade 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 in this board.

With knee replacements there was again a general downward trend in median over the ten years across the NHS Boards. The greatest impact on median was seen in NHS Lanarkshire where the median decreased from 16 to 8. There was a slight increase of 3 days in the median length of stay over the ten years in NHS Western Isles - from 11 in 1996/97 to 14 in 2005/06. However this was the only NHS Board where a rise was seen over the decade which can be explained by the relatively small number of operations carried out in this Board with an average of 13 per year.

**Table 20: Median 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 |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scotland                | 12    | 11    | 10    | 10    | 9     | 9     | 9     | 8     | 8     | 7     |
| Argyll & Clyde          | 14    | 12    | 11    | 10    | 9     | 9     | 9     | 8     | 7     | 8     |
| Ayrshire & Arran        | 12    | 12    | 12    | 10    | 9     | 9     | 9     | 8     | 9     | 9     |
| Borders                 | 11    | 11    | 10    | 9     | 9     | 9     | 9     | 8     | 8     | 8     |
| Dumfries & Galloway     | 12    | 11    | 10    | 10    | 9     | 9     | 9     | 9     | 9     | 9     |
| Fife                    | 9     | 9     | 9     | 8     | 8     | 8     | 8     | 8     | 8     | 8     |
| Forth Valley            | 12    | 12    | 13    | 12    | 11    | 10    | 10    | 9     | 8     | 6     |
| Golden Jubilee Hospital | -     | -     | -     | -     | -     | -     | 9     | 8     | 7     | 7     |
| Grampian                | 12    | 12    | 11    | 11    | 10    | 10    | 10    | 9     | 8     | 8     |
| Highland                | 12    | 11    | 11    | 10    | 8     | 7     | 7     | 7     | 7     | 6     |
| Lanarkshire             | 15    | 14    | 11    | 11    | 10    | 9     | 9     | 8     | 9     | 8     |
| Lothian                 | 9     | 9     | 8     | 7     | 7     | 7     | 7     | 7     | 7     | 6     |
| North Glasgow           | 10    | 10    | 9     | 9     | 8     | 9     | 8     | 8     | 7     | 7     |
| South Glasgow           | 12    | 11    | 10    | 9     | 9     | 9     | 9     | 8     | 8     | 7     |
| Tayside                 | 13    | 12    | 11    | 11    | 10    | 9     | 9     | 8     | 8     | 7     |
| Western Isles           | 11    | 11    | 10    | 14    | 11    | 11    | 10    | 14    | 14    | 17    |

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**Table 21: Median 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 |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scotland                | 12    | 11    | 10    | 10    | 9     | 9     | 8     | 8     | 7     | 7     |
| Argyll & Clyde          | 14    | 12    | 10    | 10    | 9     | 9     | 8     | 8     | 7     | 7     |
| Ayrshire & Arran        | 13    | 12    | 11    | 11    | 9     | 9     | 8     | 8     | 9     | 8     |
| Borders                 | 14    | 14    | 13    | 11    | 10    | 9     | 9     | 9     | 8     | 8     |
| Dumfries & Galloway     | 14    | 12    | 12    | 11    | 11    | 10    | 10    | 11    | 10    | 10    |
| Fife                    | 10    | 9     | 9     | 8     | 8     | 8     | 8     | 8     | 8     | 8     |
| Forth Valley            | 13    | 11    | 13    | 13    | 11    | 11    | 10    | 9     | 9     | 7     |
| Golden Jubilee Hospital | -     | -     | -     | -     | -     | -     | 9     | 8     | 7     | 7     |
| Grampian                | 13    | 13    | 11    | 11    | 10    | 10    | 10    | 9     | 8     | 8     |
| Highland                | 14    | 14    | 11    | 9     | 8     | 8     | 7     | 7     | 7     | 7     |
| Lanarkshire             | 16    | 15    | 12    | 13    | 10    | 9     | 9     | 8     | 8     | 8     |
| Lothian                 | 11    | 9     | 8     | 8     | 8     | 7     | 7     | 7     | 7     | 6     |
| North Glasgow           | 10    | 9     | 9     | 9     | 9     | 9     | 8     | 8     | 7     | 7     |
| South Glasgow           | 12    | 11    | 10    | 9     | 9     | 9     | 8     | 8     | 8     | 7     |
| Tayside                 | 13    | 12    | 11    | 11    | 9     | 9     | 9     | 8     | 8     | 7     |
| Western Isles           | 11    | 14    | 11    | 8     | 11    | 11    | 13    | 14    | 16    | 14    |

**Table 22: 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 |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scotland                | 12.7  | 12.1  | 11.2  | 11.0  | 9.8   | 9.8   | 9.9   | 9.1   | 8.5   | 8.1   |
| Argyll & Clyde          | 14.0  | 12.7  | 11.7  | 11.1  | 10.0  | 9.6   | 8.9   | 8.0   | 7.1   | 7.7   |
| Ayrshire & Arran        | 12.5  | 12.6  | 12.5  | 11.9  | 10.5  | 10.4  | 10.2  | 10.1  | 9.5   | 9.8   |
| Borders                 | 11.9  | 11.7  | 10.2  | 9.5   | 9.2   | 8.8   | 8.7   | 7.8   | 7.6   | 7.9   |
| Dumfries & Galloway     | 14.5  | 11.8  | 12.2  | 11.9  | 10.4  | 11.0  | 10.9  | 10.5  | 10.8  | 10.4  |
| Fife                    | 11.2  | 10.2  | 10.2  | 9.8   | 8.7   | 9.1   | 9.1   | 9.2   | 9.2   | 8.6   |
| Forth Valley            | 12.2  | 12.2  | 13.7  | 14.6  | 12.3  | 11.5  | 12.0  | 9.7   | 9.1   | 7.4   |
| Golden Jubilee Hospital | -     | -     | -     | -     | -     | -     | 9.8   | 8.8   | 7.4   | 7.5   |
| Grampian                | 12.8  | 12.4  | 11.5  | 12.6  | 10.6  | 10.3  | 10.5  | 9.5   | 9.0   | 8.3   |
| Highland                | 14.1  | 12.8  | 12.4  | 10.3  | 9.0   | 8.3   | 9.4   | 8.5   | 8.5   | 7.4   |
| Lanarkshire             | 16.0  | 14.4  | 11.3  | 12.2  | 11.3  | 10.4  | 10.8  | 9.9   | 10.0  | 9.7   |
| Lothian                 | 10.9  | 10.4  | 8.7   | 8.6   | 8.2   | 7.8   | 8.3   | 7.8   | 7.4   | 7.0   |
| North Glasgow           | 11.4  | 11.7  | 10.7  | 9.3   | 9.1   | 9.6   | 9.2   | 9.3   | 8.8   | 7.7   |
| South Glasgow           | 13.9  | 12.2  | 11.0  | 11.0  | 9.8   | 11.4  | 12.1  | 9.4   | 8.4   | 8.1   |
| Tayside                 | 13.0  | 13.3  | 12.2  | 12.3  | 10.3  | 10.1  | 10.7  | 9.4   | 8.3   | 7.9   |
| Western Isles           | 12.3  | 11.8  | 11.2  | 13.5  | 14.9  | 13.6  | 13.9  | 15.2  | 14.6  | 18.6  |



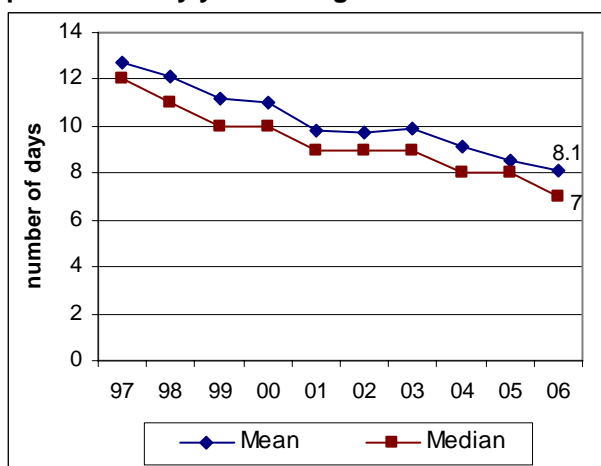
## Scottish Arthroplasty Project Annual Report 2007

**Table 23: 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 |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scotland                | 13.2  | 12.2  | 11.3  | 10.9  | 10.2  | 9.8   | 9.3   | 8.9   | 8.4   | 7.8   |
| Ayrshire & Arran        | 12.8  | 12.6  | 12.1  | 11.5  | 10.9  | 10.7  | 9.7   | 9.4   | 10.1  | 9.4   |
| Borders                 | 15.1  | 14.7  | 13.2  | 11.7  | 10.4  | 9.4   | 8.6   | 8.6   | 7.9   | 8.1   |
| Argyll & Clyde          | 14.0  | 12.8  | 10.9  | 10.4  | 9.3   | 9.3   | 8.8   | 7.7   | 8.0   | 8.1   |
| Golden Jubilee Hospital | -     | -     | -     | -     | -     | -     | 9.8   | 8.7   | 7.9   | 7.9   |
| Fife                    | 10.5  | 10.2  | 9.3   | 9.1   | 9.6   | 8.4   | 8.8   | 9.2   | 9.6   | 8.5   |
| Highland                | 14.4  | 13.9  | 13.1  | 10.4  | 9.2   | 8.6   | 9.1   | 8.3   | 7.4   | 7.3   |
| Lanarkshire             | 17.3  | 14.6  | 12.7  | 13.0  | 11.3  | 10.5  | 9.6   | 9.2   | 8.8   | 8.5   |
| Grampian                | 13.7  | 13.3  | 12.9  | 12.0  | 11.2  | 10.4  | 10.3  | 10.0  | 9.0   | 7.9   |
| North Glasgow           | 11.9  | 10.7  | 10.6  | 10.1  | 9.8   | 10.0  | 9.4   | 8.7   | 8.2   | 7.7   |
| Lothian                 | 12.0  | 10.2  | 8.9   | 9.0   | 8.3   | 7.7   | 7.7   | 7.0   | 7.1   | 6.4   |
| South Glasgow           | 13.5  | 12.1  | 11.3  | 10.8  | 10.5  | 12.0  | 10.2  | 9.4   | 9.1   | 7.9   |
| Tayside                 | 14.1  | 12.9  | 12.1  | 11.6  | 10.8  | 10.2  | 9.5   | 8.7   | 7.7   | 7.4   |
| Forth Valley            | 13.1  | 12.3  | 13.1  | 13.5  | 12.2  | 11.4  | 11.0  | 10.4  | 9.5   | 7.4   |
| Western Isles           | 12.3  | 17.6  | 14.4  | 9.7   | 11.5  | 9.6   | 13.5  | 13.1  | 15.0  | 14.9  |
| Dumfries & Galloway     | 13.7  | 13.0  | 12.9  | 11.5  | 12.2  | 10.7  | 10.7  | 12.1  | 11.9  | 11.8  |

Figure 71 and 72 show the average length of stay for elective primary hip and elective primary knee replacements respectively in each of the last ten years (1997 to 2006). All numbers are displayed by year ending March.

**Figure 71: Average Length of Stay per Continuous Inpatient Stay for Hip Replacements by year ending March**



**Figure 72: Average Length of Stay per Continuous Inpatient Stay for Knee Replacements by year ending March**

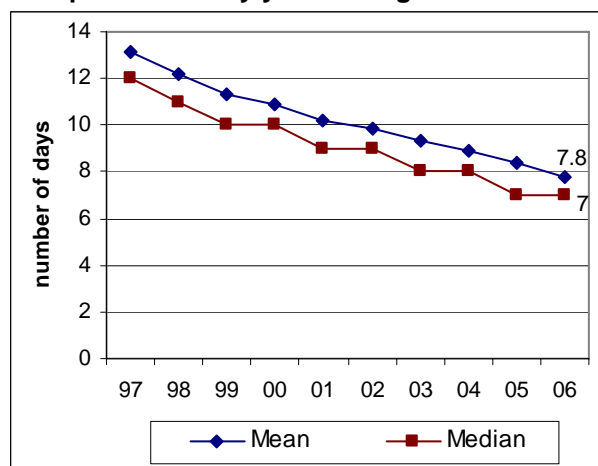


Table 24: Median Length of Stay per Continuous Inpatient Stay for Hip Replacements by age group and table 25 shows the median length of stay for hip and knee replacement operations broken down by age group and Health Board for financial year 2005/06

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**Table 24: 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         | 6     | 6     | 6     | 6     | 7     | 8     | 9    |
| Argyll & Clyde          | -         | 6     | 6     | 9     | 7     | 7     | 8     | 8    |
| Ayrshire & Arran        | -         | -     | 8     | 9     | 8     | 9     | 9     | 12   |
| Borders                 | -         | -     | -     | 5     | 8     | 8     | 8     | 10   |
| Dumfries & Galloway     | -         | -     | -     | 8     | 7     | 9     | 10    | 12   |
| Fife                    | -         | -     | -     | 7     | 6     | 7     | 8     | 10   |
| Forth Valley            | -         | 4     | 1     | 4     | 6     | 6     | 8     | 7    |
| Golden Jubilee Hospital | -         | 5     | 5     | 8     | 6     | 7     | 7     | 8    |
| Grampian                | -         | 9     | 7     | 7     | 7     | 7     | 8     | 10   |
| Highland                | -         | -     | 5     | 6     | 5     | 6     | 8     | 8    |
| Lanarkshire             | -         | -     | 10    | 8     | 7     | 8     | 9     | 13   |
| Lothian                 | 3         | 6     | 5     | 6     | 5     | 6     | 6     | 8    |
| North Glasgow           | 5         | 5     | 7     | 6     | 6     | 6     | 7     | 9    |
| South Glasgow           | 9         | 7     | 6     | 7     | 6     | 8     | 8     | 10   |
| Tayside                 | -         | -     | 8     | 7     | 7     | 7     | 8     | 9    |
| Western Isles           | -         | -     | -     | -     | -     | 18    | 16    | 20   |

**Table 25: 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                |           | 8     | 6     | 6     | 6     | 7     | 7     | 8    |
| Argyll & Clyde          |           | -     | -     | 10    | 7     | 7     | 8     | 9    |
| Ayrshire & Arran        |           | -     | -     | 6     | 8     | 8     | 9     | 9    |
| Borders                 |           | -     | -     | -     | 8     | 8     | 8     | 6    |
| Dumfries & Galloway     |           | -     | -     | 9     | 8     | 8     | 10    | 13   |
| Fife                    |           | -     | -     | 7     | 7     | 8     | 8     | 9    |
| Forth Valley            |           | -     | -     | 6     | 6     | 7     | 7     | 8    |
| Golden Jubilee Hospital |           | -     | -     | 9     | 7     | 7     | 7     | 8    |
| Grampian                |           | -     | 9     | 6     | 7     | 7     | 8     | 9    |
| Highland                |           | -     | -     | 6     | 6     | 6     | 7     | 8    |
| Lanarkshire             |           | -     | 4     | 9     | 6     | 7     | 8     | 11   |
| Lothian                 |           | 9     | 6     | 6     | 5     | 6     | 6     | 7    |
| North Glasgow           |           | -     | 7     | 6     | 6     | 7     | 7     | 8    |
| South Glasgow           |           | 6     | -     | 6     | 6     | 6     | 8     | 9    |
| Tayside                 |           | -     | -     | 4     | 7     | 7     | 7     | 8    |
| Western Isles           |           | -     | -     | -     | 9     | 12    | 18    | 18   |

Table 26: Hip Replacement Operations and Table 27: Knee Replacement Operations show the proportion of patients undergoing a hip or knee replacement by the day of operation in relation to the day of admission for 2005/06.

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**Table 26: Hip Replacement Operations**

|                         | Median 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                     | 11.4                             | 84.7                             | 2.1                                   | 1.8   |
| Argyll & Clyde          | 8                     | 4.6                              | 94.6                             | 0.7                                   | 0.0   |
| Ayrshire & Arran        | 9                     | 9.4                              | 89.9                             | 0.6                                   | 0.0   |
| Borders                 | 8                     | 1.5                              | 95.5                             | 1.5                                   | 1.5   |
| Dumfries & Galloway     | 9                     | 1.0                              | 97.1                             | 2.0                                   | 0.0   |
| Fife                    | 8                     | 3.7                              | 96.0                             | 0.3                                   | 0.0   |
| Forth Valley            | 6                     | 16.8                             | 80.1                             | 0.6                                   | 2.5   |
| Golden Jubilee Hospital | 7                     | 1.8                              | 96.4                             | 1.0                                   | 0.8   |
| Grampian                | 8                     | 6.5                              | 77.8                             | 9.3                                   | 6.5   |
| Highland                | 6                     | 24.3                             | 73.6                             | 1.2                                   | 0.9   |
| Lanarkshire             | 8                     | 30.2                             | 67.3                             | 1.8                                   | 0.7   |
| Lothian                 | 6                     | 19.1                             | 79.5                             | 0.4                                   | 1.0   |
| North Glasgow           | 7                     | 1.2                              | 97.1                             | 1.4                                   | 0.3   |
| South Glasgow           | 7                     | 28.8                             | 63.5                             | 1.4                                   | 6.3   |
| Tayside                 | 7                     | 5.6                              | 91.0                             | 2.3                                   | 1.1   |
| Western Isles           | 17                    | 89.5                             | 5.3                              | 0.0                                   | 5.3   |

**Table 27: Knee Replacement Operations**

|                         | Median Length of Stay | % operations on day of admission | % operations day after admission | % operations two days after admission | % operations three or more days after admission |
|-------------------------|-----------------------|----------------------------------|----------------------------------|---------------------------------------|---|
| <b>Scotland</b>         | 7                     | 11.6                             | 85.1                             | 1.6                                   | 1.7   |
| Argyll & Clyde          | 7                     | 4.3                              | 94.8                             | 0.0                                   | 0.9   |
| Ayrshire & Arran        | 8                     | 6.0                              | 93.2                             | 0.6                                   | 0.3   |
| Borders                 | 8                     | 0.0                              | 97.9                             | 1.1                                   | 1.1   |
| Dumfries & Galloway     | 10                    | 3.8                              | 93.7                             | 1.3                                   | 1.3   |
| Fife                    | 8                     | 6.0                              | 93.0                             | 0.6                                   | 0.3   |
| Forth Valley            | 7                     | 21.2                             | 76.9                             | 0.6                                   | 1.3   |
| Golden Jubilee Hospital | 7                     | 2.2                              | 96.8                             | 1.0                                   | 0.0   |
| Grampian                | 8                     | 10.4                             | 77.2                             | 6.5                                   | 5.8   |
| Highland                | 7                     | 20.5                             | 77.1                             | 0.7                                   | 1.7   |
| Lanarkshire             | 8                     | 28.3                             | 70.0                             | 1.3                                   | 0.3   |
| Lothian                 | 6                     | 15.6                             | 83.2                             | 1.0                                   | 0.2   |
| North Glasgow           | 7                     | 2.2                              | 95.9                             | 1.4                                   | 0.5   |
| South Glasgow           | 7                     | 29.4                             | 58.8                             | 2.4                                   | 9.4   |
| Tayside                 | 7                     | 13.3                             | 84.4                             | 1.2                                   | 1.0   |
| Western Isles           | 14                    | 100.0                            | 0.0                              | 0.0                                   | 0.0   |

28% and 30% of patients undergoing knee and hip replacements respectively, in Lanarkshire are now admitted on the day of surgery, which may explain why this region has the largest drop in length of stay.

## **7.5 Appendix 5 – Number of Arthroplasty Procedures Performed per Surgeon**

Figures 73 to 76 (overleaf) illustrate the number of joint replacements (primary and revision for both hip and knee) recorded as performed by each consultant surgeon operating in NHSScotland. 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.

A total number of 183 consultant surgeons are recorded as having performed primary hip replacements in 2006 in the NHS. There were 36 consultant surgeons who performed less than 5 primary hip replacements. Also, 71 out of 115 consultant surgeons (62%) performed less than 5 revisions of primary hip replacements in 2006 which is a decrease from 66% in 2005.

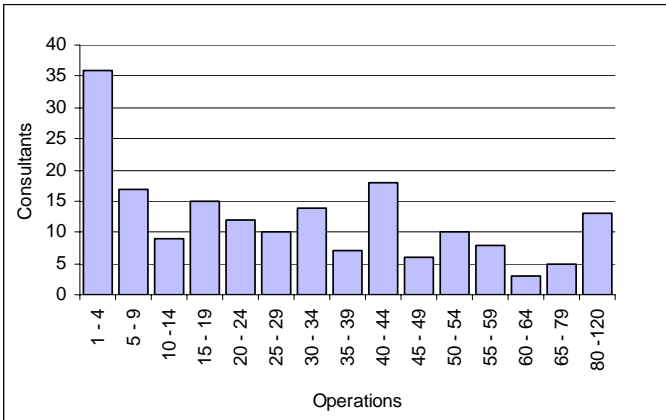
There were 173 consultant surgeons who performed primary knee replacements in 2006. Eighteen of these consultant surgeons (10%) performed less than 5 primary knee replacements. Of the 83 consultant surgeons who performed revisions of primary knee replacements in 2006, there were 25 consultant surgeons (30%) who performed only one revision.

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

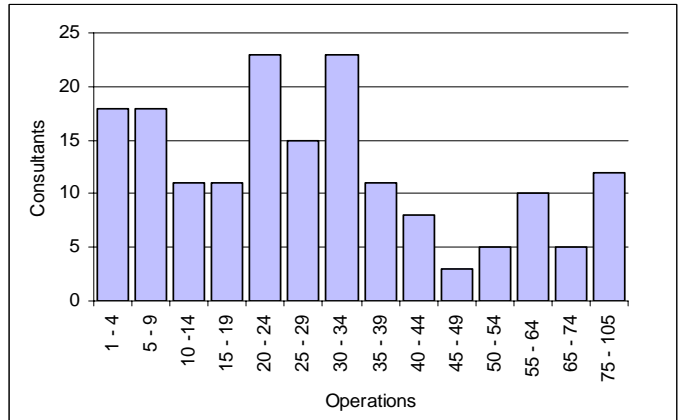
In an attempt to make the data more understandable (and to observe change) annualised figures for the percentage of arthroplasty surgery carried out by surgeons performing less than a specific number of procedures have been reported in Appendix 5 (operations performed by surgeons carrying out small volumes of procedures). 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.

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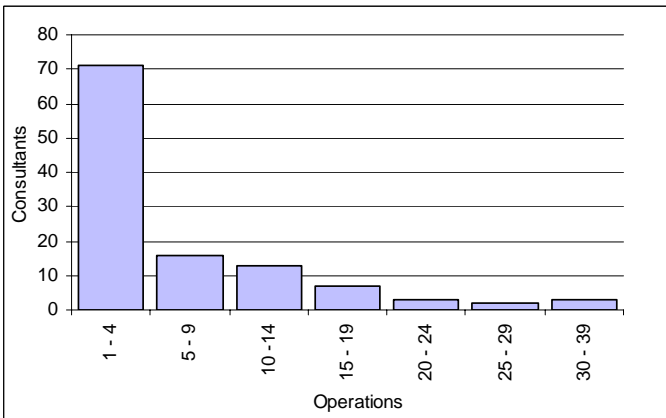
**Figure 73: Primary hip replacements for year ending March 2006**



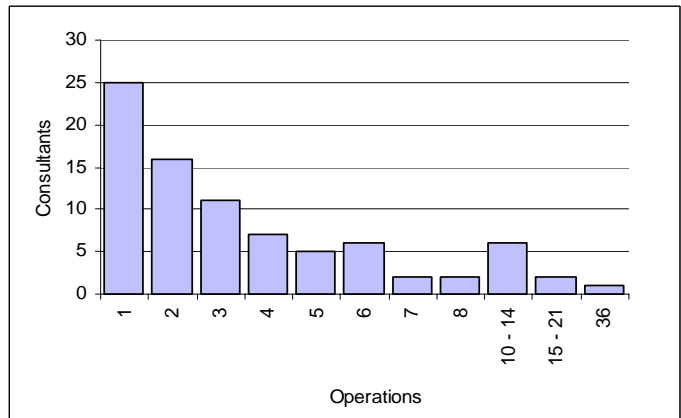
**Figure 74: Primary knee replacements for year ending March 2006**



**Figure 75: Revision hip replacements for year ending March 2006**



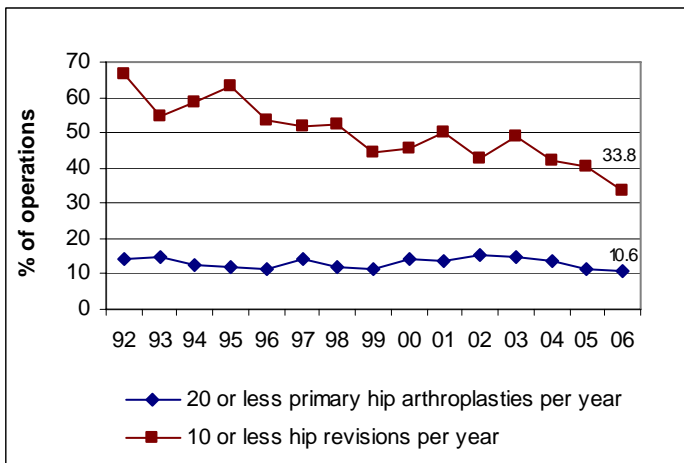
**Figure 76: Revision knee replacements for year ending March 2006**



**7.6 Appendix 6 – Operations performed by Surgeons Carrying Out Small Volumes of Procedures**

Figures 77 and 78 represent the number of primary and revision operations carried out by a surgeon doing less than a specified number of similar 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.

**Figure 77: % of hip replacements by surgeons carrying out small volumes of procedures per year**



**Figure 78: % of knee replacements by surgeons carrying out small volumes of procedures per year**

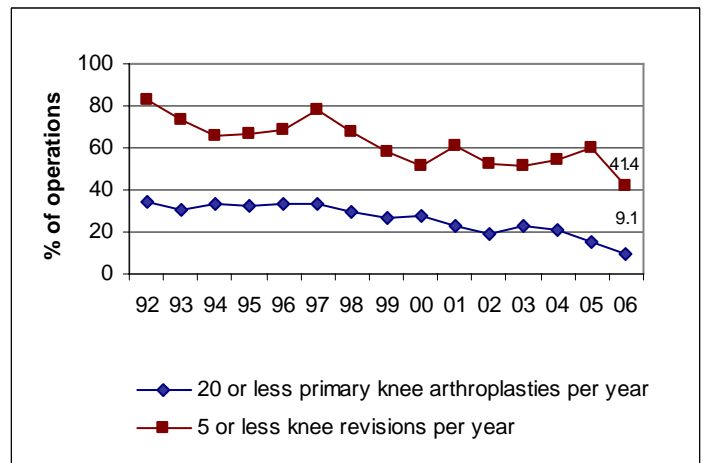


Figure 77 shows that the trend in the percentage of surgeons carrying out 10 or less hip revisions has been steadily decreasing from approximately 70% of operations in 1992 to 40.5% in 2005. The percentage of surgeons carrying out 20 or less primary hip arthroplasties is now 10.6% which may represent new appointments and retrials occurring through the year.

Figure 78 shows an overall decrease in the percentage of operations carried out by surgeons performing 5 or less of knee revisions (from 82% in 1992 to 41.4% in 2006). The percentage of surgeons carrying out 20 or less primary knee arthroplasties has also been steadily decreasing from around 35 percent of operations per year to 9.1% in 2005.

For several years, consultants have been dissuaded from performing a low volume of arthroplasties and encouraged to pass patients requiring arthroplasty surgery to consultants who perform such surgery more frequently. In doing so, it is hoped that arthroplasty specialists would be created. It is therefore of interest to see if there is a difference in the number of consultants performing a low volume of arthroplasties from year to year.

### **7.7 Appendix 7 – Consent and confidentiality**

#### **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](http://www.arthro.scot.nhs.uk)).

#### **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 (see Section 2.2).

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

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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.



### **7.8 Appendix 8 – 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, Orthopaedic 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;
- Ms Louise Spencer, Private 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.

## **7.9 Appendix 9 – 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. 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 two 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 private hospitals sector also contribute by sitting on the Steering Committee.

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**7.10 Appendix 10 – Action Plan**

Scottish Arthroplasty Project:

Action Plan resulting from the identification of data outwith normal variation

GMC 99999999

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.)

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### **7.11 Appendix 11 – References and links**

AOA National Joint Replacement Registry Annual report

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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

Swedish National Hip Arthroplasty Register Annual report

Swedish Knee Arthroplasty Register Annual Report 2004

#### **Previous Scottish Arthroplasty Project Annual Reports**

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2005

[http://www.arthro.scot.nhs.uk/Reports/Scottish\\_Arthroplasty\\_Final\\_Report\\_2005\\_Web.pdf](http://www.arthro.scot.nhs.uk/Reports/Scottish_Arthroplasty_Final_Report_2005_Web.pdf)

Scottish Arthroplasty Project. Scottish Arthroplasty Project Annual Report 2004

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#### **Other Websites**

Scottish Audit of Surgical Mortality

<http://www.sasm.org.uk>