AUSTRALIAN ORTHOPAEDIC ASSOCIATION

NATIONAL JOINT REPLACEMENT REGISTRY

Annual Report

2001

AUSTRALIAN ORTHOPAEDIC ASSOCIATION
NATIONAL JOINT REPLACEMENT REGISTRY

ANNUAL REPORT

2001

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Implementation of the registry has been funded by a grant from the Commonwealth Government

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ISSN 1445-3657

AUSTRALIAN ORTHOPAEDIC ASSOCIATION

NATIONAL JOINT REPLACEMENT REGISTRY

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September 1999 to December 2000

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PARTICIPATING HOSPITALS - July 2001

The hospitals listed below commenced contributing data to the Registry on or before July 2001. Not all the hospitals listed have provided data for this report.

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Public Hospitals
Clare District Hospital
Flinders Medical Centre
Gawler Health Services
Lyell McEwin Hospital
Modbury Public Hospital
Mt Barker District Soldiers Memorial Hospital
Mt Gambier Regional Hospital
Murray Bridge Soldiers Memorial Hospital
Naracoorte Health Service
Noarlunga Hospital
Northern Yorke Peninsula Hospital
Port Augusta Hospital
Port Lincoln Hospital
Port Pirie Hospital
Queen Elizabeth Hospital
Repatriation General Hospital
Riverland Regional Hospital
Royal Adelaide Hospital
South Coast District Hospital
Whyalla Health Service
Women's and Children's Hospital

Private Hospitals
Abergeldie Hospital
Ashford Community Hospital
Burnside War Memorial Hospital
Calvary Hospital Adelaide Inc
Central Districts Private Hospital
Flinders Private Hospital
Glenelg Community Hospital
North Eastern Community Hospital
Parkwynd Private Hospital
Sportsmed SA
St Andrew's Private Hospital
Stirling & District Hospital
The Memorial Hospital
Wakefield Hospital
Western Community Hospital

TASMANIA

Public Hospitals
North West Regional Hospital
Launceston General Hospital
Royal Hobart Hospital

Private Hospitals
Calvary Hospital
Hobart Private Hospital
Mersey Community Hospital
North-West Private Hospital
St Luke's Hospital
St Vincent's Hospital

QUEENSLAND

Public Hospitals
Bundaberg Hospital
Cairns Hospital
Gladstone Hospital
Gold Coast Hospital
Hervey Bay Hospital
Ipswich Hospital
Logan Hospital
Mackay Hospital
Maryborough Hospital
Mater Misericordiae Public Adult's Hospital
Mater Misericordiae Public Children's Hospital
Prince Charles Hospital
Princess Alexandra Hospital
Queen Elizabeth II Jubilee Hospital
Rockhampton Base Hospital
Royal Brisbane Hospital
Toowoomba Hospital
Townsville Hospital

Private Hospitals
Allamanda Private Hospital
Caboolture Hospital
Caloundra Private Hospital
Calvary Private Hospital
Friendly Society's Hospital
Greenslopes Private Hospital
Hillcrest Private Hospital
Holy Spirit Hospital
John Flynn Hospital
Logan Private Hospital
Mater Misericordiae Private Hospital
Mater Misericordiae Hospital Bundaberg
Mater Misericordiae Hospital Mackay
Mater Misericordiae Hospital Rockhampton
Mater Misericordiae Hospital Townsville
Mater Private Hospital Redland
Nambour Private Hospital
Noosa Hospital
North West Private Hospital
Peninsula Private Hospital
Pindara Private Hospital
Pioneer Valley Hospital
Riverview Private Hospital
St Andrew's Private Hospital
St Andrew's Toowoomba Hospital
St Andrew's War Memorial Hospital
St Stephen's Private Hospital
St Vincent's Hospital
Sunnybank Private Hospital
The Sunshine Coast Private Hospital
The Wesley Park Haven Private Hospital
Wesley Hospital

Participating Hospitals Cont.

WESTERN AUSTRALIA

Public Hospitals
Albany Regional Hospital
Bunbury Regional Hospital
Fremantle Hospital
Geraldton Regional Hospital
Kalgoorlie Regional Hospital
Royal Perth Hospital, Shenton Park
Royal Perth Hospital, Wellington St
Sir Charles Gairdner Hospital

Private Hospitals
Fremantle Kayleeya Hospital
Gosnells Family Hospital
Hollywood Private Hospital
Joondalup Health Campus
Mercy Hospital Mt Lawley
Mount Hospital
Peel Health Campus
Rockingham Family Hospital
St John of God, Subiaco
St John of God, Bunbury
St John of God, Geraldton
St John of God, Murdoch

VICTORIA

Public Hospitals
Austin & Repatriation Medical Centre, Austin Campus
Austin & Repatriation Medical Centre, Repat Campus
Ballarat Base Hospital
Bendigo Health Care Group
Box Hill Hospital
Cohuna District Hospital
Colac Community Health Service
Dandenong Hospital
East Grampians Health Service
Echuca Regional Health
Latrobe Regional Hospital
Maroondah Hospital
Mildura Base Hospital
Monash Medical Centre, Clayton Campus
Monash Medical Centre, Moorabbin Campus
Peninsula Health Service, Frankston Hospital
Portland & District Hospital
Royal Melbourne Hospital
St Vincent's Public Hospital
Sandringham & District Memorial Hospital
South West Healthcare Warrnambool Campus
Stawell District Hospital
Swan Hill District Hospital
The Alfred
The Geelong Hospital, Barwon Health
The Northern Hospital
Wangaratta District Base Hospital
West Gippsland Healthcare Group
West Wimmera Health Service
Western Hospital
Western District Health Service
Williamstown Hospital
Wimmera Health Care Group
Wonthaggi District Hospital

VICTORIA

Private Hospitals
Baronor Private Hospital
Bayside Private Hospital
Beleura Private Hospital
Bellbird Private Hospital
Brighton Private Hospital
Cabrini Private Hospital
Cotham Private Hospital
Epworth Hospital, Epworth Campus
Epworth Hospital, Bethesda Campus
Freemasons Hospital
Hartwell Private Hospital
John Fawkner Hospital
Knox Private Hospital
Masada Private Hospital
Maryvale Private Hospital
Melbourne Private Hospital
Mentone Private Hospital
Mildura Private Hospital
Mitcham Private Hospital
Mount Alvernia Mercy Hospital
North Park Private Hospital
Peninsula Private Hospital
Ringwood Private Hospital
St John of God, Ballarat
St John of God, Geelong
St Vincent's and Mercy Private Hospital, Mercy Campus
St Vincent's and Mercy Private Hospital, St Vincent's
Shepparton Private Hospital
South Eastern Private Hospital
The Avenue Hospital
The Geelong Private Hospital
The Valley Private Hospital
Vimy House Private Hospital
Wangarratta Private Hospital
Warringal Hospital
Waverly Private Hospital

AUSTRALIAN CAPITAL TERRITORY

Private Hospitals
John James Memorial Hospital
The National Capital Private Hospital

Public Hospitals
The Canberra Hospital

Public & Private Hospitals
Calvary Health Care

NORTHERN TERRITORY

Public Hospitals
Alice Springs Hospital
Royal Darwin Hospital

Private Hospitals
Darwin Private Hospital

Participating Hospitals Cont.

NEW SOUTH WALES

Public Hospitals
Bankstown/Lidcombe Hospital
Fairfield Hospital
Hornsby & Ku-Ring-Gai Hospital
Lismore Base Hospital
Murwillumbah District Hospital
Royal Newcastle Hospital
Royal Prince Alfred Hospital
St Vincent's Public Hospital
The Institute of Rheumatology and Orthopaedic Surgery
The Sutherland Hospital
Tweed Heads District Hospital

Private Hospitals
Baringa Private Hospital
Brisbane Waters Private Hospital
Calvary Private Hospital
Delmar Private Hospital
Hurstville Community Private Hospital
Kareena Private Hospital
Lingard Private Hospital
Macarthur Private Hospital
Nepean Private Hospital
North Gosford Private Hospital
Nowra Community Private Hospital
Orange Private Hospital
Pt Macquarie Private Hospital
Prince of Wales Private Hospital
St George Private Hospital and Medical Centre
St Vincent's Private Hospital – Lismore
Strathfield Private Hospital
Sydney Adventist Hospital
Tamara Private Hospital
The Hills Private Hospital
Warners Bay Private Hospital
Westmead Private Hospital

ACKNOWLEDGEMENTS

The Registry would like to acknowledge the co-operation and support provided by hospitals, orthopaedic surgeons, registrars and nursing staff. In addition, the Registry has continued to receive support and invaluable assistance from the Federal Government, State Health Departments and Orthopaedic Companies.

INTRODUCTION

This is the second annual report of the Australian Orthopaedic Association National Joint Replacement Registry. Following a successful application in March 1998, the Federal Government provided funding to the Australian Orthopaedic Association (AOA) to establish the National Joint Replacement Registry. Prior to commencement of the Registry, a pilot study provided information essential to the successful implementation of the Registry. Since the release of the 1st Annual Report the Registry has continued to grow at a rapid pace. At the time of this report 225 Hospitals across all states and territories contribute data to the Registry. At the end of June 2001 the Registry had received 22,985 hip and knee procedure forms.

BACKGROUND TO THE REGISTRY

Joint replacement surgery is a common procedure that has considerable success in alleviating pain and disability in individuals suffering a variety of major joint disorders. In Australia more than 40,000 hip and knee replacements are performed each year. Previously, joint replacement was reserved for the elderly. However, due to the success of the procedure it is increasingly used in younger individuals. This, combined with an ageing population, has resulted in an increasing incidence of primary joint replacement. The rate of revision surgery is also expected to increase, as more patients survive longer than the life expectancy of the joint replacement. Revision surgery however, is associated with increased morbidity and mortality and has a far less successful outcome than primary joint replacement.

There is an increasing number and variety of prostheses being developed that are available on the Australian market. More recent prostheses are the product of new technologies. For many of these the mid to long term survival rate remains unknown. Further to this there is considerable variation in outcome for different prostheses. Surgical technique and specific patient characteristics also affect outcome. Inadequate outcome data, as well as variability related to different surgical techniques and diagnostic groups, have made it difficult for surgeons to identify the relative effectiveness of different prostheses and treatments.

The AOA National Joint Replacement Registry simultaneously monitors all types of prosthetic design. A registry is the most effective method of determining which prostheses and surgical techniques are most successful for given demographic and diagnostic sub-groups. A number of registries have been established in other countries. The ability to identify factors important in achieving successful outcomes has resulted in both improved standards and significant cost savings in those countries.

SPECIFIC AIMS

The specific aims of the AOA National Joint Replacement Registry include:

- Determining demographic and diagnostic characteristics of patients undergoing joint replacement surgery nationally
- Providing accurate information on the use of different types of prostheses in both primary and revision joint replacements
- Evaluating the effectiveness of different types of joint replacement prostheses and surgical techniques at a national level
- Comparing the Australian joint replacement experience to that of other countries
- Providing confidential data to individual surgeons and hospitals to audit their joint replacement surgery
- Educating Australian orthopaedic surgeons in the most effective prostheses and surgical techniques to achieve successful outcomes

REGISTRY OVERVIEW

Implementation of the Registry began in mid 1999. A specific Registry Committee appointed by the Federal Board of the AOA manages the Registry. The committee consists of the chairman, Registry director, an orthopaedic surgeon from each state and territory and two orthopaedic industry representatives (see back of cover for committee members). The Data Management and Analysis Centre, Adelaide University, is contracted by the AOA to provide data management services. Surgeons and Hospital Administrations have been contacted on a state by state basis regarding implementation of the Registry. Details of data collection and validation methods and the progression of the Registry are outlined below.

Registry Implementation

Hospitals nationally, both public and private that undertake hip or knee replacement have been contacted to participate in data collection for the Registry. Following initial contact with hospital administration and orthopaedic surgeons an Information Collection Document outlining the Registry and data collection is provided to each hospital. The document has been prepared in a manner to allow hospital administrations the choice of presenting the document to an ethics, quality assurance or medical advisory committee. Once approval is given, procedures are implemented to begin data collection. Each hospital nominates a hospital coordinator (usually a member of theatre nursing staff) to liaise with Registry staff.

The Registry commenced data collection in nine South Australian hospitals in September 1999. During the following eighteen months hospitals in the remaining states and territories were contacted in a staged manner. This report has been prepared using data collected during the period September 1999 to December 2000. This includes data collected from South Australian, Western Australia, Queensland, Northern Territory, Tasmanian and Victorian hospitals. Due to the staged manner of contacting hospitals, data are not complete from the states mentioned and data from New South Wales and the Australian Capital Territory hospitals are not included in this report.

Data from hospitals in New South Wales and the Australian Capital Territory will be included in the next annual report.

Data Collection Method

At this time, hospitals participating in the Registry provide data on specific Registry forms. The forms are completed in theatre at the time of surgery and are returned to the Registry on a monthly basis. Initial discussions with hospitals indicated that most hospitals would prefer to send the information to the Registry electronically. However, the majority of hospitals do not collect all the information required by the Registry on either theatre or hospital information systems. All hospitals are however, provided with electronic file formats of the complete data set to meet Registry requirements when computer or software systems are enhanced or updated.

Data Validation

An essential feature of the Registry is validation of collected data. Information from hospitals and State Health Departments is used to validate patient and procedure information. The Registry is still in the process of developing validation procedures of components used with data submitted by the orthopaedic manufacturing companies.

South Australia is the only state with a complete year of data collection for the year 2000. The Registry data from this state have been validated with State Health Department data. Comparison of the total numbers of joint replacements between health data (4230) and Registry data (4105) indicated a 97% capture rate of data. These figures were further validated with individual hospital monthly reports. Discrepancies between Registry, hospital and Health Department data were identified and followed up. With submission of the additional data to the Registry the procedure capture rate will approach 100%.

GOVERNMENT JOINT REPLACEMENT DATA 1999 – 2000

Joint replacement data were obtained from State and Territory health departments. The data include the number and type of joint replacement procedure undertaken for the period 1st July 1999 to 30th June 2000 in both public and private hospitals. Health departments in each state and territory receive data from hospitals on a monthly basis. Although the accuracy is likely to be high the Registry is not aware that any validation has been undertaken. The data provide general information on the frequency of joint replacement but are unable to provide any outcome information and are presented as an overview of joint replacement surgery nationally.

Analysis compared to 1998-1999 data indicates an overall increase of 5.1% in joint replacement surgery during 1999-2000 (Table 2). This comprises a 4.7% increase in all hip procedures and a 5.5% increase in all knee procedures. Primary total hip replacement increased by 2.5% and primary knee procedures increased by 4.7%. The percentage shown for primary knee replacement includes patella/trochlear and unicompartmental knee replacement. Patella/trochlear and unicompartmental knee replacements have been collected separately for the first time this year.

There is considerable difference between the states and territories in the numbers of unicompartmental knee replacement undertaken. The percentage of unicompartmental knee replacement is higher in New South Wales (Table 1).

The rate of revision hip replacement surgery for this period is 14.3%. It is not possible to determine from the health department data which type (partial, primary or revision) of hip replacement has been revised. The rate of revision knee surgery is 9.9%. As for hips, it is not possible to determine which type of knee replacement has been revised. Hip and knee revision surgery has increased since last year. Revision hip surgery has increased by 13.1% and revision knee surgery has increased by 12.8%.

Table 1: Number of Hip & Knee Replacements Nationally 1999 – 2000

Type of joint replacement	*NSW*	*VIC*	*QLD*	*WA*	*SA*	*TAS*	*ACT/ NT*	*Aust. total*
Hip replacement								
Partial	1631	1398	981	521	568	111*	75	5285
Primary total	4736	3878	1871	1462	1431	449	366	14193
Revision	957	848	567	375	307	100	85	3239
Total hips	**7324**	**6124**	**3419**	**2358**	**2306**	**660**	**526**	**22717**
Knee replacement								
Patello/trochlear	65	38	45	12	15	2*	2	179
Unicompartmental	1426	409	118	69	130	0*	13	2165
Primary total	5599	3021	2780	1757	1525	414	456	15552
Revision	630	421	352	232	232	41	48	1956
Total knees	**7720**	**3889**	**3295**	**2070**	**1902**	**457**	**519**	**19852**
State Total	**15044**	**10013**	**6714**	**4428**	**4208**	**1117***	**1045**	**42569**

Note: *Not all private hospital data was available at the time of this report. The Tasmanian Health Department has indicated that the figures for all types of joint replacement may be underestimated by approximately 100 . *These figures are public hospital data only, due to the small numbers involved and confidentiality agreements between private hospitals and the Tasmanian Health Department.*

Table 2: Joint Replacement Percentage Changes 1999 - 2000 Relative to 1998 - 1999

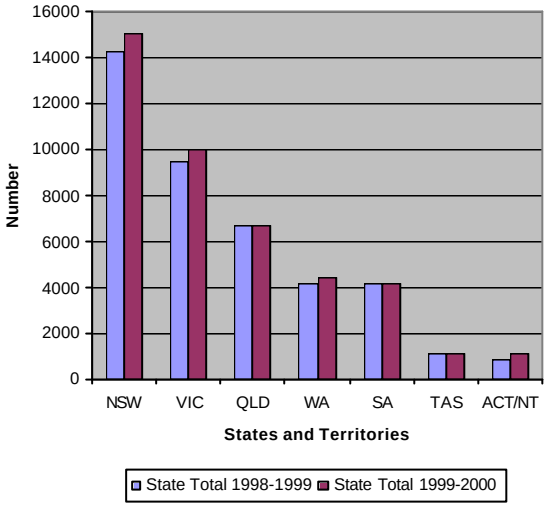
Type of joint replacement	**Aust. Total 1997-1998**	**Aust. Total 1998-1999**	**Aust. Total 1999-2000**	**Percentage change relative to 1998-19999**
Hip replacement				
Partial	4940	4985	5285	6.0
Primary total	13545	13848	14193	2.5
Revision	2894	2864	3239	13.1
Knee replacement				
Patella/trochlear	N/K	N/K	179	N/K
Unicompartmental	N/K	N/K	2165	N/K
Primary total	15599	17085	15552	-9.0
Revision	1718	1734	1956	12.8
National Total	**38696**	**40516**	**42569**	**5.1**

Note: *N/K means not known. These data were not previously available. Information on patella/trochlear and unicompartmental is available separately for the first time this year. In previous years patella/trochlear and unicompartmental have been included in the primary total knee replacement (see page 6)*

Table 3: State and Territories Percentage Changes 1999 - 2000 Relative to 1998 - 1999

States and Territories	**State Total 1997 – 1998**	**State Total 1998 - 1999**	**State Total 1999-2000**	**Percentage change relative to 1998 - 1999**
NSW	13277	14268	15044	5.4
VIC	9612	9419	10013	6.3
QLD	6493	6648	6714	1.0
WA	3301	4151	4428	6.7
SA	4037	4103	4208	2.6
TAS	1164	1041	1117	7.3
ACT/NT	812	886	1045	17.9
National Total	**38696**	**40516**	**42569**	**5.1**

Graph 1: State & Territories Total Joint Replacements 1998 - 1999 & 1999 - 2000



Graph 2: Hip and Knee Joint Replacement Surgery Public & Private Hospitals 1999 - 2000

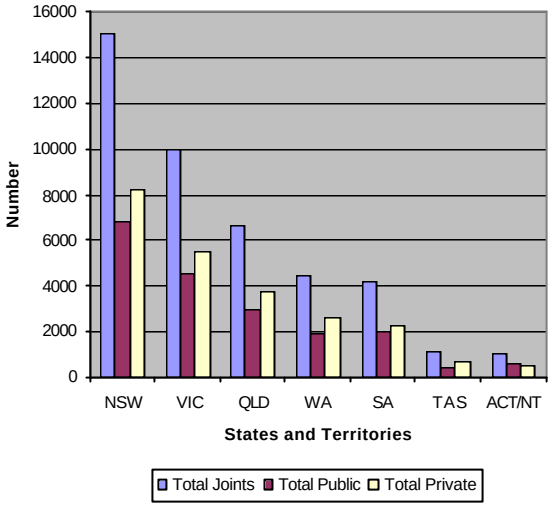
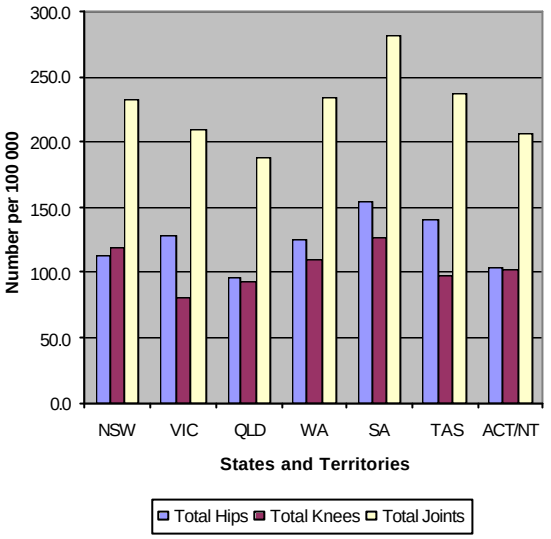


Table 4: Incidence of Hip and Knee Joint Replacement per 100,000 of Population 1999-2000

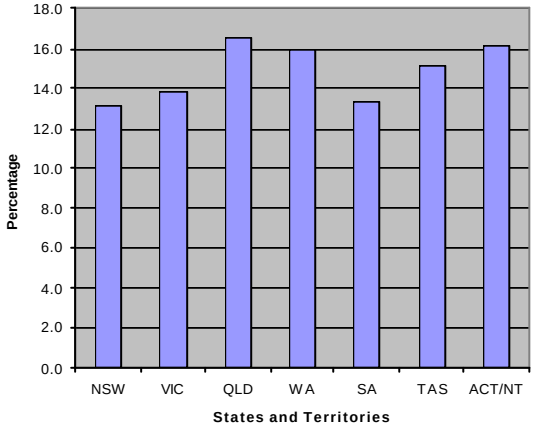
Type of joint replacement	***NSW*** ***Pop.*** *6463455*	***VIC*** ***Pop.*** *4765856*	***QLD*** ***Pop.*** *3566357*	***WA*** ***Pop.*** *1883860*	***SA*** ***Pop.*** *1497634*	***TAS*** ***Pop.*** *470376*	***ACT/NT*** ***Pop.*** *506302*
Hip replacement							
Partial	25.2	29.3	27.5	27.7	37.9	23.6	14.8
Primary total	73.3	81.4	52.5	77.6	95.6	95.5	72.3
Revision	14.8	17.8	15.9	19.9	20.5	21.3	16.8
Total hips	**113.3**	**128.5**	**95.8**	**125.2**	**154.0**	**140.3**	**103.9**
Knee replacement							
Patella/trochlear	1.0	0.8	1.3	0.6	1.0	0.4	0.4
Unicompartmental	22.1	8.6	3.3	3.7	8.7	0.0	2.6
Primary total	86.6	63.4	78.0	93.3	101.8	88.0	90.1
Revision	9.7	8.8	9.9	12.3	15.5	8.7	9.5
Total knees	**119.4**	**81.6**	**92.4**	**109.9**	**127.0**	97.2	**102.5**
State total	**232.8**	**210.1**	**188.3**	**235.0**	**281.0**	**237.5**	**206.4**

Note: *The displayed value of the total hip and knee replacement rate per 100,000 population may not equal the sum of the displayed figures due to rounding.*

Graph 3: Incidence of Joint Replacement by State & Territories 1999 - 2000

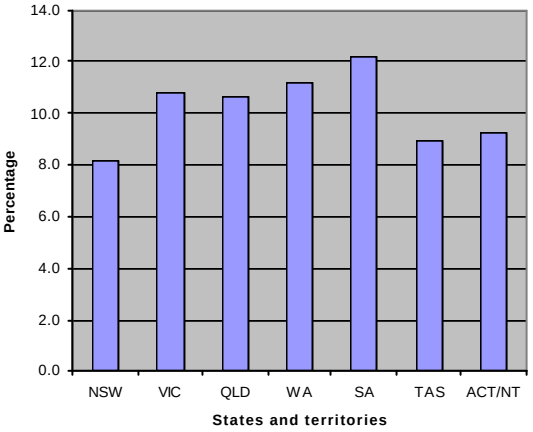


Graph 4: Percentage of Revision Hip Replacement 1999 - 2000



Graph 4 represents, within each state, the percentage of hip surgery that was revision surgery for 1999 – 2000. It is not possible to determine which type (partial, primary or revision) of hip replacement had been revised.

Graph 5: Percentage of Revision Knee Replacement 1999 - 2000



Graph 5 represents, within each state, the percentage of knee surgery that was revision surgery for 1999 – 2000. Primary total or uni as well as revision knee replacements may have been revised.

AOA National Joint Replacement Registry
Hip Replacement Data

The data presented in this report have been processed and analysed by the Registry for the period 1/9/99 to 31/12/00. The data are a proportion of hip replacement surgery that has been undertaken during this period. It includes complete data from South Australia for 2000 and varying proportions of data from Western Australia, Queensland, Tasmania, Northern Territory and Victoria. Due to the staged implementation of the Registry no data from New South Wales and the Australian Capital Territory are included. The Registry will be completely implemented nationally by December 2001.

Demographics and Diagnosis

This report details information on over 6,000 hip replacement operations. Primary total hip procedures comprise 65.7%, 20.3% are partial hips and 14.1% are revision procedures. The number of revision procedures does not reflect the revision rate but rather the proportion of hip surgery that is revision operations. They include revision of all types of primary procedures (partial and total) as well as previous revisions (Table 5).

The demographic data are largely as expected and the tables are self-explanatory. With respect to primary and revision hip surgery, it is more common for men to undergo both primary and revision hip operations at a younger age (Tables 6-9).

Fractured neck of femur is the most common diagnosis for partial hip replacement however these prostheses are also used for a variety of different diagnoses (Table 10). Osteoarthritis is the most common condition requiring a primary total hip replacement. This particular diagnosis includes both primary and secondary osteoarthritis. The number of secondary arthritis within this group however is small. The primary aetiology for this, e.g. post traumatic, Perthes etc, is commonly indicated and has been recorded in the database for later analysis. When the diagnosis of avascular necrosis is combined with osteoarthritis, avascular necrosis has been recorded as the primary diagnosis. Developmental dysplasia has also been reported as a separate category (Table 11).

The most common reasons for revision surgery are loosening, lysis and problems associated with wear and breakage of components. Dislocation is also a significant cause of revision surgery. It is an often under estimated problem which has been responsible for 14.1% (147 patients) of revisions to date (Table 12). As yet it remains uncertain what the timing of those dislocations are in relation to the preceding hip replacement. The Registry has recorded the preceding hip replacement for 28 patients who have undergone revision for dislocation within this group (Table 37). The timing for this group has been clearly identified. Subsequent reports will provide detailed information on the timing of dislocation and will clearly define the extent of the problem with respect to both early and late dislocation. Analysis examining variation with prostheses type, femoral head diameter, head/neck ratios etc will also be possible.

Zirconia Femoral Heads

There has been a number of recalls in the last year. The most important with respect to the potential number of patients involved has been the recall of zirconia femoral heads. Most of these were implanted prior to the Registry collecting data. Within this reporting period the Registry has recorded information on 855 procedures involving the use of these femoral heads. They represent 16.5 % of primary total hips and 9.3% of revisions. There have been four cases that have subsequently been revised. None of these revisions has been for breakage. The note of caution is that the majority of these zirconia heads are just reaching the minimum time period before breakage of the head has been reported elsewhere. These, as well as additional heads that have been implanted and recorded by the Registry since 31st of December 2000, will be monitored for ongoing problems. At the time

of writing this report, there have been discussions with the Therapeutic Goods Administration (TGA) regarding the potential role of the Registry in collating information and monitoring all patients who received zirconia heads. Included will be those patients who are not currently in the Registry database. At this stage no decisions have been made on that involvement.

Prosthesis Fixation and Usage for Primary Partial Hip Replacements.

Partial hip replacements include unipolar monoblock replacements such as Austin-Moore and Thompson type prosthesis, unipolar modular prosthesis and bipolar replacement. The most common type of partial hip replacement is a unipolar monoblock (68.3%) with 88.1% being of the Austin-Moore variety. Unipolar modular and bipolar replacements make up 9.8% and 22.0% respectively of the partial hip group. In contrast to the cementless Austin-Moore, cemented stems are used for 88.6% and 90.2% of the unipolar and bipolar prostheses. It is possible that significant changes may occur in the type of partial hip replacements used. This relates to concerns over the use of the unipolar monoblocks, particularly in the active elderly. In addition, the comparative ease of later acetabular component insertion with modular unipolar or bipolar prostheses may influence prosthesis choice. As can be seen with reference to table 44, acetabular only revision has been undertaken with these particular types of prostheses. However the femoral stem is always replaced with the unipolar monoblock prosthesis revisions. The femoral stems and unipolar modular heads and bipolar prostheses used are listed in table 14.

Prosthesis Fixation and Usage for Primary Total Hip Replacements

The numbers of primary total cemented, total cementless and hybrid hip replacements are recorded in table 15. This table also contains a group referred to as "other". These are re-surfacing and thrust plate prostheses. The 'conventional' total primary hip replacement has the acetabular component cemented 25.4% of the time. The incidence of cement fixation for femoral stems is 64.5%. An entirely cementless primary total hip is used in 35.5% of cases.

Tables 16-19 detail the types of prostheses used. Cemented and hybrid total hips do not demonstrate as much variation in the number of prostheses or combinations of prostheses as do the cementless. Despite this there is still considerable variation in the combination of prostheses within these groups. As an example the Exeter stem has been used in association with 7 cemented acetabular components and 10 different cementless acetabular components. There will be a variation in outcome between each of these combinations, as the performance of the acetabular components will differ. In addition there is the potential for variation in the performance of the stem with each of these different acetabular components. This variability in prosthesis combination presents difficulties in analysis and interpretation of outcomes. It highlights the need to be able to analyse the performance of acetabular and femoral components both individually and in combination with different components. Superimposed on this is the outcome variation related to patient and disease characteristics. The AOA National Joint Replacement Registry database has been designed to differentiate these factors.

The final table in this section details two other types of primary hip replacement, the resurfacing and thrust plate prostheses. The resurfacing prostheses account for 2.3% of all primary total hips and the thrust plate 0.4% (Table 20).

These findings indicate that there are major differences in the practice of joint replacement surgery between Australia and Sweden. In Sweden the most common replacement is the total cemented hip (93%) with very little use of cementless or hybrid prostheses. There is also significant variation in the type of prostheses used between the two countries. In addition, as can be seen from the Australian data, there is a considerable amount of mixing of component type that does not appear to be apparent from the Swedish data. All of these factors have the potential to cause considerable variation in outcomes and as such emphasises the need for an Australian Registry.

Most Commonly Used Primary Total Hip Prostheses.

The top ten tables are an amalgamation of cemented, cementless and hybrid primary total hips that are subdivided into the various categories listed. The Exeter stem is by far the most common stem used when compared to both cemented and cementless stems. The first 7 cemented stems account for 86.8% of all cemented stems while the first 5 stems listed are 73.1% of the total (Table 21). The first 5 cemented acetabular components account for 72.2% of all cemented acetabular components (Table 23). There is a larger number of different prostheses used for cementless hip replacement and more so for femoral components compared to acetabular components (43.4% and 65.5% for the first five respectively) (Tables 22 & 24).

Prosthesis Fixation and Usage for Revision Hip Replacement

Revision surgery has been divided into major and minor revisions. A major revision is defined as a revision procedure where a major component has been used. A major component is a component that interfaces with bone. Insertion of a stem is a major revision. The same applies to an acetabular cup or shell. The insertion of a femoral head or acetabular insert however is a minor revision, as these do not interface with bone. Of the 872 revisions recorded there are 769 (88.2%) major revisions and 103 (11.8%) minor revisions (Tables 25 & 26).

The most common major revision involves the insertion of both acetabular and femoral components (44.0%). Revision involving the use of an acetabular or femoral component only occurs 32.0% and 20.9% of the time (Table 25). The most common minor revision involves replacement of both the femoral head and acetabular insert (67.0%) (Table 26).

In major revision surgery, when a femoral stem is inserted, it is cemented 52.5% of the time. This is less often than in the primary situation but still marginally more common than a cementless stem. When an acetabular component is used, 32.5% are cemented and 67.5% are cementless (Table 27). This reflects a small increase in the rate of cement fixation of the acetabular component when compared to primary hip replacements. Ten (1.3%) of the major revisions involved the use of a femoral stem and bipolar prosthesis (Table 28).

It is known that the type of revision undertaken varies for a variety of reasons. These include the reason for revision, the nature of the previous procedure and the original components used. Major revision operations in the Registry includes revision of partial hip replacements, total primary and previous revisions. In most cases, the type of procedure or components used previously is unknown. As a consequence it is difficult to interpret why a particular approach to the revision was undertaken. With time, a greater percentage of revisions will be linked to patients who have previously been recorded in the Registry. As a result this important information will be available. Analysis of the small number of revisions undertaken when the previous procedure has been recorded demonstrates the value of knowing this information (Tables 36-46).

The Exeter stem is the most common cemented stem used in revision (just over 40% of cemented stem revisions). As with the primary hips, it is used with a large number of different acetabular components (6 cemented and 11 cementless). The remaining cemented stems are used at a similar rate to the primary cemented stems. The most common cementless stems are the Restoration stem (17.7% of cementless stem revisions) and the S-Rom (17.3%) (Tables 29-33).

The information gained from minor revisions is potentially a little different than for major revisions. Only certain minor components can be combined with particular major components. As a consequence, in patients who have had their original surgery prior to the Registry collecting data it may be possible to determine at least some of the components used in the preceding hip replacement. This is particularly true for cementless acetabular components where the insert is changed. It could be argued that as a consequence it may well be possible to undertake a degree of prosthesis monitoring in a group of patients which were originally operated on pre-registry.

The difficulty however, is knowing with any degree of certainty how the incidence of acetabular liner revision relates to the original incidence of insertion of the acetabular shell. This is important to obtain an estimate of the rate of revision.

This problem is illustrated in table 34. There is a wide array of minor components that have been exchanged, some of which are for prostheses that have been commonly used in the past but are rarely, if ever used now. As such, it is difficult to determine if the numbers of minor revisions are occuring at a rate that is unacceptable. For less commonly used prostheses however, the interpretation becomes a little easier. If the number of minor revisions appear to far exceed the estimated likely incidence of use of that component then it highlights a potential problem. Currently the figures are too small to draw any conclusions.

Bilateral Hip Replacements

During the period of data collection, the majority of bilateral hip replacements are undertaken at least 6 weeks after the original replacement (71.6%). There is a small number undertaken on the same day. Most of the bilateral procedures are primary total hips (87.2%). Resurfacing hip replacement was used for a small number of bilaterals. Most of those were undertaken on the same day (Table 35).

Registry Recorded Primary to Revision Hip Replacement

This section of the report deals with revision surgery that has been undertaken on hip replacement procedures previously recorded in the Registry database. It is the most important section of the report as revision rates are determined and therefore appropriate or inappropriate prosthesis performance identified. Registry recorded primary to revision surgery is only a small percentage of the total revision surgery (5.5%). This is because most revision surgery is undertaken on patients who have had their preceding surgery performed prior to Registry data collection. As time progresses the proportion of this group will increase to 100 %. The staged introduction of the Registry has meant that the number of procedures being recorded by the Registry has increased with time. As a consequence, the majority of the information collected during the period of this report has come towards the end of the reporting period. The effect of this is to under estimate the early revision rate. In subsequent reports it will be possible to provide an accurate indication of this. With time, the late revision rates will also become evident.

Of the primary hip procedures recorded in this period 0.9% have been revised. The chance of having a revision procedure varied between 0.8% and 2.5% depending on the type of primary hip procedure that was undertaken. The greatest risk of revision occurred following a bipolar hip replacement. Primary total hip replacement was least likely to result in revision surgery (Table 36).

The most common cause for revision was dislocation accounting for 57.1% (67% before 6 weeks and 45.5% after that time). The next most common cause was loosening which in this early period reflects more a failure to gain adequate initial fixation. Infection as a cause of revision only occurred in 3 cases. This figure does not represent the infection rate but is the number of patients undergoing revision for infection during this early period (Table 36).

The report has listed tables that indicate what particular components were revised. In these tables the last column lists the revision rate for that particular prosthesis combination. This analysis can also be undertaken for individual components. Care must always be taken with the interpretation. A good example of this is demonstrated in table 38. This table reports bipolar replacements that have undergone revision. Of the four combinations listed there are apparent differences in the rate of revision. These differences however are not significant not only because the numbers are too small but also for a number of other reasons. As the numbers of procedures increase the relevance of any variation will become more significant.

In order to determine if it is significant however it will always be necessary to undertake more detailed analyses examining

for effects of confounding factors which may not be evident initially. It would appear from table 39 that the UHR bipolar is more likely to undergo revision than the Centrax. When examining the revision rate for the two prostheses independent of the stem however, the rate of revision of the UHR is 3.1% and the Centrax is 3.8% (see Table 14 for total numbers of UHR and Centrax used). It could then perhaps be concluded that it is the combination with the Omnifit stem that increases the rate of revision. Some supporting evidence for this is that when the UHR is combined with the Exeter stem there have been no revisions although a similar number of cases were undertaken. Examination of what was revised however indicates that one of the Omnifit/UHR revisions involved revision of the stem as well. In order to determine if the revision was related to either a problem with the stem or perhaps independent of either component (e.g. infection), it is necessary to cross reference to the underlying diagnosis.

In this section of the report there are also additional tables that detail what the components are revised to (Tables 40, 42, 44, 48 & 49). This provides a number of important details. It indicates which of the components have been removed, the type of revision procedure that was undertaken and components inserted.

As well as the analysis presented, it is possible to provide information not only for specific components independent of combinations, but also to undertake analysis down to the level of lot/batch number. In addition, a range of generic features common to a number of different types of components that may be related to specific modes of failure can also be examined. Good examples of this are femoral head size and head/neck ratios in relation to the risk of dislocation. These reports will be provided as the number of procedures subsequently undergoing revision increase.

Registry Recorded Revision to Revision Hip Replacement

There are 25 patients who have been recorded as having undergone a revision hip procedure and who have had a further revision of that hip. As the numbers are small the information has not been presented in tables. These data will be reported in more detail in subsequent Registry reports.

These early figures suggest that a revision procedure carries with it an increased risk of a further early revision. The rate of revision during the period of data collection for primary hip was 0.9%. The equivalent rate of revision for revision procedures was 2.9%. The most common reasons for these subsequent revisions were dislocation (44.0%) and infection (36.0%).

Hip Replacement - 1/9/1999 to 31/12/2000

Table 5: Number of Hip Replacements by sex

Type of hip replacement	*Female*		*Male*		*Total*	
	Number	*%*	*Number*	*%*	*Number*	*%*[*]
Primary Partial Hip	925	14.9	332	5.4	1257	20.3
Primary Total Hip	2201	35.5	1875	30.2	4076	65.7
Revision Hip	498	8.0	374	6.0	872	14.1
Total	**3624**	**58.4**	**2581**	**41.6**	**6205**	**100.0**

Note: *percents shown are cell percents out of 6205*
[*]*entries do not equal 100% due to rounding*

Definitions
Partial: *includes either unipolar or bipolar hip replacement*
Primary total: *primary total hip replacement, resurfacing and thrust plate procedures*
Revision: *re-operation for exchange or removal of one or more components*

Demographic characteristics of patients undergoing Hip Replacement - 1/9/1999 to 31/12/2000

Table 6: Summary statistics of age (by sex) for All Hip Replacements

	Female *N=3624 (58.4%)*	***Male*** *N=2581 (41.6%)*	***All Patients*** *N=6205 (100.0%)*
Median	75	70	73
Minimum	20	23	20
Maximum	101	103	103
Mean	73.1	68.6	71.2
Standard Deviation	12.5	12.4	12.7

Table 7: Summary statistics of age (by sex) for Primary Partial Hip Replacement

	Female *N=925 (73.6%)*	***Male*** *N=332 (26.4%)*	***All Patients*** *N=1257 (100.0%)*
Median	83	82	83
Minimum	30	47	30
Maximum	101	103	103
Mean	82.4	81.1	82.1
Standard Deviation	8.8	8.9	8.8

Graph 6: Age and Sex - Partial Hip Replacement

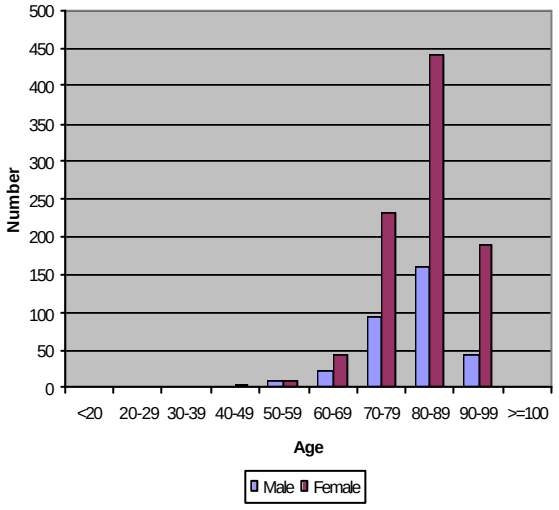


Table 8: Summary statistics of age (by sex) for Primary Total Hip Replacement

	Female *N=2201 (54.0%)*	*Male* *N=1875 (46.0%)*	*All Patients* *N=4076 (100.0%)*
Median	71	67	69
Minimum	20	23	20
Maximum	96	97	97
Mean	69.0	66.0	67.6
Standard Deviation	11.7	11.7	11.8

Graph 7: Age and Sex - Primary Hip Replacement

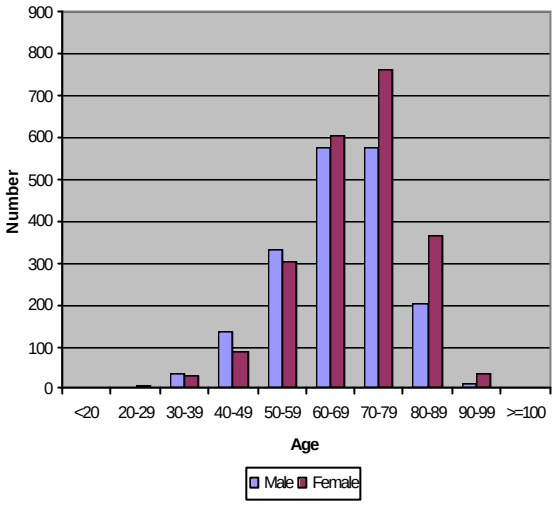
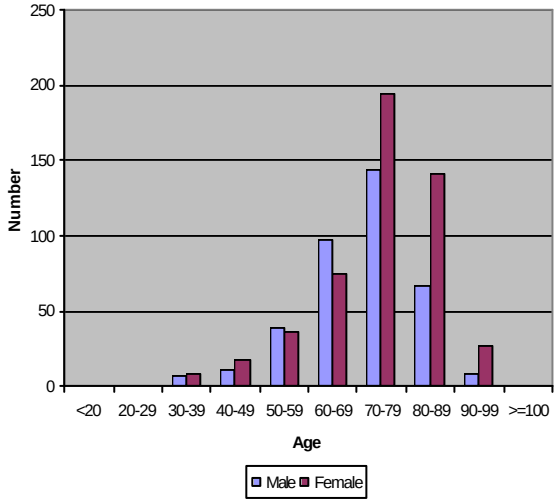


Table 9: Summary statistics of age (by sex) for Revision Hip Replacement

	Female *N=498 (57.1%)*	*Male* *N=374 (42.9%)*	*All Patients* *N=872 (100.0%)*
Median	76	73	74
Minimum	30	25	25
Maximum	97	96	97
Mean	73.6	70.5	72.2
Standard Deviation	12.1	11.7	12.0

Graph 8: Age and Sex - Revision Hip Replacement



Diagnosis for Hip Replacement - 1/9/1999 to 31/12/2000

Table 10: Principal Diagnosis - Partial Hip Replacement

Principal Diagnosis	*Number*	*%*
Fractured Neck of Femur	1185	94.3
Osteoarthritis	36	2.9
Tumour	19	1.5
Failed Internal Fixation	8	0.6
Avascular Necrosis	5	0.4
Developmental Dysplasia	3	0.2
Rheumatoid Arthritis	1	0.1
Total	**1257**	**100.0**

Table 11: Principal Diagnosis - Primary Total Hip Replacement

Principal Diagnosis	*Number*	*%**
Osteoarthritis	3522	86.4
Avascular Necrosis	200	4.9
Rheumatoid Arthritis	109	2.7
Fractured Neck of Femur	99	2.4
Developmental Dysplasia	74	1.8
Other Inflammatory Arthritis	30	0.7
Tumour	20	0.5
Failed Internal Fixation	12	0.3
Arthrodesis Takedown	4	0.1
Other	6	0.1
Total	**4076**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 12: Diagnosis - Revision Hip Replacement

Diagnosis	*Number*	*%**
Loosening	542	52.1
Dislocation	147	14.1
Lysis	107	10.3
Fracture	71	6.8
Infection	61	5.9
Wear Acetabular	38	3.7
Implant Breakage Acetabular	32	3.1
Pain	21	2.0
Implant Breakage Stem	5	0.5
Other	17	1.6
Total	**1041**	**100.0**

Note: *some patients had multiple diagnoses*
**entries do not equal 100% due to rounding*

Prosthesis Fixation and Usage for Partial Hip Replacement - 1/9/1999 to 31/12/2000

Table 13: Prosthesis fixation - Partial Hip Replacement

Fixation	*Unipolar Monoblock*		*Unipolar Modular*		*Bipolar*		*All Patients*	
	Number	*%**	*Number*	*%*	*Number*	*%*	*Number*	*%*
Cemented	102	8.1	109	8.7	254	20.2	443	35.2
Cementless	756	60.1	14	1.1	22	1.8	814	64.8
Total	**858**	**68.3**	**123**	**9.8**	**276**	**22.0**	**1257**	**100.0**

Note: **entries do not equal total due to rounding*

Table 14: Prosthesis Usage - Partial Hip Replacement

	Unipolar Monoblock		*Number*	*%**
Cemented	Thompson Type		102	11.9
Cementless	Austin-Moore Type		756	88.1
Total			**858**	**100.0**
	Unipolar Modular			
	Stem	*Unipolar Head*		
Cemented Stem	CCA	Hemi Head	46	37.4
	Spectron	Unipolar *(S&N)*	26	21.1
	Spectron	Unitrax	5	4.1
	CPT	Unipolar *(Zimmer)*	22	17.9
	Omnifit	Unitrax	8	6.5
	Elite Plus	Elite Hemi	2	1.6
Cementless Stem	Mod Endo	Mod Endo	7	5.7
	Alloclassic	Unipolar *(S&N)*	3	2.4
	Matrix	Unipolar Ballhead *(Sulzer)*	3	2.4
	APR	Unipolar Ballhead *(Sulzer)*	1	0.8
Total			**123**	**100.0**
	Bipolar			
	Stem	*Bipolar Prosthesis*		
Cemented Stem	Exeter	Centrax	92	33.3
	Exeter	UHR	32	11.6
	Thompson Modular	Ultima	39	14.1
	Elite Plus	Hastings	32	11.6
	Elite Plus	UHR	1	0.4
	Omnifit	UHR	29	10.5
	Omnifit	Centrax	1	0.4
	Definition	Centrax	12	4.3
	Definition	UHR	1	0.4
	C-Stem	Hastings	4	1.4
	Spectron	Centrax	3	1.1
	CCA	Bipolar *(Mathys)*	2	0.7
	Charnley	Hastings	2	0.7
	Lima H Moos	Bipolar *(Lima)*	2	0.7
	Bi-Metric	Bipolar *(Biomet)*	1	0.4
	MRS	UHR	1	0.4
Cementless Stem	Mallory-Head	Centrax	10	3.6
	Mallory-Head	Bipolar *(Biomet)*	1	0.4
	Alloclassic	Bipolar Ballhead *(Sulzer)*	5	1.8
	Stability	Hastings	3	1.1
	Austin-Moore Modular	Ultima	1	0.4
	RPS	Bipolar *(Lima)*	1	0.4
	Taperloc	Bipolar *(Biomet)*	1	0.4
Total			**276**	**100.0**

Note: **entries do not equal 100% due to rounding*

Prosthesis Fixation and Usage for Primary Total Hip Replacement - 1/9/1999 to 31/12/2000

Table 15: Prosthesis Fixation - Primary Total Hip Replacement

Prosthesis Fixation	*Number*	*%*
Cemented	1034	25.4
Cementless	1408	34.5
Hybrid	1524	37.4
Other	110	2.7
Total	**4076**	**100.0**

Note: *other includes resurfacing and thrust plate systems*

Table 16: Prosthesis Usage - Primary Total Hip Replacement where both the Femoral and Acetabular components were Cemented

Femoral Component	*Acetabular Component*	*Number*	*%**
Exeter	Contemporary	172	16.6
	Exeter	122	11.8
	Elite Plus	20	1.9
	X-Change	5	0.5
	Charnley	2	0.2
	Low Profile Cup	1	0.1
	Reflection	1	0.1
Charnley	Charnley	134	13.0
MS 30	Low Profile Cup	105	10.3
	Low Profile Cup *(metasul inlay)*	2	0.2
	Apollo	7	0.7
Spectron	Reflection	84	8.1
	Apollo	24	2.3
	Elite Plus	4	0.4
Elite Plus	Charnley	67	6.5
	Elite Plus	31	3.0
	Apollo	9	0.9
	Reflection	1	0.1
Omnifit	Omnifit	76	7.4
	Contemporary	19	1.8
CPT	ZCA	42	4.1
	Reflection	5	0.5
C-Stem	Charnley	23	2.2
	Elite Plus	13	1.3
	Exeter	2	0.2
	Apollo	1	0.1
CCA	CCB Special Cup	16	1.5
	CCB	3	0.3
VerSys	ZCA	9	0.9
	Elite Plus	3	0.3
Definition	Contemporary	11	1.1
Natural Hip	Apollo	11	1.1
Other	Other	9	0.9
Total		**1034**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name*
**entries do not equal 100% due to rounding*

Table 17: Prosthesis Usage - Primary Total Hip Replacement where the Femoral and Acetabular components were Cementless

Femoral Component	*Acetabular Component*	*Number*	*%**
Mallory-Head	Mallory-Head	233	16.5
Secur-Fit Plus	Trident	93	6.6
	Omnifit	14	1.0
	Secur-Fit	1	0.1
S-Rom	Option	41	2.9
	Duraloc	40	2.8
	S-Rom	5	0.4
	Trident	4	0.3
	Mallory-Head	2	0.1
	Secur-Fit	1	0.1
	Vitalock	1	0.1
Secur-Fit	Trident	43	3.1
	Secur-Fit	35	2.5
	Omnifit	12	0.9
	Vitalock	1	0.1
Omnifit	Secur-Fit	43	3.1
	Trident	38	2.7
	Omnifit	4	0.3
	Vitalock	2	0.1
Synergy	Reflection	80	5.7
	Convene	1	0.1
CLS	CLS	57	4.0
	Fitmore	19	1.3
	Armor	1	0.1
	Morscher	1	0.1
ABGII	ABGII	70	5.0
	Vitalock	1	0.1
VerSys	Trilogy	68	4.8
Citation	Vitalock	50	3.6
	ABGII	13	0.9
	Trident	2	0.1
	Mallory-Head	1	0.1
Alloclassic	Allofit	25	1.8
	Fitmore	15	1.1
	Morscher	11	0.8
	Mallory-Head	6	0.4
	Inter-Op	2	0.1
	Artek	1	0.1
Natural Hip	Fitmore	27	1.9
	Artek	11	0.8
	Allofit	5	0.4
	Inter-Op	5	0.4
	Mallory-Head	1	0.1
Stability	Duraloc	17	1.2
	ABGII	13	0.9
	Option	11	0.8
	Hedrocel	1	0.1
	Reflection	1	0.1
	SPH	1	0.1
	Transcend	1	0.1
	Trilogy	1	0.1

Table 17: continued next page

Table 17: continued

Femoral Component	*Acetabular Component*	*Number*	*%**
APR	Artek	32	2.3
	Allofit	10	0.7
	Fitmore	2	0.1
	SPH	1	0.1
Unirom	Duraloc	26	1.8
	Option	5	0.4
	Reflection	5	0.4
	Transcend	1	0.1
CBC Stem	CBF Cup	31	2.2
Meridian	Vitalock	27	1.9
	Secur-Fit	1	0.1
Margron	Transcend	18	1.3
	Interseal	6	0.4
	Trident	3	0.2
F2L	SPH	22	1.6
Other	Other	86	6.1
Total		**1408**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name*
** entries do not equal 100% due to rounding*

Table 18: Prosthesis Usage - Hybrid -Primary Total Hip Replacement where the Femoral component was Cemented and the Acetabular component was Cementless

Femoral Component	*Acetabular Component*	*Number*	*%**
Exeter	Vitalock	448	29.6
	ABGII	32	2.1
	Secur-Fit	32	2.1
	Mallory-Head	28	1.8
	Trident	27	1.8
	Duraloc	18	1.2
	Trilogy	6	0.4
	Morscher	5	0.3
	Reflection	4	0.3
	Omnifit	1	0.1
Spectron	Reflection	184	12.2
	ABGII	15	1.0
	Secur-Fit	4	0.3
	Convene	3	0.2
Definition	Vitalock	131	8.7
	Trident	28	1.8
	ABGII	11	0.7
Omnifit	Secur-Fit	69	4.6
	Trident	46	3.0
	Omnifit	2	0.1
	Vitalock	2	0.1
	Duraloc	1	0.1
Elite Plus	Duraloc	82	5.4
	Mallory-Head	13	0.9
	Secur-Fit	5	0.3
	Reflection	2	0.1
	ABGII	1	0.1
	S-Rom	1	0.1
	Vitalock	1	0.1
CPT	Trilogy	44	2.9
	S-Rom	14	0.9
	Reflection	4	0.3
Charnley	Vitalock	53	3.5
	Duraloc	5	0.3
Freeman	Mallory-Head	55	3.6
MS 30	Fitmore	38	2.5
	Fitek	6	0.4
	Mallory-Head	3	0.2
	Trilogy	3	0.2
	ABGII	1	0.1
	Allofit	1	0.1
	Hedrocel	1	0.1
Other	Other	84	5.5
Total		**1514**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name*
**entries do not equal 100% due to rounding*

Table 19: Prosthesis Usage - Hybrid - Primary Total Hip Replacement where the Femoral component was Cementless and the Acetabular component was Cemented

Femoral Component	*Acetabular Component*	*Number*	*%*
Secur-Fit	Contemporary	2	20.0
Secur-Fit	Omnifit	1	10.0
Natural Hip	Apollo	1	10.0
Natural Hip	Low Profile Cup	1	10.0
Alloclassic	Elite Plus	1	10.0
CLS	Low Profile Cup	1	10.0
Corail	Elite Plus	1	10.0
Friendly Hip	Mueller	1	10.0
Mallory-Head	Kasselt	1	10.0
Total		**10**	**100.0**

Table 20: Other types of Primary Hip Replacements

Resurfacing Head	*Resurfacing Cup*	*Number*	*%*
Birmingham Head	Birmingham Cup	94	98.9
Conserve Plus	Conserve Plus	1	1.1
Total Resurfacing		**95**	**100.0**

Thrust Plate	*Shell/Cup*		
DSP	Fitmore	13	86.7
DSP	Artek	2	13.3
Total Thrust Plate		**15**	**100.0**

Top Ten Femoral and Acetabular Components used for Primary Total Hip Replacement - 1/9/1999 to 31/12/2000

Table 21: Top Ten Cemented Stems used in Primary Total Hip Replacement

Cemented Stems	*Number*	*%**
Exeter	924	36.3
Spectron	318	12.5
Omnifit	215	8.4
Elite Plus	213	8.4
Charnley	192	7.5
Definition	181	7.1
MS 30	167	6.6
CPT	109	4.3
C-Stem	73	2.9
Freeman	55	2.2
Other	101	4.0
Total	**2548**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 22: Top Ten Cementless Stems used in Primary Total Hip Replacement

Cementless Stems	*Number*	*%**
Mallory-Head	234	16.5
Secur-Fit Plus	108	7.6
S-Rom	94	6.6
Secur-Fit	94	6.6
Omnifit	87	6.1
Synergy	81	5.7
CLS	79	5.6
ABGII	71	5.0
VerSys	68	4.8
Citation	66	4.7
Other	436	30.7
Total	**1418**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 23: Top Ten Cemented Acetabular components used in Primary Total Hip Replacement

Cemented Acetabular	*Number*	*%**
Charnley	226	21.6
Contemporary	205	19.6
Exeter	124	11.9
Low Profile Cup	108	10.3
Reflection	92	8.8
Omnifit	77	7.4
Elite Plus	73	7.0
Apollo	53	5.1
ZCA	51	4.9
CCB Special Cup	16	1.5
Other	19	1.8
Total	**1044**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 24: Top Ten Cementless Acetabular components used in Primary Total Hip Replacement

Cementless Acetabular	*Number*	*%**
Vitalock	718	24.6
Mallory-Head	392	13.4
Reflection	301	10.3
Trident	285	9.8
Duraloc	217	7.4
Secur-Fit	191	6.5
ABGII	156	5.3
Trilogy	130	4.4
Fitmore	104	3.6
Option	65	2.2
Other	363	12.4
Total	**2922**	**100.0**

Note: **entries do not equal 100% due to rounding*

Prosthesis Fixation and Usage for Revision Hip Replacement - 1/9/1999 to 31/12/2000

Table 25: Components Used - Major Revision Hip

Component Used	*Number*	*%*
Femoral and Acetabular	338	44.0
Acetabular Component Only	246	32.0
Femoral Component Only	161	20.9
Bipolar head and stem	10	1.3
Cement Spacer/Cement	10	1.3
Removal Prosthesis	4	0.5
Total	**769**	**100.0**

Table 26: Components Used - Minor Revision Hip

Component Used	*Number*	*%*
Head/insert	69	67.0
Bipolar Head only	15	14.6
Cable/Other Minor Components	13	12.6
Insert only	6	5.8
Total	**103**	**100.0**

Table 27: Prosthesis Fixation - Major Revision Hip Replacement

Component Used	*Cementless*		*Cemented*		*Hybrid*		*N/A*		*Total*	
	Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%**
Femoral Only	93	12.3	68	9.0	-	-	-	-	161	21.2
Acetabular Only	168	22.1	78	10.3	-	-	-	-	246	32.4
Femoral and Acetabular	121	15.9	89	11.7	128	16.9	-	-	338	44.5
Prostheses not reinserted	-	-	-	-	-	-	14	1.8	14	1.8
Total	**382**	**50.3**	**235**	**31.0**	**128**	**16.9**	**14**	**1.8**	**759**	**100.0**

Note: *N/A means not applicable. No hip component was used.*
**entries do not equal 100% due to rounding*

Table 28: Prosthesis Fixation - Bipolar - Major Revision Hip Replacement

Component Used	*Cementless Stem*		*Cemented Stem*		*Total*	
	Number	*%*	*Number*	*%*	*Number*	*%*
Bipolar head and Stem	1	10.0	9	90.0	10	100.0
Total	**1**	**10.0**	**9**	**90.0**	**10**	**100.0**

Table 29: Prosthesis Usage - Bipolar - Major Revision Hip Replacement

Femoral Component	*Bipolar*	*Number*	*%*
Exeter	Centrax	6	60.0
Definition	Centrax	1	10.0
Mallory-Head	Centrax	1	10.0
Omnifit	Centrax	1	10.0
Omnifit	UHR	1	10.0
Total		**10**	**100.0**

Table 30: Prosthesis Usage - Cemented Major Revision Hip Replacement

Femoral Component	*Acetabular Component*	*Number*	*%**
Exeter	-	26	11.1
Elite Plus	-	11	4.7
Charnley	-	7	3
Omnifit	-	7	3
Spectron	-	6	2.6
CPT	-	5	2.1
Other	-	6	2.5
-	Charnley	15	6.4
-	Contemporary	12	5.1
-	Reflection	12	5.1
-	Exeter	9	3.8
-	Omnifit	5	2.1
-	Elite Plus	4	1.7
-	Apollo	3	1.3
-	Bioclad	3	1.3
-	Low Profile Cup	3	1.3
-	X-Change	3	1.3
-	ZCA	3	1.3
-	Other	6	2.7
Exeter	Contemporary	26	11.1
	Exeter	12	5.1
	Brunswick	3	1.3
	X-Change	3	1.3
	Elite Plus	1	0.4
	Reflection	1	0.4
MS 30	Low Profile Cup	9	3.8
Charnley	Charnley	6	2.6
Spectron	Brunswick	4	1.7
	Apollo	1	0.4
	Reflection	1	0.4
Elite Plus	Charnley	3	1.3
	Elite Plus	3	1.3
Omnifit	Contemporary	3	1.3
	Omnifit	2	0.9
	Brunswick	1	0.4
Definition	Contemporary	4	1.7
C-Stem	Charnley	2	0.9
	Elite Plus	1	0.4
Other	Other	3	1.3
Total		**235**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name*
- equals no component used
**entries do not equal 100% due to rounding*

Table 31: Prosthesis Usage - Cementless Major Revision Hip Replacement

Femoral Component	*Acetabular Component*	*Number*	*%**
Restoration	-	16	4.2
S-Rom	-	14	3.7
Mallory-Head	-	9	2.4
Solution	-	9	2.4
Revision Hip	-	8	2.1
Link Stem	-	6	1.6
VerSys	-	5	1.3
Austin-Moore Type	-	3	0.8
Echelon	-	3	0.8
Margron	-	3	0.8
Other	-	17	4.5
-	Secur-Fit	50	13.1
-	Vitalock	32	8.4
-	Reflection	21	5.5
-	Mallory-Head	19	5.0
-	Duraloc	14	3.7
-	Trilogy	10	2.6
-	Trident	6	1.6
-	Omnifit	3	0.8
-	S-Rom	3	0.8
-	Other	10	2.6
Restoration	Trident	14	3.7
	Secur-Fit	5	1.3
	Vitalock	4	1.0
	Lor	1	0.3
	Omnifit	1	0.3
	SPH	1	0.3
S-Rom	Vitalock	6	1.6
	Duraloc	4	1.0
	Secur-Fit	4	1.0
	Option	3	0.8
	Trident	3	0.8
	S-Rom	2	0.5
	ABGII	1	0.3
Solution	Duraloc	10	2.6
	Mallory-Head	1	0.3
	Secur-Fit	1	0.3
	Vitalock	1	0.3
Revision Hip	SPH	9	2.4
	Bilobo	2	0.5
	Vitalock	1	0.3
Mallory-Head	Mallory-Head	11	2.9
VerSys	Trilogy	7	1.8
	Mallory-Head	1	0.3
Echelon	Reflection	5	1.3
	Vitalock	2	0.5
	Mallory-Head	1	0.3
PFM-R	Allofit	2	0.5
	CLS	1	0.3
	Fitmore	1	0.3
	Mallory-Head	1	0.3
	Trilogy	1	0.3
Matrix	Reflection	3	0.8
Other	Other	11	2.9
Total		**382**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name - equals no component used, *entries do not equal 100% due to rounding*

Table 32: Prosthesis Usage - Hybrid (stem cemented) Major Revision Hip Replacement

Femoral Component	*Acetabular Component*	*Number*	*%**
Exeter	Vitalock	27	25.7
	Secur-Fit	16	15.2
	Reflection	7	6.7
	Trident	5	4.8
	Mallory-Head	4	3.8
	Trilogy	2	1.9
	ABGII	1	1.0
	Duraloc	1	1.0
	Link Shell	1	1.0
	S-Rom	1	1.0
	SPH	1	1.0
Omnifit	Secur-Fit	10	9.5
	Trident	3	2.9
CPT	Trilogy	5	4.8
Spectron	Reflection	5	4.8
Freeman	Mallory-Head	3	2.9
Elite Plus	Duraloc	2	1.9
	S-Rom	1	1.0
Other	Other	10	9.5
Total		**105**	**100.0**

Note: *model name not repeated but usage continues down the column until change of model name*
**entries do not equal 100% due to rounding*

Table 33: Prosthesis Usage - Hybrid (cup cemented) Major Revision Hip Replacement

Femoral Component	*Acetabular Component*	*Number*	*%**
Revision Hip	Mueller	3	13.0
	Exeter	2	8.7
	Elite Plus	1	4.3
PFM-R	Low Profile Cup	2	8.7
	Apollo	1	4.3
	Reflection	1	4.3
S-Rom	Reflection	2	8.7
	Contemporary	1	4.3
	Omnifit	1	4.3
Other	Other	9	39.1
Total		**23**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 34: Prosthesis Usage - Minor component exchange Revision Hip Replacement

Head	*Liner*	*Number*	*%**
Hip System	PCA	8	8.9
Hip System	Mallory-Head	1	1.1
Hip System	Omnifit	1	1.1
Anatomic	HPGII	8	8.9
Anatomic	Longevity	1	1.1
C-Taper	Omnifit	6	6.7
C-Taper	Constrained *(Osteonics)*	2	2.2
C-Taper	Trident	1	1.1
Modular Head *(Biomet)*	Ringloc	3	3.3
Modular Head *(Biomet)*	HPGII	1	1.1
Modular Head *(Biomet)*	Mallory-Head	1	1.1
Morse Taper	Omnifit	4	4.4
Morse Taper	Constrained *(Osteonics*)	1	1.1
Modular Head *(Corin)*	Ringloc	3	3.3
Modular Head *(Corin)*	Mallory-Head	1	1.1
Universal	Reflection	4	4.4
PCA	PCA	3	3.3
S-Rom	HPGII	1	1.1
S-Rom	Omnifit	1	1.1
S-Rom	S-Rom	1	1.1
Elite Plus	Mallory-Head	1	1.1
Elite Plus	Reflection	1	1.1
Exeter	Constrained *(Osteonics)*	1	1.1
Exeter	Vitalock	1	1.1
Metasul head	APR	1	1.1
Metasul head	Armor	1	1.1
Tapered Femoral Head	Mallory-Head	1	1.1
Tapered Femoral Head	Reflection	1	1.1
Articul/Eze	Mallory-Head	1	1.1
Femoral Head *(Lima)*	SPH	1	1.1
Femoral Head *(S&N)*	Reflection	1	1.1
Mallory-Head	Ringloc	1	1.1
Metasul	Duraloc	1	1.1
Solution	Universal	1	1.1
Stability	Duraloc	1	1.1
Total Head *(Sulzer)*	Fitmore	1	1.1
Ultima	Arcom	1	1.1
Exeter	-	5	5.6
Femoral Head *(S&N)*	-	2	2.2
S-Rom	-	2	2.2
Alum-Ceramic Head *(Zimmer)*	-	1	1.1
Femoral Head *(Lima)*	-	1	1.1
Link Head	-	1	1.1
Modular Head *(Biomet)*	-	1	1.1
Natural Hip	-	1	1.1
Centrax*	-	1	1.1
-	Omnifit	2	2.2
-	Constrained *(Osteonics)*	1	1.1
-	HPGII	1	1.1
-	Longevity	1	1.1
-	Vitalock	1	1.1
Total		**90**	**100.0**

Note: *- equals no component used*
**entries do not equal 100% due to rounding*

Bilateral Hip Replacement - 1/9/1999 to 31/12/2000

Table 35: Days between procedures for Bilateral Primary Hips

1st Procedure	*2nd Procedure*	*Days between Bilateral Procedures*								*Total*	
		Same Day		*<2 weeks*		*2-6 weeks*		*>6 weeks*			
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%**	*N*	*%*
Bipolar	Bipolar	1	0.9	-	-	-	-	-	-	1	0.9
Unipolar monoblock	Unipolar monoblock	-	-	1	0.9	-	-	6	5.5	7	6.4
Unipolar monoblock	Primary Total	-	-	-	-	-	-	1	0.9	1	0.9
Resurfacing	Resurfacing	3	2.8	1	0.9	-	-	1	0.9	5	4.6
Primary Total	Primary Total	18	16.5	4	3.7	3	2.8	70	64.2	95	87.2
Total		**22**	**20.2**	**6**	**5.5**	**3**	**2.8**	**78**	**71.6**	**109**	**100.0**

Note: **entries do not equal total due to rounding*

Registry Recorded Primary to Revision Hip Replacement - 1/9/1999 to 31/12/2000

Table 36: Days to Revision by Primary procedure type

Primary Procedure (N)		*Days to revision Procedure*								*Total*		*Proportion of primary procedures revised*
		Same Day		*<2 weeks*		*2-6 weeks*		*>6 weeks*				
		N	*%*	*N*	*%*	*N*	*%**	*N*	*%*	*N*	*%**	*%*
Bipolar	(276)	-	-	1	2.1	2	4.2	4	8.3	7	14.6	**2.5**
Unipolar Monoblock	(858)	1	2.1	1	2.1	1	2.1	5	10.4	8	16.7	**0.9**
Unipolar Modular	(123)	1	2.1	-	-	-	-	1	2.1	2	4.2	**1.6**
Total Hip	(3966)†	1	2.1	10	20.8	8	16.7	12	25.0	31	64.6	**0.8**
Total	**(5223)**	**3**	**6.3**	**12**	**25.0**	**11**	**22.9**	**22**	**45.8**	**48**	**100.0**	**0.9**

Note: **entries do not equal total due to rounding*
†total excludes resurfacing and thrust plates

Table 37: Days to Revision by Revision Diagnosis

Diagnosis	*Days to revision Procedure*								*Total*	
	Same Day		*<2 weeks*		*2-6 weeks*		*>6 weeks*			
	N	*%*	*N*	*%*	*N*	*%**	*N*	*%*	*N*	*%**
Dislocation	2	4.1	7	14.3	9	18.4	10	20.4	28	57.1
Fracture	-	-	2	4.1	1	2.0	1	2.0	4	8.2
Infection	-	-	-	-	1	2.0	2	4.1	3	6.1
Loosening	1	2.0	2	4.1	1	2.0	7	14.3	11	22.4
Other	-	-	1	2.0	-	-	2	4.1	3	6.1
Total	**3**	**6.1**	**12**	**24.5**	**12**	**24.5**	**22**	**44.9**	**49**	**100.0**

Note: *1 revision had 2 diagnoses*
**entries do not equal total due to rounding*

Table 38: Primary to Revision procedure types

Primary	*Revision*	*Number*	*%**
Bipolar	Acetabular Component Only	5	10.4
	Bipolar Head Only	1	2.1
	Bipolar head and stem	1	2.1
Unipolar Monoblock	Total Hip	3	6.3
	Bipolar head and stem	2	4.2
	Unipolar Monoblock	1	2.1
	Unipolar Modular	2	4.2
Unipolar Modular	Acetabular Component Only	1	2.1
	Unipolar Modular	1	2.1
Total Hip	Femoral Component Only	4	8.3
	Acetabular Component Only	14	29.2
	Total Hip	2	4.2
	Minor revision	11	22.9
Total		**48**	**100.0**

Note: *model type not repeated but continues down the column until change of model type*
**entries do not equal 100% due to rounding*

Components used in the Primary Procedures that were Revised

Table 39: Primary Bipolar Procedures requiring Revision

Femoral Component	*Bipolar*	*Number Revised*	*%*	*Total Number*	*% of Total Revised*
Exeter	Centrax	3	42.9	92	**3.3**
Omnifit	UHR	2	28.6	29	**6.9**
Bi-Metric	Bipolar *(Biomet)*	1	14.3	1	**100.0**
Definition	Centrax	1	14.3	12	**8.3**
Total		**7**	**100.0**	**276***	**2.5**

Note: **total number equals total primary bipolar procedures*

Table 40: Components Used - Primary Bipolar to Revision

Primary Procedure		*Revision Procedure*			*N*	*%*
Femoral Component	*Bipolar Head*	*Femoral Component*	*Bipolar Head*	*Acetabular Component*		
Exeter	Centrax	Not revised		Secur-Fit	1	14.3
Exeter	Centrax	Not revised		Brunswick	1	14.3
Omnifit	UHR	Not revised		Secur-Fit	1	14.3
Bi-Metric	Bipolar *(Biomet*	Not revised		Kasselt	1	14.3
Definition	Centrax	Not revised		Secur-Fit	1	14.3
Omnifit	UHR	Omnifit	UHR		1	14.3
Exeter	Centrax	Not revised	Centrax		1	14.3
Total					**7**	**100.0**

Table 41: Primary Unipolar Monoblock Procedure requiring Revision

Unipolar Monoblock	*Number Revised*	*%*	*Total Number*	*% of Total Revised*
Austin-Moore Type	8	100.0	756	**1.1**
Total	**8**	**100.0**	**858***	**0.9**

Note: **total number equals total unipolar monoblock*

Table 42: Components Used - Primary Unipolar Monoblock to Revision

Primary Procedure	*Revision Procedure*					*N*	*%*
Unipolar Monoblock	*Femoral Component*	*Acetabular Component*	*Bipolar Head*	*Unipolar Head*	*Unipolar Monoblock*		
Austin-Moore	Exeter	Trident				1	12.5
Austin-Moore	Omnifit	Secur-Fit				2	25.0
Austin-Moore	Exeter		Centrax			2	25.0
Austin-Moore	Omnifit			Unitrax		1	12.5
Austin-Moore	Spectron			Unipolar *(S&N)*		1	12.5
Austin-Moore					Austin-Moore	1	12.5
Total						**8**	**100.0**

Table 43: Primary Unipolar Modular Procedures requiring Revision

Femoral Component	*Unipolar Head*	*Number Revised*	*%*	*Total Number*	*% of Total Revised*
Omnifit	Unitrax	1	50.0	8	**12.5**
Spectron	Unipolar *(S&N)*	1	50.0	26	**3.8**
Total		**2**	**100.0**	**123†**	**0.9**

Note: *†total number equals total unipolar monoblock*

Table 44: Components Used - Primary Unipolar Modular to Revision

Primary Procedure		*Revision Procedure*			*N*	*%*
Femoral Component	*Unipolar Head*	*Femoral Component*	*Acetabular Component*	*Unipolar Head*		
Omnifit	Unitrax	Not revised	Secur-Fit		1	50.0
Spectron	Unipolar *(S&N)*	Spectron		Unipolar *(S&N)*	1	50.0
Total					**2**	**100.0**

Table 45: Primary Total where the Femoral and Acetabular components were Cemented requiring Revision

Femoral Component	*Acetabular Component*	*Number Revised*	*%**	*Total Number*	*% of Total Revised*
Exeter	Contemporary	1	33.3	172	**0.6**
Exeter	Exeter	1	33.3	122	**0.8**
Charnley	Charnley	1	33.3	134	**0.7**
Total		**3**	**100.0**	**1034**†	**0.3**

Note: *†total number of Cemented Procedures*
**entries do not equal 100% due to rounding*

Table 46: Primary Total where the Femoral and Acetabular components were Cementless requiring Revision

Femoral Component	*Acetabular Component*	*Number Revised*	*%**	*Total Number*	*% of Total Revised*
Mallory-Head	Mallory-Head	5	33.3	233	**2.1**
Margron	Transcend	2	13.3	18	**11.1**
Omnifit	Secur-Fit	2	13.3	43	**4.7**
Meridian	Vitalock	1	6.7	27	**3.7**
VerSys	Trilogy	1	6.7	68	**1.5**
Natural Hip	Artek	1	6.7	11	**9.1**
Alloclassic	Allofit	1	6.7	25	**4.0**
ABGII	ABGII	1	6.7	70	**1.4**
Synergy	Reflection	1	6.7	80	**1.3**
Total		**15**	**100.0**	**1048**†	**1.4**

Note: *† total number of Cementless Procedures*
** entries do not equal 100% due to rounding*

Table 47: Hybrid - Primary Total Hip where the Femoral component was Cemented and the Acetabular component was Cementless requiring Revision

Femoral Component	*Acetabular Component*	*Number Revised*	*%*	*Total Number*	*% of Total Revised*
Exeter	Vitalock	4	30.8	448	**0.9**
Freeman	Mallory-Head	2	15.4	55	**3.6**
Elite Plus	Duraloc	2	15.4	82	**2.4**
Spectron	ABGII	1	7.7	15	**6.7**
Spectron	Reflection	1	7.7	184	**0.5**
HMRS	Vitalock	1	7.7	1	**100.0**
Omnifit	Trident	1	7.7	46	**2.2**
CPT	Trilogy	1	7.7	44	**2.3**
Total		**13**	**100.0**	**1514**†	**0.8**

Note: *† total number of Hybrid Procedures*

Table 48: Components Used – Major - Primary Total Hip to Revision - Cemented, Cementless & Hybrid

Primary Procedure		***Revision Procedure***		***Number***	***%***
Femoral Component	*Acetabular Component*	*Femoral Component*	*Acetabular Component*		
Exeter	Vitalock	Not revised	Secur-Fit	1	5.0
Exeter	Vitalock	Not revised	Exeter	1	5.0
Exeter	Exeter	Not revised	X-Change	1	5.0
Mallory-Head	Mallory-Head	Not revised	Mallory-Head	3	15.0
Mallory-Head	Mallory-Head	Not revised	Contemporary	1	5.0
Omnifit	Secur-Fit	Not revised	Secur-Fit	1	5.0
Margron	Transcend	Not revised	Mallory-Head	1	5.0
Freeman	Mallory-Head	Not revised	Mallory-Head	1	5.0
Elite Plus	Duraloc	Not revised	Duraloc	1	5.0
Spectron	Reflection	Not revised	Reflection	1	5.0
Natural Hip	Artek	Not revised	Inter-Op	1	5.0
Synergy	Reflection	Not revised	Reflection	1	5.0
Spectron	ABGII	Revision Hip	Elite Plus	1	5.0
Meridian	Vitalock	Definition	Contemporary	1	5.0
Exeter	Vitalock	Exeter	Not revised	1	5.0
Margron	Transcend	Margron	Not revised	1	5.0
VerSys	Trilogy	Omnifit	Not revised	1	5.0
CPT	Trilogy	VerSys	Not revised	1	5.0
Total				**20**	**100.0**

Table 49: Components Used – Minor - Primary Total Hip to Revision - Cemented, Cementless & Hybrid

Primary Procedure		***Revision Procedure***			***Number***	***%****
Femoral Component	*Acetabular Component*	*Head*	*Insert*	*Other*		
Exeter	Vitalock	Not Used	Vitalock		1	9.1
Exeter	Contemporary	Exeter	Not Revised		1	9.1
Mallory-Head	Mallory-Head	C-Taper	Omnifit		1	9.1
Omnifit	Secur-Fit	C-Taper	Trident		1	9.1
Omnifit	Trident	Exeter	Vitalock		1	9.1
Freeman	Mallory-Head	Modular Head *(Biomet)*	Not Revised		1	9.1
Elite Plus	Duraloc	Not Revised	Not Revised	Cable/Other	1	9.1
HMRS	Vitalock	Modular Head *(Corin)*	Ringloc		1	9.1
Charnley	Charnley	Not Revised	Not Revised	Cable/Other	1	9.1
Alloclassic	Allofit	Metasul head	Armor		1	9.1
ABGII	ABGII	Not Revised	Not Revised	Cable/Other	1	9.1
Total					**11**	**100.0**

Note: *** *entries do not equal 100% due to rounding*

AOA National Joint Replacement Registry
Knee Replacement Data

The data presented in this report have been processed and analysed by the Registry for the period 1/9/99 to 31/12/00. The data are a proportion of the knee replacement surgery that has been undertaken during this period. It includes complete data from South Australia for 2000 and varying proportions of data from Western Australia, Queensland, Tasmania, Northern Territory and Victoria. Due to the staged implementation of the Registry no data from New South Wales and the Australian Capital Territory are included.

Demographics and Diagnosis

This report details information on just fewer than 6,000 knee replacement operations. The majority of knee replacements are primary total knees (77.6%). Unicompartmental knee replacement accounts for 11.1% of the knee replacement surgery, revision surgery 10.8% and a small number of patella /trochlear (0.5%) are also included (Table 50).

Patients undergoing primary total knee replacement are generally older when compared to primary total hip replacement (Tables 54 & 8). Unicompartmental and patella/trochlear surgery is undertaken in younger patients (Tables52 & 53). The age of patients having revision knee surgery is similar to those having primary total knee replacement. This probably reflects that younger patients having knee replacement are more likely to require revision.

There are a number of gender differences. Unicompartmental and patella/trochlear replacements are more likely to be performed in males (Tables 52 & 53). Primary total knee replacement and revision surgery are more frequently undertaken in females, the difference however is not as great in the revision group (Tables 54 & 55).

Osteoarthritis is the most common diagnosis for all forms of primary knee replacement (Tables 56, 57 & 58). There are a large number of different diagnoses used for revision knee surgery. Loosening, lysis, implant wear and breakage are responsible for over 60% of revisions. Revision for infection is reported more often for knees than hips (11.9% compared to 5.9%). There is also a significant number of knee revisions undertaken when the underlying diagnosis is not apparent. This refers to the "unknown" group reported in table 41 as the forms for this group were returned with "unknown" written in the diagnosis section. This group combined with the diagnosis of pain accounts for 6.3% of revisions. This does not include patella/trochlear pain that is largely confined to patella only revisions.

Prosthesis Fixation and Usage for Primary Knee Replacement

Two types of patella/trochlear replacements have been used (Table 60). Nine different prostheses have been used for unicompartmental knee replacement with the Oxford prosthesis being the most common prosthesis used (Table 62). The method of fixation for the unicompartmental knees is almost entirely cemented (Table 61).

The tibial component is cemented in almost 80% of primary total knee procedures. The femoral component is cemented in just over 50% of cases. When a patella is inserted it almost always cemented (92.0%) (Table 63).

In the majority of primary total knees (68.2%) a patella component is not used (Table 63). There is variation in patella use depending on the type of fixation used for the femoral and tibial components. A patella is used in only 18.4% of cementless primary total knees but on 37.5% of occasions if both the femoral and tibial components are cemented. Apart from the LCS these differences in patella use related to fixation are evident even when the same prosthesis is used (e.g. Nexgen cementless 1.6%, cemented 25.6%, Duracon cementless

11.4% cemented 57.9% and Genesis II cementless 8.2% cemented 50.8%). There is also significant variation in patella use between the different types of knee prostheses. (Tables 64, 65, 66 & 67)

Table 68 lists the most commonly used primary knee prostheses irrespective of the method of component fixation. The five most frequently used knee prostheses listed in this table account for 67.6% of knee prostheses used.

Prosthesis Fixation and Usage for Revision Knee Replacement

Knee revision surgery has been divided into major and minor revisions. They are defined in a similar manner to the hip in that a major revision is defined as a revision procedure where a major component has been replaced or removed. A major component is a component that interfaces with bone with the exception of the patella. Therefore a revision involving the insertion of a femoral and/or tibial component is a major revision. Any revision involving a patellar component or a component that does not interface with bone (i.e. a tibial insert) +/- a patellar component is regarded as a minor revision. There have been 632 knee revisions reported. Using the above definitions 57.3% are major revisions and 42.7% are minor (Tables 69 & 70).

The most common major revision involves the insertion of both femoral and tibial components (66.6%). The tibial component only has been used in 16.9% of cases and the femoral component only in 8.8%. Replacement of unicompartmental components has occurred in 2.8% of the major revisions. Also included in this group is the use of cement spacers and one fusion nail for an arthrodesis. They are included in major revisions as all previous components have been removed (Table 71).

In minor revisions a patella prosthesis has been used in 65.5% of cases. In just under half of these it is combined with a change of tibial insert. A tibial insert only has been used in 34.5% of cases (31.5 % total knee and 3% unicompartmental) (Table 70).

Cement is almost always used for fixation of major revision components. In a total knee revision when the tibial component is used it is cemented 96% of the time. The femoral component when used is cemented on 90.8% of occasions. In the small number of unicompartmental component revisions all the femoral and tibial components have been cemented (Table 71). When a patellar component has been used in a major revision it is cemented almost universally (Table 69).

The component types used in major unicompartmental and total knee revisions are reported in tables 72-81. The tables are subdivided depending on which type of component was used and whether the components were cemented or cementless. When both tibial and femoral components have been used, the Registry will not know the original prostheses if the preceding procedure was performed prior to Registry data collection. As time progresses there will be an increasing proportion of patients that have their original prostheses recorded. This will then allow the rate of revision for that prosthesis to be determined. It is only possible to determine the rate of revision for those prostheses that have been recorded since the Registry commenced data collection.

Theoretically it is possible to monitor prosthesis performance to a degree when the preceding procedure was undertaken prior to the Registry collecting data. This relies on the need to match knee components when one or more components are left in situ during knee revision surgery. It is evident that for major revisions where only one of the components has been replaced or when a minor revision procedure has been performed, it is possible to determine, with a reasonable degree of certainty, features of the original components. In knee revision surgery this scenario occurs 58.2% of the time. This has the potential to provide a useful guide to prosthesis performance although it is not possible however to determine the revision rate for this group. Timing from the preceding procedure and the frequency of prosthesis use are essential

to be able to determine this. It is also quite difficult to be precise about the sizing details of the original components. If however the frequency of revision for a particular prosthesis is well above what could be reasonably anticipated when compared to a likely estimate of its overall frequency of use, the potential to raise concerns about the performance of that prosthesis exists. At this stage the absolute number of revisions that fall into this category are too small to make any significant conclusions regarding prosthesis performance.

In this report a number of analyses relevant to the practice of both primary and revision knee surgery has not been presented. These include factors such as the degree of prosthesis constraint, mobile bearings and the use of stems, blocks, wedges as well as many other issues of interest. As Registry data collection increases and procedures previously recorded in the Registry are revised these details will become more relevant and will be presented in subsequent reports.

It is possible to make a number of comments on the prostheses used in revision knee surgery (Tables 72-85). Independent of the type of fixation, the five most common knee replacements used in total revision where both femoral and tibial components are replaced, account for 62.3% of prostheses used. They include, Genesis II (17.4%), Duracon and Nexgen (both 13.3%), LCS (12.9%) and the Scorpio (5.4%). The prostheses used for revision where only one of the major components is replaced are dictated by the remaining component. This also applies to the minor revisions. The numbers are too small to make any comments concerning these data and whether it reflects a problem with any of the current or previously available prostheses.

Bilateral Primary Knee Replacements

During the period of data collection 7.1% of patients underwent bilateral primary knee replacement. Bilateral surgery was performed on the same day in 65.2% of cases. The most common same day bilateral procedure was bilateral primary total knee replacement. This accounts for 76.2% of the bilateral knee replacements performed. The majority of the remaining same day bilateral procedures were unicompartmental replacements. These account for just fewer than 20% of the same day bilateral procedures. Same day bilateral primary total knee replacement was performed on 4.1% of patients undergoing primary total knee replacement and 7.5% of those undergoing primary unicompartmental knee replacement (Table 86).

Registry Recorded Primary to Revision Surgery

As mentioned in the corresponding section on hip replacement, this is the most important section of the report, as revision rates are determined and appropriate and inappropriate prosthesis performance is identified. As with the hip section, the current number of knee revision procedures where the Registry records the details of the preceding procedure is small. Currently it is 3.8% of all knee revisions. As time progresses it will approach 100%.

Most revisions are undertaken after 6 weeks (Table 87). The small number of revisions undertaken before this was related to problems of stability and infection (Table 88). Large numbers of diagnoses were recorded. Within this group were 3 tibial component breakages. These were not related to any specific component. In future, this will be an important area of focus when monitoring prosthesis performance.

The overall revision rates during this period for primary total knee replacements and unicompartmental knees were 0.4% and 0.8% respectively. There was also a difference in the nature of revision surgery. Almost 80% of the primary total knee revisions were minor revisions whereas the unicompartmental knees underwent major revision in four out of five cases (2 to total knees and 2 unicompartmental major component revisions) (Tables 87 & 89).

The tables presented in this section have been done in a similar manner as the hip procedures. The numbers are too small to

attempt to present any revision rates or to make any significant comments. These data have been presented largely for interest and as an example of the type of information that will be reported in the future.

Registry Recorded Revision to Revision Knee Replacement

There was a small number of patients who underwent a revision knee procedure and who had a further revision during the period of data collection. A single subsequent revision was undertaken on 26 patients. Two patients had a further two revisions following the initial revision procedure. As the numbers are small the information has not been presented in tables. These data will be reported in more detail in subsequent reports.

Infection was the principal cause for these subsequent revisions. It accounted for 61.5% of the patients having a single subsequent revision and both patients who had two further revisions.

Knee Replacement - 1/9/1999 to 31/12/2000

Table 50: Number of Knee Replacements by sex

Type of knee replacement	*Female*		*Male*		*Total*	
	Number	*%*	*Number*	*%**	*Number*	*%*
Patella/trochlear	19	0.3	8	0.1	27	0.5
Unicompartmental Knee	309	5.3	340	5.8	649	11.1
Primary Total Knee	2517	43.0	2026	34.6	4543	77.6
Revision Knee	323	5.5	309	5.3	632	10.8
Total	**3168**	**54.1**	**2683**	**45.9**	**5851**	**100.0**

Note: *percents shown are cell percents out of 5851*
**entries do not equal total due to rounding*

Definitions
Patella/trochlear: *patella/trochlear replacement*
Unicompartmental: *either medial or lateral unicompartmental knee replacement*
Primary total: *primary total knee replacement*
Revision: *re-operation for exchange or removal of one or more components*

Demographic characteristics of patients undergoing Knee Replacement - 1/9/1999 to 31/12/2000

Table 51: Summary statistics of age (by sex) for All Knee Replacements

	Female *N=3168 (54.1%)*	*Male* *N=2683 (45.9%)*	*All Patients* *N=5851 (100.0%)*
Median	72	71	72
Minimum	20	17	17
Maximum	96	99	99
Mean	70.5	69.9	70.2
Standard Deviation	10.0	9.3	9.7

Table 52: Summary statistics of age (by sex) for Patella/trochlear Replacement

	Female *N=19 (70.4%)*	*Male* *N=8 (29.6%)*	*All Patients* *N=27 (100.0%)*
Median	56	53	56
Minimum	48	36	36
Maximum	83	77	83
Mean	60.3	54.8	58.6
Standard Deviation	11.3	11.2	11.3

Graph 9: Age and Sex - Patella/trochlear Knee Replacement

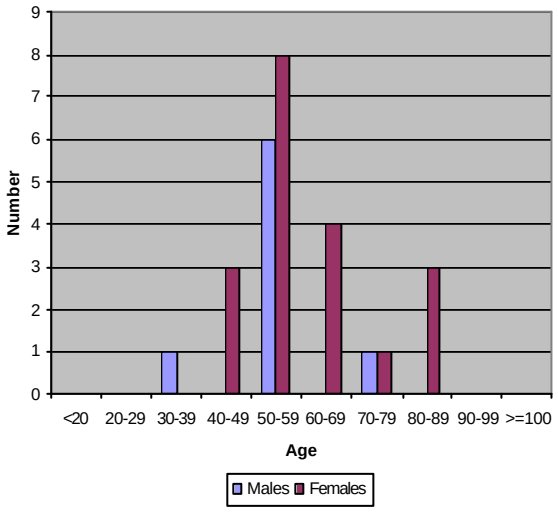


Table 53: Summary statistics of age (by sex) for Unicompartmental Knee Replacement

	Female *N=309 (47.6%)*	*Male* *N=340 (52.4%)*	*All Patients* *N=649 (100.0%)*
Median	67	66	67
Minimum	39	44	39
Maximum	89	99	99
Mean	66.2	66.8	66.5
Standard Deviation	10.9	9.4	10.1

Graph 10: Age and Sex - Unicompartmental Knee Replacement

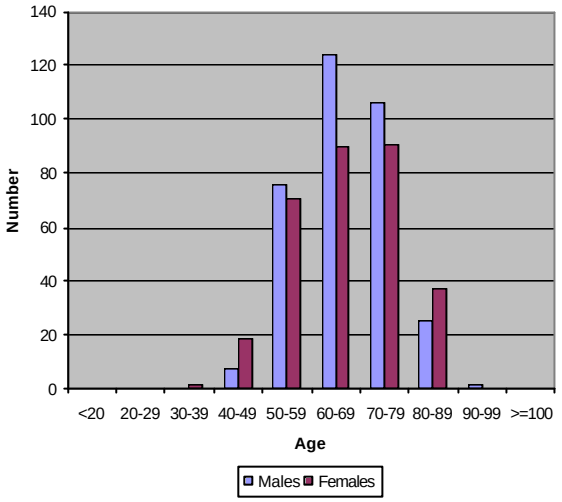


Table 54: Summary statistics of age (by sex) for Primary Total Knee Replacement

	Female *N=2517 (55.4%)*	*Male* *N=2026 (44.6%)*	*All Patients* *N=4543 (100.0%)*
Median	72	72	72
Minimum	20	17	17
Maximum	96	93	96
Mean	71.0	70.4	70.7
Standard Deviation	9.6	9.1	9.4

Graph 11: Age and Sex - Primary Total Knee Replacement

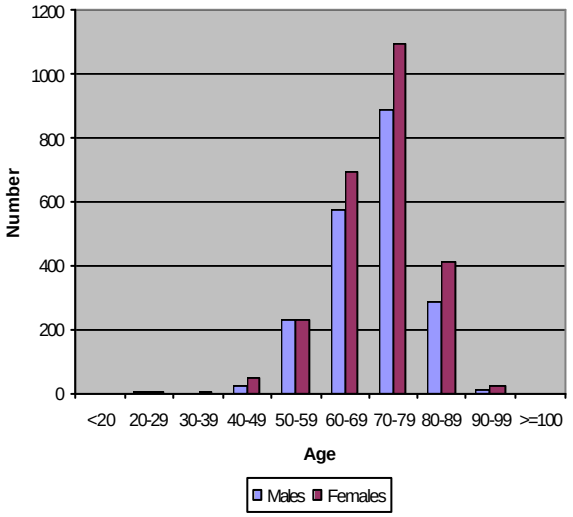
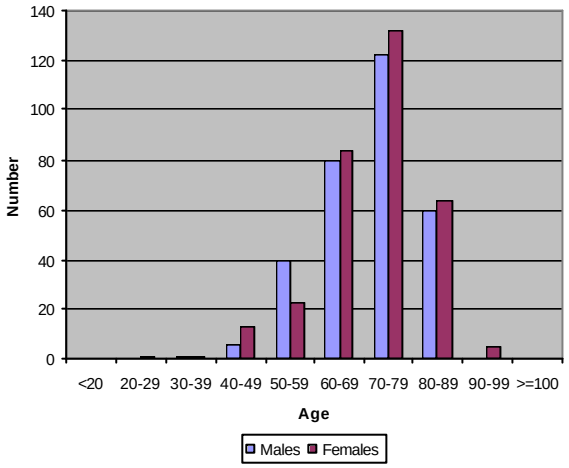


Table 55: Summary statistics of age (by sex) for Revision Knee Replacement

	Female *N=323 (51.1%)*	***Male*** *N=309 (48.9%)*	***All Patients*** *N=632 (100.0%)*
Median	73	72	73
Minimum	22	37	22
Maximum	95	88	95
Mean	71.5	70.5	71.0
Standard Deviation	10.6	9.7	10.2

Graph 12: Age and Sex - Revision Total Knee Replacement



Diagnosis for Knee Replacement - 1/9/1999 to 31/12/2000

Table 56: Diagnosis - Patella/trochlear Replacement

Diagnosis	*Number*	*%*
Osteoarthritis	27	100.0
Total	**27**	**100.0**

Table 57: Diagnosis - Unicompartmental Knee Replacement

Diagnosis	*Number*	*%**
Osteoarthritis	632	97.4
Avascular Necrosis	14	2.2
Other Inflammatory Arthritis	3	0.5
Total	**649**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 58: Diagnosis - Primary Total Knee Replacement

Diagnosis	*Number*	*%**
Osteoarthritis	4338	95.5
Rheumatoid Arthritis	150	3.3
Other Inflammatory Arthritis	36	0.8
Avascular Necrosis	12	0.3
Tumour	7	0.2
Total	**4543**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 59: Diagnosis - Revision Knee Replacement

Diagnosis	*Number*	*%*
Loosening	267	35.4
Infection	90	11.9
Wear Tibial	66	8.8
Implant Breakage Tibial	58	7.7
Patella Femoral Pain	54	7.2
Lysis	48	6.4
Implant Breakage Patella	32	4.2
Pain	32	4.2
Wear Patella	18	2.4
Instability	15	2.0
Fracture	13	1.7
Patella Maltracking	12	1.6
Arthrofibrosis	10	1.3
Implant Breakage Femoral	7	0.9
Malalignment	7	0.9
Dislocation	4	0.5
Incorrect Sizing	4	0.5
Heterotropic Bone	2	0.3
Unknown	16	2.1
Total	**755**	**100.0**

Note: *some patients had multiple diagnoses*

Prosthesis Fixation and Usage for Patella/trochlear Knee Replacement - 1/9/1999 to 31/12/2000

Table 60: Prosthesis Usage - Patella/trochlear Replacement

Patella/trochlear Replacement	*Patella*	*Number*	*%*
Avon	Kinemax	13	48.1
MOD III	Resurfacing System	14	51.9
Total		**27**	**100.0**

Prosthesis Fixation and Usage for Unicompartmental Knee Replacement - 1/9/1999 to 31/12/2000

Table 61: Prosthesis Fixation - Unicompartmental Knee Replacement

Fixation	*Number*	*%*
Tibial and femoral cemented	605	93.2
Femoral only cemented	5	0.8
Tibial and femoral cementless	39	6.0
Total	**649**	**100.0**

Table 62: Prosthesis Usage - Unicompartmental Knee Replacement

Prosthesis Used	*Number*	*%**
Oxford 3	345	53.2
Allegretto Uni Knee	110	16.9
M/G	74	11.4
PFC Sigma	35	5.4
Unix	30	4.6
Genesis	23	3.5
Repecci	15	2.3
LCS	12	1.8
Natural Knee	5	0.8
Total	**649**	**100.0**

Note: **entries do not equal 100% due to rounding*

Prosthesis Fixation and Usage for Primary Total Knee Replacement - 1/9/1999 to 31/12/2000

Table 63: Prosthesis Fixation - Primary Total Knee Replacement

Fixation	*Total*		*Patella used*			
			Patella cementless		*Patella cemented*	
	Number	*%*[*]	*Number*	*%*[†]	*Number*	*%*[†]
Tibial and femoral cementless	933	20.5	73	7.8	99	10.6
Tibial and femoral cemented	2285	50.3	30	1.3	828	36.2
Tibial only cemented	1319	29.0	11	0.8	402	30.5
Femoral only cemented	6	0.1	1	16.7	2	33.3
Total	**4543**	**100.0**	**115**	**2.5**	**1331**	**29.3**

Note: [*]*entries do not equal 100% due to rounding*
[†]*percents shown are row percents out of total number*

Table 64: Prosthesis Usage - Primary Total Knee Replacement where both the Tibial and Femoral components were Cementless

Prosthesis Used	*Total Number*	*%*[*]	*Patella used*	*%*[†]
LCS	348	37.3	92	26.4
Nexgen	125	13.4	2	1.6
Duracon	105	11.3	12	11.4
Genesis II	73	7.8	6	8.2
Advantim	67	7.2	3	4.5
Natural Knee	46	4.9	15	32.6
Scorpio	46	4.9	25	54.3
Maxim	44	4.7	1	2.3
Interax	35	3.8	10	28.6
AMK	20	2.1	2	10.0
Profix	19	2.0	4	21.1
Other	5	0.5		0.0
Total	**933**	**100.0**	**172**	**18.4**

Note: [*]*entries do not equal 100% due to rounding*
[†]*percents shown are row percents out of total number*

Table 65: Prosthesis Usage - Primary Total Knee Replacement where both the Tibial and Femoral Component were Cemented

Prosthesis Used	*Total Number*	*%**	*Patella used*	*%†*
Nexgen	402	17.6	103	25.6
LCS	359	15.7	99	27.6
Duracon	304	13.3	176	57.9
Genesis II	303	13.3	154	50.8
AGC	165	7.2	29	17.6
Scorpio	118	5.2	28	23.7
PFC Sigma	106	4.6	66	62.3
Kinemax	106	4.6	95	89.6
Profix	82	3.6	18	22.0
Advantim	78	3.4	-	-
I/B II	56	2.5	16	28.6
Series 7000	40	1.8	9	22.5
AMK	33	1.4	2	6.1
Apollo Knee	22	1.0	21	95.5
Advance	21	0.9	-	-
Genesis	18	0.8	2	11.1
Natural Knee	17	0.7	11	64.7
Trac	16	0.7	14	87.5
Exactec	10	0.4	9	90.0
Maxim	9	0.4	2	22.2
Other	20	0.8	4	20.0
Total	**2285**	**100.0**	**858**	**37.5**

Note: *- equals no patella used*
**entries do not equal 100% due to rounding*
†percents shown are row percents out of total number

Table 66: Prosthesis Usage - Primary Total Knee Replacement where the Tibial component was Cemented and the Femoral component was Cementless

Prosthesis Used	*Total Number*	*%*	*Patella used*	*%†*
Duracon	325	24.6	97	29.8
Scorpio	193	14.6	90	46.6
LCS	163	12.4	20	12.3
PFC Sigma	127	9.6	66	52.0
Genesis II	118	8.9	48	40.7
AGC	98	7.4	7	7.1
AMK	93	7.1	4	4.3
Nexgen	83	6.3	32	38.6
Natural Knee	56	4.2	31	55.4
Trac	26	2.0	8	30.8
Profix	15	1.1	1	6.7
Other	22	1.8	9	40.9
Total	**1319**	**100.0**	**413**	**31.3**

Note: *†percents shown are row percents out of total number*

Table 67: Prosthesis Usage - Primary Total Knee Replacement where the Tibial component was Cementless and the Femoral component was Cemented

Prosthesis Used	*Total Number*	*%**	*Patella used*	*%†*
Advantim	2	33.3	-	-
AMK	1	16.7	-	-
Interax	1	16.7	1	100.0
Scorpio	1	16.7	1	100.0
LCS	1	16.7	1	100.0
Total	**6**	**100.0**	**3**	**50.0**

Note: *- equals no patella used*
**entries do not equal 100% due to rounding*
†percents shown are row percents out of total number

Top Ten Knee Prostheses used for Primary Total Knee Replacement - 1/9/1999 to 31/12/2000

Table 68: Top Ten Knee Prostheses used in Primary Total Knee Replacements

Femoral Prosthesis	*Number*	*%*
LCS	871	19.2
Duracon	734	16.2
Nexgen	610	13.4
Genesis II	494	10.9
Scorpio	358	7.9
AGC	263	5.8
PFC Sigma	233	5.1
AMK	147	3.2
Advantim	147	3.2
Natural Knee	119	2.6
Other	567	12.5
Total	**4543**	**100.0**

Prosthesis Fixation and Usage for Revision Knee Replacement - 1/9/1999 to 31/12/2000

Table 69: Components Used - Major Revision Knee Replacement

Components Used	*Total*		*Patella used*			
			cementless		*cemented*	
	Number	*%**	*Number*	*%†*	*Number*	*%†*
Tibial and Femoral	241	66.6	-	-	92	38.2
Tibial Only	61	16.9	1	1.6	20	32.8
Femoral Only	32	8.8	-	-	7	21.9
Sub - Total	**334**	**92.3**	**1**	**1.6**	**119**	**35.6**
Uni - Tibial and Femoral	5	1.4	-	-	-	-
Uni - Tibial Only	3	0.8	-	-	-	-
Uni - Femoral Only	2	0.6	-	-	-	-
Cement spacer	17	4.7	-	-	-	-
Fusion Nail	1	0.3	-	-	-	-
Total	**362**	**100.0**	**1**	**0.3**	**119**	**32.9**

Note: *- equals no patella used*
**entries do not equal 100% due to rounding*
†percents shown are row percents out of total number

Table 70: Components Used - Minor Revision Knee Replacement

Components Used	*Number*	*%*
Patella Only	93	34.4
Insert Only	85	31.5
Insert and Patella	84	31.1
Uni Insert Only	8	3.0
Total	**270**	**100.0**

Table 71: Prosthesis Fixation - Major Revision Knee Replacement

Components Used	*Cemented*		*Cementless*		*Tibial cemented Femoral cementless*		*Tibial cementless Femoral cemented*		*N/A*		*Total*	
	N	*%*	*N*	*%**	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%**
Tibial and Femoral	215	59.4	10	2.8	15	4.1	1	0.3	-	-	241	66.6
Tibial Only	60	16.6	1	0.3	-	-	-	-	-	-	61	16.9
Femoral Only	32	8.8	-	-	-	-	-	-	-	-	32	8.8
Uni - Tibial and Femoral	5	1.4	-	-	-	-	-	-	-	-	5	1.4
Uni - Tibial Only	3	0.8	-	-	-	-	-	-	-	-	3	0.8
Uni - Femoral Only	2	0.6	-	-	-	-	-	-	-	-	2	0.6
Cement Spacer/cement	-	-	-	-	-	-	-	-	17	4.7	17	4.7
Fusion Nail	-	-	-	-	-	-	-	-	1	0.3	1	0.3
Total	**317**	**87.6**	**11**	**3.0**	**15**	**4.1**	**1**	**0.3**	**18**	**5.0**	**362**	**100.0**

Note: *N/A means not applicable because a knee component was not used.*
**entries do not equal total due to rounding*

Table 72: Prosthesis Used - Unicompartmental - Major Revision Knee Replacement - Tibial and Femoral component

Prosthesis Used	*Number*
Oxford 3	4
Genesis	1
Total	**5**

Table 73: Components Used - Unicompartmental - Major Revision Knee Replaceme nt - Tibial component only

Prosthesis Used	*Number*
Genesis	1
Oxford 3	1
M/G	1
Total	**3**

Table 74: Components Used - Unicompartmental - Major Revision Knee Replacement - Femoral component only

Prosthesis Used	*Number*
Allegretto Uni Knee	1
Oxford 3	1
Total	**2**

Table 75: Prosthesis Usage - Major Revision Knee Replacement where both the Tibial and Femoral components were Cemented

Prosthesis Used	*Total*		*Patella used*	
	Number	*%*[*]	*Number*	*%*[†]
Genesis II	42	19.5	20	47.6
Nexgen	32	14.9	11	34.4
Duracon	31	14.4	17	54.8
LCS	23	10.7	8	34.8
Profix	13	6.0	5	38.5
Series 7000	12	5.6	6	50.0
PFC Sigma	11	5.1	4	36.4
Cordinate	9	4.2	1	11.1
Scorpio	8	3.7	4	50.0
AGC	7	3.3	3	42.9
Finn	5	2.3	1	20.0
S-Rom	6	2.8	-	-
MRS	3	1.4	1	33.3
Natural Knee	3	1.4	3	100.0
Kinemax	3	1.4	2	66.7
Advantim	2	0.9	-	-
I/B II	2	0.9	-	-
Maxim	1	0.5	-	-
Apollo Knee	1	0.5	-	-
BalanSys	1	0.5	-	-
Total	**215**	**100.0**	**86**	**40.0**

Note: - *equals no patella used*
[*] *entries do not equal 100% due to rounding*
[†] *percents shown are row percents out of total number*

Table 76: Prosthesis Usage - Major Revision Knee Replacement where both the Tibial and Femoral components were Cementless

Prosthesis Used	*Total*		*Patella used*	
	Number	*%*	*Number*	*%*[†]
LCS	4	40.0	1	25.0
Advantim	2	20.0	-	-
Natural Knee	1	10.0	-	-
Scorpio	1	10.0	1	100.0
S-Rom	1	10.0	-	-
Finn	1	10.0	1	100.0
Total	**10**	**100.0**	**3**	**30.0**

Note: - *equals no patella used*
[†] *percents shown are row percents out of total number*

Table 77: Prosthesis Usage - Major Revision Knee Replacement where the Tibial component was Cementless and the Femoral component was Cemented

Prosthesis Used	*Total*		*Patella used*	
	Number	*%*	*Number*	*%*
Advantim	1	100.0	0	0.0
Total	**1**	**100.0**	**0**	**0.0**

Table 78: Prosthesis Usage - Major Revision Knee Replacement where the Tibial components were Cemented and the Femoral Components were Cementless

Prosthesis Used	*Total*		*Patella used*	
	Number	*%**	*Number*	*%†*
Scorpio	6	40.0	1	16.7
LCS	4	26.7	-	-
Natural Knee	3	20.0	1	33.3
Duracon	1	6.7	-	-
Apollo Knee	1	6.7	1	100.0
Total	**15**	**100.0**	**3**	**20.0**

Note: - *equals no patella used*

**entries do not equal 100% due to rounding*

†percents shown are row percents out of total number

Table 79: Prosthesis Usage - Major Revision Knee Replacement where the Tibial component only was used and was Cemented

Prosthesis Used	*Total*		*Patella used*	
	Number	*%**	*Number*	*%†*
Duracon	13	21.7	3	23.1
LCS	9	15.0	2	22.2
PFC Sigma	8	13.3	6	75.0
M/G	7	11.7	3	42.9
Series 7000	6	10.0	4	66.7
Genesis II	5	8.3	1	20.0
Genesis	4	6.7	1	25.0
Coordinate	2	3.3	-	-
Link Tib Comp	2	3.3	-	-
Natural Knee	1	1.7	-	-
Apollo Knee	1	1.7	-	-
Advantim	1	1.7	1	100.0
Nexgen	1	1.7	-	-
Total	**60**	**100.0**	**21**	**35.0**

Note: - *equals no patella used*

**entries do not equal 100% due to rounding*

†percents shown are row percents out of total number

Table 80 Prosthesis Usage - Major Revision Knee Replacement where the Tibial component only was used and was Cementless

Prosthesis Used	*Total*		*Patella used*	
	Number	*%*	*Number*	*%*
Synatomic	1	100.0	0	0.0
Total	**1**	**100.0**	**0**	**0.0**

Table 81: Components Used - Major Revision Knee Replacement where the Femoral component only was used and was Cemented

Prosthesis Used	*Total*		*Patella used*	
	Number	*%*	*Number*	*%*[†]
Maxim	11	34.4	3	27.3
Cordinate	6	18.8	2	33.3
Genesis	3	9.4	-	-
LCS	3	9.4	-	-
Profix	2	6.3	-	-
Natural Knee	1	3.1	-	-
Series 7000	1	3.1	-	-
Advantim	1	3.1	-	-
Trac	1	3.1	-	-
Duracon	1	3.1	1	100.0
PFC Sigma	1	3.1	1	100.0
AGC	1	3.1	-	-
Total	**32**	**100.0**	**7**	**21.9**

Note: *- equals no patella used*

[†]*percents shown are row percents out of total number*

Table 82: Prosthesis Usage - Minor Revision Knee Replacement where a Patella only was used

Patella Used	*Total*	
	Number	*%*[*]
LCS	16	17.2
Genesis II	15	16.1
Duracon	9	9.7
I/B II	8	8.6
AGC	6	6.5
Series 7000	6	6.5
PFC Sigma	5	5.4
AMK	4	4.3
Scorpio	4	4.3
Profix	4	4.3
Nexgen	3	3.2
Interax	2	2.2
Advantim	2	2.2
M/G	2	2.2
PCA	1	1.1
Advance	1	1.1
Genesis	1	1.1
Kinemax	1	1.1
Resurfacing System	1	1.1
Link Patella	1	1.1
Natural Knee	1	1.1
Total	**93**	**100.0**

Note: [*]*entries do not equal 100% due to rounding*

Table 83: Prosthesis Usage - Minor Revision Knee Replacement where an Insert only was used

Insert Used	*Total*	
	Number	*%**
LCS	18	21.2
PCA	10	11.8
M/G	10	11.8
Genesis	9	10.6
Nexgen	7	8.2
Duracon	7	8.2
PFC Sigm	6	7.1
Profix	3	3.5
I/B II	3	3.5
AMK	2	2.4
Series 7	2	2.4
Kinemax	1	1.2
Trac	1	1.2
Advantim	1	1.2
Advance	1	1.2
Link Tib	1	1.2
Natural	1	1.2
Scorpio	1	1.2
Ortholoc	1	1.2
Total	**85**	**100.0**

Note: **entries do not equal 100% due to rounding*

Table 84: Prosthesis Usage - Minor Revision Knee Replacement where a Patella and an Insert were used

Insert Used	*Patella Used*	*Total*	
		Number	*%**
M/G	I/B II	19	22.6
	M/G	8	9.5
PFC Sigma	PFC Sigma	11	13.1
PCA	PCA	6	7.1
	Kinemax	1	1.2
LCS	LCS	7	8.3
Scorpio	Series 7000	1	1.2
	Scorpio	5	6.0
Duracon	Duracon	5	6.0
Series 7000	Series 7000	5	6.0
Ortholoc	Advantim	5	6.0
Genesis	Genesis	3	3.6
	Genesis II	1	1.2
Advantim	Advantim	2	2.4
Nexgen	Nexgen	2	2.4
AGC	AGC	1	1.2
Natural Knee	Natural Knee	1	1.2
Profix	Profix	1	1.2
Total		**84**	**100.0**

Note: *model name not repeated but continues down the column until change of model name*
**entries do not equal 100% due to rounding*

Table 85: Prosthesis Usage - Minor Revision Knee Replacement where a Unicompartmental Insert only was used

Insert Used	*Total*	
	Number	*%*
M/G	3	37.5
Oxford 3	3	37.5
Unix	2	25.0
Total	**8**	**100.0**

Bilateral Knee Replacement - 1/9/1999 to 31/12/2000

Table 86: Days between procedures for Bilateral Primary Hips

1st Procedure	*2nd Procedure*	*Days between Bilateral Procedures*								*Total*	
		Same Day		*<2 weeks*		*2-6 weeks*		*>6 weeks*			
		N	*%**	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%**
Patella/trochlear	Patella/trochlear	4	1.1	-	-	-	-	-	-	4	1.1
Unicompartmental	Unicompartmental	45	12.9	1	0.3	1	0.3	4	1.1	51	14.7
Unicompartmental	Primary Total	4	1.1	-	-	1	0.3	2	0.6	7	2.0
Primary Total	Unicompartmental	1	0.3	-	-	-	-	3	0.9	4	1.1
Primary Total	Primary Total	173	49.7	16	4.6	6	1.7	87	25.0	282	81.0
Total		**227**	**65.2**	**17**	**4.9**	**8**	**2.3**	**96**	**27.6**	**348**	**100.0**

Note: **entries do not equal total % due to rounding*

Registry Recorded Primary to Revision Knee Replacement - 1/9/1999 to 31/12/2000

Table 87: Days to Revision by Primary procedure type

Primary Procedure (N)		*Days to revision Procedure*						*Total*		*Proportion of primary procedures revised*
		<2 weeks		*2-6 weeks*		*>6 weeks*				
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*%*
Unicompartmental Knee	(649)	-	-	-	-	5	20.8	5	20.8	**0.8**
Primary Total Knee	(4543)	1	4.2	3	12.5	15	62.5	19	79.2	**0.4**
Total	**(5192)**	**1**	**4.2**	**3**	**12.5**	**20**	**83.3**	**24**	**100.0**	**0.5**

Table 88: Days to Revision by Revision Diagnosis

Revision Diagnosis	*Days to revision Procedure*						*Total*	
	<2 weeks		*2-6 weeks*		*>6 weeks*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Dislocation	1	4.0	1	4.0	-	-	2	8.0
Fracture	-	-	-	-	3	12.0	3	12.0
Implant Breakage Tibial	-	-	-	-	3	12.0	3	12.0
Infection	-	-	1	4.0	3	12.0	4	16.0
Instability	-	-	1	4.0	-	-	1	4.0
Loosening	-	-	-	-	4	16.0	4	16.0
Lysis	-	-	-	-	1	4.0	1	4.0
Malalignment	-	-	-	-	1	4.0	1	4.0
Patella Femoral Pain	-	-	-	-	4	16.0	4	16.0
Unknown	-	-	-	-	2	8.0	2	8.0
Total	**1**	**4.0**	**3**	**12.0**	**21**	**84.0**	**25**	**100.0**

Note: *1 patient had two diagnoses*

Table 89: Primary to Revision procedure types

Primary	*Revision*	*Number*	*%*
Unicompartmental	Total Knee	2	8.3
	Unicompartmental	2	8.3
	Unicompartmental Insert	1	4.2
Primary Total	Total Knee	2	8.3
	Tibial Components Only	1	4.2
	Insert and Patella	3	12.5
	Patella Only	4	16.7
	Insert Only	8	33.3
	No Components	1	4.2
Total		**24**	**100.0**

Note: *model type not repeated but continues down the column until change of model type*

Table 90: Components Used - Total Unicompartmental Primary to Total Knee Revision

Primary *Unicompartmental*	*Revision* *Total Knee*	*Number*	*%*
Allegretto Uni Knee	Scorpio	1	50.0
Oxford 3	Profix	1	50.0
Total		**2**	**100.0**

Table 91: Components Used - Total Unicompartmental Primary to Total Unicompartmental Revision

Primary *Unicompartmental*	*Revision* *Unicompartmental*	*Number*	*%*
Oxford 3	Oxford 3	2	100.0
Total		**2**	**100.0**

Table 92: Components Used - Unicompartmental Primary to Revision Unicompartmental - Insert only

Primary *Unicompartmental*	***Revision*** *Unicompartmental Insert*	***Number***	***%***
Oxford 3	Oxford 3	1	100.0
Total		**1**	**100.0**

Table 93: Components Used - Total Knee Primary to Total Knee Revision

Primary *Total Knee*	***Revision*** *Total Knee*	***Number***	***%***
Genesis II	Genesis II	1	50.0
Natural Knee	Apollo Knee	1	50.0
Total		**2**	**100.0**

Table 94: Components Used - Total Knee Primary to Revision - Tibial component Only

Primary		***Revision***	***Number***	***%***
Femoral	*Tibial*	*Tibial Only*		
Genesis II	Mobile Bearing	Genesis II	1	100.0
Total			**1**	**100.0**

Table 95: Components User - Total Knee Primary to Revision - Insert and Patella addition

Primary			***Revision***		***Number***	***%****
Total Knee	*Insert*	*Patella*	*Insert*	*Patella*		
LCS	LCS	Not used	LCS	LCS	1	33.3
Scorpio	Scorpio	Not used	Scorpio	Scorpio	1	33.3
Series 7000	Series 7000	Not used	Series 7000	Series 7000	1	33.3
Total					**3**	**100.0**

Note: *******entries do not equal 100% due to rounding*

Table 96: Components Used - Total Knee Primary to Revision - Patella addition

Primary		***Revision***	***Number***	***%***
Total Knee	*Patella*	*Patella*		
AMK	Not used	AMK	1	25.0
Genesis II	Not used	Genesis II	1	25.0
LCS	Not used	LCS	1	25.0
Trac	Not used	AGC	1	25.0
Total			**4**	**100.0**

Table 97: Components Used - Total Knee Primary to Revision - Insert only

Primary		*Revision*	*Number*	*%*
Total Knee	*Insert*	*Insert*		
Advance	Advance	Advance	1	12.5
Duracon	Duracon	Duracon	1	12.5
Genesis II	Genesis II	Genesis II	1	12.5
LCS	LCS	LCS	1	12.5
Nexgen	Nexgen	Nexgen	2	25.0
PFC Sigma	PFC Sigma	PFC Sigma	1	12.5
Trac	Trac	Trac	1	12.5
Total			**8**	**100.0**

Table 98: Components Used - Total Knee Primary to Revision for Infection - All components removed

Primary	*Revision*	*Number*	*%*
Total Knee	*Patella*		
Profix	Cement Spacer	1	100.0
Total		**1**	**100.0**

Appendix 1

PATIENT CONSENT AND CONFIDENTIALITY GUIDELINES

Patient Consent

The Registry adopted an "opt off" approach to obtain patient consent to allow the collection of data on patients undergoing hip or knee replacement surgery. This approach was employed for the following reasons:

- No direct patient contact is required
- The large number of patients undergoing joint replacement Australia
- The number of hospitals involved with data collection.

Using this approach, patients are provided with information on the Registry and asked to contact the Registry should they wish to opt off. The required information, how it is collected and the avenues to take should a patient wish to opt off are clearly explained in the Patient Information Sheet provided. The information is provided to patients by surgeons and hospitals prior to surgery. Patients may contact the Registry any time pre or post operation. To accommodate those patients that may wish to opt off, or have enquires or issues to discuss, a toll free number *(no cost to the patient*) has been implemented at the Registry.

Patient Confidentiality

Joint replacement patients will not be contacted directly by the Registry. No individual patient will be identified during analysis or in the reports and publications produced by the Registry. Patient operative and prostheses data will be managed in accordance with the Guidelines for the Protection of Privacy in the Conduct of Medical Research. Personal data collected is for use by the AOA National Joint Replacement Registry only. Further to this the Registry is a Federal Quality Assurance Activity *(see below)* and all information is protected.

Data Management & Confidentiality

The Data Management and Analysis Centre, University of Adelaide undertakes data entry, validation and analysis and provides secure data storage.

The DMAC was established in 1995 to handle systems development, data management and statistical analysis for the Second Australian National Blood Pressure Study (ANBP2), a large, multi-centred, randomised clinical trial. Dr Philip Ryan, Senior Lecturer in Public Health, heads the DMAC. The centre staff includes data managers, database programmers, statisticians and data assistants from the Department of General Practice and the Department of Public Health. It is engaged in an increasing variety of work, including clinical trials, pharmacoepidemiological studies, consultations and cohort studies.

The list of personnel with access to identified Registry information is as follows:

- Director Dr. Stephen Graves
- Project Coordinator Ms Lisa Ingerson
- Data Management and Analysis Centre Staff including data assistants and data manager

Declaration of the project as a Quality Assurance Activity ensures that Registry and DMAC staff are bound to maintain confidentiality. Confidentiality not only applies to individual patients but also includes surgeons and hospitals.

The DMAC has security systems to limit access to DMAC and Registry staff only. There are policies and procedures in place as well as software barriers to protect personal information. These include the use of codes, passwords and encryption.

The proforma used for data collection will be stored in a secure locked room at the DMAC. After a period of time the forms will be optically scanned and electronically stored on either compact disk or microfiche. As with all data these will be securely stored. All data will be retained in accordance with good scientific practice.

Surgeon Confidentiality

Surgeon confidentiality is assured. The purpose of the Registry is to provide demographic and outcome information relevant to joint replacement surgery. It is not designed or capable of monitoring the performance of individual surgeons. Surgeon name is not recorded in the Registry database. In addition to this, the AOA Registry Management Committee made a decision in October 1999 to remove surgeon name from any Registry forms. The Board of the AOA ratified this decision. As a consequence of this, Registry staff blackout surgeon name, whether it is hand written or printed on the hospital patient identification, on all forms received by the Registry.

It has always been thought however, that it is an important Registry function to provide a service to surgeons that allows them to monitor and audit their own performance. It is for this reason that surgeons have a choice to identify themselves by code. In this manner specific procedures can be linked with that code. This is an optional choice and there is no requirement that the surgeon code be completed. The codes are provided to surgeons by the AOA and Registry staff do not have access to those codes.

The intention is to provide surgeons with access to their own information through secure internet access. As yet the software has not been developed that would allow this to occur. It is important to emphasis that surgeons have the choice of using their code and that surgeon name is not recorded and also permanently removed from any of the Registry forms.

Federal Quality Assurance Activity

The Australian Orthopaedic Association National Joint Replacement Registry was declared a Federal Quality Assurance Activity by the Federal Minister for Health and Aged Care, Dr Wooldridge, in March 1999. This ensures freedom from subpoena and absolute confidentiality of information held by the Registry.

The Quality Assurance legislation is part of the Health Insurance Act of 1973. This act was amended in 1992 to include quality assurance confidentiality. The Act operates on the underlying assumption that quality assurance activities are in the public interest.

A declaration as a quality assurance activity by the Commonwealth Minister of Health and Aged Care prohibits the disclosure of information which identifies individual patients or health care providers, that is known solely as a result of the declared quality assurance activity. It is not possible to provide identifying information to any individual or organisation including the government.

The protection provided by the declaration assures surgeons, hospitals and government that information supplied to the Registry remains confidential and secure. The act also protects persons engaging in those activities in good faith from civil liability in respect of those activities.

The declaration of the Registry as a Quality Assurance Activity is for an initial five-year period but covers information collected during this period indefinitely.

HEALTH DEPARTMENTS

Health Departments in each state and territory were contacted about validating components of the Registry data. Information outlining the Registry was provided to the director of each department. The following departments have agreed to validate the Registry information on a quarterly basis:

South Australia, Northern Territory, Australian Capital Territory, Tasmania, Victoria, Western Australia and Queensland.

Western Australian Health Department

Access to WA Health Department Data requires authorisation by the Confidentiality of Health Information Committee prior to release. Approval was given on 14th March 2000.

Queensland Health Department

During the past year a deed of agreement was negotiated between the AOA and the QLD government through the QLD Health Department. The purpose of this Agreement is to allow hospitals to release information to the Registry.

The QLD government is also in the process of reviewing the states Quality Assurance Act, which will allow hospitals to release data to a Quality Assurance Committee. Participation in this act by the Registry is under review.

New South Wales

An application to the NSW health department Ethics Committee is currently under review.

Appendix 2

ICD 10 AM AND CMBS CODES

The Registry identified the following ICD 10 AM and CMBS codes for data collection.

ICD 10 AM CODES

HIP PROCEDURES

Primary Total Hip replacement

Partial Hip	49315-00	partial arthroplasty (excludes Austin Moore)
	47522-00	austin moore
Single	49318-00	total arthroplasty of hip unilateral
Bilateral	49319-00	total arthroplasty of hip bilateral

Revision Hip

49312-00	excision arthroplasty of hip (removal of prosthesis without replacement)
49324-00	revision of total arthroplasty of hip
49327-00	revision of total arthroplasty with bone graft to acetabulum
49330-00	revision of total arthroplasty with bone graft to femur
49333-00	revision of total arthroplasty with bone graft to acetabulum and femur
49339-00	revision of total arthroplasty of hip with anatomic specific allograft to acetabulum
49342-00	revision of total arthroplasty of hip with anatomic specific allograft to femur
49345-00	revision of total arthroplasty with anatomic specific allograft to acetabulum and femur
49346-00	revision of partial arthroplasty hip replacement

KNEE PROCEDURES

Patellofemoral joint of knee

49534-00	total replacement arthroplasty of patellofemoral joint of knee

Unicompartmental knee

49517-00	hemi arthroplasty of knee

Total knee

Single	49518-00	total arthroplasty of knee uinlateral
Bilateral	49519-00	total arthroplasty of knee bilateral
	49521-00	total arthroplasty of knee with bone graft to femur unilateral
	49521-01	total arthroplasty of knee with bone graft to femur bilateral
	49521-02	total arthroplasty of knee with bone graft to tibia unilateral
	49521-03	total arthroplasty of knee with bone graft to tibia bilateral
	49524-00	total arthroplasty of knee with bone graft to femur and tibia unilateral
	49524-01	total arthroplasty of knee with bone graft to femur and tibia bilateral

Revision knee

49515-00	removal-prostheses from knee
49527-00	revision of total arthroplasty of knee
49530-00	revision of total arthroplasty of knee with bone graft to femur
49530-01	revision of total arthroplasty of knee with bone graft to tibia
49533-00	revision of total arthroplasty of knee with bone graft to femur and tibia
49554-00	revision of total arthroplasty of knee with anatomic specific allograft

Appendix 2 cont.

CMBS CODES

HIP PROCEDURES

Partial hip

49315 HIP, arthroplasty of, unipolar or bipolar

Primary hip

49309 HIP, arthrectomy or excision arthroplasty of, including removal of prosthesis (austin moore or similar (non-cement))
49318 HIP, total replacement arthroplasty of, including minor bone grafting
49319 HIP, total replacement arthroplasty of, including major bone grafting, if performed-bilateral
49321 HIP, total replacement arthroplasty of, including major bone grafting, including obtaining of graft

Revision hip

49312 HIP, arthrectomy or excision arthroplasty of, including removal of prosthesis cemented, porous coated of similar)
49324 HIP, total replacement arthroplasty of, revision procedure including removal of prosthesis
49327 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to acetabulum, including obtaining of graft
49330 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to femur, including obtaining of graft
49333 HIP, total replacement arthroplasty of, revision procedure requiring bone grafting to both acetabulum and femur, including obtaining of graft
49336 HIP, revision of a fracture of the femur where revision total hip replacement is required as part of the treatment of the fracture
49339 HIP, revision total hip replacement of, requiring anatomic specific allograft of proximal femur greater than 5cm in length
49342 HIP, revision total hip replacement of, requiring anatomic specific allograft of acetabulum
49345 HIP, revision total hip replacement of, requiring anatomic specific allograft of both femur and acetabulum
49346 HIP, revision arthroplasty with replacement of acetabular liner or ceramic head, not requiring removal of femoral component or acetabular shell

Appendix 2 cont.

CMBS CODES

KNEE PROCEDURES

Patellofemoral joint of knee

49534 KNEE, patellofemoral joint of, total replacement arthroplasty as a primary procedure

Unicompartmental knee

49517 KNEE, hemiarthroplasty of

Primary knee

49518 KNEE, total replacement arthroplasty of,
49519 KNEE, total replacement arthroplasty of, including associated minor grafting, if performed-bilateral
49521 KNEE, total replacement arthroplasty of, requiring major bone grafting to femur or tibia, including obtaining of graft
49524 KNEE, total replacement arthroplasty of, requiring major bone grafting to femur and tibia, including obtaining of graft

Revision knee

49512 KNEE, arthrodesis of, with removal of prosthesis
49515 KNEE, removal of prosthesis, cemented or uncemented, including associated cement, as the first stage of a 2 stage procedure
49527 KNEE, total replacement arthroplasty of, revision procedure, including removal of prosthesis
49530 KNEE, total replacement arthroplasty of, revision procedure, requiring bone grafting to femur or tibia, including obtaining of graft and including removal of prosthesis
49533 KNEE, total replacement arthroplasty of, revision procedure, requiring bone grafting to femur and tibia, including obtaining of graft and including removal of prosthesis
49554 KNEE, revision of total replacement of, by anatomic specific allograft of tibia or femur