

## Quantifying the demand for hip and knee replacement in Otago, New Zealand

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### Abstract

**Aim** The purpose of this study is to quantify the current demand in Otago for hip and knee replacement.

**Methods** Hospital databases and the New Zealand Joint Registry were used to calculate the intervention rate for primary total hip (THR) or knee (TKR) replacement between February 2010 and February 2012. All patients meeting the clinical threshold but waiting for surgery were also recorded over the same period.

**Results** The intervention rate for THR and TKR in NZ in 2011 was 33.0/10000 while in Otago it has varied from 30.7 to 42.6 over the last 5 years. This is at or above the national average based on population share. Over a 2-year period the numbers reaching the clinical threshold and waiting for primary joint replacement surgery rose from 247 to 347 patients, while 1496 primary elective joints replacements were performed. The current demand for primary THR and TKR is 798 per year (41.7/10000 per year). The unmet demand is 73 cases per year.

**Conclusion** The increased demand in Otago compared to the NZ average is due to greater numbers of people over the age of 55 years and the backlog of patients due to under provision relative to demand in previous years.

Osteoarthritis is a common condition affecting about 15% of adult New Zealanders.<sup>1</sup> It is typically a disease of older age and hence the prevalence is likely to increase further as the population ages.

Hip and knee replacement are highly successful operations for symptomatic osteoarthritis. In response to increasing demand the Ministry of Health introduced the joint initiative in 2004 with the aim of increasing the rate of publicly funded major joint replacements. In Otago the agreed volumes were an increase of 160 cases from a base contract of 315 to a new target of 475 major joints.

It is government policy that there should be nationally consistent access to surgery. Prioritisation tools such as the Clinical Priority Access Criteria (CPAC) score and the Hip and Knee prioritisation tool developed by the Orthopaedic Working Group of the National Waiting Times Project are used to varying degrees across the country. Currently the target national standardised intervention rate (SIR) for publicly funded major joint replacement (primary, bilateral or revision hip or knee replacement) is 21.0/ 10000 population per year.

In 2009, following the end of the joint initiative, the minimum number of joints required to be performed in Otago was reduced from 475 to 425 in order to match the SIR. It appears that the clinical need for surgery is significantly greater than this.

A DHB must not offer certainty of surgery to a patient if they are unable to perform the surgery within 5 months (6 months until June 2012) (Elective Surgery Performance Indicator (ESPI) 5). Patients not meeting this “financial threshold” may be placed on Active Review (AR) if their condition is likely to deteriorate and meet the threshold within the foreseeable future, or they are returned to their General Practitioner (GP) for ongoing care and monitoring.

In Otago the financial threshold has risen to an unacceptably high level in order to maintain ESPI compliance. This has led to an increasing number of significantly disabled patients now not qualifying for surgery in the public sector.

The purpose of this study is to quantify the current incidence of hip and knee arthritis in Otago that is severe enough to justify primary hip or knee replacement and compare it with local and national intervention rates in both public and private sectors.

## Methods

All patients undergoing hip and knee replacement in NZ are registered in the NZ joint registry (NZJR) for which there is 98% compliance.<sup>2</sup> Figures for primary and revision total hip (THR) and total knee replacement (TKR) and unicompartmental knee replacement (UKR) were obtained for calendar years 2007–2011.

Numbers performed at Dunedin Public Hospital (DPH) and Mercy Hospital, Dunedin were also obtained from the NJR and cross referenced with numbers of cases performed at the hospitals from prospectively gathered figures. Bilateral cases are counted as two separate procedures in the NJR, but as one procedure to calculate the SIR for major joint replacement. UKRs were included in the figures for TKR. THRs for acute hip fractures were excluded.

The Public sector financial year runs from 1 July to 30 June. DPH figures were available by month from July 2006 to June 2012. Cases performed at a private hospital under contract from the DHB were classified as publicly funded. ACC funded cases were classified separately or included in private figures. Patients were placed on the public waiting list if they had failed medical management and were judged by a consultant orthopaedic surgeon to be a suitable candidate for THR or TKR.

The hip and knee replacement tool developed by the Orthopaedic Working Group of the National Waiting Times Project (Appendix 1) was used to score the patient and an Oxford hip or knee score (OHKS)<sup>3</sup> given to the patient to complete. For the last 2 years the threshold for certainty has been 79 points or higher and active review over 62 points. Patients falling below the threshold for active review are classified as Clinical Benefit (CB). These patients are returned to their GP for ongoing care. Surgery is rarely advised if the score is less than 50 points.

Total numbers of patients in each category have been recorded over the past 3 years. The two years 2010 and 2011 were analysed to determine the current level of demand based on intervention rates and changes in total waiting list numbers.

An audit of all patients seen for FSA at DPH with a hip or knee problem between February and August 2012 was performed. The outcome of the consultation, (wait list, discharge, further investigation etc), CPAC score and Oxford score were recorded and final decision regarding certainty, active review or return to GP was noted. All patients on active review are sent a questionnaire including an OHKS. For this study the OHKS was scored from 0-48 with 0 the worst and 48 the best possible score.<sup>3</sup>

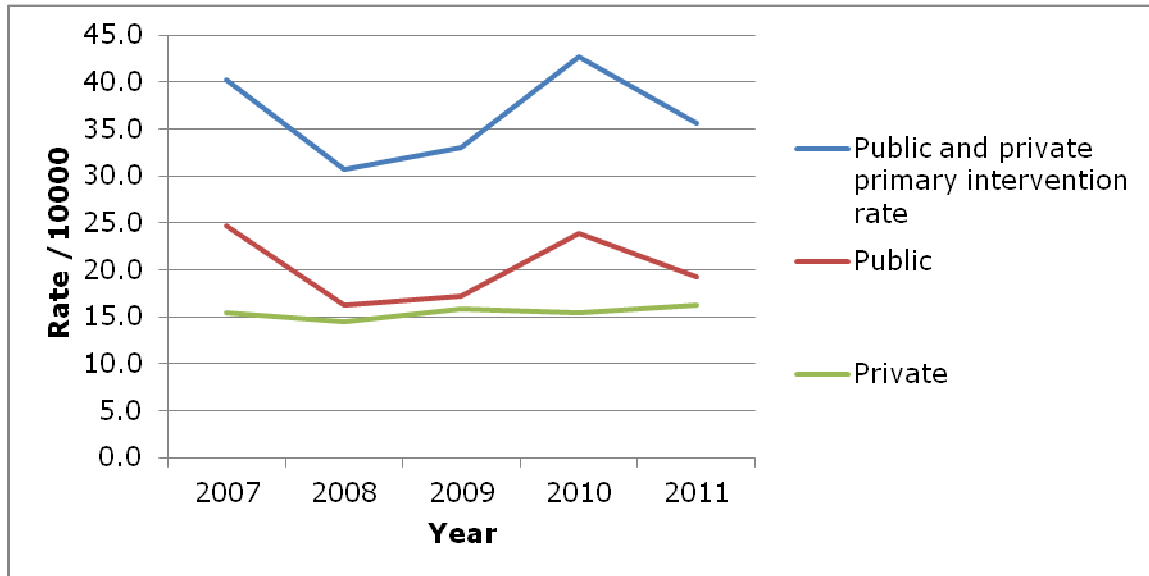
Population figures (191,361) for the Otago region (excluding Queenstown) were based on the latest estimates from Southern DHB funding and planning department. The national population figure was taken as 4,271,223.

The 2006 Census figures with 5-year age bands were used to compare Otago to New Zealand.<sup>4</sup> Comparative raw intervention rates for England and Wales and Australia were calculated from their respective joint registries.<sup>5,6</sup>

## Results

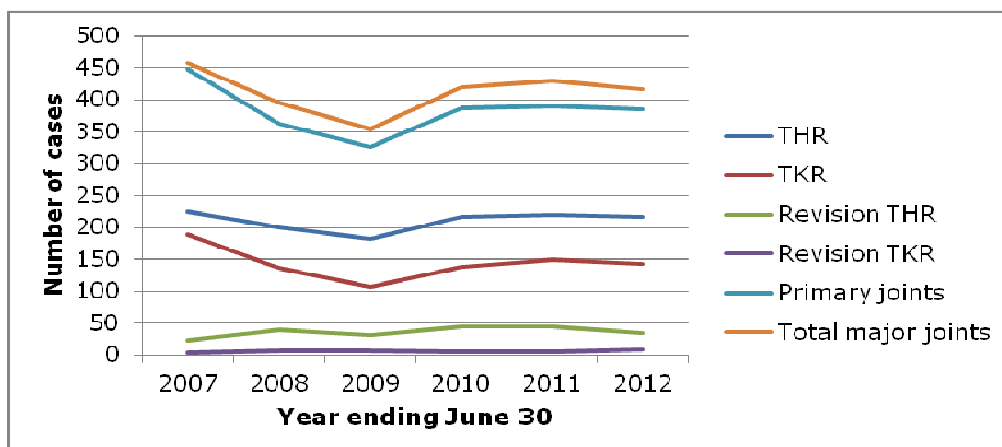
The intervention rate for primary THR or TKR in New Zealand has risen from 28.9/10000 in 2005 to 33.0/10000 in 2011. In Otago the rate has varied from 29.2 in 2005 to 42.6 /10000 in 2010 with the variation chiefly occurring in the public sector (Figure 1).

**Figure 1 Intervention rates per 10,000 population per year for primary elective THR, TKR in Otago calendar years 2007–2011**



The breakdown of major joint replacements in the public sector is shown in Figure 2.

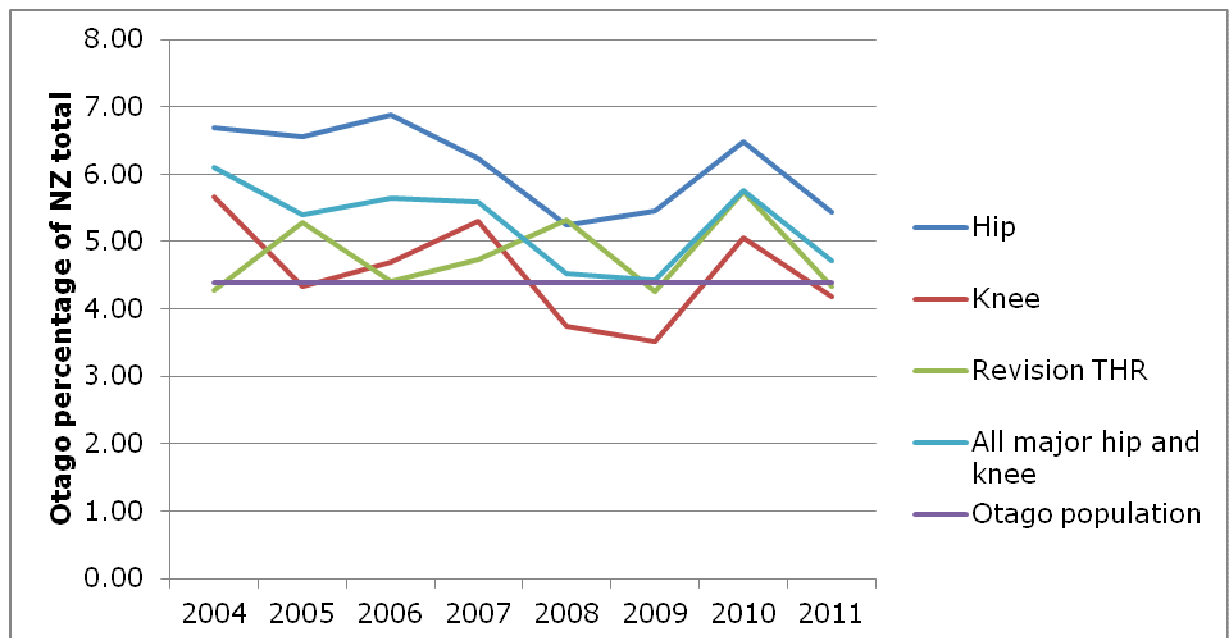
**Figure 2. DHB-funded elective major joint replacements (financial years ending 30 June 2007–2012)**



Fewer than the target volume of 475 joints were performed in years ending June 2008 and 2009 due to problems with dropped lists due to acute cases, and lack of beds, theatre and anaesthetic resource. The target volume was reduced to 425 joints for year ending June 2010. Over the last 3 years there has been a shortfall of only nine joints.

Otago comprises approximately 4.5% of the NZ population. Since 2007 Otago has provided major joint replacements at or above the national average based on its population share. (Figure 3). This is mainly due to high rates of primary hip replacement with the rate of primary knee replacements below the population share for three of the past 4 years.

**Figure 3. Percentage of joint replacements performed in Otago compared with New Zealand total (public and private combined)**



From 1 February 2010 to 1 February 2012 the number of patients on the public waiting list for primary hip and knee replacement surgery rose by 100 from 247 to 347 patients. (Table 1) During this time 4389 referrals were received at DPH, 2558 (58%) were seen and 1183 referrals (27%) were returned. These included 234 patients referred with hip or knee arthritis.

In the same period a total of 1496 primary elective joints were performed in Otago (mean 748 per year): 827 (55.2%) were funded by the DHB, 53 (3.6%) by ACC and 616 (41.2%) in private (insurance or self-funding). (Table 2)

**Table 1. Waiting list at Dunedin Public Hospital**

Status	February 2010	February 2012	August 2012
Certainty	72	127	126
Active Review	66	114	162
Clinical Benefit	109	106	106
Total wait list	247	347	394

**Table 2. Details of primary joint replacements performed in Otago 2010–2012**

	Feb 2010–Feb 2012	%	Per year	Intervention rate/10000 per year
Joints performed	1496		748	39.1
Public	827	55.2	414	21.6
Private	616	41.2	308	16.1
ACC	53	3.6	27	1.4
Change in total waiting	+100		+50	2.6
Total demand	1596		798	41.7

Therefore the current minimum demand for primary hip and knee replacement in Otago is 798 per year. This equates to an intervention rate of 41.7/10000 per year.

Currently there is funding for approximately 390 primary hip or knee replacements or 20.4/10000 per year by the DHB for the Otago region. This assumes no change in the number of revisions or bilateral procedures performed. An additional 335 are performed in private or under ACC.

This gives a shortfall of 73 primary joints per year. If these were to be funded by the DHB then the contracted volume would need to rise by 17% to 498 major joint replacements per year.

Over the 6-month period February to August 2012 the total public wait list for primary hip or knee replacement increased by a further 47 patients despite performing 209 procedures (Table 1). During this period a total of 225 patients were seen at DPH out-patients with a hip or knee problem. 155 (69%) were listed for primary TKR or THR of whom 96% had a Oxford score of 20 or less, 74% less than 15 and 37% less than 10 points.

124 (80%) scored over 70 points on the CPAC score, while 76 (49%) scored 79 points or more. In total 81 patients (52%) were given certainty, 61 patients (39%) were placed on active review and 13 (8%) were classified as clinical benefit and returned to their GP.

On average over the last 12 months, 82% of patients, initially classified as active review, have moved to certainty.

## Discussion

It is difficult to estimate demand for primary hip and knee replacement. In this study we have collected data on all patients meeting the clinical threshold for THR or TKR whether they were placed on the certainty or active review list or were returned to their GP with advice.

Our end point therefore is based on orthopaedic assessment, radiographs and patient reported scores in a patient suitable for surgery. In order to accurately compare our figures with other DHBs similar data need to be collected.

Using intervention rates allows comparison between countries but assumes no limit on access. In 2009 Germany had the highest rate of hip and knee replacement at 50.1/10000.<sup>7</sup> The rates for Australia and England and Wales are 30.6 and 30.5/10000.<sup>5,6</sup> In New Zealand the combined public and private intervention rate in 2011 was 33.0/10000.

The intervention rate for primary THR and TKR in Otago (public and private combined) has been at or higher than the national average for many years. Despite this current demand exceeds capacity by 7–10% per annum.

We made a number of assumptions in calculating the demand for primary joint replacement in Otago. In the private sector these include that there is no limit on private hospital capacity, there is no net flow of private patients in or out of the province and the number insured and the number prepared to self-fund remain constant. These are reasonable assumptions but may underestimate the future demand for publicly funded surgery.

There is good access to primary healthcare in Otago and this may be a cause for the high number of referrals made requesting an FSA. The limited access to FSA is likely to underestimate the potential demand. During the 2 year study period 234 referrals of patients with hip or knee arthritis were returned. At least some of these are likely to have reached the clinical threshold for joint replacement. However, many of these may have subsequently been re-referred and will appear on the waiting list figures.

There may be a number of reasons for the increased demand. In the public sector raw intervention rates are corrected to the standardised rate by a formula that includes age, gender, rural location and deprivation. Revision procedures are also counted in the standardised intervention rate. A higher number of revisions will reduce the number of primary procedures that can be performed. Nationally the revision burden (percentage of revisions to primaries) is approximately 13% for hips and 8% for knees. In Otago the rates are 12.3% and 4.3%.<sup>2</sup>

The proportion of patients with health insurance or able to afford private healthcare may influence demand in the public sector. However, high rates of private provision may not be associated with better access to publicly funded surgery.<sup>8</sup> Otago does not appear to have a smaller than average private sector.

In 2010/11, DHBs had widely differing rates for the percentage of joint replacements performed in a private hospital (range 9% to 73%).<sup>2</sup> These figures include public cases contracted out to private hospitals so reflect the use of out-sourcing as well as the private market.

Otago was on the median for the country with 44% of cases performed in a private hospital but during this time only 14 joint replacements were out-sourced. It has been reported that rural populations have a higher need for hip replacement<sup>9,10</sup> but not for knee replacement.<sup>10</sup> This may partially explain why there is a much higher rate of THR than TKR in Otago.

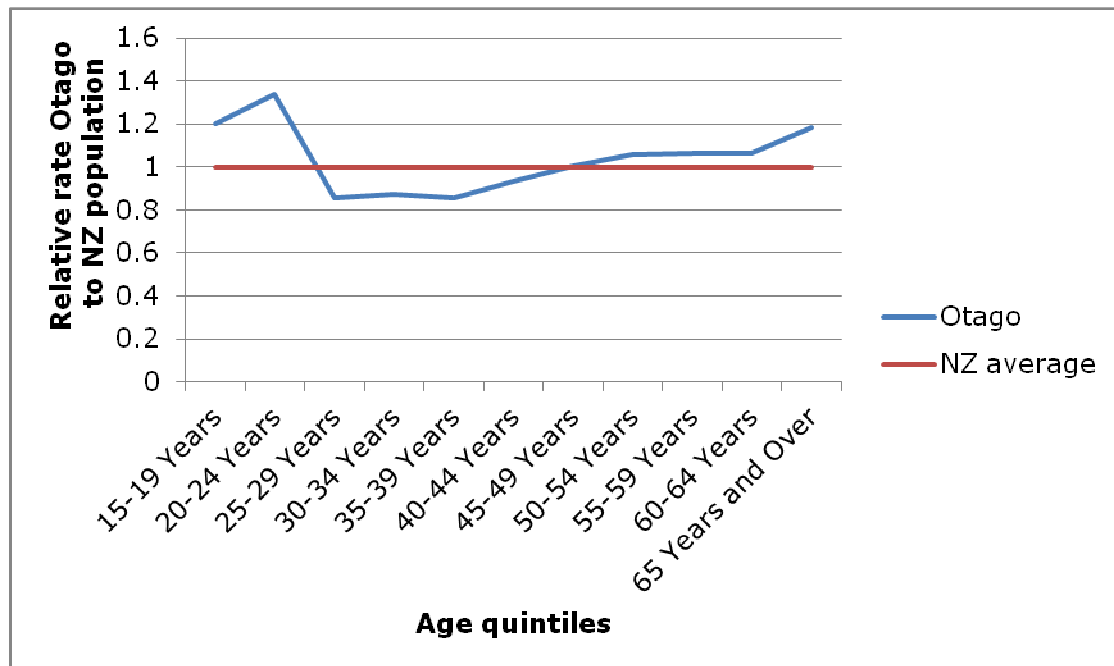
The local orthopaedic surgeons do not appear to be more likely to recommend joint replacement than average. In the audited 6-month period the Oxford scores of those patients wait-listed in public were less than 20 in 96%, less than 15 in 74% and less than 10 in 37%. In a large study from Scotland the average OHKS for patients undergoing THR or TKR was 18.3 and 18.7 respectively.<sup>11</sup>

Age is strongly associated with increasing demand for joint replacement. Eighty eight per cent of primary hip and knee replacements in NZ are performed in the over 55 age group.<sup>2</sup>

Despite having a large young student population there is a higher proportion of people for each 5-year age group over 50 years in Otago than the NZ average (Figure 3). The prevalence of people over 55 years relative to the NZ average is 1.13 and over 65 years is 1.18.

Adjusting the national intervention rate of 33.0/10000 to reflect this would result in an age adjusted rate of approximately 39/10000 pa which more closely matches our estimated demand. In the public sector an increase of 73 joints per year from 425 would equate to a 17% increase.

**Figure 3. Proportion of Otago population in 5-year bands compared to New Zealand population (figures from 2006 Census)<sup>4</sup>**



Another key determinant of demand is the backlog of patients awaiting surgery. In the public sector there has been a shortfall of nine patients over the last 3 years against the minimum target of 425 major joints. The target for years ending June 2008 and 2009 was 475 joints (315 base contract plus 160 joint initiative).

The Dunedin Public Hospital capacity was restricted at this time by a shortage of anaesthetists and beds. This resulted in a backlog of 210 joints against potential public funding. Only a limited number of cases (34) were outsourced to the private sector between April and November 2008.

If the volumes had not been reduced in 2010 and 475 joints (12% greater than NZ average to reflect the age of the Otago population) had been performed each year for the last 5 years then an additional 358 joint replacements could have been performed which would almost eliminate the current waiting list of 394 patients.

Anecdotally we hear that some DHBs have very similar problems to Otago while in others patients are qualifying for surgery with a lower score or less severe symptoms regardless of whether their DHB is over or under providing against the national average. Some DHBs have no patients on active review while others have more than recommended. This may reflect either implementation of policy, or possibly a lower financial threshold.

When the clinical priority criteria were introduced the two crucial issues were whether they would correctly and consistently prioritise patients according to symptoms and ability to benefit from surgery and whether the thresholds would be chosen so as not to leave patients with clear needs untreated.<sup>12</sup>

We believe that the scoring tools are useful but lose the ability to discriminate at higher scores. However it is clear that currently the financial threshold in Otago is too high and many patients with severe symptoms who would benefit from joint replacement are not qualifying for surgery.

In conclusion in Otago the current demand for primary hip and knee replacement is approximately 41.7/10000. Current funding from the DHB is for approximately 20.4/10000 with the private sector and ACC providing 17.5/100000.

There is an unmet demand of at least 73 cases per year or 3.8/10000. The two main reasons for this are the greater numbers of people over the age of 55 years in Otago and the backlog of patients due to under provision in previous years.

To address both the ongoing local demand and the backlog, there needs to be additional provision for joint replacement surgery by the DHB or the situation will continue to deteriorate.

The problem is unlikely to be isolated to Otago and similar data needs to be collected to allow direct comparison between other DHBs. Using standardised intervention rates to determine volumes will not necessarily result in equity of access across the country.

**Competing interests:** Nil.

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## Appendix 1. Hip and knee prioritisation tool

Criterion	Category	Category Descriptions - Assign patient to highest scoring category that applies <i>(Patient must be on optimal medical therapy at time of rating)</i>	Points
Pain	1	No Pain	0
	2	Episodic activity-related pain	4
		May use occasional analgesics	
	3	Daily pain with weight-bearing activity	10
		2-3 times/week pm use of simple analgesics/NSAIDs	
	4	Pain which cannot be ignored with activity and at rest	19
Sleep disturbance 2-3 times / week due to pain			
Daily analgesics/NSAIDs			
5	Dominates life and interferes with sleep every night	27	
	Pain poorly controlled by analgesics		
Personal Functional Limitation <b>DUE</b> to Hip or Knee Orthopaedic Condition	1	No Limitation	0
	2	<b>Minimal restriction of personal activities</b> e.g. trouble reaching toes	3
		Walking stick used for longer walks	
	3	<b>Moderate restriction of personal activities</b> e.g. requires help with socks/shoes	9
		Requires help cutting toenails	
		Use of walking stick indoors and outdoors	
4	<b>Severe Restriction of personal activities</b> e.g. requires help with dressing or showering	18	
	Consistently uses 2 crutches or wheelchair		
	1	No Limitation	0

<b>Social Limitation DUE to Hip or Knee Orthopaedic Condition</b>	2	<b>Mild Restriction</b> e.g. can't walk >1 hour	4
		Some limitation of leisure activity e.g. golf or tennis	
	3	<b>Moderate Restriction</b> e.g. can walk 15-60 mins	10
		Significant limitation of leisure activity	
		Can manage garden or bowls	
	4	<b>Severe Restriction</b> e.g. can't walk > 15 mins - slow	19
		Difficulty with steps or stairs	
		Severe limitation on leisure activity – can't maintain garden	
		Requires help with shopping	
	5	<b>Profound Restriction</b> e.g. confined to the property	23
Shopping done by others			
Requires meals or other domestic help			
Can't work due to orthopaedic condition			
<b>Potential to Benefit from Operation (for patient, dependents or community)</b>	1	Small Improvement Likely – significant residual symptoms +/- functional limitation	0
	2	Moderate Improvement Likely – some residual symptoms +/- functional limitation	6
	3	Return to near normal likely – asymptomatic + full return of function	
<b>Consequence of delay &gt;6 months (for patient, dependents or community)</b>	1	Little risk will deteriorate over next 6 months	0
	2	Considerable risk will deteriorate and result in increased disability during next 6 months	7
	3	Likely to progress to major complication during next 6 months with increased clinical costs, e.g. impending fracture or structural failure	24