

**Priority Criteria
for Hip and Knee Replacement:
*Addressing Health Service Wait Times***

**Report I *Literature Review*
Waiting, Consequences &
Benchmarks for Joint Replacement**

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Waiting, Consequences & Benchmarks for Joint Replacement

Literature Review

Executive Summary

Timely access to health care services is a major concern for many Canadians, including patients and their families, physicians and hospital administrators, health ministries and politicians.

Many people waiting for specialized care such as orthopaedic assessment and hip or knee replacement report that they have to cope with pain, anxiety and stress while waiting. In one recent national survey, almost a third found their waiting time unacceptable.

Physicians and other health care providers are, understandably, also troubled by the burden being borne by patients facing undue or unnecessary suffering. As a reflection of this concern, seven Canadian medical organizations recently joined forces under the banner of The Wait Time Alliance in order to devise medically acceptable waiting times. At the same time, the federal Minister of Health recently urged the provinces to continue to be energetic about reducing waiting lists even while benchmarks are being established by medical professionals.

The focus of this literature review is the topic of waiting times for two cornerstone operations within orthopaedics, namely, hip and knee replacements. This is one phase of a project aimed at understanding the current reality of waiting for such operations, the consequences of such waiting, and potential solutions to problems of access. This project is, in turn, part of a cross-country waiting list study being sponsored by the Canadian Institute of Health Research.

The forces which make a waiting list necessary (or inevitable), and the means to reduce or eliminate a waiting list, are recognized to be very complex. Consequently, the literature on waiting lists is extensive, and is steadily growing even within sub-categories such as hip and knee replacement. Our approach in this review involved a brief overview of the waiting list terrain, then narrowing to the region of scheduled surgery (sometimes inaccurately called elective surgery), and finally concentrating on hip and knee replacement surgery.

A key consideration emerged from the start of the discussion, namely, the definition of waiting time. A consensus still needs to be reached on the necessity and practicality of addressing the true *total* waiting time related to joint replacement,

stretching from initial patient concerns about pain and disability, to general practitioner and surgical care, and lastly to post-surgery rehabilitation.

Another result of the overview of waiting lists, especially in the realm of scheduled surgery, was a good understanding of the components which inform the development and management of any waiting list. The result was the following checklist of concerns and areas which may be amenable to new and improved policies:

1. Defining the type of wait list (e.g., whether to not there are “urgency categories” or whether it is simply a single, first come-first served queue).
2. Establishing criteria for excluding from, or removal from, a waiting list.
3. Deciding whether *implicit* criteria applied by individual physicians will guide prioritization of patients as they are added to a waiting list, or some *explicit* categories and measures will be applied—possibly mediated by a scoring tool; as well, the impact of demographic, personal and social criteria must be carefully considered.
4. Setting benchmarks (i.e., maximum acceptable wait times).
5. Choosing and, if possible, modeling an approach to wait list management (e.g., through computer forecasting).
6. Devising the system for measuring, monitoring and reporting.
7. Planning interventions to achieve targets on the road to satisfying benchmarks.

Well-known features of major joint replacement are reviewed in the report, including its manifest effectiveness and dramatic cost-effectiveness as an intervention for end-stage arthritis. There are many other compelling reasons to provide *as many such procedures as are appropriate and required in Canada, as soon as possible*. The rationales for such a national policy include:

- The growing demand for hip and knee replacement.
- The steady improvement in surgical technology and technique.
- The evidence that delayed surgery can lead to poorer outcomes.
- The startling fact that it very possibly can save money to do hip and knee replacements earlier in the course of disease—savings not just in terms of productivity costs, but in direct medical costs as well.

Canada has recently been at the forefront of research in the area of priority criteria schemes and maximum acceptable waiting times for different urgency categories.

There appears to be little controversy among the main proponents of maximum acceptable waiting times (MAWTs) for major joint replacement in the country. Once priority has been established by an orthopaedic surgeon (perhaps using a criteria scoring tool), the most urgent cases need to receive surgery within 1 month and the next most urgent cases should be scheduled to receive treatment within 3 months. All other cases should be completed within at most 5 to 6 months after the operation is booked. An overall upper limit of 6 months is very consistent with past policies in different countries for generic surgery, and the benchmark of 3 months for what

might be considered the “typical” urgent joint replacement candidate is certainly reflected in other studies and various settings. The way that prioritization of patients articulates with MAWTs is illustrated in the most recent Western Canada Waiting List Project report:

<i>Category</i>	<i>Priority score</i>	<i>MAWT</i>
Urgency 1	0-30	20 weeks
Urgency 2	31-75	12 weeks
Urgency 3	76-100	4 weeks

The creators of this report intended for it to establish a good foundation for the future phases of the project, especially the quest for sustainable solutions to long waiting lists. We hope that a pattern can be modelled for major joint replacement that may help other arenas of health care as well. We live in a climate—especially since the Supreme Court decision of June 9, 2005, seemingly opened the door to privately funded health care in Quebec (and perhaps across the country)—where the medical and political stakes have only gotten higher. The intensification of politico-legal pressure and operational research is especially pertinent for our topic of major joint replacements. After all, the specific concern raised by physician Dr. Jacques Chaoulli, the applicant in the Supreme Court case, was the injustice of his patient being denied timely access to a hip replacement. Furthermore, hip and knee replacements are firmly on the list of key procedures requiring concerted national action, as identified by one public commission or First Ministers’ meeting after another.

Although aiming at comprehensiveness, we inevitably had to leave some topics unfinished (mainly because this reflects the current state of progress in the literature). These areas include:

- *Refining and validating priority criteria scoring (PCS):* this is an ongoing project; validation involves testing against implicit clinical judgment *and* patient-driven quality-of-life assessments; the ultimate question is how acceptable PCS will be to patients and orthopaedic surgeons alike.
- *The utility of prioritization:* an interesting “cognitive gap” exists with regard to PCS; some authorities imagine that priority scoring is a tool to reduce waiting lists, but such a purpose did *not* occur to, for instance, the leaders of the prototype New Zealand prioritization project; politicians and health care managers need to acknowledge that PCS may only reduce current median wait times for those “fortunate” enough to be near the head of the queue, and likewise may only reduce a list if people are dropped from it or drop out on their own initiative.
- *Redressing inequities:* if a group or area has been demonstrably under-serviced by hip and knee replacement in the past, is there an argument to temporarily offer preferential treatment levels that leave behind strictly clinical considerations?
- *The disutility of MAWTs:* the sense from past prioritization discussions was that defining elapsed waiting time as part of the weighted criteria introduced more problems than it solved; thus, having studiously attempted to avoid

anomalies such as bumping more urgent patients, it now seems that adopting MAWTs could produce that very type of dilemma.

The final omissions in this report are *intentional*. This reflects the fact that there are two more phases to come in this project, with a focus on access to care and solutions to long wait lists. A key question, in light of the current report, will be how prioritization and MAWTs can contribute to the reduction of wait lists and / or times for hip and knee replacement.

Background and Purpose

In recent years, timely access to health care services is a major concern for many Canadians, including patients and their families, physicians and hospital administrators, health ministries and politicians.

The most recent Health Services Access Survey results (conducted in 2003, published in June, 2004) pointed out that Canadians see waiting times as the greatest barrier to accessing specialized health care services.¹ The good news is that many people get access to specialists and non-emergency operations and tests within three months. A significant proportion, however, encountered difficulties, mostly relating to having to wait too long. One in ten Canadians waiting for specialized care reported that they had to cope with pain while waiting. The most common impacts of waiting were worry and stress. Overall, almost a third of Canadians accessing specialist care found their waiting time unacceptable.

Understandably, physicians are also concerned about the subset of their patients who are suffering through delayed access to services; a 2001 report comparing 5 countries showed that 64% of Canadian doctors felt that waiting to receive care is a problem in their practice.² Recently, seven Canadian medical organizations joined forces to devise medically acceptable waiting times.³ While this initiative was well-received by the federal government, the Minister of Health recently urged the provinces to continue to be energetic about reducing waiting lists even while benchmarks are being established.⁴ An example of the provincial response to waiting lists was the appointment of a special advisor in Ontario, and the development of a wait time strategy.⁵ The stakes were recently raised for all levels of government in Canada when the Supreme Court ruled in favour of a patient and a doctor in Quebec who challenged the province's ban on private health insurance for medically necessary services.⁶

Narrowing the focus to scheduled operations raises a special concern. In the Access Survey quoted earlier, the proportion who found waiting times for surgery unacceptable varied across the country, from a low of 13% in Manitoba to a high of 25% in British Columbia. Significantly, individuals waiting for a specialist visit or diagnostic test were more likely to get care within one month than those waiting for scheduled surgery.

¹ See the relevant report in The Daily from Statistics Canada at <http://www.statcan.ca/Daily/English/040630/d040630b.htm> (accessed June 2005). Also see the summary at <http://www.statcan.ca/English/freepub/82-575-XIE/2003001/pdf/highlights.pdf>. Accessed June 2005.

² Blendon RJ, Schoen C, DesRoches CM et al. Inequities in health care: a five-country survey. *Health Affairs*. 2002; 21(3): 182-91.

³ The Wait Time Alliance. *No More Time To Wait— Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005.

⁴ See the news report at http://mediresource.sympatico.ca/health_news_detail.asp?channel_id=14&menu_item_id=&news_id=6344. Accessed June 2005.

⁵ See the summary at http://www.health.gov.on.ca/transformation/wait_times/wt_news.html. Accessed June 2005.

⁶ See the news report, Supreme Court strikes down Quebec ban on private health insurance. *Canadian Medical Association*. 2005; 173(2). Published on-line at www.cmaj.ca.

The focus of this review is waiting times for two cornerstone operations within orthopaedics, namely, hip and knee replacements. This is one phase of a project aimed at understanding the current reality of waiting for such operations, the consequences of such waiting, and potential solutions. This project is, in turn, part of a pan-Canadian research initiative on waits for health care services being sponsored by the Canadian Institute of Health Research.

The three phases of the project can be summarized as follows:

Phase 1 - to critically appraise the available literature regarding benchmarks and prioritization tools that have been developed around the world.

Phase 2 - to assess the reality of the wait lists across Canada, and determine what initiatives have been used to improve access to care in the various jurisdictions.

Phase 3 - to design strategies to improve access to care and monitor these effects through priority areas for research and evidence based studies.

The literature on waiting lists and times is extensive, and is steadily growing even within sub-categories such as hip and knee replacement. Our planned approach will be to briefly overview the waiting list terrain, narrow to the region of scheduled surgery, and finally concentrate on hip and knee replacement surgery.

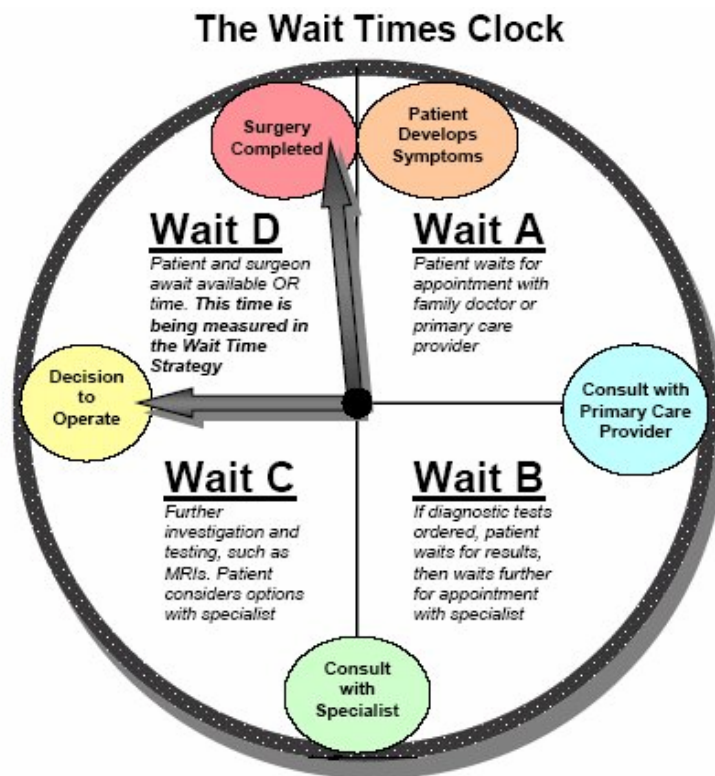
The Complexity of Waiting in Health Care

Chaos theory and complexity are relatively new and closely related concepts in science. They have also been increasingly applied to the social sciences, and used to interpret the functioning of organizations from universities to entire democratic governments. Health care also seems like a ripe field for analysis from the point of view of chaos theory and complexity. Although there would be political resistance to describing health care in chaotic terms, when one realizes that “chaos” is really a way of talking about “unpredictable order” then the attribution may seem more apt. What this means is that health care can be thought of as a system where unexpected, and sometime undesired, macro-features develop out of a set of smaller initial decisions or conditions. One such “emergent property” in health care is the waiting list (and associated waiting times), e.g., for scheduled surgical procedures.

The forces which make a waiting list necessary (or inevitable), and the means to reduce or eliminate a waiting list, are recognized to be very complex.

What is a Waiting List? Just a Matter of Time

A waiting list, at its simplest, is a roster of those people waiting to obtain something. Waiting time refers to the time on the list. But nothing is simple in health care. Waiting for a specialized procedure can occur in at least three phases: waiting for evaluation and referral (e.g., by a family doctor), waiting to see the specialist / surgeon for further evaluation and then finally waiting for the procedure itself. The Ontario Ministry of Health and Long-term Care identifies the multiple types of waiting in a thorough and refreshingly transparent way on their website:⁷



⁷ Available at http://www.health.gov.on.ca/transformation/wait_times/wt_understanding.html. Accessed June 2005).

A disproportionate amount of attention is usually given to the interval between the “date of scheduling” and the “scheduled date” for a procedure (Wait D). Published waiting times (and waiting time strategies) in most cases concentrate on this part of the waiting process. This focus, however, may be problematic, as the other phases of the process can also be drawn out in some cases. This is especially true when one or more sophisticated diagnostic tests are ordered by the family doctor or the specialist—tests which usually involve their own waiting period, either for scheduling, obtaining results, or both.

An additional component of waiting could be added to the Wait Times Clock, particularly for major joint replacement, namely, the wait time after surgery to access rehabilitation services. This is particularly germane to the frail elderly who have undergone joint replacement or other treatment after injury. They constitute a serious bottleneck to efficient care across Canada by blocking acute care beds, which then reduces access to care to new patients awaiting admission into those beds.

Some argue that the only “true meaningful measure of waiting” is the *total waiting time* between when a patient seeks care and the provision of treatment.⁸ This definition was proposed as long as 20 years ago in the UK, and more recently by the British Columbia Medical Association.⁹ In 1999, a promise was made that the waiting list website maintained by the BC Ministry of Health would be retrofitted to include data on total waiting time.¹⁰ This award-winning website was recently scaled back due to concerns about the accuracy and applicability of the data.¹¹ The definition of the waiting times currently being reported is not transparent.

In reporting waiting times, and monitoring the statistics over time for a particular waiting list, there also are a number of options. Two common approaches are the mean (or average) and median waiting time. These metrics have their strengths and weaknesses. One advantage of the median waiting time is that it is less sensitive to “outliers,” that is, waiting times that are markedly longer or shorter than others on the list; by contrast, a mean waiting time statistic can easily be skewed by a few people on the list with extraordinarily long or short (e.g. through unscheduled accelerated admission due, for instance, to a periprosthetic fracture while awaiting revision joint replacement) waits for the procedure in question.

Why Waiting Lists?

Economists seek to understand waiting lists from the perspective of the market. The central issue, especially in neoclassical economics, is the scarcity of a good. A good is scarce if it is limited in supply, and if people would consume more of it if it were free (or at least cheaper). The implication of the last statement is that price becomes a standard means used to create an equilibrium between demand and supply. The price of a good that is in short supply rises until the right number of people deprive themselves of the good (usually people with less financial means) and an equilibrium is established.

⁸ Sanmartin CA. Toward standard definitions for waiting times. *Healthcare Management Forum*. Available at <http://www.cchse.org/Forum/Summer2003/Sanmartin%20final.pdf>. Accessed June 2005.

⁹ British Columbia Medical Association. *Waiting List Report II*. 1998.

¹⁰ Kent H. Waiting-list Web site “inaccurate” and “misleading,” BC doctors complain. *Canadian Medical Association Journal*. 1999; 161(2): 181-2.

¹¹ Explanation available at <http://www.healthservices.gov.bc.ca/cpa/mediasite/waittime/median.html>. Accessed June 2005.

But what if “money is no object,” or at least reduced in impact through mechanisms such as imposed price ceilings? This weakens the usefulness of price as a tool of rationing. In this event, other types of rationing are brought to bear. A classic case of this is the waiting line. In the former Soviet Union, where even a staple such as bread was in short supply, market equilibrium was established through long line-ups outside of shops; in this sense, each loaf of bread had a double price, the money paid to the shop and the time investment of waiting. The ration booklet used to buy food or gasoline during wartime is another form of double payment, i.e., money plus a certain number of coupons out of the ration of coupons made available to each person. This double effect of money and time prices on health care waiting lists (with distance sometimes added in as a third type of cost) has been well-analyzed, especially in the UK setting^{12,13,14}; however, this has not been fully appreciated in the Canadian system.

The Utility of Waiting Lists

Seeing waiting lists as an intentional way to ration scarce goods and services in health care is clearly not a popular perspective, especially given the negative publicity surrounding, for example, delays in surgery. Significantly, though, many citizens *do* seem to be accepting of the *primary* stated purpose for waiting lists, namely, to be a tool or vehicle for prioritizing patients according to certain transparent criteria (see below under Electing to Wait?).

There is, in fact, a suspicion that some other, less straightforward types of utility are attached to waiting lists within the health care system. One example is when a medical specialty, health authority or hospital employs waiting list statistics to make a case for increased funding. Another example is when government agencies look for reductions in waiting lists in order to report to the public that progress is being made.

Supply and Demand as Applied to Health Care

Whatever its failings, an economic model for waiting lists offers insight and potential prescriptions that cannot be ignored. For example, the field of scheduled surgery experiences some classic challenges in the form of long (and steadily lengthening) waiting lists in many different jurisdictions. It seems unavoidable to trace these lists to a mismatch between supply and demand.

On the one hand, the demand for certain operations seems to be ever increasing. As will be detailed below, this certainly is true for the procedures in focus in this report, namely, hip and knee replacements. In the Canadian setting, with little or no cost to the patient or the physician, there is really no theoretical ceiling on this demand. On the other side of the equation, there is scarcity that limits supply. As Gravelle et al. summarized: “When there is excess demand for elective care, and more patients are added to waiting lists than are being treated, the waiting list grows and waiting times increase.”¹⁵ Conversely, these same researchers have confirmed earlier work showing that demand is relatively “inelastic” with respect to waiting time; this means that

¹² Gravelle H, Dusheiko M, Sutton M. The demand for elective surgery in a public system: time and money prices in the UK National Health Service. *Journal of Health Economics*. 2002; 21(3): 423-49.

¹³ Gravelle H, Dusheiko M, Sutton M. *Rationing by Time, Distance and Money in the NHS: Variations in Admission Rates*. Technical Paper Series 17. University of York Centre for Health Economics; 2000.

¹⁴ Blundell R, Windmeijer F. Identifying demand for health resources using waiting times information. *Health Economics*. 2000; 9(6): 465-74.

¹⁵ Gravelle H, Dusheiko M, Sutton M. The demand for elective surgery in a public system: time and money prices in the UK National Health Service. *Journal of Health Economics*. 2002; 21(3): 423-49.

increasing the supply of a procedure will have a “powerful effect” on the number on the waiting list and the total time of waiting. Although this is encouraging, there still is presumably an upper limit on how many areas of health care can be enhanced in this way at the same time.

Even partners in the Canadian health care system that sometimes hold divergent views have managed to agree on this type of basic economic analysis:¹⁶

Waiting for care is part of the normal functioning of any health care system.... No country has sufficient resources at its disposal to build the excess capacity necessary to meet all health care needs, irrespective of clinical urgency, on an urgent basis.

As with so many other areas of health care, the topic of *scarcity* is itself complex. The most obvious limitation is operating money to pay for providers and supplies and capital to pay for infrastructure. However, the availability of trained personnel and operating rooms can be as great—or more—of a limiting factor. More intangible gaps may include the absence of management tools such as efficient scheduling protocols.

Compounding the complexity is the fact that providers accessing the various “pools” of health care resources, e.g., in order to offer a certain type of surgery, are not acting in isolation. In a publicly-funded system, the available resource pools themselves are dynamic, regularly being influenced by two external forces: first, how much money is set aside overall for health care, and second, how great the competition is among different health care services for the same limited resources. This latter reality was acknowledged by The Wait Time Alliance in its recent report. In fact, that is one of the aims of having an “alliance,” or people working cooperatively within a framework that is bigger than any one discipline. The partners in The Wait Time Alliance are determined to ensure that improvements in wait times in certain areas are “not offset by an increase in wait times in other areas of care.”¹⁷

The Disutility of Waiting Lists

Whatever the “benefits” of waiting lists which were articulated in the preceding section, they are far outweighed by their disadvantages. First, there are deleterious effects for patients when they wait a long time for specialist assessment and / or treatment. Mortality is a well-defined possible outcome of delayed treatment, though one which nonetheless is fraught with complexity and controversy. Interestingly, it seems that “waiting time for cardiac surgery, potentially one of the most dangerous medical waits, does not significantly alter mortality risk.”¹⁸ But certainly death is not the only outcome of interest to patients. In reality, the issue for many people is *quality of life*. Treatments aimed at reducing pain and increasing function, such as hip and knee replacement, have been intensively studied in terms of the impact of waiting. In a sense, when dealing with a very effective intervention such as joint

¹⁶ Canadian Medical Association, Canadian Nurses Association. *The Taming Of The Queue: Towards A Cure For Health Care Wait Times*. Discussion Paper. 2004. Available at <http://www.cprn.com/en/doc.cfm?doc=588>. Accessed June 2005.

¹⁷ The Wait Time Alliance. *No More Time To Wait—Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005.

¹⁸ Shortt SED. *Waiting for Medical Services in Ontario: Clarifying the Issues in a Period of Health Reform*. 2000. Available at <http://chspr.queensu.ca/Waiting%20For%20Medical%20Services%20in%20Ontario.pdf>. Accessed July 2005.

replacement, the unnecessary “cost” to patients of any extended suffering is thrown into even sharper relief.¹⁹

Waiting for assessment and then again for treatment, while not necessarily fatal, often can increase morbidity. Although the evidence is both limited²⁰ and mixed,²¹ some research has shown that anywhere from a quarter to a half of patients on surgical waiting lists report a worsened condition before treatment (e.g., the development or worsening of co-morbidities).^{22,23} A 2004 qualitative study of the consequences of delay for selected operations from a physician perspective did note some physical decline, but even more psychological and social impacts.²⁴ The expert assessments noted the following emotional consequences of waiting: anxiety, frustration, fear, anger and depression. There were observed “cognitive appraisals such as uncertainty, worries and stress regarding what might happen during the wait, as well as whether the delay will affect postoperative recovery or prognosis.” The social consequences of waiting lists are also very relevant. Delayed treatment can lead to one or more of the following effects:

- abnormal social functioning
- abandoned activities and roles
- altered relationships
- reduced or modified work
- prolonged sick leave
- job loss.

On the latter category, one UK study showed that 12 to 13% of patients waiting for orthopaedic surgery such as joint replacement had given up on employment while on the waiting list.²⁵ Such impacts of course extend beyond the patient themselves, to include dependants and other family members.

There is very little information about the impact of waiting lists on physicians, and none with respect to other health care providers. What is known is that waiting lists are a source of frustration to physicians: “on the one hand they are required to act as the patient’s advocate, while on the other, they are expected to ration scarce health care resources on behalf of a constrained system.”²⁶

¹⁹ Derrett S, Paul C, Morris JM. Waiting for elective surgery: Effects on health-related quality of life. *International Journal for Quality in Health Care*. 1999; 11(1): 47-57.

²⁰ Oudhoff JP, Timmermans DR, Bijnen AB et al. Waiting for elective general surgery: physical, psychological and social consequences. *ANZ Journal of Surgery*. 2004; 74(5): 361-7.

²¹ Shortt SED. *Waiting for Medical Services in Ontario: Clarifying the Issues in a Period of Health Reform*. 2000. Available at <http://chspr.queensu.ca/Waiting%20For%20Medical%20Services%20in%20Ontario.pdf.pdf>. Accessed July 2005.

²² Royal Australian College of Surgeons. Surgical waiting lists in Victorian hospitals. *Medical Journal of Australia*. 1991; 154: 326-8.

²³ West R, Frankel S, Roberts R. Waiting for general surgery: a question of priorities. *Journal of Management in Medicine*. 1991; 5: 19-26.

²⁴ Hilkhuisen GL, Oudhoff JP, Rietberg M et al. Waiting for elective surgery: a qualitative analysis and conceptual framework of the consequences of delay. *Public Health*. 2005; 119(4): 290-3.

²⁵ Rigge M. Quality of life of long wait orthopaedic patients before and after admission: a consumer audit. *Quality Health Care*. 1994; 3(3): 159-63.

²⁶ Shortt SED. *Waiting for Medical Services in Ontario: Clarifying the Issues in a Period of Health Reform*. 2000. Available at <http://chspr.queensu.ca/Waiting%20For%20Medical%20Services%20in%20Ontario.pdf.pdf>. Accessed July 2005.

The health care system and society as a whole are also affected by waiting lists. First, waiting times generate intense negative publicity, which may be motivating but also can skew political decision-making towards imbalanced, short-term considerations. Waiting for treatment most obviously increases economic costs by reducing productive employment. One Canadian estimate put the lost work time at the same level as that due to labour disputes.²⁷ There are more subtle public costs of waiting lists as well:²⁸

- treatment may be more expensive or outcomes less profound with a deteriorating condition (either effect reduces the cost-effectiveness of the intervention).
- discouraged patients not showing up for specialist or even for surgical appointments.
- “impatient” patients travelling for surgery, stretching resources in neighbouring regions or demanding coverage for more expensive care in neighbouring countries.

Should There Be Waiting Lists? A Question of Values

The BCMA does not propose that all wait lists and queues should be eliminated from BC's public health system. It is inefficient use of resources to have no wait times in a public system. — British Columbia Medical Association²⁹

The question that heads this section is based on a presumption, namely, that waiting lists are amenable to reasonable choices and approaches that could reduce them to zero, or at least reduce to zero the number of people waiting for an inappropriate length of time. Of course, such a position is open to debate (see the next section). After acknowledging this fact, the next observation is that, by definition, any question that begins with “should” is firmly lodged in the realm of *values*. For simplicity, the ideological divide in Canada around waiting lists can be summarized in terms of two “camps:”

1. The procedures for which Canadians currently wait are a fundamental right, and therefore ought to be provided in a timely manner, *no matter what the public cost*. A variation on the theme of personal rights involves defining some *subset* of health care services as inalienable. Identifying such core services would naturally raise its own challenges.
2. In the absence of the control provided by charging the patient, waiting lists will be the inevitable means of rationing amidst growing demands and scarce resources. Such analysts propose that the only alternative would be to create

²⁷ Globerman S. A policy analysis of hospital waiting lists. *Journal of Policy Analysis & Management*. 1991; 10(2): 247-62.

²⁸ Shortt SED. *Waiting for Medical Services in Ontario: Clarifying the Issues in a Period of Health Reform*. 2000. Available at <http://chspr.queensu.ca/Waiting%20For%20Medical%20Services%20in%20Ontario.pdf>. Accessed July 2005.

²⁹ See their website at http://www.bcma.org/public/news_publications/publications/policy_papers/ManagedCare/applicationsforbc.asp. Accessed June 2005.

a “market” that would allow those with economic means to trade “suffering time” for out-of-pocket payments to either private or non-profit providers. One of the objections of such a system has been that the obvious advantages to those who can buy earlier treatment may not be matched by increased access for lower income people or those who otherwise choose the publicly-funded route. The problem is that we are not sure what would happen to demand or supply in the system, if widespread independent clinics were to be introduced and still permitted to draw funds from the public purse. One obvious implication is trying to replace the many high quality staff (most of whom have had partially subsidized training) who may be drawn to the private clinics.³⁰ On the other hand, one of the arguments for allowing some procedures to be covered out-of-pocket is the reality that everyone is ultimately, albeit covertly, having to pay for a growing health care bill anyway (i.e., through taxation).

Beyond the ideological divide, there are three unifying values; equity, efficiency and a minimal standard of care delivery. Within the category of *equity*, many believe that, where waiting lists exist, they need to be managed fairly. That is to say, people under equal conditions should have to wait equally long, at least for publicly funded services. Ideally, this would be true no matter what community they lived in. At this point, this value does not completely rule in Canada, either by default (under-serviced regions) or design (e.g., preferentially served categories such as worker compensation claims).

Unfortunately, *efficiency* is a difficult concept to define. Assessing the cost-effectiveness of a procedure for an individual is not the same as evaluating benefits across a whole population or efficiencies across the entire health care system. The main way that efficiency is operationalized at each level is various types of *prioritization* (see below).

The value of a *minimal standard of care delivery*, seems to be shared across the political and medical spectrum. Demarking the limits of “reasonable” waiting time, however, becomes one of the main conceptual challenges of achieving timely access. Applying the standards efficiently to each patient is also very challenging. In practice, the ideal is usually “downgraded” to monitoring summary measures such as median waiting time, an approach which can feel exploitive to the 50% of people above the median! One way that a degree of individual consideration is reintroduced into the statistical picture is the establishment of *maximum acceptable wait times* (see below).

Is Reducing Waiting Times Possible?

This is the question at the heart of the assumption identified in the previous section, namely that reducing or eliminating waiting lists is possible. To be worthwhile, a *desired* scenario requires a *possible* scenario. Answering the question about potential solutions is the topic of the third phase of this project. For now, it will suffice to note that many jurisdictions are proceeding vigorously on the assumption that progress can be made on waiting lists for health care services. Theoretically, clearing a waiting list only depends on increasing the rate of procedures performed above the incident rate of new procedures being demanded in the system, or decreasing the demand

³⁰ See the editorial, Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005: 173(2). Published on-line at www.cmaj.ca.

below the current supply rate, or some combination of these two tactics. Eventually, the excess balance in the rate of provision will satisfy the excess need. Then the challenge becomes finding the maintenance level of services so that the waiting list does not mushroom all over again. Beyond theory, it is encouraging to note that different settings have actually seen some success with this basic approach, including in the realm of hip and knee surgery (these cases will be examined in detail in phase 2 of the project).

Of course, all such attempted and / or successful measures in the case of one waiting list must be carried out against the backdrop of *other* efforts to reduce *other* waiting lists. This begs the complex question, asked by the British Columbia Medical Association in 1998, “what is the *relative* significance of waiting lists for certain procedures such as heart surgery, hip replacement, and cataract surgery?”³¹

Summary: Building Blocks of a Waiting List

We began this section of the report by recognizing that waiting lists are a complex phenomenon. Although we recognize that waiting lists already exist, i.e., they have been “built,” it is still useful to step back and itemize the components that need to be considered when constructing or managing such lists. The following provides a checklist of concerns and areas which may be amenable to new and improved policies:

1. Defining the type of wait list (e.g., whether to not there are “urgency categories” or whether it is simply a single, first come-first served queue).
2. Establishing criteria for excluding from, or removal from, a waiting list.
3. Deciding whether implicit criteria applied by individual physicians will guide prioritization of patients as they are added to a waiting list, or some explicit categories and measures will be applied—possibly mediated by a scoring tool; as well, the impact of demographic, personal and social criteria must be carefully considered.
4. Setting benchmarks (i.e., maximum acceptable wait times).
5. Choosing and, if possible, modeling an approach to wait list management (e.g., through computer forecasting).
6. Devising the system for measuring, monitoring and reporting.
7. Planning interventions to achieve targets on the road to satisfying benchmarks.

This summary of components to be considered in *any* waiting list will be more fully explained below in the context of scheduled surgery. This will, in turn, provide a framework to better understand the issues with hip and knee replacement surgery.

³¹ British Columbia Medical Association. *Waiting List Report II*. 1998.

Waiting for Scheduled Surgery

The topic of waiting lists in elective surgery is a focus of great attention throughout developed nations. This is no less true of orthopaedic surgery in general and total joint replacement in particular. Moran and Horton's comment in 2000 is typical: "Already there is a large unmet need for knee replacement in the United Kingdom, and the waiting time for surgery is often unacceptably long. Waiting list management is becoming a major political issue...."³²

What's in a Name?

We have already used a term which is open to discussion. An operation whose timing is not driven by emergency conditions has commonly been classified as "elective." But there is a growing trend towards using terms such as non-emergency, required, scheduled or even planned essential surgery in order to avoid the problematic connotations of elective. Surgery by choice (election) is an ambiguous idea because the choosing agent is not specified. To some extent, patient preferences unilaterally drive procedures such as cosmetic surgery, while "medically necessary" operations such as hip and knee replacement require cooperative decisions by patients, physicians and (ultimately) funders—in other words, it is not all up to the patient. The concern has been that too often "elective" may become confused with optional or marginal.³³ The fact is that the sort of elective operations with long waiting lists, while not necessarily a matter of life and death (or imminent catastrophic decline in health), are certainly essential and effective treatments to forestall long-term negative sequelae and dramatically improve quality of life. Thus, in medicine, labelling a procedure elective does not really mean it is optional; it simply means that researchers or authorities have deemed that *it can be scheduled for a specific future time*. In this report, we introduce the standard terminology of "scheduled surgery." The idea of being scheduled (or booked) for surgery has a positive connotation. Of course, terminology does not solve every question. For instance, scheduling is naturally connected to the concepts of urgency and order on a waiting list, i.e., the issue of prioritization.

Priorities in Theory

*Any prioritisation system is a form of rationing and [any] ad hoc system is rationing by another term.*³⁴

The term "priority setting" has largely superseded talk about rationing in health care. Setting priorities overlaps with rationing where it deals with establishing which procedures will be funded and who will get access to those procedures. This kind of

³² Moran CG, Horton TC. Total knee replacement: the joint of the decade—A successful operation, for which there's a large unmet need *British Medical Journal* 2000; 320: 820.

³³ See the Saskatchewan Surgical Care Network website at http://66.102.7.104/search?q=cache:3R7G_QkNxyAJ:www.sasksurgery.ca/assessingyourneed.html+elective+not+optional+surgery&hl=en&start=7 Accessed June 2005.

³⁴ *Waiting List Prioritisation Scoring Systems*. Discussion Paper No. 6. British Medical Association: Health Policy & Economic Research Unit; 1998. Available at <http://www.bma.org.uk/ap.nsf/Content/Waiting+list+prioritisation+scoring+systems>. Accessed July 2005.

macro-level prioritization in health care is complex, and a vast literature has been generated on relevant decision-making tools, processes and outputs.^{35,36,37,38,39,40,41}

For our purposes, the other end of the prioritization scale is of more pertinence. This focuses on micro-decisions, not rationing health care over a whole system so much as *rationalizing* the timing of care for individual patients according to some understood set of criteria. At least four questions immediately arise:

- What are the priority criteria?
- How can they be applied consistently?
- Who applies them to a particular patient?
- What is the process involved with re-evaluating patients once they are on the wait list?

Priority Criteria

As noted above, those working in the field of scheduled surgery have been leaders in the practice of prioritizing waiting lists. They have observed that there are several different criteria that could influence the level at which a patient enters a waiting list:

- Need in terms of relieving present pain and / or disability.
- The risk of a worse outcome with a delay in surgery.
- The degree to which the need for emergency care is imminent. This factor can be composed of considerations such as the risk of death and the rate of progression of a condition.
- Redressing imbalances in the past provision of a surgical procedure to a group or region.
- Other personal or so-called social factors, which have been supported by both professionals and the wider public, but which have proven to be a very grey area. An example is whether or not a person is a tobacco user; it is well-known that certain surgical outcomes are affected by smoking, so considering such behaviour when priority-setting has been proposed. Other factors, such as age, role in the workforce, and whether a person is an active caregiver are all part of this highly debatable class of criteria. Applying such factors actually introduces a distinction between priority and urgency; priority refers to the relative position on the waiting list, while urgency relates to the speed required to intervene to obtain a desired clinical outcome.

³⁵ Mitton C, Patten S. Evidence-based priority-setting: what do the decision-makers think? *Journal of Health Services Research & Policy*. 2004; 9(3): 146-52.

³⁶ Mullen PM. Quantifying priorities in healthcare: transparency or illusion? *Health Services Management Research*. 2004; 17(1): 47-58.

³⁷ Mitton C, Donaldson C. Health care priority setting: principles, practice and challenges. *Cost Effectiveness and Resource Allocation*. 2004; 2(1): 3.

³⁸ Mitton C, Donaldson C. Resource allocation in health care: health economics and beyond. *Health Care Analysis*. 2003; 11(3): 245-57.

³⁹ Hoedemaekers R, Dekkers W. Key concepts in health care priority setting. *Health Care Analysis*. 2003; 11(4): 309-23.

⁴⁰ Mitton CR, Donaldson C. Setting priorities and allocating resources in health regions: lessons from a project evaluating program budgeting and marginal analysis (PBMA). *Health Policy*. 2003; 64(3): 335-48.

⁴¹ Mitton C, Donaldson C. Tools of the trade: a comparative analysis of approaches to priority setting in healthcare. *Health Services Management Research*. 2003; 16(2): 96-105.

A smoker may be deemed to require *urgent* surgery, but there may be differing views about their surgical *priority*.

It is clear that decision-makers are faced with competing criteria in devising a priority schema. As one recent paper commented on the topic of the foundations for making health care decisions, “over a wide range of these there is a general ethical ambivalence: fulfilling one principle violates another.”⁴² Traditionally, “lay” people trusted physicians to informally “internalize” many of the public concerns about fair distribution of resources.⁴³ It remains to be seen if explicit priority criteria and tools (see below) can do an even better job.

Priority Tools and Categories

Once priority criteria have been selected at a conceptual level, the next task is to find a way to consistently measure a surgical candidate against the standard. This has led to the call for scoring systems designed to eliminate some of the “professional subjectivity” from the equation.⁴⁴ A 2004 study in Spain was consistent with research in other jurisdictions: focus groups made up of professionals, patients and their families, and the general public agreed that current “implicit” prioritization by physicians was inadequate.⁴⁵ This is not to say that implicit approaches demonstrate poor functionality. Studies of surgical urgency show that physicians tend to internalize the very sorts of criteria that the public would be likely to support, e.g., severity of a condition, risk of serious deterioration without treatment, and being off work.^{46,47}

In the past, summary assessments were the norm in prioritized waiting lists. Traditional aggregate categories within surgical services are:⁴⁸

1. Urgent.
2. Semi-urgent.
3. Non-urgent / routine.

Of course, not all operations are the same, and there have been calls to tailor prioritization schemes and scores to best fit specific procedures. The goal is to achieve some kind of parity in the meaning of “urgent” across various types of surgery.

⁴² Richardson J, McKie J. Empiricism, ethics and orthodox economic theory: what is the appropriate basis for decision-making in the health sector? *Social Science & Medicine*. 2005; 60(2): 265-75.

⁴³ Arnesen KE, Erikssen J, Stavem K. Factors influencing physicians' assessment of urgency for inpatient surgery. *Journal of Health Services Research & Policy*. 2001; 6(4): 214-9.

⁴⁴ Dolin SJ, Williams AC, Ashford N et al. Factors affecting medical decision-making in patients with osteoarthritis of the hip: allocation of surgical priority. *Disability & Rehabilitation*. 2003; 25(14): 771-7.

⁴⁵ Sampietro-Colom L, Espallargues M, Reina MD et al. [Citizens opinions, experiences and perceptions about waiting lists for elective cataract surgery and hip and knee replacement.]. *Atencion Primaria*. 2004; 33(2): 86-94.

⁴⁶ Arnesen KE, Erikssen J, Stavem K. Factors influencing physicians' assessment of urgency for inpatient surgery. *Journal of Health Services Research & Policy*. 2001; 6(4): 214-9.

⁴⁷ Arnesen KE, Erikssen J, Stavem K. Gender and socioeconomic status as determinants of waiting time for inpatient surgery in a system with implicit queue management. *Health Policy*. 2002; 62(3): 329-41.

⁴⁸ *Review of Elective Surgery Waiting Lists*. Department of Human Services, Victoria, Australia. Available at <http://www.dhs.vic.gov.au/ahs/archive/waitlist/>. Accessed July 2005.

Priority Players

Who applies the criteria and decides where a patient enters a surgical waiting list? In theory, there are three agents who would seem to have the greatest legitimacy as gatekeepers: the surgeon, the manager of a surgical team or department, and the patient themselves. In times past, professionals ruled somewhat unilaterally in medical decision-making. We now live in an era of greater cooperation between physician and patient. In practical terms, though, it may seem the patient's opinion is mostly expressed in the form of current pain and disability assessments and whether or not surgery is desired. In other words, it is a question of whether to be on the list at all rather than a matter of prioritization; if a patient is actively seeking a procedure, then the assumption is that their opinion in reference to waiting list will always be "the sooner the better." Surprisingly, there is a limited literature which contradicts this view, showing that some elderly citizens are willing to cede priority to younger or self-employed persons.^{49,50}

This discussion naturally verges onto the topic of other patient choice. As one policy response to waiting lists, plans have been proposed in different jurisdictions to offer patients an option as to the location of their surgery and / or the surgeon assigned (the theory being that they will speed up access by choosing shorter waiting lists); a variation on this theme has been the creation and management of a central waiting list registry within regions or geographically limited countries. Again, surprisingly, there has been resistance from patients: "although reduced waiting times is important to patients, it is not all that matters."⁵¹ Of key importance, for example, is the reputation of proffered alternatives.

A counterproductive aspect of this sort of assessment is the idea that the longer the waiting list maintained by a surgeon, the greater their reputation and assumed proficiency; this sometimes promotes even longer waiting lists for a few surgeons. The latter is an example of a system anomaly that can develop in unexpected ways. One recent analysis demonstrated that offering patients choice of caregiver within a health care pathway almost certainly extends the "system optimum" time and may even produce *longer waiting times for all patients*.⁵²

More troublesome are the "unofficial" departures from the priority scores and summary assessments. These occur in two forms. First, audits of some waiting list systems have shown that some clerks in the administrative chain have re-categorized patients unilaterally and without notice to the registering clinician.⁵³ Second, some physicians or managers manipulate priority scores in order to improve their patient's position on a waiting list; this phenomenon, often referred to as "gaming," actually

⁴⁹ Bowling A, Mariotto A, Evans O. Are older people willing to give up their place in the queue for cardiac surgery to a younger person? *Age & Ageing*. 2002; 31(3): 187-92.

⁵⁰ Mariotto A, De Leo D, Buono MD et al. Will elderly patients stand aside for younger patients in the queue for cardiac services? *The Lancet*. 1999; 354(9177): 467-70.

⁵¹ Burge P, Devlin N, Appleby J et al. Do patients always prefer quicker treatment? a discrete choice analysis of patients' stated preferences in the london patient choice project. *Applied Health Economics & Health Policy*. 2004; 3(4): 183-94.

⁵² Gallivan S. Can patient choice degrade health systems? London: University College, Clinical Operational Research Unit (CORU); 2004. Available at <http://www2.wmin.ac.uk/coiec/Nosokinetics23.pdf>. Accessed June 2005.

⁵³ *Review of Elective Surgery Waiting Lists*. Department of Human Services, Victoria, Australia. Available at <http://www.dhs.vic.gov.au/ahs/archive/waitlist/>. Accessed July 2005.

has been the occasion for some litigation.⁵⁴ The reply of some concerning these abuses is that the chaotic, non-transparent waiting lists of the past are even more subject to manipulation.⁵⁵

Any “gaming” practice by physicians is quite different than departures from priority scoring that are explicit and anticipated. There are few prioritization systems in the world that do not acknowledge some role for professional expertise and case-by-case clinical freedom. It is assumed that dealing with a patient can never be reduced simply “to the numbers.” In fact, the validation of priority scores is an ongoing task. Generic surgical criteria scoring systems have sometimes not fared well when tested against a consensus clinical judgment offered by surgeons.⁵⁶

Priority Shifting

Establishing “queues within queues” in waiting list management solves some problems and creates new ones. The main questions surround the movement of patients from one category to the next. How is this best achieved within a particular surgical service? For example, how often can a patient be reassessed? daily? weekly? monthly? And who drives the re-evaluation process: the patient, the physician, some other player? One report from Australia drew this clear conclusion: “recategorisation should only be undertaken by clinicians, preferably the treating consultant or the registrar in consultation with the consultant. No patient should be recategorised by junior medical staff, or any other person, without the express approval of the senior doctor in charge of the case.”⁵⁷

A final consideration is the care that must be taken with a person’s total waiting. If a semi-urgent case is bumped to the urgent level, the patient conceivably ought to receive credit for “time served” on the original list.

The preceding discussion assumes that patients enter each category queue at the bottom, i.e., on a first come, first served basis. The situation becomes far more complex if patients enter a list in a more precise way, matching their relative priority closely against the rest of the patients. The operational challenge which can result is that patients with relatively benign conditions never make it to the top of the queue. This can be addressed in a couple of different ways: maximum acceptable waiting times (see below) and adding points to the score for time spent waiting, for example, on a wait list for the same procedure elsewhere. A variation on the latter method was introduced in Wales; waiting time was taken into consideration for all patients, but those with a higher initial score moved up the waiting list faster.⁵⁸ However, such “cures” can become worse than the problem: patients with less severe conditions

⁵⁴ Scanlon DP, Hollenbeak CS, Lee W et al. Does competition for transplantable hearts encourage 'gaming' of the waiting list? *Health Affairs*. 2004; 23(2): 191-8.

⁵⁵ Taylor MC, Hadorn DC. Developing priority criteria for general surgery: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2002; 45(5): 351-7.

⁵⁶ Dennett ER, Parry BR. Generic surgical priority criteria scoring system: the clinical reality. *New Zealand Medical Journal*. 1998; 111(1065): 163-6.

⁵⁷ *Review of Elective Surgery Waiting Lists*. Department of Human Services, Victoria, Australia. Available at <http://www.dhs.vic.gov.au/ahs/archive/waitlist/>. Accessed July 2005.

⁵⁸ Health Service Management Centre. *Tackling NHS Waiting Lists: Can Booking and Scoring Systems Help?* 1998.

might, simply by virtue of having waited for a long time, consistently “bump” new patients with more severe conditions.⁵⁹

Priorities in Practice

Whereas New Zealand set the pace in the world for developing comprehensive surgical priority schemes,^{60,61} more recently other countries have been at the forefront, including Canada and the UK. For instance, the Western Canada Wait List (WCWL) project is a federally funded partnership of 19 organizations with a mandate to improve the management of waiting lists. Three of five original target areas involved surgery, including hip and knee replacement. The WCWL project has identified at least three utilities for a point-count system.⁶²

- to guide decisions about the relative order and urgency of surgery among patients on waiting lists.
- to ensure that such prioritization is as fair as possible, i.e., based solely on clinical urgency.
- to develop case-mix descriptions of patients to allow comparisons across regions and over time.

By comparison, a 1998 British report endorsed the introduction of priority scoring systems for surgical waiting lists, listing the following benefits.⁶³

- greater transparency
- equity across the country
- decisions made according to clinical need
- a service in control of clinicians.

Very little literature has been published validating the various priority schemes against standard clinical judgment. One of the goals of the WCWL project and other research efforts is to redress this gap. Taylor and Hadorn reported that WCWL generic priority scoring system for surgery (adapted from the New Zealand model) has tested well in terms of validity and inter-rater reliability. This system focuses mainly on current pain and disability; the authors acknowledge that a model that will truly rank patients in priority order will also need to capture the projected health

⁵⁹ Taylor MC, Hadorn DC. Developing priority criteria for general surgery: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2002; 45(5): 351-7.

⁶⁰ Hadorn DC, Holmes AC. The New Zealand priority criteria project. Part 1: Overview. *British Medical Journal*. 1997; 314(7074): 131-4. One prioritization effort in Ontario did predate the work in New Zealand; this project, which focused on coronary revascularization, produced fairly unsatisfactory results. See Naylor CD, Baigrie RS, Goldman BS et al. Assessment of priority for coronary revascularisation procedures. Revascularisation Panel and Consensus Methods Group. *The Lancet*. 1990; 335(8697): 1070-3.

⁶¹ *Waiting List Prioritisation Scoring Systems*. Discussion Paper No. 6. British Medical Association: Health Policy & Economic Research Unit; 1998. Available at <http://www.bma.org.uk/ap.nsf/Content/Waiting+list+prioritisation+scoring+systems>. Accessed July 2005.

⁶² Taylor MC, Hadorn DC. Developing priority criteria for general surgery: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2002; 45(5): 351-7.

⁶³ *Waiting List Prioritisation Scoring Systems*. Discussion Paper No. 6. British Medical Association: Health Policy & Economic Research Unit; 1998. Available at <http://www.bma.org.uk/ap.nsf/Content/Waiting+list+prioritisation+scoring+systems>. Accessed July 2005.

outcomes of a surgical procedure for each patient.⁶⁴ This point has been highlighted in assessments of the New Zealand trial projects. An emphasis on current pain and disability and a lack of focus on actual surgical outcomes actually created anomalies in the prioritization: patients with high perioperative mortality and morbidity made it on to the list for sometimes very expensive procedures, while others with potentially high improvement in quality of life were excluded.⁶⁵

The Limits of Priorities

Whatever the case for, and characteristics of, a patient prioritization scheme, limitations are inevitably encountered.

First, there are systemic constraints. The decisions being made by physicians in concert with patients and managers are not made in isolation. In other words, the various “levels” of rationing are not sealed off from one another. Increasingly, political decisions are being made that affect individual treatment priorities; likewise, professional health care providers influence bulk funding of medical and surgical specialties, a process that can have either a competitive tone (who creates the most persuasive report?) or a cooperative spirit (how can we make the whole system work better?).⁶⁶ This is a complex area of health care planning, requiring the development of “decision-making tools...to compare urgency levels across procedures and assist with resource allocation.”⁶⁷

Given the fluidity of health technology and cost-effectiveness research, thinking through the *process* for designing (and redesigning) operational limits on prioritization (see below) may be more important than any current conclusions. Some agencies, for example, the British Columbia Medical Association, have suggested that any attempts to define “medical necessity” are not very useful; instead, society should simply recognize that political and economic leaders ultimately need to decide on the core list of publicly-funded health care services and then establish and clearly communicate access standards.⁶⁸

The remaining limitations on patient prioritization to be discussed are in fact operational. They involve either a lower bound for the “score” or clinical assessment below which a patient will not be recommended for an intervention at all, or the upper bound of how long a patient in a particular urgency category will be required to wait for their procedure.

⁶⁴ Taylor MC, Hadorn DC. Developing priority criteria for general surgery: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2002; 45(5): 351-7.

⁶⁵ *Waiting List Prioritisation Scoring Systems*. Discussion Paper No. 6. British Medical Association: Health Policy & Economic Research Unit; 1998. Available at <http://www.bma.org.uk/ap.nsf/Content/Waiting+list+prioritisation+scoring+systems>. Accessed July 2005.

⁶⁶ McDonald O, Shortt S, Sanmartin C et al. *Waiting Lists and Waiting Times for Health Care in Canada: More Management, More Money?* Ottawa: Health Canada; 1998.

⁶⁷ The Wait Time Alliance. *No More Time To Wait— Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005

⁶⁸ See the Policy Paper at

[http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care Guarantees/patient_care_guarantees.asp](http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care%20Guarantees/patient_care_guarantees.asp). Accessed July 2005.

Screening for Eligibility

The issue of eligibility for a procedure has a longer history. Sometimes this topic is described in terms of *threshold criteria*, *appropriateness* or, traditionally, *indications* for an intervention. Whatever the language, when eligibility criteria are explicitly applied, it may be considered a type of *screening*.

Although assessing a patient's eligibility has been a routine, informal practice of individual specialists and general practitioners for a long time, in the interest of fairness and consistency, there has been great interest in moving towards more quantitative means of selecting appropriate treatment. These approaches would be applied in the same way by all physicians and yield results of comparable validity.

Modern priority criteria are also now used as a tool to assist the screening process. For example, in the 1990s, a cut-off of 25 points was established for funding coronary artery bypass grafting in New Zealand; this provides an interesting case of reversal of the usual tension between medicine and economics, because the suggested cut-off point from a clinical perspective was actually 10 points *higher*.⁶⁹ Note that, though explicit eligibility criteria are preferred, implicit or default screening can also occur, i.e., when a patient is rated so low on the priority list that their surgery does not come up before they die or seek another option.

Maximum Waits

The issue of an upper limit for how long a patient will have to wait has been an intense area of discussion in the last few years, including at the various national commissions in Canada.⁷⁰ As a result, key research, consensus-building, and policy-setting projects are under way, from New Zealand to the Netherlands.^{71,72} One of the lead agencies in Canada in this regard is the Western Canada Wait List Project, which recently shifted from phase one of its work (which focused on prioritization) to phase two and the topic of maximum acceptable wait time (MAWTs).⁷³

Again, there is a range of terminology that has been employed to label the mandated end-point of a waiting period, including *patient care guarantee*, *threshold*, *benchmark* and *maximum acceptable wait time*. Recently, The Wait Time Alliance amalgamated some of these options in the phrase, "medically acceptable wait-time benchmark."⁷⁴

⁶⁹ Hadorn DC, Holmes AC. The New Zealand priority criteria project. Part 2: Coronary artery bypass graft surgery. *British Medical Journal*. 1997; 314(7074): 135-8.

⁷⁰ See one summary at Spurgeon D. Canada considers maximum waiting times for patients. *British Medical Journal*. 2002; 324(7345): 1057.

⁷¹ See the Netherlands project at

<http://www.onderzoekinformatie.nl/en/oi/nod/onderzoek/OND1277430/>. Accessed July 2005.

⁷² *The Taming of the Queue II: Wait Time Measurement, Monitoring and Management*. Colloquium Report. 2005. Available at <http://www.cprn.com/en/doc.cfm?doc=1274>. Accessed July 2005.

⁷³ Western Canada Waiting List Project. *Moving Forward—Final Report*. 2005. Available at http://www.wcwl.ca/media/pdf/news/moving_forward/report.pdf. Accessed June 2005.

⁷⁴ The Wait Time Alliance. *No More Time To Wait—Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005.

More broadly, the issue of maximum wait times fits under the rubric of *access*. The position of the Canadian Medical Association on “timely access to care” sums up the challenge.⁷⁵

Governments must establish clear guidelines and standards around quality and waiting times that are evidence-based and that patients, providers and governments consider reasonable.

There are many interconnected issues related to MAWTs. These include the following:

Complexity and Specificity

A key issue is whether to have generic maximum waits for all operations or a class of operations, or maximums tailored for specific operations, or even for specific urgency categories in the waiting list for that procedure.⁷⁶ Over 10 years ago, Sweden opted for the generic approach, mandating a maximum wait of 3 months for 12 different procedures, including hip and knee replacement.⁷⁷ The famous Patient Charter of the UK, introduced in 1991, followed a similar pattern, though with a more conservative 18-month care guarantee for hip and knee replacement and other hospital services.⁷⁸ A 2001 advisory report in Alberta matched the Swedish plan by recommending a guarantee of specialist service delivery within 90 days of diagnosis. Other jurisdictions have been very dubious that a generic maximum waiting time for all scheduled surgery makes any kind of medical sense.⁷⁹ Governments such as the one in British Columbia have rejected the approach on the basis of economic practicality.⁸⁰

Evidence and Clinical Judgment

The simpler, generic systems more amenable to public communication campaigns have tended to be driven by political considerations and government policy, whereas the more tailored approaches have been shaped by medical arguments similar to those that inform surgical priority systems. These arguments represent a combination of research evidence (hence, labels such as “evidence-based benchmarks”) and clinical judgment. As The Wait Time Alliance recently acknowledged, “in many circumstances, little research evidence exists, yet key resource allocation decisions must still be made.” Others agree that this is unlikely to change in the near future because of the “complex nature of the

⁷⁵ Reported by the British Columbia Medical Association at [http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care Guarantees/patient_care_guarantees.asp](http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care%20Guarantees/patient_care_guarantees.asp). Accessed July 2005.

⁷⁶ See, for example, the categories implemented in 1992 in Victoria, Australia. Reported in Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports.15.pdf. Accessed June 2005.

⁷⁷ Hanning M. Maximum waiting-time guarantee--an attempt to reduce waiting lists in Sweden. *Health Policy*. 1996; 36(1): 17-35. It is important to note that only those patients given a priority rating were extended a guarantee; there were insufficient resources to cover all candidates for the interventions.

⁷⁸ Available at <http://www.pfc.org.uk/medical/pchrt-e1.htm#hosp-reducing>. Accessed July 2005. Note: the Patient Charter was superseded in 2000 by other UK health plans.

⁷⁹ McCormick AD, Parry BR. Waiting time thresholds: are they appropriate? *ANZ Journal of Surgery*. 2003; 73(11): 926-8.

⁸⁰ Reported by the British Columbia Medical Association at [http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care Guarantees/patient_care_guarantees.asp](http://www.bcma.org/public/news_publications/publications/policy_papers/Patient%20Care%20Guarantees/patient_care_guarantees.asp). Accessed July 2005.

problem.”⁸¹ Thus, the Alliance recommends being evidence-based but not “evidence-bound.”⁸²

Type of Criteria

“Life or death” issues such as mortality rates while on a waiting list generate compelling data, so it is not surprising that cardiac care has been an early and sustained focus of concern in terms of maximum waits.^{83,84,85} The task becomes one of gathering evidence as to “the clinical consequences of delay so as to determine limits within which patient safety is not compromised.”⁸⁶ Another type of “delay cost” is any serious decline in prognosis as a disease progresses. The optimum window for care is sometimes assessed using simulation models. The ultimate challenge, though, is to establish MAWTs when “softer” consequences are at stake; in other words, “you will not die nor will your condition deteriorate significantly,” but other “quality of life” costs *are* likely to be experienced, including.^{87,88,89}

- pain and suffering
- mental anguish
- reduced productivity
- stress on personal relationships.

In the case of non-life-threatening conditions, how long patients are prepared and willing to wait for care may end up being a key factor in establishing MAWTs.⁹⁰

Process

A “middle way” between government mandate and “pure” clinical judgment is some kind of stakeholder consensus-building which gathers a range of opinions, from the general public and patients to hospital administrators and physicians. The aim of such processes is to find some balance between what is ideal,

⁸¹ Tu JV. *Challenges in Developing National Benchmarks for Waiting Times*. 2005. Presentation available at <http://www.cprn.com/en/doc.cfm?doc=1296>. Accessed July 2005.

⁸² The Wait Time Alliance. *No More Time To Wait— Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005.

⁸³ Basinski AS, Almond DG, James RG et al. Rating the urgency of coronary angiography: results of an expert panel process. Ontario Coronary Angiography Panel. *Canadian Journal of Cardiology*. 1993; 9(4): 313-21.

⁸⁴ Spurgeon P, Barwell F, Kerr D. Waiting times for cancer patients in England after general practitioners' referrals: retrospective national survey. *British Medical Journal*. 2000; 320(7238): 838-9.

⁸⁵ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

⁸⁶ Shortt SED. *Waiting for Medical Services in Ontario: Clarifying the Issues in a Period of Health Reform*. 2000. Available at <http://chspr.queensu.ca/Waiting%20For%20Medical%20Services%20in%20Ontario.pdf>. Accessed July 2005.

⁸⁷ Esmail N. “Acceptable” wait times? Fraser Institute Editorial. April 7, 2005. Available at <http://www.fraserinstitute.ca/shared/readmore1.asp?sNav=ed&id=341>. Accessed July 2005.

⁸⁸ Tu JV. *Challenges in Developing National Benchmarks for Waiting Times*. 2005. Presentation available at <http://www.cprn.com/en/doc.cfm?doc=1296>. Accessed July 2005.

⁸⁹ Globerman S. A policy analysis of hospital waiting lists. *Journal of Policy Analysis & Management*. 1991; 10(2): 247-62.

⁹⁰ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

reasonable and achievable, and adopt standards acceptable to as many key people as possible, as well as to the general public and (in today's political environment) the media.⁹¹ A commentary on a paper by Naylor highlights possible dysfunctions in the way the system can operate in practice:⁹²

One fascinating dimension of rationing is the interface between the media, who publicize the fate of the patients who fall victim to the queues, and politicians, who respond to the resulting hue and cry in a way that underscores their accountability to the electorate.

Thus, whatever the value of public processes, opinion gathering must be informed and balanced by both existing and new scientific research results (especially on the long-term cost of waiting)—data which is regularly reviewed by clinical panels.⁹³

Universality

There is a question of whether allowing different MAWTs in different regions or provinces is appropriate, perhaps informed by the capacity of various tertiary care centres or the demands of competing procedures. The clear position of The Wait Time Alliance, for instance, is that MAWTs need to be established on a pan-Canadian basis.⁹⁴ Some advisors go even further and suggest that waiting list management systems need to be standardized.

Implementation

Many different approaches have been put forward to achieve MAWTs, with varying degrees of success. The other phases of this project will concentrate on reviewing these and making recommendations in the context of hip and knee replacement. It is critical to know how governments and the health care system will respond when targets are not being achieved expeditiously. The nature of the response depends on the drivers in the system. If the MAWTs are “rigidly” mandated by clinical concerns, then implementation needs to be well-funded and flexible; if they are tied to the rise and fall of financing capacity, for example, then the level of accountability will feel quite different to both patients and health care providers. An instance of the latter approach can be seen in the New Zealand plan established in 2000: “all patients with a level of need *which can be met within the resources (funding) available* are provided with surgery within 6 months of assessment [emphasis ours].”⁹⁵ Clearly, the highlighted qualification will significantly affect the “intensity” of implementation.

⁹¹ Tu JV. *Challenges in Developing National Benchmarks for Waiting Times*. 2005. Presentation available at <http://www.cprn.com/en/doc.cfm?doc=1296>. Accessed July 2005.

⁹² Naylor CD. A different view of queues in Ontario. *Health Affairs*. 1991; 10(3): 110-28.

⁹³ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

⁹⁴ The Wait Time Alliance. *No More Time To Wait— Toward benchmarks and best practices in wait time management*. 2005. Available at http://www.eyesite.ca/pdf/no_more_time_to_wait.pdf. Accessed June 2005.

⁹⁵ Reported in Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports.15.pdf. Accessed June 2005.

Monitoring and reporting progress

The most common means to measure progress towards achieving MAWTs is in terms of the proportion of patients who receive surgery within the mandated threshold. An improving percentage represents a positive direction towards some interim or final target for the best real-world scenario, e.g., at least 95% of patients receiving care within the MAWT. Resources to allow careful monitoring need to be built in to any strategy.

Managing problems

One issue that may arise with the application of MAWTs is the phenomenon of patients who are at the end of their maximum wait period “bumping” more urgent cases. When the UK was under the mandate of the Patient Charter, this dynamic was referred to as the challenge of the “18-monthers.” While the Patient Charter did instigate clearing backlogged patients, it also caused waits among other patients to increase.⁹⁶ Recognizing this sort of problem means acknowledging that prioritization schemes and MAWTs represent health care strategies that can end up on a collision course, especially when implementation is hampered by inadequate resources.⁹⁷

The Point of the Exercise

In this overview of prioritization and maximum acceptable wait times for scheduled surgery and other health care services, it is easy to miss the main point in the midst of the details. The “bottom line” is not the reduction of, nor the efficient management of, waiting lists. The ultimate issue is serving, i.e., providing appropriate care at the appropriate time so as to maximize benefit and minimize both personal and societal cost. Sanmartin effectively sums up the main objective:⁹⁸

The primary purpose...of establishing acceptable waits is to improve patient access to health care services and ensure that it is occurring in a timely manner in an effort to reduce the risk of adverse events both pre- and post-operatively.

⁹⁶ Western Canada Waiting List Project. *From Chaos to Order: Making Sense of Waiting Lists in Canada—Final Report*. 2001. Available at http://www.wcwl.org/media/pdf/library/final_reports.2.pdf. Accessed June 2005.

⁹⁷ Hanning M, Spangberg UW. Maximum waiting time - a threat to clinical freedom? Implementation of a policy to reduce waiting times. *Health Policy*. 2000; 52(1): 15-32.

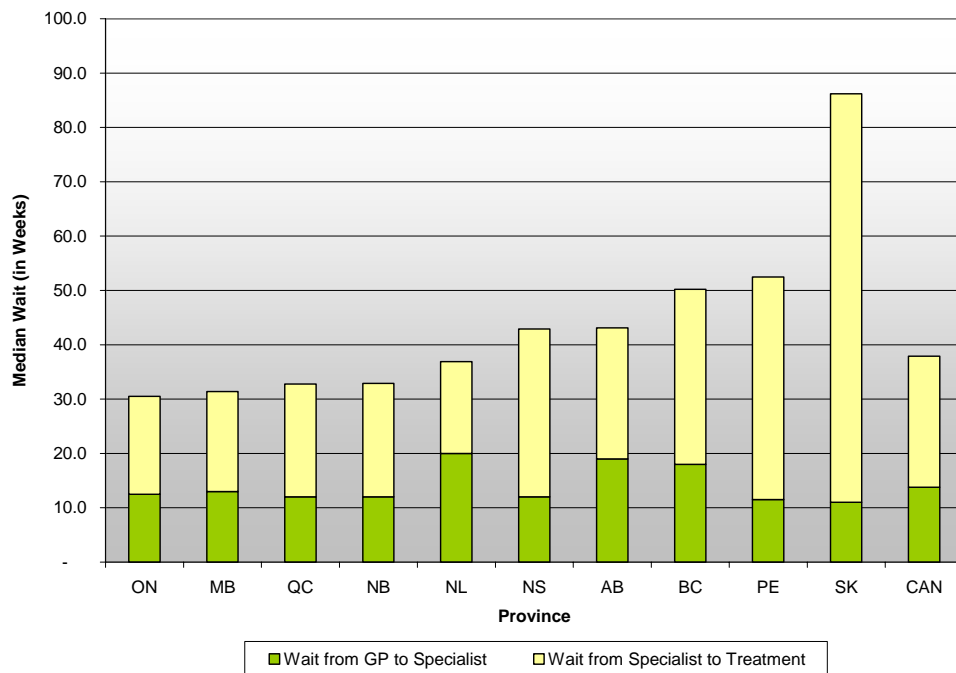
⁹⁸ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

The Context of Hip & Knee Replacement

The demand for total hip replacement (THR) and total knee replacement (TKR) operations is increasing rapidly in developed nations, largely due to the ageing of ‘baby boomers’ as well as changing patient profiles. Current global projections suggest that the need for total hip and knee replacements will increase from 20 to 50% during the next two or three decades. Given this demand, many jurisdictions, including Canada, are struggling with a growing waiting list for these cost-effective procedures. In light of this, there is a persistent and growing call to do something about the waiting lists for orthopaedic surgery, which are longer than any other type of surgery.⁹⁹ In fact, the problem with waits for orthopaedic surgery have been recognized in some jurisdictions for at least 20 years.¹⁰⁰

While data on actual wait times is limited, the Fraser Institute has attempted to quantify this information. According to their analysis, total median wait times (defined as the time from referral by a GP to a specialist and the completion of the operation) for orthopaedic surgery at 37.9 weeks in 2004 are the longest of any surgical specialty, with significant variation between provinces, as indicated on the following chart. In addition, these median wait times have increased from 19.5 weeks in 1993 to the current 37.9 weeks.¹⁰¹

**Waiting Time for Orthopaedic Surgery
Canadian Provinces
2004**



⁹⁹ Quan H, Lafreniere R, Johnson D. Health service costs for patients on the waiting list. *Canadian Journal of Surgery*. 2002; 45(1): 34-42..

¹⁰⁰ Niinimaki T. Increasing demands on orthopedic services. *Acta Orthopaedica Scandinavica Supplement*. 1991; 241: 42-3.

¹⁰¹ Esmail N, Walker M. *Waiting Your Turn: Hospital Waiting Lists in Canada*, 2004.

Itemizing the specific forces at work to create long waiting times will form part of the introduction to Phase 3 of this project. For now, it is useful to acknowledge the role of the underlying diseases.

By far the most frequent condition that occasions the need for THR and TKR is arthritis, a set of conditions that afflicts 1 in 6 Canadians over the age of 15, two-thirds of whom are women. The main rationale for joint replacement is to relieve the pain from arthritis that limits mobility and hence impairs or eliminates various desired life, occupational and recreational activities.

The Nature and Burden of Arthritis

Arthritis is a non-specific umbrella term which simply refers to a condition or symptom where one or more joints of the body are inflamed or degenerated. The landmark *Arthritis in Canada* report summed up the impact of this class of diseases.¹⁰²

Compared with people with other chronic conditions, those with arthritis experienced more pain, activity restrictions and long-term disability, were more likely to need help with daily activities, reported worse self-rated health and more disrupted sleep and depression, and more frequently reported contact with health care professionals in the previous year.

Contrary to some popular opinions, arthritis is not just a disease of the elderly. Nearly 3 out of 5 Canadians with arthritis are under 65 years of age.

In 1998, the economic burden of arthritis to Canadian society was estimated to be \$4.4 billion, as indicated on the following table. About 80% of these costs are related to long-term disability, throwing into sharp relief the importance of joint replacement surgery—which usually enables people to “get back on their feet” and even return to full productivity.¹⁰³

Economic Burden of Arthritis		
By Cost Component		
Canada, 1998		
Type of Cost	Component	Costs (in \$Millions)
Direct Costs	Hospital Care	\$ 457.5
	Drugs	\$ 262.7
	Physician Care	\$ 183.5
	Total Direct	\$ 903.7
Indirect Costs	Mortality Costs	\$ 33.7
	Morbidity Costs due to Long-term Disability	\$ 3,375.5
	Morbidity Costs due to Short-term Disability	\$ 105.3
	Health Research	\$ 5.2
	Total Indirect	\$ 3,519.7
Total Costs		\$ 4,423.4

¹⁰² Health Canada. *Arthritis in Canada: An Ongoing Challenge*. Ottawa: Health Canada, 2003.

¹⁰³ Health Canada. *Arthritis in Canada: An Ongoing Challenge*. Ottawa: Health Canada, 2003.

The authors of this study note that these costs should be considered to be conservative, as they are based on arthritis as the principle diagnosis only; secondary and subsequent diagnosis are not being captured. In addition, the costs presented

exclude expenditures for care in institutions other than hospitals, costs related to health care professional other than physicians (such as rehabilitation professionals) and direct health expenditures (such as for over-the-counter medications, assistive device and informal care giving). As well, the value of time lost from work and leisure activities by family members or friends who care for the patient are not included. As a result, these data likely underestimate the total costs of arthritis. In addition, the drug expenditures presented here pre-date the availability of new arthritis medications such as COX-2 inhibitors and biologic disease-modifying anti-rheumatic drugs (DMARDs), which are costly (p. 45).

A more recent study by Maetzel and colleagues suggest that the economic costs of arthritis in Canada are \$5.27 billion annually.¹⁰⁴

The Canadian Joint Replacement Registry Report for 2005 indicates that 81% of primary hip replacement and 92% of primary knee replacement operations are due to degenerative osteoarthritis, with the classic inflammatory arthritis, rheumatoid arthritis (RA), accounting for a smaller but still significant subset of total surgeries.¹⁰⁵ (See Appendix A for details.)

What is Osteoarthritis?

Osteoarthritis (OA) is a chronic condition affecting movable joints, characterized by focal destruction of articular cartilage, bone growth, and, frequently, a synovial reaction. It is the most prevalent form of arthritis, especially in the elderly, and the greatest single cause of functional impairment due to a musculoskeletal disorder.¹⁰⁶ In the entire inventory of disabling medical conditions, OA is only rivalled by cardiovascular disease.¹⁰⁷ OA can represent a significant burden for individual patients, resulting in high cumulative economic costs to society.^{108,109} Age is the clearest and strongest risk factor for OA. Canada and other developed jurisdictions in the world face a growing burden due to OA as the elderly cohort increases in the population.^{110,111}

¹⁰⁴ Maetzel A, Li LC, Pencharz J et al. The economic burden associated with osteoarthritis, rheumatoid arthritis, and hypertension: a comparative study *Annals of the Rheumatic Diseases* 2004; 63: 395-401.

¹⁰⁵ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJRR) 2005 Report*, 2005.

¹⁰⁶ Badley EM. The effect of osteoarthritis on disability and health care use in Canada. *Journal of Rheumatology*. 1995; 43(Suppl): 19-22.

¹⁰⁷ Guccione AA, Felson DT, Anderson JJ et al. The effects of specific medical conditions on the functional limitations of elders in the Framingham study. *American Journal of Public Health*. 1994; 84: 351-8.

¹⁰⁸ Birrell FN. Patterns of joint pain: lessons from epidemiology. *Rheumatology*. 2004; 43(4): 408-9.

¹⁰⁹ Gunther KP, Sturmer T, Sauerland S et al. Prevalence of generalized osteoarthritis in patients with advanced hip and knee osteoarthritis: the Ulm Osteoarthritis Study. *Annals of the Rheumatic Diseases*. 1998; 57: 717-23.

¹¹⁰ Valkenburg HA. Epidemiologic considerations of the geriatric population. *Gerontology*. 1988; 34 Suppl 1:2-10.

¹¹¹ Verville SG. Musculoskeletal aging. *Current Opinion on Rheumatology*. 2004; 16(2): 114-8.

The natural history of osteoarthritis is not well understood.¹¹² The disease usually develops slowly, but there may be phases of more rapid progression. Joints can stabilize and even demonstrate clinical and, occasionally, radiographic improvement. Flare-ups of pain and disability often can be traced to specific mechanical stress. The general risk factors for initiation of OA have been distinguished from those associated with progression.^{113,114} Significant for our report, one study showed that about 30% of knee osteoarthritis will progress to the point of requiring joint replacement.¹¹⁵

The Disease Burden of Osteoarthritis

Osteoarthritis is the most common form of arthritis.¹¹⁶ The *Arthritis in Canada* study reported the estimated prevalence of symptomatic OA over all joints as 10% of Canadian adults, or about 3 million people.¹¹⁷ According to the World Health Organization, it ranks fourth in health consequences among women and eighth among men.¹¹⁸ The impact of OA and other arthritides will continue to expand in the ageing populations of industrialized countries. In Canada, the number of people with all forms of arthritis is projected to increase by over 50% between 2001 and 2026, when 6.4 million people over age 15 will then be afflicted.¹¹⁹ OA will continue to constitute the largest share of this enormous national burden.

Joint Replacement Surgery

Total hip replacement and total knee replacement are examples of total joint replacement (TJR), an orthopaedic procedure where an arthritic or otherwise diseased or damaged joint is removed and replaced with an artificial joint or prosthesis. Other names for this surgery are total hip arthroplasty and total knee arthroplasty. The general aim is to decrease pain and stiffness and enable the new joint to move like a normal, healthy joint. Although hip and knee replacements are the most common type of TJR, joint replacement surgery can also be performed on the ankle, foot, shoulder, elbow and fingers.¹²⁰

With time, the artificial joint may loosen, often due to weakening of adjacent bone (a process called osteolysis) and revision surgery may be required (as distinguished from the original or primary surgery). Often only a single part of the implant needs to

¹¹² Rottensten K. Monograph series on aging-related diseases IX: osteoarthritis. *Chronic Diseases in Canada*. 1997; 17(3).

¹¹³ Cooper C, Dieppe P, Snow S et al. Determinants of incidence and progression of radiographic knee osteoarthritis. *Arthritis & Rheumatism*. 1997; 40: S331. A dramatic example of this risk factor differential is the fact that osteoporosis protects against OA initiation but is predictive of progression.

¹¹⁴ Doherty M. Risk factors for progression of knee osteoarthritis. *The Lancet*. 2001; 358: 775-6.

¹¹⁵ Schouten JS, van den Ouweland FA, Valkenburg HA. A 12 year follow up study in the general population on prognostic factors of cartilage loss in osteoarthritis of the knee. *Annals of the Rheumatic Diseases*. 1992; 51(8): 932-7.

¹¹⁶ Lawrence RC, Helmick CG, Arnett FC et al. Estimates of the prevalence of arthritis and selected musculoskeletal diseases in the United States. *Arthritis & Rheumatism*. 1998; 41: 778-99.

¹¹⁷ The age threshold was not defined, and the research source is not clear. Health Canada. *Arthritis in Canada: An Ongoing Challenge*. Ottawa: Health Canada, 2003. This figure compares to the estimated 4 million Canadians with one of the over 100 forms of arthritis. OA clearly predominates in the arthritis universe. Available at <http://www.arthritisresearch.ca/about/prfel.htm>. Accessed September 2004.

¹¹⁸ Murray CJL, Lopez AD. *The Global Burden of Disease*. Geneva: World Health Organization, 1997.

¹¹⁹ Health Canada. *Arthritis in Canada: An Ongoing Challenge*. Ottawa: Health Canada, 2003.

¹²⁰ For convenience, henceforth in this report, joint replacement and total joint replacement will be considered to refer to hip and knee replacement (sometimes called major joint replacement).

be replaced. Younger patients may in fact require a second total joint replacement sooner due to wear and tear on the joint caused by their more active lifestyle. Early surgical complications, fractures dislocations, infections or (rarely) prosthesis breakage may also result in the need for revision surgery. Sometimes, even before loosening, younger people wear out the lining of their cup (in THR) or their tibial component (in TKR), requiring a second one to be implanted when appropriate.

Revision surgery tends to be more complicated and expensive than primary surgery due to scarring and bone loss^{121,122,123} With revision surgery, patient outcomes are not as positive as with the primary surgery, and the lifespan of the implant usually decreases.¹²⁴ Nevertheless revision surgery has been shown to be effective in improving function and quality of life.¹²⁵

Technological advances in the prosthesis have improved the strength and reliability of artificial joints, critical to reducing the requirement for and the economic impact of revision surgery. In some countries, surgeons are guided to use proven types of prostheses that have been shown, for the most part, to last at least 10 years.¹²⁶

See Appendix B for the reasons reported in Canada for revising total hip and knee replacement procedures.

¹²¹ Saleh KJ, Rand JA, McQueen DA. Current status of revision total knee arthroplasty: how do we assess results? *Journal of Bone & Joint Surgery—American Volume*. 2003; Supplement 1: 18-20.

¹²² Mushinski M. Average charges for a total hip arthroplasty: geographic variations, 1995 *Statistical Bulletin* 1996.

¹²³ Rorabeck CH, Murray P. Cost effectiveness of revision total knee replacement. *Instructional Course Lectures*. 1997; 46: 237-40. The comparison of total costs for primary versus revision TKR was U.S. \$10,868 and \$14,444, respectively.

¹²⁴ Espehaug B, Havelin LI, Engesaeter LB, et al. Patient satisfaction and function after primary and revision total hip replacement. *Clinical Orthopaedics & Related Research*. 1(351): 135-48.

¹²⁵ Rorabeck CH, Murray P. Cost effectiveness of revision total knee replacement. *Instructional Course Lectures*. 1997; 46: 237- 40.

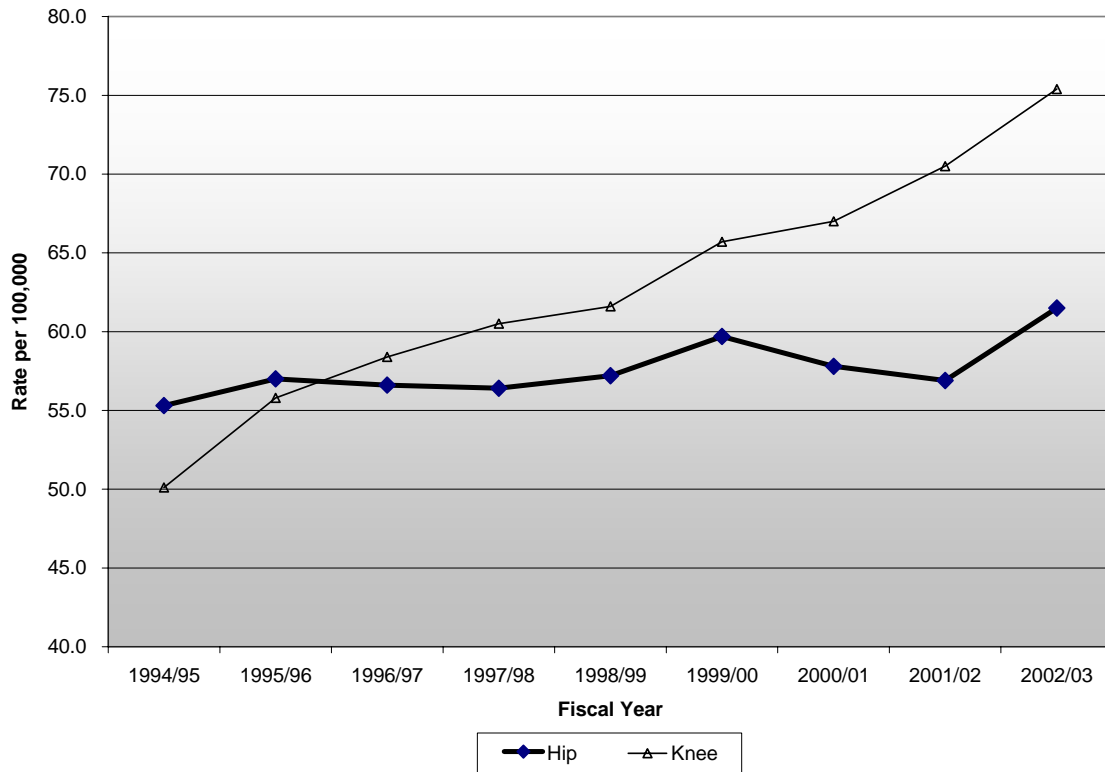
¹²⁶ Briggs, A, Sculpher M, Dawson J, et al. *Modeling the cost-effectiveness of primary hip replacement: how cost-effective is the Spectron compared to the Charnley prosthesis?* York: Centre for Health Economics, 2003.

Hip and Knee Replacement Procedures in Canada

The number of hospitalizations for total hip and knee replacement surgeries in Canada has increased from 31,463 in 1994/95 to 48,419 in 2002/03, an increase of 16,956 or 54%. This increase has been more rapid for total knee replacement procedures (14,938 to 26,500 or 77%) than for total hip replacement procedures (16,525 to 21,919 or 33%).¹²⁷

The trend in age-standardized rates per 100,000 population are shown on the following chart.¹²⁸

**Trend in Age-standardized Rates for Total Hip and Knee Replacement Hospitalizations
Canada 1994/95 to 2002/03**



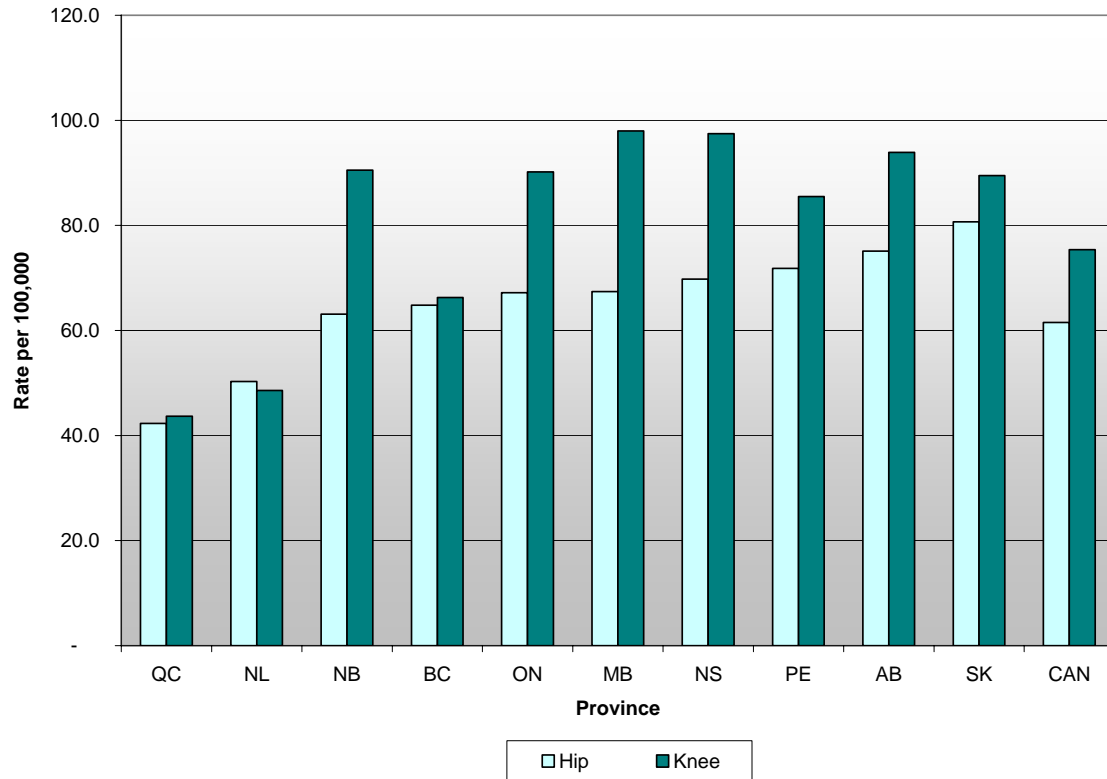
The age-standardized rate for total hip replacement procedures increased from 55.3 per 100,000 in 1994/95 to 61.5 per 100,000 in 2002/03, an increase of 11%. The age-standardized rate for total knee replacement procedures increased from 50.1 per 100,000 in 1994/95 to 75.4 per 100,000 in 2002/03, an increase of 50%.

¹²⁷ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJJR) 2005 Report*, 2005.

¹²⁸ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJJR) 2005 Report*, 2005.

Despite these increases in rates over the last decade, there remains considerable variation across the country in the provision of these procedures, as indicated on the following chart.¹²⁹

Age-standardized Rates for Total Hip and Knee Replacement Hospitalizations Canadian Provinces 2002/03

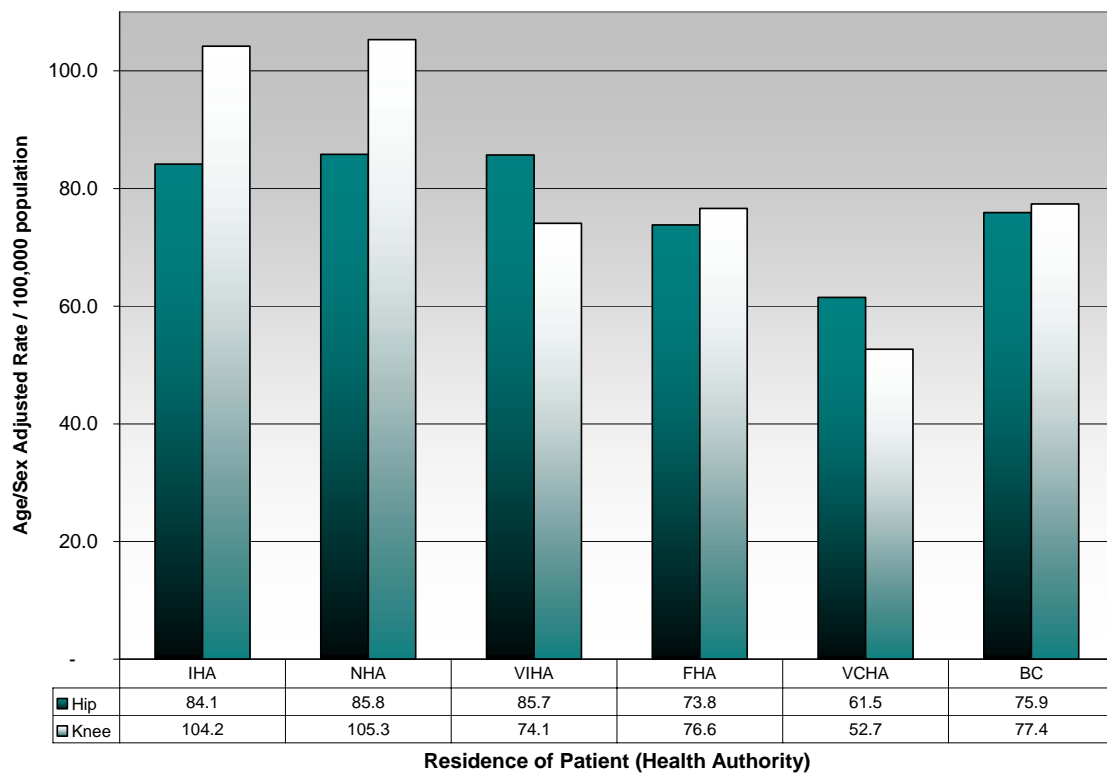


Age-standardized rates per 100,000 for total hip replacement procedures range from a low of 42.3 in Quebec to a high of 80.7 in Saskatchewan. Likewise, Age-standardized rates per 100,000 for total knee replacement procedures range from a low of 43.7 in Quebec to a high of 98.0 in Manitoba.

¹²⁹ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJRR) 2005 Report*, 2005.

Not only is there significant variation in rates between provinces, but similar variations exist in geographic regions within provinces. In British Columbia, for example, the age and sex standardized rate per 100,000 for total hip replacement procedures in 2002/03 ranged from a low of 61.5 for residents of the Vancouver Coastal Health Authority to a high of 85.8 for residents of the Northern Health Authority. Likewise, the age and sex standardized rate per 100,000 for total knee replacement procedures ranged from a low of 52.7 for residents of the Vancouver Coastal Health Authority to a high of 105.3 for residents of the Northern Health Authority (see following chart).¹³⁰

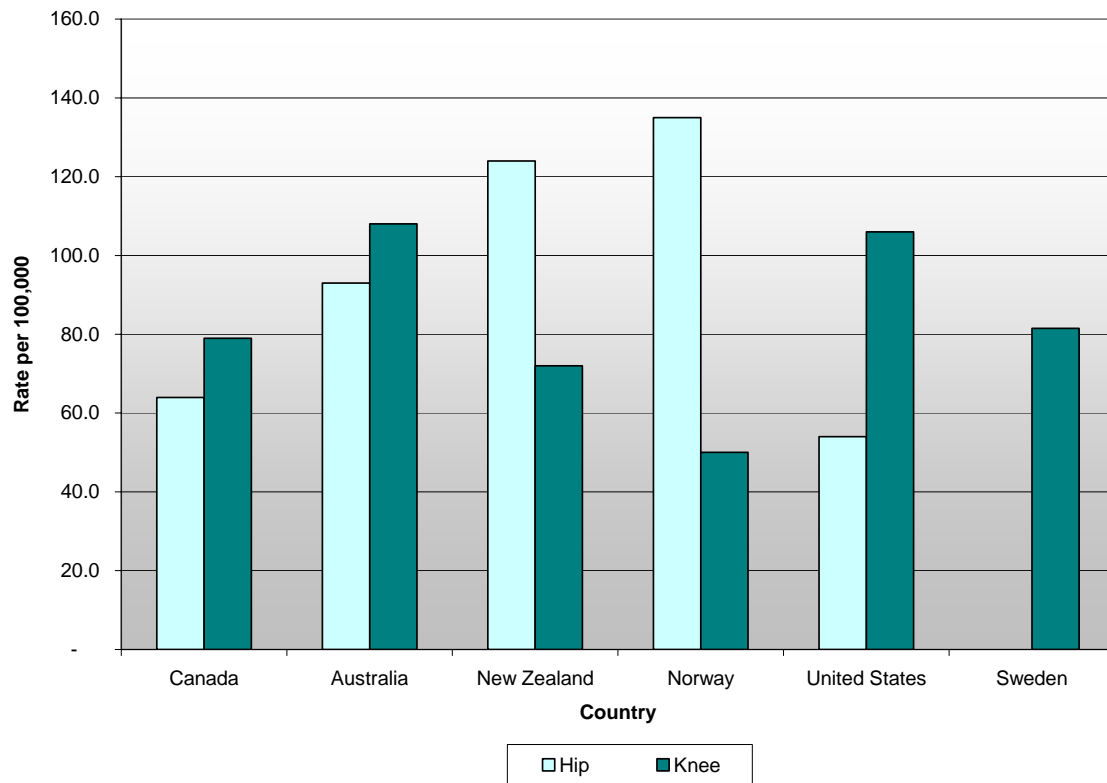
**Hip and Knee Replacement Surgery
B.C. Health Authorities
2002/03 (Age/Sex Adjusted Rate / 100,000)**



¹³⁰ Produced by H. Krueger & Associates Inc.

Finally, there appears to be significant variation in the provision of these two procedures internationally. The CJJR 2005 Report¹³¹ provides information on the crude rate per 100,000 for primary hip and knee replacement procedures for selected countries where this information is available. This information has been summarized on the following chart. It is important to note that these are crude rates and thus have not been adjusted for differences in the age or gender structure for the various countries. Nevertheless, they provide a rough estimate of the incidence of primary joint replacement procedures in these countries.

Crude Rates for Primary Hip and Knee Replacements International Comparison: 2000-2003



¹³¹ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJJR) 2005 Report*, 2005.

Expected Patient Outcomes

One reason for the popularity and ubiquity of hip and knee replacement operations are the strong positive outcomes and relatively rare negative results. The various patient outcomes can be classified as perioperative (i.e. complications up to three months), short-to-medium term, and long term.

Perioperative Outcomes

As with any surgery, there are risks associated with TJR. The most common serious complications in the perioperative period include hip dislocation, pulmonary embolism and deep infection. One recent study in the US identified the rates for these three complications in hip replacement surgery as 3.1%, 0.9% and 0.2%, respectively, for a primary procedure, and 8.3%, 0.8% and 1.0% for revision surgery.¹³² Similar rates have been identified in other countries and settings.^{133,134,135,136,137}

Mortality rates for TJR surgery are also very low, with figures reported in the literature ranging from 0.4 to 0.8%.^{138,139,140,141}

Short-to-Medium Term Outcomes

In practice, hip and knee replacement outcomes have often been evaluated by surgeons' clinical assessments of total joint function, using, for example, the Harris Hip Score (introduced 35 years ago) or the Knee Society Score. More recently, the patient has been brought in to the equation: "major joint arthroplasty is normally performed to improve patients' quality of life (QOL); therefore, patients' own perspective should be central to assessing the effects of procedures."¹⁴² Some studies

¹³² Katz JN, Losina E, Barrett J, et al. Association between hospital and surgeon procedure volume and outcomes of total hip replacement in the United States Medicare population. *Journal of Bone & Joint Surgery—American Volume*. 2001; 83-A(11): 1622-9.

¹³³ Phillips CB, Barrett JA, Losina E, et al. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. *Journal of Bone & Joint Surgery—American Volume*. 2003; 85-A: 20-26. See also Mahomed, NN, Barrett JA, Katz JN, et al. Rates and outcomes of primary and revision total hip replacement in the United States Medicare population. *Journal of Bone & Joint Surgery—American Volume*. 85-A(1): 27-32.

¹³⁴ Poon PC, Rennie J, Gray DH. Review of total hip replacement—the Middlemore Hospital experience, 1980-1991. *New Zealand Medical Journal*. 2001; 114: 254-6.

¹³⁵ Franklin J, Robertsson O, Gestsson et al. Revision and complication rates in 654 Exeter total hip replacements, with a maximum follow-up of 20 years. *BMC Musculoskeletal Disorders*. 2003; 4(6).

¹³⁶ Brookenthal KR, Freedman KB, Lotke PA et al. A meta-analysis of thromboembolic prophylaxis in total knee arthroplasty. *Journal of Arthroplasty*. 2001; 16: 293-300.

¹³⁷ Mantilla CB, Horlocker TT, Schroeder DR et al. Frequency of myocardial infarction, pulmonary embolism, deep venous thrombosis, and death following primary hip or knee arthroplasty. *Anesthesiology*. 2002; 95(5): 1140-46.

¹³⁸ Ibid.

¹³⁹ Seagroatt V, Tan HS, Goldacre M, et al. Elective total hip replacement: incidence, emergency readmission rate and postoperative mortality. *British Medical Journal*. 1991; 303: 1431-35.

¹⁴⁰ Lie SA, Engesaeter LB, Havelin LI et al. Mortality after total hip replacement. *Acta Orthopaedica Scandinavica*. 2000; 71(11): 19-27.

¹⁴¹ Williams O, Fitzpatrick R, Shakoor H et al. Mortality, morbidity, and 1-year outcomes of primary elective total hip arthroplasty. *Journal of Arthroplasty*. 2002; 17(2): 165-71.

¹⁴² Salmon P, Mall GM, Peerbhoy D et al. Recovery from hip and knee arthroplasty: patients' perspective on pain, function, quality of life, and well-being up to 6 months postoperatively. *Archives of Physical Medicine & Rehabilitation*. 2001; 82: 360-6.

have shown that the patient and surgeon perspective on outcomes can diverge significantly.¹⁴³

Numerous measurement tools have been developed to assess patient outcomes.¹⁴⁴ With respect to total joint replacement, several instruments have been developed, validated and utilized over a long period of time. These include the Western Ontario and McMaster University (WOMAC) Index and the SF-36. Some of these instruments are staff-administered and some are completed independently by the patient. Many comparative tests of the measurement tools have been run. For example, the Harris Hip Score has been shown to be very reliable as a test of THR outcomes, and consistent with results from WOMAC and SF-36.¹⁴⁵

Measured over the first 3 postoperative months, and often continuing up to 12 months, the short-term outcomes for THR and TKR have been very positive. Improvements can be noticed at an early stage, though one study showed that steady progress was more pronounced for hips than knees, and significantly so by 6 months.^{146,147} Another study demonstrated that most pain relief for hip replacement was already in place by 3 months, but that it took a complete year to reach the full benefit in improved function. At 12 months, the WOMAC scores for pain, stiffness and physical function had all almost doubled¹⁴⁸ over the preoperative levels.^{149,150} Notably, these positive results are maintained for THR performed on patients 75 years and older,¹⁵¹ and they are observed regardless of the underlying cause (OA, RA, etc.).¹⁵² An Irish prospective study showed a 95% satisfaction rate for THR at 9 to 12 months.¹⁵³

¹⁴³ Brokelman RBG, van Loon CJM, Rijnberg WJ. Patient versus surgeon satisfaction after total hip arthroplasty. *Journal of Bone & Joint Surgery—British Volume*. 2003; 85-B: 495-8.

¹⁴⁴ Gill TM, Feinstein AR. A critical appraisal of the quality-of-life measurements. *Journal of the American Medical Association*. 1994; 272: 619-626.

¹⁴⁵ Soderman P, Malchau H. Is the Harris hip score system useful to study outcome of total hip replacement? *Clinical Orthopaedics & Related Research*. 2001; (384): 189-97.

¹⁴⁶ Jones CA, Voaklander DC, Johnston WC, Suarez-Almazor ME. Health related quality of life outcomes after total hip and knee arthroplasties in a community based population. *Journal of Rheumatology*. 2000; 27(7): 1745-52.

¹⁴⁷ Williamson OD. Measuring the success of joint replacement surgery. *Medical Journal of Australia*. 1999; 171: 229-230.

¹⁴⁸ Higher WOMAC scores register more positive results.

¹⁴⁹ Nisdotter AK, Lohmander LS. Age and waiting time as predictors of outcome after total hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(11): 1261-7.

¹⁵⁰ Laupacis A, Bourne R, Rorabeck C et al. The effect of elective total hip replacement on health-related quality of life. *Journal of Bone & Joint Surgery—American Volume*. 1993; 75(11): 1619-26

¹⁵¹ Healy, W. Hip implant selection for total hip arthroplasty in elderly patients. *Clinical Orthopaedics & Related Research*. 2002; 1(405): 54-64.

¹⁵² Kirwan JR, Currey HLF, Freeman MAR, et al. Overall long-term impact of total hip and knee joint replacement surgery on patients with osteoarthritis and rheumatoid arthritis. *British Journal of Rheumatology*. 1994; 33: 357-60.

¹⁵³ O'Connell T, Browne C, Corcoran R, Howell F. Quality of life following total hip replacement. *Irish Medical Journal*. 2000; 93(4): 108-110.

Not all TJR patients have complete satisfaction with the procedure. The following concerns have been expressed: moderate or severe pain, pain interfering with work, difficulty in basic life tasks, severe walking restrictions and limping most of the time.¹⁵⁴ These problems seem to be more prevalent in certain patient subgroups, in particular those with co-morbidities. Suggestions to improve the outcomes in such situations include performing surgery earlier in the life of the patient¹⁵⁵ or more extensive postoperative rehabilitation.¹⁵⁶

Total knee replacement surgery shows positive short-term results, though not always as great as that seen for hip replacement. In one case, the WOMAC scores for TKR at 12 months showed a 53% reduction in pain and 43% for stiffness, with function scores also improved by 43%.¹⁵⁷ A community-based study of outcomes for TKR was very positive: persistent relief of pain and improved physical function two to seven years post-operatively.¹⁵⁸ A very useful study compared two groups of patients undergoing TJR, with one group presenting with more pain and less function than the other; the former group showed markedly less improvement 6 months postoperatively. The results suggest that surgery performed later in the natural history of hip and (especially) knee OA, with concomitant functional decline, results in worse postoperative results. This has implications for traditional orthopaedic practice, which once aimed “to delay surgery until pain and functional limitation are intolerable.”¹⁵⁹ The application of such results to the issue of waiting lists will be further explored below.

Long-Term Outcomes

Long term analyses have mostly involved measuring prosthetic survival rates (to put it positively) or revision rates (to put it negatively). A multitude of studies have been performed, partly driven by the need to assess the wide range of implants now on the market.

Prosthetic failure in the long term is normally due to loosening between the bone and the implant, which can be exacerbated by wear over the years, whereby wear particles may cause bone loss and erosion. This is a serious outcome, as the revision surgery that is usually required to repair a failed joint is both more expensive and less effective than the original TJR. As a comparison with figures provided earlier in this report, one large national study showed the revision operations done between 1995 and 1998 represented 1 in 6 of all THRs, and were mainly necessitated by loosening (67%), dislocation (12%) and deep infection (11%).¹⁶⁰

¹⁵⁴ Williams O, Fitzpatrick R, Shakoor H et al. Mortality, morbidity, and 1-year outcomes of primary elective total hip arthroplasty. *Journal of Arthroplasty*. 2002; 17(2): 165-71.

¹⁵⁵ Hopman WM, Mantle M, Towhead TE. Determinants of health-related quality of life following elective total hip replacement. *American Journal of Medical Quality*. 1999; 14(3): 110-6.

¹⁵⁶ Trudelle-Jackson E, Emerson R, Smith S. Outcomes of total hip arthroplasty: a study of patients one year postsurgery. *Journal of Orthopaedic & Sports Therapy*. 2002; 32(6): 260-267.

¹⁵⁷ Bachmeier CJ, March LM, Cross MJ et al. A comparison of outcomes in osteoarthritis patients undergoing total hip and knee replacement surgery. *Osteoarthritis Cartilage*. 2001; 9(2): 137-46.

¹⁵⁸ Hawker G, Wright J, Coyte P et al. Health-related quality of life after knee replacement. *Journal of Bone & Joint Surgery—American Volume*. 1998; 80-A(2): 163-173.

¹⁵⁹ Fortin PR, Clarke AE, Joseph L et al. Outcomes of total hip and knee replacement—preoperative functional status predicts outcomes at six months after surgery. *Arthritis & Rheumatism*. 1999; 42(8): 1722-1728.

¹⁶⁰ Lucht U. The Danish Hip Arthroplasty Register. *Acta Orthopaedica Scandinavica*. 2000; 71(5): 433-39.

The good news is that most implants perform very well. In a large study of THR in Sweden, the survival rate for all prostheses was 93% after 10 years.¹⁶¹ Some of the same researchers noted that the incidence of revision has decreased by a factor of 3 times over the past 15 years, to less than 3% at 10 years. They observed that the effectiveness of the selected surgical technique is the most important factor for reducing the risk of revision, followed by the choice of implant.¹⁶² Incredibly, even after 20 years, the survival rate reported for the original Charnley prosthesis was still 83%.¹⁶³ Large-scale studies^{164,165} form a baseline to compare similar results in smaller national settings.¹⁶⁶

Possibly of more importance to patients than revision rates (except those who, as their first concern, are seeking to avoid another operation), was the generally strong health enjoyed up to 10 years following THR. The average normalized WOMAC score had dropped from a high of 74 in year 2 only as far as 63 in year 10 (for comparison, the Harris Hip Score dropped from 90 to 81). Most of this loss related to reduced function due to ageing.

Total knee replacement shows similar positive long-term outcomes, including implant durability. The 5-year survival of the 6 most-used prostheses in Norway was shown to vary between 95% and 99%, depending on the model.¹⁶⁷ Similarly, a British study showed uncemented and cemented implants had an equal survival rate at 10 years of just over 95%.¹⁶⁸ The revision rate at 4 years determined by a meta-analysis was 3.8%.¹⁶⁹

The outcomes of revision surgery for the knee are more mixed. A meta-analysis of the literature from 1966 to 2000 showed that the results of revision TKR were satisfactory, with significant relief of pain and improvement in function. Comparing

¹⁶¹ Soderman P, Malchau H, Herberts P et al. Outcome after total hip arthroplasty Part I. General health evaluation in relation to definition of failure in the Swedish National Hip Arthroplasty Register. *Acta Orthopaedica Scandinavica*. 2000; 71(4) 354-59.

¹⁶² Herberts P, Malchau H. Long-term registration has improved the quality of hip replacement: a review of the Swedish THR Register comparing 160,000 cases. *Acta Orthopaedica Scandinavica*. 2000; 71(2): 111-21.

¹⁶³ Older, J. Charnley low-friction arthroplasty: a world-wide retrospective review at 15 to 20 years. *Journal of Arthroplasty*. 2002; 17(6): 675-80. An upcoming report shows that many patients are functioning well 30 years after receiving their Charnley implant; two-thirds of the living patients in the study were still using their original prosthesis after a minimum of 25 years. Available at <http://www.aaos.org>.

¹⁶⁴ Garelick G, Malchau H, Herberts P. Survival of hip replacements: a comparison of a randomized trial and a registry. *Clinical Orthopaedics & Related Research*. 2000; (375): 157-67

¹⁶⁵ Havelin L, Engesaeter LB, Espehaug B et al. The Norwegian Arthroplasty Register: 11 years and 73,000 arthroplasties. *Acta Orthopaedica Scandinavica*. 2000; 71(4): 337-53.

¹⁶⁶ For example, Franklin J, Robertsson O, Gestsson et al. Revision and complication rates in 654 Exeter total hip replacements, with a maximum follow-up of 20 years. *BMC Musculoskeletal Disorders*. 2003; 4(6).

¹⁶⁷ Furnes O, Espehaug B, Lie SA et al. Early failure among 7,174 total knee replacements: a follow-up study from the Norwegian Arthroplasty Register 1994-2000. *Acta Orthopaedica Scandinavica*. 2002; 73(2): 117-129.

¹⁶⁸ Khaw FM, Morris RW, Gregg PJ et al. Cementless and cemented implants had similar survival in total knee replacement. *Journal of Bone & Joint Surgery—American Volume*. 2003; 85-A(5): 973.

¹⁶⁹ Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following tricompartmental total knee replacement. A meta-analysis. *Journal of the American Medical Association*. 1994; 271: 1349-57.

preoperative and postoperative status, knee scores sometimes more than doubled.¹⁷⁰ As has been noted earlier, though, there remains a substantially higher rate of prosthesis failure and infection in revision surgery.¹⁷¹ Likewise, the satisfaction has been generally poorer than that following primary surgery, scoring from 37 to 89% lower over a series of TKR studies.¹⁷² One recent study actually drew a different conclusion, namely, finding that revision TKR outcomes at 6 to 12 months were comparable to primary TKR.¹⁷³

Summary

Of course, TJR outcomes are not uniform. Many patient characteristics have been studied, alongside factors such as implant model and surgical technique, to identify predictors of TJR results. For example, one study concluded that the best functional outcomes and prosthesis survival rates in THR are found among patients who were 45-75 years old, weighed less than 70 kg, had strong social support and a higher educational level, and started off at a higher preoperative status.¹⁷⁴

However, observed variations do not take away from the general results, which show significant improvement over a long period for the wide majority of patients. Indeed, a 1994 synthesis of 130 outcome studies concluded that TKR was both safe and effective.¹⁷⁵ Likewise, the recently published consensus statement on TKR by the U.S. National Institute of Health notes a substantial improvement in pain, functional status and overall quality of life in about 90% of patients.¹⁷⁶ In a 2002 paper, O'Shea et al. summed up the general opinion: "Few, if any, procedures can compare with the immediacy and degree of improvement in the quality of life experienced by those who undergo total joint replacement".¹⁷⁷

¹⁷⁰ Saleh, KJ, Dykes DC, Tweedie RL et al. Functional outcome after total knee arthroplasty revision: a meta-analysis. *Journal of Arthroplasty*. 17(8): 967-77.

¹⁷¹ Saleh KJ, Rand JA, McQueen DA. Current status of revision total knee arthroplasty: how do we assess results? *Journal of Bone & Joint Surgery—American Volume*. 2003; Supplement 1: 18-20. Re-revision rates of 13% compare with 7-9% revision rates for TKR. Saleh, KJ, Dykes DC, Tweedie RL et al. Functional outcome after total knee arthroplasty revision: a meta-analysis. *Journal of Arthroplasty*. 17(8): 967-77.

¹⁷² Hartley RC, Barton-Hanson NG, Finley R, Parkinson RW. Early patient outcomes after primary and revision total knee arthroplasty. *Journal of Bone & Joint Surgery—British Volume*. 2002; 84-B: 994-9.

¹⁷³ Ibid.

¹⁷⁴ Young NL, Cheah D, Waddell JP, Wright JG. Patient characteristics that affect the outcome of total hip arthroplasty: A review. *Canadian Journal of Surgery*. 1998; 41(3): 188-195. Compare the results of an upcoming epidemiological study showing higher rates of mortality and complications for primary and revision TKR with increasing age, male gender and lower income. Available at <http://www.aaos.org>

¹⁷⁵ Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following tricompartmental total knee replacement. A meta-analysis. *Journal of the American Medical Association*. 1994; 271: 1349-57.

¹⁷⁶ National Institute of Health. *Consensus Statement on Total Knee Replacement*. Feb. 17, 2004 Available at <http://consensus.nih.gov/cons>. Also reviewed in Vastag B. Knee replacement underused, says panel. *Journal of the American Medical Association*. Jan. 28, 2004; 291(4): 413-4.

¹⁷⁷ O'Shea K, Bale E, Murray P. Cost Analysis of Primary Total Hip Replacement. *Irish Medical Journal*. 2002; 95(6): 177-80.

Economic Evaluation of Joint Replacement

In health care, the concern which parallels effectiveness is the concept of cost-effectiveness. We live in an era where these twin evidence pillars dominate the landscape of medical decision-making. Having just reviewed the effectiveness of the procedure, we now marshal the economic data related to TJR.

As with any question in the realm of health economics, the matter of costs related to TJR is complex. Ideally, a thorough analysis would include direct, indirect and intangible costs.¹⁷⁸ Direct costs include the personnel, supplies, facility and even patient costs (such as travel) explicitly connected to the intervention. These are the costs that have figured in most TJR cost-effectiveness studies. Indirect costs include those connected to lost productivity. Intangible costs attempt to evaluate the reductions in quality of life associated with pain and suffering. These costs are often incorporated in the summary measurement known as a quality-adjusted life year (QALY).¹⁷⁹ Finally, the “downstream costs” associated with TJR need to be included, such as readmission for dislocation, infection and revision surgery. The complication and revision rates discussed above enter in to these calculations.

While numerous studies touch on the issue of the cost-effectiveness of TJR, relatively few are considered to be comprehensive in their analysis. Economic evaluations in the area of TKR¹⁸⁰ and THR¹⁸¹ often have methodological weaknesses; this same concern has been raised about orthopaedic surgery in general.¹⁸² The two evaluations of TJR considered to be the most comprehensive¹⁸³ were conducted by Liang and co-authors in 1986¹⁸⁴ and by Chang and colleagues in 1996.¹⁸⁵

The study by Liang et al. concluded that both hip and knee arthroplasty are more cost-effective for patients with *poor* preoperative health-related quality of life than for those with better preoperative health status. The study by Chang et al. performed a sophisticated cost-utility analysis of THR for osteoarthritis of the hip. They employed a stochastic tree decision analytic model (for modeling the probability of events over time), took into account both short- and long-term outcomes and employed detailed hospital cost-accounting data. Their conclusion was that THR for OA is cost-effective even under very conservative assumptions. Indeed, the cost per QALY of \$6,100 is superior to the cost per QALY for coronary artery bypass surgery (\$8,100 per QALY) and renal dialysis (\$59,400 per life year gained), both of which are routinely provided medical procedures. The most impressive results are for a base-case scenario of a 60-year-old white women, where the procedure is actually

¹⁷⁸ Bozic KJ, Rosenberg AG, Huckman RS, Herndon JH. Economic evaluation in orthopaedics. *Journal of Bone and Joint Surgery—American Volume*. 2003; 85-A(1): 129-42.

¹⁷⁹ A year of life adjusted for its quality or its value. A year in perfect health is considered equal to 1.0 QALY.

¹⁸⁰ Saleh KJ, Gafni A, Macauley WB. Understanding economic evaluations: a review of the knee arthroplasty literature. *American Journal of Knee Surgery*. 1999; 12:155-160.

¹⁸¹ Saleh KJ, Gafni A, Saleh L et al. Economic evaluations in the hip arthroplasty literature. *Journal of Arthroplasty*. 1999; 14(5): 527-532.

¹⁸² Brauer CA, Rosen AB, Olchanski NV et al. Cost-utility analyses in orthopaedic surgery. *Journal of Bone & Joint Surgery - American Volume*. 2005; 87(6): 1253-9.

¹⁸³ Bozic KJ, Rosenberg AG, Huckman RS, Herndon JH. Economic evaluation in orthopaedics. *Journal of Bone & Joint Surgery—American Volume*. 2003; 85-A(1): 129-42.

¹⁸⁴ Liang MH, Cullen KE, Larson MG, et al. Cost-effectiveness of total joint arthroplasty in osteoarthritis *Arthritis and Rheumatism* 1986; 29(8): 937-943.

¹⁸⁵ Chang RW, Pellisier, JM, Hazen, GB. A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip. *Journal of the American Medical Association*. 1996; 275(11):858-865.

cost-saving compared with the expensive custodial care when a person becomes dependent due to worsening hip OA.

The most comprehensive Canadian study was completed by Laupacis and colleagues in 1994.¹⁸⁶ This study, using a detailed methodology, estimated post-operative outcomes and costs for three years after scheduled hip arthroplasty. They estimated the cost per QALY to be \$8,031 during the first three years post-surgery.

While other cost-effectiveness studies have not been as comprehensive or methodologically rigorous, they do tend to confirm the findings of these three studies: namely, that TJR is strongly cost-effective within the spectrum of medical treatments and that both total hip replacement^{187,188,189} and total knee replacement^{190,191,192} surgeries, and even the more expensive revision surgeries,¹⁹³ are very effective at a relatively modest cost to society.

The study by Chang et al. cited above underlines the even more dramatic possibility of TJR being cost-saving in comparison with conservative interventions or with the long-term care required as a result of surgical delays. The authors note that “there are many instances when [total hip arthroplasty] may reduce societal lifetime costs....”¹⁹⁴ It is difficult to demonstrate the full extent of this result. Garellick and colleagues note that if it were possible to account for the opportunity costs to the patient who does not have surgery (e.g. analgesics, home or residential care, special transport services, income support), then the cost utility of TJR would rank even higher.¹⁹⁵

¹⁸⁶ Laupacis A, Bourne R, Rorabeck C et al. Costs of total hip arthroplasty during the first year: cemented versus noncemented. *Journal of Arthroplasty*. 1994; 9(5): 481-7.

¹⁸⁷ O’Shea K, Bale E, Murray P. Cost Analysis of Primary Total Hip Replacement. *Irish Medical Journal*. 2002; 95(6): 177-80.

¹⁸⁸ Garellick G, Malchau H, Herberts P et al. Life expectancy and cost utility after total hip replacement. *Clinical Orthopaedics & Related Research*. 1998; (346): 141-151.

¹⁸⁹ Rissanen P, Aro S, Sintonen H et al. Costs and cost-effectiveness in hip and knee replacements. A prospective study. *International Journal of Technology Assessment in Health Care*. 1997; 13(4): 575-88.

¹⁹⁰ Lavernia CJ, Guzman JF, Gachupin A. Cost effectiveness and quality of life in knee arthroplasty. *Clinical Orthopaedics & Related Research*. 1997; 1(345): 134-139.

¹⁹¹ Rorabeck CH, Murray P. The cost benefit of total knee arthroplasty. *Orthopedics*. 1996; 19(9): 777-9.

¹⁹² Hirsch HS. Total joint replacement: a cost-effective procedure for the 1990s. *Medicine & Health Rhode Island*. 1998; 81(5): 162-4.

¹⁹³ Rorabeck CH, Murray P. Cost effectiveness of revision total knee replacement. *Instructional Course Lectures*. 1997; 46: 237-40.

¹⁹⁴ Chang RW, Pellisier, JM, Hazen, GB. A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip. *Journal of the American Medical Association*. 1996; 275(11):858-865.

¹⁹⁵ Garellick G, Malchau H, Herberts P et al. Life expectancy and cost utility after total hip replacement. *Clinical Orthopaedics & Related Research*. 1998; (346): 141-151.

Optimizing the Timing for Joint Replacement

There are a variety of compelling arguments to effectively manage hip and knee waiting lists and ensure that the timing of operations with respect to the underlying disease course is optimal. As we will see, these goals will be best expressed through providing surgical care as early as possible, which probably will mean providing a higher rate of surgery. We will begin by examining the reasons for increasing the number of TJRs anyway, independent of timing considerations. Although wanting to embrace the spirit of cooperation between different aspects of health care in allocating resources and managing waiting lists, it is difficult not to acknowledge the *unique* position occupied by hip and knee replacement among the various medical interventions.

Before turning to specific indicators for prioritization and benchmarks, it is clear that there are general arguments in the literature for timely (i.e., as early as possible) hip and knee replacements; furthermore, the procedures in question have *independent* support that goes beyond timing (such as unique benefits and unique demand).

Powerful Outcomes at a Reasonable Cost

Two features have already been well-demonstrated: the procedures are highly effective in terms of outcomes (a factor especially attractive to patients and physicians) and also highly cost-effective (a factor especially attractive to health care planners). Indeed, it has been suggested that the only medical intervention which is more cost effective than total joint replacement is the treatment of pneumococcal pneumonia with oral penicillin.¹⁹⁶ Whether or not this claim stands up, what seems to be clear is that, under certain conditions, hip replacement in particular appears to be *cost saving*.

Economics aside, there is a rationale that stands out among the reasons to reduce the number of people waiting and the wait time for total joint replacement. Simply put, in order to minimize the duration of suffering and disability we ought to expose as many people as possible to this effective surgery as soon as possible. Naylor and Slaughter emphasized this point: “Beyond debates about how many are waiting and for how long, the underlying issue is the burden of delay—namely, the years with impaired quality of life.”¹⁹⁷

Enhanced Efficiencies

Many efficiencies and cost containment measures are being pursued in the area of hip and knee replacement procedures, some of which have already proven successful. These include improved clinical pathways, discharge planning and rehabilitation access; better management of prosthetic purchasing; and the use of regional or specialized surgical centres with a quality track record. Technological change, though sometimes a driver of demand (see below), may also save money. For example, minimal access and computer-assisted surgery is being explored, as well as prosthetic devices that will last even longer, thus obviating the need for expensive

¹⁹⁶ The Department of Orthopaedics sponsors the Gill Lecture at the Philadelphia Orthopaedic Society. *University of Pennsylvania Orthopaedic Journal*. 2000; 13: 97.

¹⁹⁷ Naylor CD, Slaughter PM. A stitch in time: case for assessing the burden of delayed surgery. *Quality in Health Care*. 1994; 3(4): 221-4.

revision procedures.¹⁹⁸ The real potential for enhancements in hip and knee replacement procedures promotes them as attractive areas of health care to encourage.

Unusual Demand and Unmet Need

The preceding factors begin to explain another aspect of TJR, namely, the fact that there is a unique and increasing demand for these procedures in developed countries.

We noted earlier that the age-standardized rate for hip and knee replacement procedures in Canada has increased by 11% and 50%, respectively, during the last decade. Similar increases have been observed in many other countries.^{199,200,201,202} What factors are influencing this increasing demand?

Whatever the various influences and trends, the fact that the elderly dominate in the world of joint replacements is not going to change soon. Indeed, with an ageing population in all parts of the developed world, the upward pressure on rates of joint replacement among the elderly is only going to increase. Numerous studies have indicated that current needs in the area of hip and knee replacement surgery are not being met, with projected increases only promising to make matters worse.^{203,204,205,206,207,208,209}

Clearly, changes in the age structure of developed nations and the diseases associated with ageing, in particular osteoarthritis, are important contributors to the increased volume of operations performed. However, evidence from a number of countries confirms that the increasing rate of hip and knee replacement operations is only

¹⁹⁸ *Computer-assisted Hip and Knee Arthroplasty: Navigation and Active Robotic Systems*. Toronto: Ministry of Health and Long-term Care; 2004.

¹⁹⁹ Kurtz S, Mowat F, Ong K, et al. Prevalence of primary and revision total hip and knee arthroplasty in the United States from 1990 through 2002. *Journal of Bone and Joint Surgery*. 2005; 87(7): 1487-97.

²⁰⁰ Wells V, Hearn T, McCaul K, et al. Changing incidence of primary total hip arthroplasty and total knee arthroplasty for primary osteoarthritis. *The Journal of Arthroplasty*. 2002; 17(3): 267-273.

²⁰¹ Ostendorf M, Johnell O, Malchau H, et al. The epidemiology of total hip replacement in the Netherlands and Sweden: Present status and future needs. *Acta Orthop Scand*. 2002; 73(3): 282-86.

²⁰² Ingvarsson T, Hagglund G, Jonsson H, Lohmander L. Incidence of total hip replacement for primary osteoarthritis in Iceland 1982-1996. *Acta Orthop Scand*. 1999; 70(3): 229-33.

²⁰³ Katz, J. Preferences, quality and the (under)utilization of total joint arthroplasty. *Medical Care*. 2001; 39(3): 203-205.

²⁰⁴ Ostendorf M, Johnell O, Malchau H et al. The epidemiology of total hip replacement in the Netherlands and Sweden: present status and future needs. *Acta Orthopaedica Scandinavica*. 2002; 73(2): 282-286.

²⁰⁵ Holland R, Harvey I. Population needs assessment and knee replacement surgery. *Rheumatology*. 2003; 42: 503-506.

²⁰⁶ Merx H, Dreinhofer K, Shrader P et al. International variation in hip replacement rates. *Annals of the Rheumatic Diseases*. 2003; 62: 222-226.

²⁰⁷ Birrell F, Johnell O, Silman A. Projecting the need for hip replacement over the next three decades: influence of changing demography and threshold for surgery. *Annals of the Rheumatic Diseases*. 1999; 58(9): 569-72.

²⁰⁸ Juni, P, Dieppe, P, Donovan J, et al. Population requirement for primary knee replacement surgery: a cross-sectional study. *Rheumatology*. 2003; 42: 516-521.

²⁰⁹ Frankel S, Eachus J, Pearson N et al. Population requirement for primary hip-replacement surgery: a cross-sectional study. *The Lancet*. 1999; 353: 1304-1309.

partially explained by demographic shifts such as population growth and ageing.^{210,211,212}

Holland and Harvey note that projecting demand for knee replacement surgery based on demographic shifts is “likely to be an underestimate of need as at least three further factors are particularly important: changing population demand for interventions enhancing quality of life; improving anesthetic and surgical techniques, widening the scope of those able to benefit; and an increasingly obese population, likely to result in a greater prevalence of severe osteoarthritis.”²¹³

When adding together the demographic / disease pressure, the growing usefulness of the operation for younger patients, patient’s willingness to receive the surgery and the growing number of revision procedures, the conclusion is clear: more people will need THR and TKR in Canada, more people will want it, and higher surgical rates will likely be called for, placing further stresses on the system and increasing demands for better wait-list management.

Just what are the various non-demographic factors and potential rate drivers which may influence demand for TJR in the future?

Personal Preference

Patient preferences can play a major role in shaping demand for surgery.²¹⁴ Juni and colleagues found that approximately one third of patients requiring TKR surgery would not accept the procedure.²¹⁵ The “resistance rate” may even be higher. A Canadian study published in 2001 showed that, among those with severe arthritis, only 15% were definitely willing to undergo TJR.²¹⁶ This means that there likely is a large pool of unmet need for joint replacement.

A reluctance to pursue joint replacement surgery has been noted particularly among women.²¹⁷ But expectations for preserved health and mobility may be increasing,

²¹⁰ Ostendorf M, Johnell O, Malchau H et al. The epidemiology of total hip replacement in the Netherlands and Sweden. *Acta Orthopaedica Scandinavica*. 2002; 73(2): 282-286.

²¹¹ Wells VM, Hearn TC, McCaul KA et al. Changing incidence of total hip arthroplasty and total knee arthroplasty for primary osteoarthritis. *Journal of Arthroplasty*. 2002; 17(3): 267-73.

²¹² Parsons IM, Sonnabend DH. What is the role of joint replacement surgery? *Best Practices & Research Clinical Rheumatology*. 2004; 18(4): 557-72.

²¹³ Holland R, Harvey I. Population needs assessment and knee replacement surgery. *Rheumatology*. 2003; 42: 503-506.

²¹⁴ Hudak PL, Clark JP, Hawker GA et al. “You’re perfect for the procedure! Why don’t you want it?” Elderly patient’s unwillingness to consider total joint arthroplasty surgery: a qualitative study. *Medical Decision Making*. 2002 ; 22: 272-278.

²¹⁵ Juni, P, Dieppe, P, Donovan J et al. Population requirement for primary knee replacement surgery: a cross-sectional study. *Rheumatology*. 2003; 42: 516-521.

²¹⁶ Hawker GA, Wright JG, Coyte PC et al. Determining the need for hip and knee arthroplasty: the role of clinical severity and patients’ preferences. *Medical Care*. 2001; 39(3): 206-16. A just-published report notes that among those with potential need for TKR, only 13% of women and 9% of men expressed a definite willingness to undergo the procedure. See National Institute of Health. *Consensus Statement on Total Knee Replacement*. Feb. 17, 2004. Source: <http://consensus.nih.gov/cons>. Also reviewed in Vastag B. Knee replacement underused, says panel. *Journal of the American Medical Association*. 2004; 291(4): 413-4.

²¹⁷ Hawker GA, Wright JG, Coyte PC et al. Differences between men and women in the rate of use of hip and knee arthroplasty. *New England Journal of Medicine*. 2000; 342(14): 1016-22.

especially among younger patients with arthritis.^{218,219} *Continued changes in patient preferences could significantly impact the demand for these procedures.* In a 2001 paper, Hawker et al. emphasized: “clinical and policy decisions determining the rates of use of a procedure that are based solely on estimates of demonstrable need, rather than on what patients want, will be inaccurate.”²²⁰

Changes in Attitudes

There are a number of attitudinal changes that could increase the interest of patients in TJR, including those who are women or older or both.^{221,222,223,224}

- Leaving behind the perception that arthritis is a normal part of ageing, with little relief available.
- Not overestimating the pain and disability needed to warrant total joint replacement.
- Not letting the perception of inordinate waiting lists and rationing get in the way.
- Not passively waiting for physicians to offer surgery.
- Not considering oneself ineligible for surgery because of age, weight or other chronic conditions.
- Not making assumptions that only surgery at a younger age is worthwhile.
- Not erroneously believing that TKR, in particular, has a low success rate.
- Creating a better match between expectations and realistic results of surgery.^{225,226,227,228,229}

²¹⁸ Wells VM, Hearn TC, McCaul KA et al. Changing incidence of total hip arthroplasty and total knee arthroplasty for primary osteoarthritis. *Journal of Arthroplasty*. 2002; 17(3): 267-73.

²¹⁹ Parsons IM, Sonnabend DH. What is the role of joint replacement surgery? *Best Practices & Research Clinical Rheumatology*. 2004; 18(4): 557-72.

²²⁰ Hawker GA, Wright JG, Coyte PC et al. Determining the need for hip and knee arthroplasty: the role of clinical severity and patients' preferences. *Medical Care*. 2001; 39(3): 206-16.

²²¹ Sanders C, Donovan JL, Dieppe PA. Unmet need for joint replacement: a qualitative investigation of barriers to treatment among individuals with severe pain and disability of the hip and knee. *Rheumatology*. 2004; 43: 353-7.

²²² Clark JP, Hudak PL, Hawker GA et al. Wright JG. The moving target: a qualitative study of elderly patients' decision-making regarding total joint replacement surgery. *Journal of Bone & Joint Surgery - American Volume*. 2004; 86-A(7): 1366-74.

²²³ Hawker GA, Wright JG, Badley EM, Coyte PC. Perceptions of, and willingness to consider, total joint arthroplasty in a population-based cohort of individuals with disabling hip and knee arthritis. *Arthritis & Rheumatism*. 2004; 51(4): 635-41.

²²⁴ Dominick KL, Ahern FM, Gold CH, Heller DA. Health-related quality of life and health service use among older adults with osteoarthritis. *Arthritis & Rheumatism*. 2004; 51(3): 326-31.

²²⁵ Mahomed NN, Liang MH, Cook EF et al. The importance of patient expectations in predicting functional outcomes after total joint arthroplasty. *Journal of Rheumatology*. 2002; 29(6): 1273-9.

²²⁶ Mancuso CA, Sculco TP, Salvati EA. Patients with poor preoperative functional status have high expectations of total hip arthroplasty. *Journal of Arthroplasty*. 2003; 18(7): 872-8.

²²⁷ Mancuso CA, Sculco TP, Wickiewicz TL et al. Patients' expectations of knee surgery. *Journal of Bone & Joint Surgery - American Volume*. 2001; 83-A(7): 1005-12.

²²⁸ Lieberman JR, Thomas BJ, Finerman GA et al. Patients' reasons for undergoing total hip arthroplasty can change over time. *Journal of Arthroplasty*. 2003; 18(1): 63-8.

²²⁹ Dolin SJ, Williams AC, Ashford N et al. Factors affecting medical decision-making in patients with osteoarthritis of the hip: allocation of surgical priority. *Disability & Rehabilitation*. 2003; 25(14): 771-7.

Technological Change, Surgical Improvement & Physician Behaviour

Another important reason for the increased demand for TJR is new and / or improved techniques and technologies. The *Arthritis in Canada* report suggested that “the emergence of...improved surgical tools for the treatment of arthritis will likely increase the demand for surgery.”²³⁰ This may work through the mechanism of enhanced patient preference (see preceding section), but the dominant effect will probably be reflected in TJR being actively offered by medical professionals to a wider selection of patients. It is certainly known that a portion of this “wider selection” involves younger people, but it also includes the elderly.²³¹

Younger Patients

Historically, few patients under the age of 60 received TJR. Younger, more physically active people tended to strain the artificial joint, causing it to fail prematurely. Thus, it was much more common to recommend alternate surgical procedures for those under age 60. More recently, due to technological improvements in the prosthetic devices which allow them to withstand more stress, a greater number of younger patients are receiving a TJR.²³² Another possible factor is the greater number of younger patients seeing surgeons for newer procedures such as arthroscopic diagnosis, leading to more recommendations for joint replacement.

In Australia, for instance, Wells and co-authors noted a statistically significant increase in the incidence of knee replacement surgery for the age group from 45-60 between 1988 and 1998. The incidence for age 55-59 was about 6 times higher at the end of the 10-year period.²³³

Older Patients

Wells and co-authors also found a significant increase in the incidence of TKR in the 85 plus age group.²³⁴ The incidence was 3.5 times higher at the end of the 10-year period.

Current “Catch-up”

There is a “catch-up” factor potentially in play when determining surgery needs. A British study referred to the resistance to using TKR until recent surgical and technological improvements; now the “prevalence pool” is large, with 2,000 people out of every 100,000 over age 55 possibly able to benefit from the surgery.²³⁵ This compares with the normal surgery rate of around 100 per 100,000.²³⁶ The theory is

²³⁰ Health Canada. *Arthritis in Canada. An Ongoing Challenge*. Ottawa: Health Canada; 2003, p. 91.

²³¹ Ostendorf M, Johnell O, Malchau H et al. The epidemiology of total hip replacement in the Netherlands and Sweden. *Acta Orthopaedica Scandinavica*. 2002; 73(2): 282-286.

²³² Interestingly, substantial changes in prosthesis performance have not actually been clearly seen. Parsons IM, Sonnabend DH. What is the role of joint replacement surgery? *Best Practices & Research Clinical Rheumatology*. 2004; 18(4): 557-72.

²³³ Wells VM, Hearn TC, McCaul KA et al. Changing incidence of total hip arthroplasty and total knee arthroplasty for primary osteoarthritis. *Journal of Arthroplasty*. 2002; 17(3): 267-73.

²³⁴ Wells VM, Hearn TC, McCaul KA et al. Changing incidence of total hip arthroplasty and total knee arthroplasty for primary osteoarthritis. *Journal of Arthroplasty*. 2002; 17(3): 267-73.

²³⁵ Tennant A, Fear J, Pickering A et al. Prevalence of knee problems in the population aged 55 years and over: identifying the need for knee arthroplasty. *British Medical Journal*. 1995; 310(6990): 1291-93.

²³⁶ Holland R, Harvey I. Population needs assessment and knee replacement surgery. *Rheumatology*. 2003; 42: 503-506.

that this temporary “bulge” in demand will eventually clear, given sufficient provision of surgical services.

Increased Longevity & Revision Rates

Another component influencing demand for TJR is revision surgery rates. There is evidence that both the number and complexity of revision operations is increasing.^{237,238} This most likely is the result of more joint replacements being done in younger patients, combined with overall increases in patient longevity; prostheses are being afforded more of an opportunity to wear out. The burden of revision surgery as a proportion of all joint replacements is increasing as successive generations of implants loosen, wear or otherwise fail.²³⁹

Increased Rates of Obesity

Obesity is associated with osteoarthritis as a co-morbidity, often leading to an exacerbation of disability, and most likely causative of the disease in the first place.^{240,241,242} The primary mechanisms for joint damage in obesity is thought to be biomechanical or systemic; in the latter case, extra adipose tissue may increase metabolites around joints, which act to break down cartilage. A 2004 study also reported that obesity was one of the influences in the genetic regulation of knee OA.²⁴³ The result of such effects is that “obesity is probably the leading modifiable risk factor of osteoarthritis.”²⁴⁴

A recent study concluded that the odds ratio of an OA sufferer being obese is 2.25.²⁴⁵ An interesting result from a 2004 paper was that a significant *weight change* may make people even more prone to OA requiring surgery than being persistently overweight. The odds ratio for those overweight from age 20 onward was 2.37, but over 3.00 if the person was normal weight at age 20 but overweight later.²⁴⁶

That obesity is a risk factor for severe knee osteoarthritis and TKR has been known for some time. For instance, one study concluded that if all overweight and obese people reduced their weight by 5 kg or until their body mass index (BMI) was within

²³⁷ Mahomed NN, Barrett JA, Katz JN et al. Rates and outcomes of primary and revision total hip replacement in the United States Medicare population. *Journal of Bone & Joint Surgery - American Volume*. 2003; 85-A(1): 27-32.

²³⁸ Barrack RL. The evolving cost spectrum of revision hip arthroplasty. *Orthopedics*. 1999;22(9):865-6.

²³⁹ Parsons IM, Sonnabend DH. What is the role of joint replacement surgery? *Best Practices & Research Clinical Rheumatology*. 2004; 18(4): 557-72.

²⁴⁰ Eaton CB. Obesity as a risk factor for osteoarthritis: mechanical versus metabolic. *Medicine & Health, Rhode Island*. 2004; 87(7): 201-4.

²⁴¹ Powell A, Teichtahl AJ, Wluka AE, Cicuttini FM. Obesity: a preventable risk factor for large joint osteoarthritis which may act through biomechanical factors. *British Journal of Sports Medicine*. 2005; 39: 4-5.

²⁴² Tsai WL, Yang CY, Lin SF, Fang FM. Impact of obesity on medical problems and quality of life in Taiwan. *American Journal of Epidemiology*. 2004; 160(6): 557-65.

²⁴³ Jones G, Ding C, Scott F, Cicuttini F. Genetic mechanisms of knee osteoarthritis: a population based case-control study. *Annals of the Rheumatic Diseases*. 2004; 63: 1255-9.

²⁴⁴ Conway B, Rene A. Obesity as a disease: no lightweight matter. *Obesity Reviews*. 2004; 5: 145-151.

²⁴⁵ Kadam UT, Jordan K, Croft PR. Clinical comorbidity in patients with osteoarthritis: a case-control study of general practice consultants in England and Wales. *Annals of the Rheumatic Diseases*. 2004; 63(4): 408-14.

²⁴⁶ Manninen P, Riihimake H, Heliövaara M, Suomalainen O. Weight changes and the risk of knee osteoarthritis requiring arthroplasty. *Annals of the Rheumatic Diseases*. 2005; 63: 1434-37.

the recommended range, 24% of knee replacement operations could be avoided.²⁴⁷ More recently, a study established that higher BMI also increased the risk of THR due to osteoarthritis. The risk of needing surgery was almost 3 times higher for BMI \geq 35 compared with a BMI $<$ 22. The results were even more dramatic when overweight at age 18.²⁴⁸

A long-term 2004 study also has shown a trend for obesity to increase the rate of aseptic loosening and the need for revision surgery, but this connection has not yet been fully proved.²⁴⁹ General outcomes of joint replacement in obese patients have been shown to be worse in some studies.²⁵⁰

Other Factors

New attitudes among physicians concerning the effectiveness and appropriateness of TJR for more patients (especially those with knee arthritis) may lead to more frequent referrals to specialist care. One study suggested that it was possible for general practitioners to discriminate against both older patients (thinking they have too many comorbidities) and younger patients (thinking they were not sufficiently disabled) in terms of considering surgery as an option.^{251,252}

There may also be a new political will to address any disparities in surgery rates due to socioeconomic status and education level (as have been identified in the UK and the US).^{253,254,255,256,257}

Operations available more quickly make them more attractive, so that potential patients do not self-select out of the queue (or die prematurely).

On the other hand, improved OA and RA non-surgical care may result in a reduced need for TJR in these patient populations. Successful prevention initiatives, such as reducing the prevalence of obesity, may also impact the incidence of, for example,

²⁴⁷ Coggon D, Reading I, Croft P et al. Knee osteoarthritis and obesity. *International Journal of Obesity & Related Metabolic Disorders*. 2001; 25(5): 622-7.

²⁴⁸ Karlson EW, Mandl LA, Aweh GN et al. Total hip replacement due to osteoarthritis: the importance of age, obesity, and other modifiable risk factors. *American Journal of Medicine*. 2003; 114(2): 93-8.

²⁴⁹ Foran JRH, Mont MA, Rajadhyaksha AD et al. Total knee arthroplasty in obese patients. *Journal of Arthroplasty*. 2004; 19(7): 817-24.

²⁵⁰ Foran JR, Mont MA, Etienne G et al. The outcome of total knee arthroplasty in obese patients. *Journal of Bone & Joint Surgery - American Volume*. 2004; 86-A(8): 1609-15.

²⁵¹ Sanders C, Donovan JL, Dieppe PA. Unmet need for joint replacement: a qualitative investigation of barriers to treatment among individuals with severe pain and disability of the hip and knee. *Rheumatology*. 2004; 43: 353-7.

²⁵² Linsell L, Dawson J, Zondervan K et al. Prospective study of elderly people comparing treatments following first primary care consultation for a symptomatic hip or knee. *Family Practice*. 2005; 22: 118-25.

²⁵³ Dixon T, Shaw M, Ebrahim S, Dieppe P. Trends in hip and knee joint replacement: socioeconomic inequalities and projections of need. *Annals of the Rheumatic Diseases*. 2004; 63: 825-30.

²⁵⁴ Milner PC, Payne JN, Stanfield RC et al. Inequalities in accessing hip joint replacement for people in need. *European Journal of Public Health*. 2004; 14: 58-62.

²⁵⁵ Yong PFK, Milner PC, Payne JN et al. Inequalities in access to knee joint replacements for people in need. *Annals of the Rheumatic Diseases*. 2004; 63: 1483-9.

²⁵⁶ Fitzpatrick R, Norquist JM, Reeves BC et al. Equity and need when waiting for total hip replacement surgery. *Journal of Evaluation in Clinical Practice*. 2004; 10: 3-9.

²⁵⁷ Hawker GA, Wright JG, Glazier RH et al. The effect of education and income on need and willingness to undergo total joint arthroplasty. *Arthritis & Rheumatism*. 2002; 46(12): 3331-9.

osteoarthritis, and the subsequent need for a TJR. Another countervailing force could involve immigration rates. The movement into a region of people from Asia, who have a lower risk of arthritis, might reduce overall health care needs.²⁵⁸ However, it is unlikely that such changes will attenuate the demand for joint replacement to any great extent.

Consequences of Delayed Surgery

We have already signalled another significant rationale for timely hip and knee replacement, namely, the fact that serious consequences follow any undue delays in providing surgery. These costs can be classified in terms of patient impacts in terms of poorer intervention outcomes, as well as burdens for the health care system and society as a whole.

Poorer Outcomes

There are two major markers of delay in providing hip and knee replacements: the patient is further along in the course of disease, or the patient is simply older. A number of recent studies concur that performing surgery earlier in the course of functional decline may be associated with better outcomes.^{259,260,261,262,263,264,265,266}

Papers presented at the Canadian Orthopaedic Association meetings in June, 2005, confirmed these results for hip replacement, in particular—demonstrating the value of “expedited access” to surgery.²⁶⁷ One study showed that patients undergoing THR within 6 months of referral realize greater gains in health-related quality of life and mobility than patients waiting more than 6 months. The authors concluded: “Clinically important losses in HRQOL and mobility occur in patients waiting more than 6 months.”²⁶⁸ Nilsdotter and Lohmander fine-tuned the time period, suggesting

²⁵⁸ Wang PP, Elsbett-Koeppen R, Geng G et al. Arthritis prevalence and place of birth: findings from the 1994 Canadian National Population Health Survey. *American Journal of Epidemiology*. 2000; 152(5): 442-5.

²⁵⁹ Fortin PR, Penrod JR, Clarke AE, et al. Timing of total joint replacement affects clinical outcomes among patients with osteoarthritis of the hip or knee. *Arthritis & Rheumatism*. 2002; 46(12): 3327-30.

²⁶⁰ Fortin PR, Clarke AE, Joseph L et al. Outcomes of total hip and knee replacement—preoperative functional status predicts outcomes at six months after surgery. *Arthritis & Rheumatism*. 1999; 42(8): 1722-1728.

²⁶¹ Holtzman J, Saleh K, Kane R. Effect of baseline functional status and pain on outcomes of total hip arthroplasty. *Journal of Bone & Joint Surgery—American Volume*. 2002; 84-A(11): 1942-8.

²⁶² Boutron I, Poiraudeau S, Ravaud JF, et al. Disability in adults with hip and knee arthroplasty: a French national community based survey. *Annals of the Rheumatic Diseases*. 2003; 62(8): 748-54.

²⁶³ Hajat S, Fitzpatrick R, Morris R et al. Does waiting for total hip replacement matter? *Journal of Health Services Research & Policy*. 2002; 7(1): 19-25. The conclusion from the latter paper: waiting for THR surgery is associated with worse outcomes at 12 months.

²⁶⁴ Kelly KD, Voaklander DC, Johnston DWC et al. Change in pain and function while waiting for major joint arthroplasty. *Journal of Arthroplasty*. 2001; 16(3): 351-9.

²⁶⁵ Compare the study on mental state in Croft P, Lewis M, Wynn Jones C et al. Health status in patients awaiting hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(9): 1001-7; and Brownlow HC, Benjamin S, Andrew JG, Kay P. Disability and mental health in patients waiting for total hip replacement. *Annals of the Royal College of Surgeons of England*. 2001; 83(2): 128-33.

²⁶⁶ Gidwani S, Tauro B, Whitehorse S, Newman JH. Do patients need to earn total knee arthroplasty? *Journal of Arthroplasty*. 2003; 18(2): 199-203.

²⁶⁷ Summaries available at http://www.coa-aco.org/Articles/Meetings/Montreal_2005/2005_FP_ENG_REV4.pdf. Accessed July 2005.

²⁶⁸ Mahon JL, Bourne RB, Rorabeck CH et al. Health-related quality of life and mobility of patients awaiting elective total hip arthroplasty. *Canadian Medical Association Journal*. 2002; 167(10): 1115-21.

that negative outcome changes do *not* occur with waits of only 3 months.²⁶⁹ In general, the literature concurs that there is little evidence of harm from short or moderate waits (of less than six months) for scheduled surgery on major joints.^{270,271,272,273} Wait times of greater than six months, however, appear to be associated with significant declines in surgical outcomes, as well as, of course, prolonged discomfort and disability for the patient.^{274,275} Six months seems to be the reasonable wait time from a patient perspective according to a recent report on orthopaedic surgery in Halifax.²⁷⁶ The study concluded the following about the current situation: “patients waiting for orthopaedic surgery are now disadvantaged with respect to optimal surgical outcomes.”²⁷⁷ One factor which comes in to play is psychosocial, i.e., the degree of anxiety being experienced and expressed by the patient. An individual’s perception of their pre-operative status has been shown to affect overall outcomes after surgery,²⁷⁸ as has their expectation for good results.²⁷⁹

The general consensus was articulated by Jinks and colleagues: “If patients with worse preoperative pain and physical function have lower levels of improvement after surgery, there may be an argument for undertaking surgery at an earlier stage in the course of the disease.”²⁸⁰

Introducing the age factor complicates the story somewhat. First, it is important to note that the age of the patient does not automatically determine their pre-operative status.²⁸¹ Nevertheless, younger hip replacement patients generally gain more function and moved higher on the quality of life scale compared to older patients. The reverse may be true for knee operations: greater pre-operative disease (which is *typical* of older patients) actually demonstrates more functional improvement with

²⁶⁹ Nilsdotter AK, Lohmander LS. Age and waiting time as predictors of outcome after total hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(11): 1261-7.

²⁷⁰ Nilsdotter AK, Lohmander LS. Age and waiting time as predictors of outcome after total hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(11): 1261-7.

²⁷¹ Kelly KD, Voaklander DC, Johnston DWC et al. Change in pain and function while waiting for major joint arthroplasty. *Journal of Arthroplasty*. 2001; 16(3): 351-9.

²⁷² Croft P, Lewis M, Wynn Jones C et al. Health status in patients awaiting hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(9): 1001-7

²⁷³ Brownlow HC, Benjamin S, Andrew JG, Kay P. Disability and mental health in patients waiting for total hip replacement. *Annals of the Royal College of Surgeons of England*. 2001; 83(2): 128-33. Notably, there is no evidence that mental health is worse for those waiting longer.

²⁷⁴ Williams JI, Llewellyn-Thomas H, Arshinoff R et al. The burden of waiting for hip and knee replacement in Ontario. *Journal of Evaluation in Clinical Practice*. 1997; 3(1): 59-68.

²⁷⁵ Derrett S. Waiting for elective surgery: effects on health-related quality of life. *International Journal for Quality in Health Care*. 1999; 11(1): 47-57.

²⁷⁶ Dunbar MJ, Molloy L, Blake JT et al. *Wait List Management Project: Orthopaedic Pilot Project*. Halifax: Dalhousie University, January 2004.

²⁷⁷ Dunbar MJ, Molloy L, Blake JT et al. *Wait List Management Project: Orthopaedic Pilot Project*. Halifax: Dalhousie University, January 2004.

²⁷⁸ Dunbar MJ. Subjective outcomes after knee arthroplasty. *Acta Orthopaedica Scandinavica*. 2001; 72(Suppl 301): 1-63.

²⁷⁹ Mahomed NN, Liang MH, Cook EF et al. The importance of patient expectations in predicting functional outcomes after total joint arthroplasty. *Journal of Rheumatology*. 2002; 29(6): 1273-9.

²⁸⁰ Jinks C, Lewis M, Croft P. Health status after hip or knee arthroplasty *Annals of the Rheumatic Diseases* 2003; 62(8): 700-1. Compare Kili S, Wright I, Jones RS. Change in Harris hip score in patients on the waiting list for total hip replacement. *Annals of the Royal College of Surgeons of England*. 2003; 85: 269-71.

²⁸¹ Nilsdotter AK, Lohmander LS. Age and waiting time as predictors of outcome after total hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(11): 1261-7.

surgery, though health outcomes at 5 years follow-up are still worse than for younger patients. In other words, the anomaly of greater cost-effectiveness when correcting worse initial conditions disappears over time, so that, on balance, earlier surgery still seems indicated.²⁸² To this argument against letting patients get older and / or more afflicted may be added the basic position of compassion. As Kili et al. sums up: “Patients requiring total hip replacement deteriorate while on the waiting list. Waiting list times should be as short as possible to reduce unnecessary suffering.”²⁸³

Productivity Loss

There are significant indirect costs associated with waiting lists, i.e. the loss of productivity of individuals who cannot work or conduct activities of daily living due to bone, joint and arthritis-related health problems. People on the waiting list for hip and knee surgery may be—or become—disabled to the point where they cannot keep their job, with a consequent loss of many thousands of dollars in household income.²⁸⁴ Survey results presented at the 2005 Canadian Orthopaedic Association meetings showed that almost a quarter of people employed when they entered the hip replacement waiting list in Manitoba were off the job due to their condition. Follow-up studies will show whether there is a risk of people leaving the workforce permanently because of undue wait times.²⁸⁵

Unnecessary Costs

Delaying an intervention can add health care and general societal costs. In Finland, a recent report noted that the costs of delayed treatments in the medical system for both the working population and retired people exceeded the costs of treatment. The report noted that delayed treatment for a variety of conditions has been shown to increase the risk of remaining on a disability pension.²⁸⁶

We already introduced the idea of joint replacement being cost saving under certain conditions. This continues to be assessed, with a focus on whether or not time on a waiting list actually adds costs to the health care system. For example, in 2002, a forum of Australian state health authorities devised a case study to bring greater precision to the question of medical cost savings with hip replacement surgery compared to waiting for surgery. Their report concludes that the costs over a twelve month wait period of \$16,189 exceed the cost of a hip replacement without complications (\$11,734). The average costs incurred during the waiting period consisted of \$1,560 for Meals on Wheels, \$6,240 for home care, \$1,040 for community nursing, \$260 for community transport, \$1,221 for physicians, \$1,102 for medications, and \$4,765 for hospitalizations.²⁸⁷

²⁸² Kennedy LG, Newman JH, Ackroyd CE et al. When should we do knee replacements? *Knee*. 2003; 10(2): 161-6.

²⁸³ Kili S, Wright I, Jones RS. Change in Harris hip score in patients on the waiting list for total hip replacement. *Annals of the Royal College of Surgeons of England*. 2003; 85: 269-71.

²⁸⁴ Palmer KT, Milne P, Poole J et al. Employment characteristics and job loss in patients awaiting surgery on the hip or knee. *Occupational & Environmental Medicine*. 2005; 62(1): 54-7.

²⁸⁵ Data available at http://www.medicalpost.com/mpcontent/article.jsp?content=20050704_190614_5540. Accessed July 2005.

²⁸⁶ Hurst J, Siciliani L. *Tackling Excessive Waiting Times for Elective Surgery: A Comparison of Policies in Twelve OECD Countries*. Paris: OECD Health Working Papers; July 2003.

²⁸⁷ *A Report to the Australian Health Ministers' Conference from Australian Health Care Agreement Reference Groups*, September 2002. Available at www.health.gov.au/haf/ahca.htm

On another front, Saleh et al. noted that substantial cost savings are possible for immediate *revision* hip surgery compared with expenditures related to patients on waiting lists.²⁸⁸

Summary: The Uniqueness of Joint Replacement Surgery

As the preceding sections show, there are compelling reasons to focus on reducing waiting lists and times for major joint replacement or, to put it more positively, *to deliver this procedure to as many deserving people as possible, as soon as possible.*

First, hip and knee replacement are highly effective interventions. They are also cost-effective, well within the tolerances of routinely-provided medical procedures. In fact, for some patients under certain conditions, joint replacement is absolutely *cost-saving* (this is even before factoring in the cost of waiting).

There are also many managerial and technological improvements coming on stream which will promise to make joint replacement even more attractive to health care providers.

Next, there is huge and growing demand for joint replacement. There are multiple forces behind this phenomenon, suggesting that it will be a sustained trend throughout the developed world.

Finally, the consequences for inordinate delays in receiving an artificial hip or knee are serious. Apart from the productivity losses when the ability to work is impaired, the outcomes of surgery can be poorer, while the treatment costs during the wait and the actual expense of surgery may be higher. The conclusion is that it very possibly can save money to do hip and knee replacement surgery earlier, not just in productivity costs, but in direct medical costs as well.

²⁸⁸ Saleh KJ, Wood KC, Gafni A, Gross AE. Immediate surgery versus waiting list policy in revision total hip arthroplasty—an economic evaluation. *Journal of Arthroplasty*. 1997; 12(1): 1-10. An apparently contrary view is seen in a 2002 study that discovered, perhaps surprisingly, that longer waits were not associated with more physician or prescription claim costs for seniors in the year before or after surgery. Instead, the authors found a *cost benefit* with the multiple physician visits that occurred during the waiting period. However, this Alberta research was based on much shorter wait periods than the average waiting time currently seen in many jurisdictions. Quan H, Lafreniere R, Johnson D. Health service costs for patients on the waiting list. *Canadian Journal of Surgery*. 2002; 45(1): 34-42.

Thresholds and Priorities for Hip and Knee Replacement

Screening Criteria

As noted in the discussion on scheduled surgery earlier in this report, an issue which precedes any prioritization system is the question of whether or not a patient is even deemed eligible for a procedure. The art and science of understanding the appropriateness of applying an intervention was heralded as the “next frontier” ten years ago.²⁸⁹ Although some operations seem to be offered prematurely,²⁹⁰ there appears to be little controversy about whether or not the wide majority of joint replacements performed are appropriate. Indeed, evaluation of non-indicated surgery rates demonstrate figures ranging only from 5 to 8%.^{291,292,293,294,295}

Indications for Joint Replacement

Survey results were reported by Mancuso and colleagues in 1996 which revealed the main clinical indications for total joint replacement in the eyes of orthopaedists (see the following table):²⁹⁶

<i>Indications for Total Joint Replacement</i>	
Pain	Severity At rest With transfer
Function	Walking Need for cane Climbing stairs Putting on shoes
Examination	Range of motion Joint stability (knee) Quadriceps (knee)
Radiographic	Joint space

There was a wide variation in the weight given to each criterion, with pain and radiographic evidence dominating. Significantly, this basic inventory, a mixture of qualitative and quantitative factors, could be modified by many different considerations, including the following:

²⁸⁹ Brook RH. Appropriateness: the next frontier. *British Medical Journal*. 1994; 308(6923): 218-9.

²⁹⁰ Pope JE, McCrea K, Stevens A et al. Treatment of osteoarthritis of the hip and knee: a comparison of NSAID use in patients for whom surgery was and was not recommended. *Clinical & Experimental Rheumatology*. 2004; 22(2): 171-6.

²⁹¹ Quintana JM, Azkarate J, Goenaga JI et al. Evaluation of the appropriateness of hip joint replacement techniques. *International Journal of Technology Assessment in Health Care*. 2000; 16(1): 165-77.

²⁹² Quintana JM, Arostegui I, Azkarate J et al. Evaluation by explicit criteria of the use of total hip joint replacement. *Rheumatology*. 2000; 39(11): 1234-41.

²⁹³ Quintana JM, Escobar A, Azkarate J et al. Appropriateness of total hip joint replacement. *International Journal of Quality Health Care*. 2005: Epublished ahead of print.

²⁹⁴ van Walraven CV, Paterson JM, Kapral M et al. Appropriateness of primary total hip and knee replacements in regions of Ontario with high and low utilization rates. *Canadian Medical Association Journal*. 1996; 155(6): 697-706.

²⁹⁵ Wright CJ, Chambers GK, Robens-Paradise Y. Evaluation of indications for and outcomes of elective surgery. *Canadian Medical Association Journal*. 2002; 167(5): 461-6.

²⁹⁶ Mancuso CA, Ranawat CS, Esdaile JM et al. Indications for total hip and total knee arthroplasties. Results of orthopaedic surveys. *Journal of Arthroplasty*. 1996; 11(1): 34-46.

<i>Modifying Considerations</i>	
Age	>80 years <50 years
Risk factors	Comorbidity Alcohol abuse
Physical factors	Weight>90 kg. Arterial insufficiency Severe bone loss Poor musculature Poor soft tissue
Psychological factors	Depression Poor motivation Limited cooperation Unrealistic expectations
Social factors	Return to work Return to sports Desire for independence Limited home care Pending court case

Again, these criteria were not all created equal. Younger age, comorbidity, technical difficulties and a lack of motivation modified the decision towards not doing surgery, whereas the desire to be independent and return to work were seen as inspiration to pursue hip or knee replacement. Although there were some majority opinions for several criteria, there was no clear consensus. Mancuso and co-authors suggested that “possible explanations for this are that isolated indications are not as important as integrating and weighing several indications and that the patient’s desire to proceed...is an important driving force.”

In another study, almost 400 orthopaedic surgeons in Ontario were surveyed.²⁹⁷ Clinical agreement (defined as 90% or more of respondents) was demonstrated on the following patient characteristics as predisposing the surgeons against knee replacement: local active skin infection, psychiatric disorder, alcohol or drug abuse, high physical demands at work, peripheral vascular disease, age less than 55 years, noncompliant, history of septic knee arthritis or isolated patellofemoral arthritis, although there is literature to support the use of specialized replacements in that latter condition. Pain unresponsive to drug therapy was the only characteristic that consistently made the surgeons more likely to perform knee replacement, while race and gender had no effect. The latter result may be surprising, given that there is evidence that joint replacement is not always as effective in women.²⁹⁸ Interestingly, as noted above, women currently opt to not seek hip or knee replacement in disproportionate numbers compared with men.²⁹⁹

The most contentious of the classic threshold points for hip and knee replacement is that of age. Younger patients are now regularly seeking the enhanced mobility and

²⁹⁷ Wright JG, Coyte P, Hawker G et al. Variation in orthopedic surgeons' perceptions of the indications for and outcomes of knee replacement. *Canadian Medical Association Journal*. 1995; 152(5): 687-97.

²⁹⁸ Roder C, Parvizi J, Egli S et al. Demographic factors affecting long-term outcome of total hip arthroplasty. *Clinical Orthopedics & Related Research*. 2003; (417): 62-73.

²⁹⁹ Karlson EW, Daltroy LH, Liang MH et al. Gender differences in patient preferences may underlie differential utilization of elective surgery. *American Journal of Medicine*. 1997; 102(6): 524-30.

quality of life that comes with a joint replacement. The main issue that steered surgeons away from performing hip and knee replacements in those under 50 years old was the fact that the survival rate of prostheses was poor. This was ostensibly due to the more active lifestyle of younger individuals, but the impact of activity on revision rates has been questioned,³⁰⁰ some evidence has pointed to the fact that poor prosthesis design is the greater culprit.^{301,302} Even with technological improvements, cost-effectiveness models involving younger patients probably need to factor in at least one revision surgery. The dramatic improvement in quality of life through joint replacement may still make the surgery economically attractive even if the patient is young and active and prone to eventually “wear out” their first prosthesis; this conclusion will probably be most convincing at a population level for prostheses with the lowest revision rates.³⁰³

Explicit Eligibility Criteria

As indicated earlier, in addition to the traditional implicit rating by surgeons, the new types of explicit criteria schemes are also used to establish which patients should be offered publicly-funded surgery. There has been at least one project specifically focused on indications for intervention. An algorithm was developed by Quintana and colleagues to generate explicit criteria for hip and knee replacement procedures.^{304,305} In an elaborate process which began with over 200 possible indications for total hip replacement, the most significant variables for establishing the appropriateness of surgery were as follows:

³⁰⁰ Jones DL, Cauley JA, Kriska AM et al. Physical activity and risk of revision total knee arthroplasty in individuals with knee osteoarthritis: a matched case-control study. *Journal of Rheumatology*. 2004; 31(7): 1384-90.

³⁰¹ Furnes O, Lie SA, Espehaug B et al. Hip disease and the prognosis of total hip replacements. A review of 53,698 primary total hip replacements reported to the Norwegian Arthroplasty Register 1987-99. *Journal of Bone & Joint Surgery - British Volume*. 2001; 83(4): 579-86.

³⁰² Furnes O, Lie SA, Espehaug B et al. Young patients in all hip disease groups could safely be operated with a documented cemented prosthesis. *Journal of Bone & Joint Surgery - British Volume*. 2004; 86(Suppl 3): 250.

³⁰³ Briggs A, Sculpher M, Dawson J et al. The use of probabilistic decision models in technology assessment: the case of total hip replacement. *Applied Health Economics & Health Policy*. 2004; 3(2): 79-89.

³⁰⁴ Quintana JM, Arostegui I, Azkarate J et al. Evaluation of explicit criteria for total hip joint replacement. *Journal of Clinical Epidemiology*. 2000; 53(12): 1200-8.

³⁰⁵ Escobar A, Quintana JM, Arostegui I et al. Development of explicit criteria for total knee replacement. *International Journal of Technology Assessment in Health Care*. 2003; 19(1): 57-70.

<i>Explicit Criteria for Total Hip Replacement</i>		
Previous non-surgical procedures	Correctly done	Medication with no pain relief; weight control (if needed) and physical therapy.
	Incorrectly done	Inadequate medication; no weight control (if needed) or physical therapy.
Pain level	Mild	Minimal interference with daily activities, sleep. Good help from analgesics or NSAIDs ³⁰⁶ with no or tolerable side effects.
	Moderate	Some interference with daily activities. Vigorous activities cannot be performed.
	Severe	Constant interference with most activities. Pain at rest; sleep compromised. Pain is not controlled even by narcotics.
Functional limitations	Minor	Capacity for normal activities and self care. Walking for more than 1 hour, without aids.
	Moderate	Most normal activities compromised. Walking, with a cane or equivalent, for 30 minutes.
	Severe	Largely or wholly incapacitated.

As well, surgical risk sometimes played a role in the decision-making algorithm. In the study, a panel of orthopaedic surgeons applied these criteria to a set of patients, generating a score from 1 to 9, with 7 to 9 representing an appropriate case for surgery. One of the most telling results was the connection between appropriateness and outcomes; when a patient with inappropriate indications (scoring 1 to 3) underwent surgery, only a moderate improvement in health was observed.

Appropriateness of surgery and relative rankings of patients in a waiting list have sometimes been investigated at the same time. In the mid-1990s, a panel of orthopaedic surgeons and other practitioners in Ontario rated 120 case scenarios to devise a 7-point appropriateness rating and a 4-point urgency scale (keyed to specific waiting times) for major joint replacement. The physicians could agree on appropriateness ratings in over 90% of the cases.³⁰⁷ A project using similar methods was devised in the UK during this time period.³⁰⁸

³⁰⁶ Non-steroidal anti-inflammatory drugs.

³⁰⁷ Naylor CD, Williams JI. Primary hip and knee replacement surgery: Ontario criteria for case selection and surgical priority. *Quality in Health Care*. 1996; 5(1): 20-30.

³⁰⁸ Imamura K, Gair R, McKee M et al. Appropriateness of total hip replacement in the United Kingdom. *World Hospitals & Health Services*. 1996; 32(2): 10-4.

Establishing thresholds for publicly-funded surgery was also part of the New Zealand prioritization project, to which we will now turn.³⁰⁹

Priority Criteria

As noted earlier, New Zealand assumed a leadership role in developing priority criteria tools for scheduled surgery after its health system was restructured in 1992.³¹⁰ The following table outlines the criteria; it demonstrates the strong *clinical* focus of the project.

Priority Criteria for Major Joint Replacement (maximum score 100)	
Clinical features	Score
Pain (40%)	
Degree (patient must be on maximum medical therapy at time of rating):	
None	0
Mild: slight or occasional pain; patient has not altered patterns of activity or work	4
Mild-moderate: moderate or frequent pain; patient has not altered patterns of activity or work	6
Moderate: patient is active but has had to modify or give up some activities because of pain	9
Moderate-severe: fairly severe pain with substantially limited activities	14
Severe, major pain and serious limitation	20
Occurrence:	
None or with first steps only	0
Only after long walks (30 minutes)	4
With all walking, mostly day pain	10
Significant, regular night pain	20
Functional activity (20%)	
Time walked:	
Unlimited	0
31-60 minutes (e.g. longer shopping trips to mall)	2
11-30minutes (e.g. gardening, grocery shopping)	4
2-10 minutes (e.g. trip to letter box)	6
<2 minutes or indoors only (more or less house bound)	8
Unable to walk	10
Other functional limitations (e.g. putting on shoes, managing stairs, sitting to standing, sexual activity, recreation or hobbies, walking aids needed):	
None	0
Mild	2
Moderate	4
Severe	10
Movement and deformity (20%)	
Pain on examination (overall results are both active and passive range of motion):	
None	0

³⁰⁹ Western Canada Waiting List Project. *From Chaos to Order: Making Sense of Waiting Lists in Canada—Final Report*. 2001. Available at http://www.wcwl.org/media/pdf/library/final_reports.2.pdf. Accessed June 2005.

³¹⁰ Hadorn DC, Holmes AC. The New Zealand priority criteria project. Part 1: Overview. *British Medical Journal*. 1997; 314(7074): 131-4.

Mild	2
Moderate	5
Severe	10
Other abnormal findings (limited to orthopaedic problems eg reduced range of motion, deformity, limp, instability, progressive x ray findings):	
None	0
Mild	2
Moderate	5
Severe	10
Other factors (20%)	
Multiple joint disease:	
No, single joint	0
Yes, each affected joint mild: moderate in severity	4
Yes, severe involvement (e.g. severe rheumatoid arthritis)	10
Ability to work, give care to dependants, live independently (difficulty must be related to affected joint):	
Not threatened or difficult	0
Not threatened but more difficult	4
Threatened but not immediately	6
Immediately threatened	10
Total score	

Other countries have also developed priority criteria for scheduled surgery, including the US (specifically, Oregon), the Netherlands, Sweden and the UK.³¹¹ While their value has been recognized,³¹² various critiques of the prioritization schemes have been offered from the beginning. Both the earlier and more recently noted weaknesses have been itemized below.

- Relatively low weighting for social factors such as ability to work and care for dependents, even though “the most important criterion for treatment is surely the impact of a condition on a person’s lifestyle rather than the simple presence of a symptom, clinical sign, impairment, or disability.”³¹³ The New Zealand project team acknowledged that this was an area of considerable debate during its priority-setting process.³¹⁴
- Limited role allowed for economic evaluation in priority-setting.^{315,316,317}

³¹¹ Jenkins D, Birks S. *An Economic Assessment of the Priority Criteria for Elective Surgery in New Zealand*. New Zealand: Centre for Public Policy Evaluation; 1998. Available at <http://econ.massey.ac.nz/cppe/papers/cppesp02/cppesp02.pdf>. Accessed June 2005.

³¹² Health Policy and Economics Research Unit. *Waiting List Prioritization Scoring Systems*. London: British Medical Association; 1998.

³¹³ Mordue A, Parkin DW. New Zealand priority criteria project. More use should be made of patient oriented quality of life measures. *British Medical Journal*. 1997; 314(7096): 1765.

³¹⁴ Hadorn DC, Holmes AC. The New Zealand priority criteria project. Part 1: Overview. *British Medical Journal*. 1997; 314(7074): 131-4.

³¹⁵ Jenkins D, Birks S. *An Economic Assessment of the Priority Criteria for Elective Surgery in New Zealand*. New Zealand: Centre for Public Policy Evaluation; 1998. Available at <http://econ.massey.ac.nz/cppe/papers/cppesp02/cppesp02.pdf>. Accessed June 2005.

³¹⁶ Ross J. The use of economic evaluation in health care: Australian decision makers' perceptions. *Health Policy*. 1995; 31(2): 103-10.

- A process based on consensus-building among a group of professionals, with little or no direct input from the patients' perspective. Of interest, however, is the fact that when patients are consulted about their views, they are sometimes in close agreement with the perspective of physicians.³¹⁸
- The tools are completed by professionals, with no direct input from patients. This is in contrast with patient-driven assessments such as the Western Ontario and McMaster University (WOMAC) Index. A 2005 evaluation suggested there is poor correlation between priority scoring systems and WOMAC results.³¹⁹ This evaluation showed little improvement over an earlier study which concluded that "major joint arthroplasty is not prioritized on the basis of burden of illness."³²⁰ An Irish study showed that prioritization based on traditional joint scores (i.e., Harris Hip, American Knee Society) offered a good basis for wait list management.³²¹ This is consistent with the conclusion of a Canadian report on quality-of-life-enhancing surgery such as joint replacement: "patients' own perceptions of their overall symptomatic burden and ability to tolerate delayed relief should be considered along with information derived from clinical judgements and pre-weighted health instruments."³²² A 2005 study promoted proactive involvement by patients in medical decision-making to help address this issue.³²³
- Validation studies of the earliest priority systems have been limited, with the number of patients included in most analyses being relatively small.³²⁴

Canadian Research

There have been provincial studies and strategies addressing waiting lists, notably the Cardiac Care Network in Ontario.³²⁵ Recently, Canada's contribution to the work on priority criteria has intensified, especially since the launch of the Western Canada Waiting List Project (WCWLP). One of the procedures investigated by the WCWLP in terms of prioritization has been hip and knee replacement. The panel convened for

³¹⁷ Coast J. The role of economic evaluation in setting priorities for elective surgery. *Health Policy*. 1993; 24(3): 243-57.

³¹⁸ Woolhead GM, Donovan JL, Chard JA et al. Who should have priority for a knee joint replacement? *Rheumatology*. 2002; 41(4): 390-4.

³¹⁹ Coleman B, McChesney S, Twaddle B. Does the priority scoring system for joint replacement really identify those in most need? *New Zealand Medical Journal*. 2005; 118(1215): U1463.

³²⁰ Kelly KD, Voaklander D, Kramer G et al. The impact of health status on waiting time for major joint arthroplasty. *Journal of Arthroplasty*. 2000; 15(7): 877-83. See also Kelly KD, Voaklander DC, Johnston WC et al. Equity in waiting times for major joint arthroplasty. *Canadian Medical Association Journal*. 2002; 45(4): 269-76. And Fitzpatrick R, Norquist JM, Reeves BC et al. Equity and need when waiting for total hip replacement surgery. *Journal of Evaluation in Clinical Practice*. 2004; 10(1): 3-9.

³²¹ Kingston R, Carey M, Masterson E. Need-based waiting lists for hip and knee arthroplasty. *Irish Journal of Medical Science*. 2000; 169(2): 125-6.

³²² Llewellyn-Thomas HA, Arshinoff R, Bell M et al. In the queue for total joint replacement: patients' perspectives on waiting times. Ontario Hip and Knee Replacement Project Team. *Journal of Evaluation in Clinical Practice*. 1998; 4(1): 63-74.

³²³ Borders TF, Xu KT, Heavner J et al. Patient involvement in medical decision-making and pain among elders: physician or patient-driven? *BMC Health Services Research*. 2005; 5(1): 4.

³²⁴ Arnett G, Hadorn DC. Developing priority criteria for hip and knee replacement: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2003; 46(4): 290-6.

³²⁵ Western Canada Waiting List Project. *From Chaos to Order: Making Sense of Waiting Lists in Canada—Final Report*. 2001. Available at http://www.wcwl.org/media/pdf/library/final_reports.2.pdf. Accessed June 2005.

this purpose began with the New Zealand system (just as that country had been influenced by the earlier Canadian work on cardiac care prioritization). After revising the tool according to testing results, the final version was adopted in June, 2000. It is included in Appendix C.³²⁶

The main change in comparison to the New Zealand tool is decreased weighting for pain, an increased emphasis on functional limitations and ability to work, and the introduction of criteria related to the potential for disease progression. The latter was primarily inserted to “catch” revision surgery candidates, who were consistently under-prioritized by the initial criteria.

It is clear that the WCWLP approach has attempted to address some earlier deficiencies in priority criteria for hip and knee replacement. Some operational problems persist, however. For example, patients with relatively minor (but still significant) arthritis will always score lower than those with more serious conditions. Following the New Zealand lead, the WCWLP decided to not incorporate waiting time into priority scores, as this might create other problems (e.g., “bumping” more urgent cases). A study from July, 2005, supports this decision. Analysis of 125 patients waiting for hip replacements showed that while about a third of them did deteriorate, over half did not, and 15% even improved. Their conclusion: “patients should not be prioritised solely on the length of time they have spent on a surgical waiting list.”³²⁷ It should be noted that the introduction of maximum acceptable wait times (see below) represents precisely a *type of prioritization according to length of time on a waiting list*.

The WCWLP has paid serious attention to reliability testing, a feature of waiting list management which has often been limited.^{328,329} The results of such testing have sometimes been disappointing.³³⁰ One exception to this rule was a priority scoring system for joint replacement developed in the UK, which showed good agreement between the results generated by general practitioners and those seen among specialists.³³¹

The validation studies undertaken by the WCWLP have created confidence. Although some of the feedback received from professionals has been equivocal, the

³²⁶ Arnett G, Hadorn DC. Developing priority criteria for hip and knee replacement: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2003; 46(4): 290-6.

³²⁷ Chakravarty D, Tang T, Vowler SL et al. Waiting for primary hip replacement—a matter of priority. *Annals of the Royal College of Surgeons of England*. 2005; 87(4): 269-73.

³²⁸ Conner-Spady B, Estey A, Arnett G et al. Prioritization of patients on waiting lists for hip and knee replacement: validation of a priority criteria tool. *International Journal of Technology Assessment in Health Care*. 2004; 20(4): 509-15.

³²⁹ Conner-Spady BL, Arnett G, McGurran JJ et al. Prioritization of patients on scheduled waiting lists: validation of a scoring system for hip and knee arthroplasty. *Canadian Journal of Surgery*. 2004; 47(1): 39-46.

³³⁰ Lofvendahl S, Hellberg S, Hanning M. [How was the referral sheet interpreted? Questionnaire on priority assessment of patients referred to orthopedic surgeons showed great differences between reviewers]. *Lakartidningen*. 2002; 99(17): 1931-4, 7-9.

³³¹ Dent TH, Cunningham SL, Hook WE et al. The MODEL project: a scoring system to manage demand for cataract and joint replacement surgery. *British Journal of General Practice*. 2001; 51(472): 917-9.

leaders of the hip and knee replacement work concluded that perhaps the most important finding was the following:³³²

Orthopaedic surgeons and other clinicians from the 4 western provinces in Canada accepted and endorsed the ability of clinical priority criteria to reflect global expert judgements of urgency.

As with the New Zealand research before it, the WCWLP work has proven to be influential. For example, a prioritization project in Victoria, Australia, began by testing the Canadian tool, later simplifying it and adapting it to local data.³³³ Eventually, the team boiled the criteria down to the following categories and weightings:

- Pain 4.0
- Limitation of activities 2.5
- Interference with social function³³⁴ 1.0
- Psychological distress 1.0

Demographic and Other Patient Factors

As noted earlier, some fixed and modifiable characteristics of hip and knee replacement candidates have entered into eligibility assessments. Applying such factors to prioritization is no less controversial, even though there is some acceptance for doing so (at least among the general public, if not among patient cohorts). What is mostly at stake is the expected outcome of surgery, and whether or not this should influence where a person resides on a waiting list. In some cases, the cost of surgery is also a consideration.

Patient characteristics creating a greater risk of poor functional outcome in joint replacement include older age and obesity.^{335,336,337,338,339} Despite these results, it should be noted that many studies still conclude that joint replacement is very effective for the elderly.^{340,341,342,343}

³³² Arnett G, Hadorn DC. Developing priority criteria for hip and knee replacement: results from the Western Canada Waiting List Project. *Canadian Journal of Surgery*. 2003; 46(4): 290-6.

³³³ McNeill JJ, Russell C, Curtis A et al. *Victorian Waiting List Prioritising Study: Orthopaedic Section*. No date. Available at <http://www.health.vic.gov.au/electivesurgery/clinpriortho.pdf>. Accessed July 2005.

³³⁴ That is, work and leisure activities.

³³⁵ Roder C, Parvizi J, Egli S et al. Demographic factors affecting long-term outcome of total hip arthroplasty. *Clinical Orthopedics & Related Research*. 2003; (417): 62-73.

³³⁶ Sharma L, Cahue S, Song J et al. Physical functioning over three years in knee osteoarthritis: role of psychosocial, local mechanical, and neuromuscular factors. *Arthritis & Rheumatism*. 2003; 48(12): 3359-70.

³³⁷ Nilsson AK, Lohmander LS. Age and waiting time as predictors of outcome after total hip replacement for osteoarthritis. *Rheumatology*. 2002; 41(11): 1261-7.

³³⁸ Foran JR, Mont MA, Etienne G et al. The outcome of total knee arthroplasty in obese patients. *Journal of Bone & Joint Surgery - American Volume*. 2004; 86-A(8): 1609-15.

³³⁹ Foran JR, Mont MA, Rajadhyaksha AD et al. Total knee arthroplasty in obese patients: a comparison with a matched control group. *Journal of Arthroplasty*. 2004; 19(7): 817-24.

³⁴⁰ Jones CA, Voaklander DC, Johnston DW et al. The effect of age on pain, function, and quality of life after total hip and knee arthroplasty. *Archives of Internal Medicine*. 2001; 161(3): 454-60.

³⁴¹ Pagnano MW, McLamb LA, Trousdale RT. Primary and revision total hip arthroplasty for patients 90 years of age and older. *Mayo Clinic Proceedings*. 2003; 78(3): 285-8.

Comorbidities affect joint replacement outcomes, as well as hospital costs.³⁴⁴ This is true for conditions experienced by the elderly,³⁴⁵ as well as for more general diseases such as chronic infections. An example of the latter is HIV. A 2003 study concluded that physicians and surgeons should be made aware of the high rate of complications in patients with HIV and “include a frank discussion of this information with their patients who are contemplating total joint arthroplasty.”³⁴⁶ A related area is the impact of conditions that develop as a result of arthritis. A 2005 study notes that priority scoring systems for hip and knee replacement should “differentiate between severity (sic) of impairment secondary to joint disease.”³⁴⁷

It is clear that implicit, subjective prioritization by physicians has been influenced by patient-specific factors in the past; it is not clear how they ought to influence modern explicit priority tools. In particular, the New Zealand project decided that age should not be incorporated into the work on hip and knee replacement.

Equity Imbalance

The topic of equity in health care service delivery is complex. Several considerations need to be made at a conceptual level, including:

- What is the focus? Individual equity, sometimes described as equal care for equal medical need,³⁴⁸ or population-level equity, which may temporarily call for unequal treatment rates or other special interventions in order to redress historic imbalances. Clearly, the first emphasis is in more harmony with the objectives of priority scoring: any group or area with high-priority patients should automatically receive the resources needed to serve that burden. Likewise, evidence of prioritization not primarily reflecting clinical urgency may be an offence against individual or group equity. On the other hand, disproportionate resources directed towards a group represent an all together different kind of prioritization.
- What is the measure of inequity in a particular cohort? Level of unmet need,³⁴⁹ basic access to care (reflected in intervention delivery rates), or timely access to care (reflected in waiting lists and times)? For example, a

³⁴² Brander VA, Malhotra S, Jet J et al. Outcome of hip and knee arthroplasty in persons aged 80 years and older. *Clinical Orthopaedics & Related Research*. 1997; (345): 67-78.

³⁴³ Shah AK, Celestin J, Parks ML et al. Long-term results of total joint arthroplasty in elderly patients who are frail. *Clinical Orthopaedics & Related Research*. 2004; (425): 106-9.

³⁴⁴ Shah AN, Vail TP, Taylor D et al. Comorbid illness affects hospital costs related to hip arthroplasty: quantification of health status and implications for fair reimbursement and surgeon comparisons. *Journal of Arthroplasty*. 2004; 19(6): 700-5.

³⁴⁵ Wurtz LD, Feinberg JR, Capello WN et al. Elective primary total hip arthroplasty in octogenarians. *Journal of Gerontology Series A: Biological Sciences and Medical Sciences*. 2003; 58(5): M468-71.

³⁴⁶ Parvizi J, Sullivan TA, Pagnano MW et al. Total joint arthroplasty in human immunodeficiency virus-positive patients: an alarming rate of early failure. *Journal of Arthroplasty*. 2003; 18(3): 259-64.

³⁴⁷ Coleman B, McChesney S, Twaddle B. Does the priority scoring system for joint replacement really identify those in most need? *New Zealand Medical Journal*. 2005; 118(1215): U1463.

³⁴⁸ Propper C, Eachus J, Chan P et al. Access to health care resources in the UK: the case of care for arthritis. *Health Economics*. 2005; 14(4): 391-406.

³⁴⁹ Note that the level of *need* is not a test of equity. For example, the fact that rural regions in Canada have a higher rate of arthritis is only significant if that burden is being underserved in terms of hip and knee replacements, etc. The same can be said in reference to aboriginals, who demonstrate higher arthritis rates.

2003 Statistics Canada report noted that northern regions have the highest share of individuals with unmet health care needs.³⁵⁰

- What is the source of any population equity gaps? The weighting physicians or priority scorings place on socio-demographic factors, the choices made by patients, or gaps in resources. In turn, what contributes to each of these factors? For example, are patient preferences shaped by perceptions, social inequalities, cultural values or institutional barriers?^{351,352,353}
- Is inequality always (implicit) bias or inequity, or is it sometimes a consensus opinion concerning explicit priority categories? The past resistance to offering joint replacement to younger patients would seem to fit into the latter category, while low surgery rates among the “older elderly” may be a less considered phenomenon.³⁵⁴
- When is one sort of inequity (e.g., geographical) actually a disguise for the true basis of imbalance (e.g., ethnic, socioeconomic, education level)?³⁵⁵

The overall assessment of equity issues made by Kelly et al. in one Canadian setting was favourable in regards to hip and knee replacement. They found that “preferential treatment was not given to specific social or economic subgroups.”³⁵⁶ A localized UK study drew the same conclusion,³⁵⁷ and these results were consistent with the evaluation for surgery as a whole made by another set of researchers in Norway; no bias was observed in *implicit* queue management systems against women or people in lower socioeconomic classes.³⁵⁸ Even more broadly, Shortt found little support for the idea of unfairness in the health care system as a whole in Canada, a conclusion laid out in his provocatively entitled review, “Waiting for medical care: Is it who you know that counts?”³⁵⁹ This same researcher found that there was no indication that living in a region of low socioeconomic status led to longer waiting times for elective surgery.³⁶⁰

³⁵⁰ Statistics Canada. The health of rural Canadians: a rural-urban comparison of health indicators. *Rural and Small Town Canada Analysis Bulletin*. 2003; 4(6).

³⁵¹ McLeod D, Dew K, Morgan S et al. Equity of access to elective surgery: reflections from NZ clinicians. *Journal of Health Services Research & Policy*. 2004; 9 Suppl 2: 41-7.

³⁵² Hawker GA, Wright JG, Glazier RH et al. The effect of education and income on need and willingness to undergo total joint arthroplasty. *Arthritis & Rheumatism*. 2002; 46(12): 3331-9.

³⁵³ Byrne MM, O'Malley KJ, Suarez-Almazor ME. Ethnic differences in health preferences: analysis using willingness-to-pay. *Journal of Rheumatology*. 2004; 31(9): 1811-8.

³⁵⁴ Milner PC, Payne JN, Stanfield RC et al. Inequalities in accessing hip joint replacement for people in need. *European Journal of Public Health*. 2004; 14(1): 58-62.

³⁵⁵ Skinner J, Weinstein JN, Sporer SM et al. Racial, ethnic, and geographic disparities in rates of knee arthroplasty among Medicare patients. *New England Journal of Medicine*. 2003; 349(14): 1350-9.

³⁵⁶ Kelly KD, Voaklander DC, Johnston WC et al. Equity in waiting times for major joint arthroplasty. *Canadian Medical Association Journal*. 2002; 45(4): 269-76.

³⁵⁷ Hacker J, Stanistreet D. Equity in waiting times for two surgical specialties: a case study at a hospital in the North West of England. *Journal of Public Health*. 2004; 26(1): 56-60.

³⁵⁸ Arnesen KE, Erikssen J, Stavem K. Gender and socioeconomic status as determinants of waiting time for inpatient surgery in a system with implicit queue management. *Health Policy*. 2002; 62(3): 329-41.

³⁵⁹ Shortt SE. Waiting for medical care: is it who you know that counts? *Canadian Medical Association Journal*. 1999; 161(7): 823-4.

³⁶⁰ Shortt SE, Shaw RA. Equity in Canadian health care: does socioeconomic status affect waiting times for elective surgery? *Canadian Medical Association Journal*. 2003; 168(4): 413-6.

This positive assessment is not shared by researchers in other jurisdictions,³⁶¹ especially in reference to major joint replacement. For example, Yong and colleagues found significant gender, geographical and socioeconomic disparities in terms of unmet need for knee replacement in the UK.³⁶² The greatest research support has been seen for imbalance based on socioeconomic status and, to a lesser extent, education level.^{363,364,365,366} Given such variables, it is not surprising that aboriginal communities in Canada and around the world remain one of the key focal points for equity analyses.

First Nations

An identifiable group of perennial concern in terms of health care within the Canadian context is First Nation peoples.³⁶⁷ Several potential equity factors come into play to understand any gaps in care: socioeconomic status, education level, cultural preferences, ethnic bias, and, for some, rural location or even geographical isolation.

It is certainly legitimate, given historic patterns, to ask whether First Nations joint replacement candidates are even getting on to the waiting list.

Unfortunately, as serious as the health care needs are, there is an equally serious gap in information about health care delivery in First Nations contexts.³⁶⁸ It is true that arthritis is a concern among aboriginals,³⁶⁹ as are reported disability rates, which exceed the Canadian average.³⁷⁰ What is not so clear is whether or not First Nations people either in rural or urban settings are being under-served in terms of hip and knee replacement. Data suggesting a recent increase in delivering these procedures have been called into question.³⁷¹

Much better information needs to be gathered to understand current realities and trends, and to identify and overcome potential obstacles to increased surgery rates. It may well be that steps will be required to create “equity enhancement” for a period of time. Understanding the community dynamic will be crucial. As Hawker and others have shown, the role that friends and family play in personal decision-making around

³⁶¹ Pettinger N. Waiting lists. Richly deserving. *Health Service Journal*. 1999; 109(5671): 20-1.

³⁶² Yong PF, Milner PC, Payne JN et al. Inequalities in access to knee joint replacements for people in need. *Annals of Rheumatic Diseases*. 2004; 63(11): 1483-9.

³⁶³ Dixon T, Shaw M, Ebrahim S, Dieppe P. Trends in hip and knee joint replacement: socioeconomic inequalities and projections of need. *Annals of the Rheumatic Diseases*. 2004; 63: 825-30.

³⁶⁴ Fitzpatrick R, Norquist JM, Reeves BC et al. Equity and need when waiting for total hip replacement surgery. *Journal of Evaluation in Clinical Practice*. 2004; 10: 3-9.

³⁶⁵ Hawker GA, Wright JG, Glazier RH et al. The effect of education and income on need and willingness to undergo total joint arthroplasty. *Arthritis & Rheumatism*. 2002; 46(12): 3331-9.

³⁶⁶ Mahomed NN, Barrett J, Katz JN et al. Epidemiology of total knee replacement in the United States medicare population. *Journal of Bone & Joint Surgery - American Volume*. 2005; 87(6): 1222-8.

³⁶⁷ Tookenay VF. Improving the health status of aboriginal people in Canada: new directions, new responsibilities. *Canadian Medical Association Journal*. 1996; 155(11): 1581-3.

³⁶⁸ *Healthy Canadians: A Federal Report on Comparable Health Indicators 2004*. Ottawa; 2004.

³⁶⁹ Newbold KB. Problems in search of solutions: health and Canadian aboriginals. *Journal of Community Health*. 1998; 23(1): 59-73.

³⁷⁰ Ng E. Disability among Canada's aboriginal peoples in 1991. *Health Reports*. 1996; 8(1): 25-32 (Eng); 25-33 (Fre).

³⁷¹ National Aboriginal Health Organization. Briefing #: 033/02. Available at <http://www.naho.ca/english/pdf/BN033.pdf>. Accessed July 2005.

arthritis care in general, and total joint replacement in particular, is very important. This is especially observed in ethnic communities.^{372,373}

Finally, given the social cohesion of the aboriginal experience, any solutions proposed will need full input and endorsement from leaders and stakeholders within First Nations groups.

³⁷² Hawker GA. The quest for explanations for race/ethnic disparity in rates of use of total joint arthroplasty. *Journal of Rheumatology*. 2004; 31(9): 1683-5.

³⁷³ Blake VA, Allegrante JP, Robbins L et al. Racial differences in social network experience and perceptions of benefit of arthritis treatments among New York City Medicare beneficiaries with self-reported hip and knee pain. *Arthritis & Rheumatism*. 2002; 47(4): 366-71.

Joint Replacement Benchmarks

The Reality and Perception of Waiting

The relationship between waiting time and patient satisfaction is not straightforward. In a much-quoted project published by Coyte et al. in 1994, people who had received knee replacements in the US and Canada were surveyed.³⁷⁴ The Canadian patients' median wait time to see a specialist and then receive the surgery was more than double that of the US cohort; the surprising result, however, was that the satisfaction level of the two groups was virtually identical. If a Canadian patient did express dissatisfaction with their wait time, they were also more likely to be dealing with more pain and impairment; similarly, another study from 1998 showed that patients with less functional utility had a lower tolerance for waiting for joint replacement.³⁷⁵ The latter results add credence to schemes that would prioritize surgery around such factors.

The recent maximum acceptable waiting time (MAWT) projects, such as the one in western Canada, often depend on input from patients to help set the thresholds. However, the opinion of patients has been sought and studied apart from formal MAWT research. For instance, the 1998 study just noted looked at "conditional" maximum acceptable waiting times, i.e., how long a patient would wait to have an operation where there was a 1 or 2% mortality risk. The median time with a 1% risk was 7 months; this means that the "low tolerance" group, if faced with a wait of longer than 7 months, would rather have earlier surgery even with a higher mortality risk. As stated, lack of function was related to lower tolerance for waiting. Another study showed that the *anticipated* delay influenced patient (and physician) assessments of acceptable waiting time for major joint replacement.³⁷⁶

Physicians have naturally also been consulted about their view of waiting times. The Fraser Institute is well-known for its annual survey of physicians in this regard, though they focus on "reasonable" rather than maximal wait times. Sanmartin noted in a 2005 working paper that the results for reasonable joint replacement wait times published by the Institute had been fairly consistent over time and across regions.³⁷⁷ The range was 7.2 weeks in 1995, 7.8 weeks in 1999 and 9.6 weeks in 2004.³⁷⁸ Very similar results were discovered in a British Columbia Medical Association survey of orthopaedic surgeons in 1998, namely, 8 weeks. The variation in the physician opinion about benchmarks as discovered by the Fraser Institute from province to province was somewhat greater, from a low of 6 weeks to a high of 14 weeks.

³⁷⁴ Coyte PC, Wright JG, Hawker GA et al. Waiting times for knee-replacement surgery in the United States and Ontario. *New England Journal of Medicine*. 1994; 331(16): 1068-71.

³⁷⁵ Llewellyn-Thomas HA, Arshinoff R, Bell M et al. In the queue for total joint replacement: patients' perspectives on waiting times. Ontario Hip and Knee Replacement Project Team. *Journal of Evaluation in Clinical Practice*. 1998; 4(1): 63-74.

³⁷⁶ Conner-Spady B, Estey A, Arnett G et al. Determinants of patient and surgeon perspectives on maximum acceptable waiting times for hip and knee arthroplasty. *Journal of Health Services Research & Policy*. 2005; 10(2): 84-90.

³⁷⁷ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

³⁷⁸ Esmail N, Walker M. *Waiting Your Turn: Hospital Waiting Lists in Canada*, 2004

Generic Benchmarks: International Comparisons

Governments have been involved with establishing generic benchmarks or MAWTs, as described earlier in this paper. “Generic” means urgency categories (and attached maximum wait times) that apply to all scheduled surgery; the definition of when the wait begins varies from setting to setting, but the overall pattern is still instructive. The relevance to joint replacement is, of course, the fact that such orthopaedic procedures fit under the general heading of scheduled surgery. The simpler national systems did not distinguish urgency categories; for ease of comparison in the following table, we will assume that the category of interest in the more complex systems (i.e., those in Australia) is “semi-urgent” patients, i.e., those experiencing pain dysfunction or disability but who are not expected to experience a rapid deterioration in their condition. Most of the following policies were initiated in the early 1990s.³⁷⁹

Country	Surgery	MAWT
Sweden	12 procedures, including TJR	3 months
UK	1 st hip / knee & cataract; later: all	18 months
Victoria, Australia	All scheduled surgery	3 months
New South Wales	All scheduled surgery	3 months
New Zealand	Specialist appointment	6 months
	All scheduled surgery	6 months

Specific MAWTs for a Specific Procedure

The critical recent shift in dealing with MAWTs is illustrated by the Western Canada Waiting List Project (WCWLP), namely, evaluating acceptable waits in reference to the behaviour of *specific* conditions and interventions. The proposals so far should be compared to the inventory of *generic* MAWTs provided above. The WCWLP background review of MAWTs for joint replacement acknowledged the data sources mentioned above, namely, the opinion of patients and physicians; it also noted that no studies have reported the general public views on MAWTs with respect to hip and knee replacement. Perhaps surprisingly, patient and physician perspectives have shown close correspondence, with an average acceptable waiting time (from specialist appointment / decision to treat to the actual surgery) of about 3 months. The range seen in the literature was about 1 month for the most urgent patients, 4 to 7 months for the least urgent, and an upper limit of 12 months.³⁸⁰ In augmenting these results, the WCWLP obtained its own data on MAWTs during the first phase of its work on prioritization, drawing on both physician and patient views.^{381,382} Public input was solicited in the new phase of research, but the results derived were so

³⁷⁹ Sanmartin C. *Establishing Acceptable Waiting Times for Medical Services: A Review of the Evidence and Proposed Methods*. A Working Paper prepared for the Western Canada Wait (sic) List Project. No date. Available at http://www.wcwl.org/media/pdf/library/final_reports. Accessed June 2005.

³⁸⁰ Western Canada Waiting List Project. *Moving Forward—Final Report*. 2005. Available at http://www.wcwl.ca/media/pdf/news/moving_forward/report.pdf. Accessed June 2005.

³⁸¹ Conner-Spady B, Estey A, Arnett G et al. Prioritization of patients on waiting lists for hip and knee replacement: validation of a priority criteria tool. *International Journal of Technology Assessment in Health Care*. 2004; 20(4): 509-15.

³⁸² Conner-Spady BL, Arnett G, McGurran JJ et al. Prioritization of patients on scheduled waiting lists: validation of a scoring system for hip and knee arthroplasty. *Canadian Journal of Surgery*. 2004; 47(1): 39-46.

different from the clinical and patient data that they could only be used to test and adjust the ratio of times for the different urgency levels. The final conclusions drawn by the WCWLP are found in the following table.³⁸³

<i>Category</i>	<i>Priority score</i>	<i>MAWT</i>
Urgency 1	0-30	20 weeks
Urgency 2	31-75	12 weeks
Urgency 3	76-100	4 weeks

Interestingly, the results for the “average” patient in urgency category 2, namely, a maximum wait of 3 months, accords well with the most common generic surgery policies seen in the past (see the table in the preceding section).

Another helpful comparison with the WCWLP can be found in recent work by the Canadian Orthopaedic Association (COA), which formed the core of its contribution to The Wait Time Alliance (TWTA). The conclusions provided in the background report are found in the following table.³⁸⁴

<i>Category</i>	<i>MAWT</i>
Emergency	Within 24 hours
Urgent / semi-urgent	4 to 12 weeks
Routine	24 weeks

The COA opted to follow the priority / urgency categories and definitions which form the backbone of the Australian policies concerning scheduled surgery. Emergency is defined as immediate danger to life or limb, a condition that would apply less often in the case of hip and knee replacement. Semi-urgent represents a situation involving some pain and disability but that is stable and is unlikely to deteriorate quickly; urgent cases are more unstable, i.e., they could deteriorate quickly. It should be noted that hip and knee replacements fall within this urgent /semi- urgent category. Finally, routine conditions involve minimal pain and dysfunction and thus are amenable to more long-range scheduling. Despite the difference in terminology and the decision to amalgamate semi-urgent and urgent cases (for reasons that are not clear), there is little difference between the WCWLP and COA conclusions.

A Consensus on Benchmarks

There appears to be little controversy among the main proponents of maximum acceptable waiting times for major joint replacement in Canada. Once priority has been established by an orthopaedic surgeon (perhaps using a scoring tool), the most urgent cases need to receive surgery within 1 month; the next most urgent cases need

³⁸³ Western Canada Waiting List Project. *Moving Forward—Final Report*. 2005. Available at http://www.wcwl.ca/media/pdf/news/moving_forward/report.pdf. Accessed June 2005.

³⁸⁴ Rumble T, Kreder HJ. *Report on Benchmarks for Wait Times*. The National Standards Committee, Canadian Orthopaedic Association. 2005. Available at http://www.coa-aco.org/Articles/Home/WaitList_report_2005_AN.pdf. Accessed June 2005. The figures used by the Canadian Orthopaedic Association were adapted to facilitate comparison with the WCWLP.

to receive treatment within 3 months. All other cases can be scheduled within at most 5 to 6 months. An overall MAWT of 6 months is very consistent with past policies in different countries for generic surgery, and the benchmark of 3 months for what might be considered the “typical” urgent joint replacement candidate is certainly reflected in other studies and various settings.

There is some acknowledgment that waiting time must be carefully defined. Most of the focus is on the time between the specialist assessment and decision to treat and the actual date of the operation, but the Canadian Orthopaedic Association (COA) realizes that the delay in waiting to see an orthopaedic surgeon can be drawn out. As such, the COA has recommended a policy of not waiting longer than 3 months for specialist assessment—a benchmark that applies to all patients in every circumstance. In this they are following the policies or ultimate targets of other jurisdictions, including Sweden and the UK, though New Zealand is still recommending a more modest 6 month benchmark for the first specialist visit.³⁸⁵

³⁸⁵ Rumble T, Kreder HJ. *Report on Benchmarks for Wait Times*. The National Standards Committee, Canadian Orthopaedic Association. 2005. Available at http://www.coa-aco.org/Articles/Home/WaitList_report_2005_AN.pdf. Accessed June 2005.

Summary, Conclusions and Challenges

Surveying the Landscape of Waiting Lists

*All systems impose some form of rationing, whether by price or through wait lists.*³⁸⁶

The complex topic of waiting lists in health care represents a somewhat treacherous mountain range, challenging to map, daunting to traverse. Even limiting the project to one single peak, namely, waiting times for major joint replacement, still offers formidable obstacles.

Our plan of attack has been to briefly take in the whole landscape of waiting lists, then narrow our focus to the region of scheduled surgery, sometimes—wrongly, we argue—known as elective surgery. This allowed for an inventory of the key pieces of “equipment” needed to comprehend and assail any particular waiting list phenomenon. The result was the following checklist of concerns and areas which may be amenable to new and improved policies:

1. Defining the type of wait list (e.g., whether to not there are “urgency categories” or whether it is simply a single, first come-first served queue).
2. Establishing criteria for excluding from, or removal from, a waiting list.
3. Deciding whether *implicit* criteria applied by individual physicians will guide prioritization of patients as they are added to a waiting list, or some *explicit* categories and measures will be applied—possibly mediated by a scoring tool; as well, the impact of demographic, personal and social criteria must be carefully considered.
4. Setting benchmarks (i.e., maximum acceptable wait times).
5. Choosing and, if possible, modeling an approach to wait list management (e.g., through computer forecasting).
6. Devising the system for measuring, monitoring and reporting.
7. Planning interventions to achieve targets on the road to satisfying benchmarks.

The first four items form the backbone of this literature review, applied first to all scheduled surgery, and then to hip and knee replacement in particular. The last part of the list will be the focus of future phases of this project.

³⁸⁶ Flood CM, Sullivan T. Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005; Published ahead of print (June 20): In print July 19; 142-3.

Appreciating the Uniqueness of Hip and Knee Replacement

*There is absolutely no merit to being on a 2-year waiting list for hip replacement.*³⁸⁷

Having cleared a path to the singular “peak” of hip and knee replacement, we then homed in on this key subset of scheduled orthopaedic surgery. Our “route upwards” involved four stages:

- Creating a base of understanding in reference to major joint replacement, including: the main underlying cause of the surgery, namely, arthritis; the various “rates and waits” for the procedure across the country; and dramatic effectiveness (and cost-effectiveness) which is observed in typical outcomes.
- Recognizing the unique features of hip and knee replacement that should propel health care systems to provide *as many such procedures as appropriate and required, as soon as possible*. Apart from the intervention cost-effectiveness already noted, the rationale for both timely and *expanded* access to this surgery includes the growing demand for a steadily improving operation and the fact that there are manifest burdens borne by patients and the health care system alike when the operation is inordinately delayed.
- Reviewing the eligibility and priority criteria for hip and knee replacement that have been developed in various jurisdictions, including Canada. This also included an assessment of the operational complexity of such systems, such as how to best incorporate criteria which are not *directly* clinical, such as age, social involvements, productivity, risk factors (e.g., obesity), elapsed time on the waiting list, and membership in a group that has been under-served in the past.
- Elucidating the recent push among researchers to quantify maximum acceptable waiting times, or MAWTs. There has been a movement from generic benchmark times for scheduled surgery towards data that is specific to procedures, including joint replacement. The results, interestingly, have been very much the same, regardless of the approach.

Doing the Math: PCS + MAWT

*The determination of acceptable wait times is an extremely difficult process driven largely by consensus, not by scientific views of evidence.*³⁸⁸

The Western Canada Waiting List Project has been setting the pace for establishing both priority criteria scores (PCS) and waiting time benchmarks for hip and knee replacement, as well as other common procedures. The results from the latest phase of their work show how prioritization and MAWTs become integrated within urgency categories.

³⁸⁷ Flood CM, Sullivan T. Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005; Epublished ahead of print (June 20): In print July 19; 142-3.

³⁸⁸ Flood CM, Sullivan T. Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005; Epublished ahead of print (June 20): In print July 19; 142-3.

<i>Category</i>	<i>Priority score</i>	<i>MAWT</i>
Urgency 1	0-30	20 weeks
Urgency 2	31-75	12 weeks
Urgency 3	76-100	4 weeks

Comparing this conclusion with proposals from the Canadian Orthopaedic Association and equivalent bodies in other jurisdictions suggests that there is already a clear consensus around MAWTs. This both supports and belies the quotation which heads this section. The fact that MAWTs are based on consensus more than science merely underlines their political reality as an instrument of rationing or equity; and while setting them may be “difficult,” it seems to be a task that is largely complete. The real theoretical challenge ahead may not be gaining consensus around maximum waiting times but the ongoing validation and acceptance of priority scoring systems.

Acknowledging the Climate

*There are important initiatives presently under way in provinces to better manage and attend to waiting times.*³⁸⁹

As of June 9, 2005, the playing field concerning waiting lists in Canada may have changed. On that date, the Supreme Court narrowly reversed the decision of a lower court in Quebec, which had found prohibitions against private health insurance (and, by implication, against the provision of private surgeries in public hospitals) to not be an inappropriate contravention of a person’s guarantee of life, liberty and security.

A cogent editorial published by the Canadian Medical Association Journal (CMAJ) just as this report summary was being written (July 19, 2005) expressed some alarm at the potential impacts of expanded private health care delivery as a result of the judgment. The authors also suggested that governments will simply have to find other means to protect against this eventuality.³⁹⁰

Perhaps more significantly, the other aspect of the climate acknowledged by the CMAJ editorial is the energy that has been released nationally and provincially to address overly long, and sometimes ill-managed, waiting lists. Within the last few months, the second phase of the Western Canada Waiting List Project resulted in a report on MAWTs, The Wait Time Alliance published *No More Time To Wait—Toward benchmarks and best practices in wait time management*, and the Canadian Institute of Health Research commissioned a pan-Canadian research effort on key medical procedures, an initiative to which the present report belongs.

The intensification of legal-political pressure and operational research is especially pertinent for our topic of major joint replacements. After all, the specific concern raised by physician Dr. Jacques Chaoulli, the applicant in the Supreme Court case, is the injustice of his patient being denied timely access to a hip replacement. Furthermore, hip and knee replacements are firmly on this list of key procedures

³⁸⁹ Flood CM, Sullivan T. Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005; Epublished ahead of print (June 20): In print July 19; 142-3.

³⁹⁰ Note that some of their to-the-point comments have supplied the epigraphs in the sections of this summary.

requiring concerted action, as identified by one public commission or First Ministers' meeting after another.

Identifying Gaps and Challenges

*Perhaps these efforts to measure, report and clarify responsibility for wait-list reductions will be redoubled and spurred on by the Chaoulli decision.*³⁹¹

Although the aim has been to prepare a comprehensive report, there are certain questions that have been raised but not fully answered. Sometimes this is because there are research gaps that still need to be filled; in other instances, the relevant issue needs more refining, discussion and consensus-building.

The outstanding matters for observation, consideration and study include:

- *Total waiting time:* although there is some acknowledgment of the various components of waiting (e.g., by the Canadian Orthopaedic Association in terms of the delay in seeing a specialist for assessment), a consensus still needs to be reached on the necessity and practicality of addressing the true *total* waiting time related to joint replacement, from initial patient concerns about pain and disability, to general practitioner and surgical care, and finally to post-surgery rehabilitation.
- *Scheduled surgery:* will this label, more accurate, honest and encouraging than terms such as “elective,” fully take root in professional and public lexicons?
- *Refining and validating priority criteria scoring (PCS):* as suggested earlier, this is an ongoing project; validation involves testing against implicit clinical judgment *and* patient-driven quality-of-life assessments; some jurisdictions are seeking to shorten the hip and knee replacement tool to make it more user-friendly and, possibly, more effective; the ultimate question is how acceptable PCS will be in practice to patients and orthopaedic surgeons alike—the answer especially requiring evaluation of each decision surrounding controversial demographic, personal and social criteria.
- *The utility of prioritization:* an interesting “cognitive gap” exists with regard to PCS; some authorities imagine that priority scoring is a tool to reduce waiting lists, but such a purpose did *not* occur to, for instance, the leaders of the New Zealand prioritization project—they list 7 purposes for national priority criteria, and wait-list reduction is not among them;³⁹² politicians and health care managers need to acknowledge that PCS may only reduce current median wait times for those “fortunate” enough to be near the head of the queue, and only reduce a list if some are dropped from it (*de facto* screening) or drop out through discouragement—or death (default screening).

³⁹¹ Flood CM, Sullivan T. Supreme disagreement: The highest court affirms an empty right. *Canadian Medical Association Journal*. 2005; E-published ahead of print (June 20): In print July 19; 142-3.

³⁹² Hadorn DC, Holmes AC. The New Zealand priority criteria project. Part 1: Overview. *British Medical Journal*. 1997; 314(7074): 131-4.

- *Redressing inequities:* if a group or area has been demonstrably under-serviced by hip and knee replacement in the past, is there an argument to temporarily offer preferential treatment levels that leave behind strictly clinical considerations? Answering this question presupposes having reliable data concerning surgery rates and needs, a situation that does not currently exist for communities such as the First Nations.
- *The disutility of MAWTs:* we presented the conclusion of prioritization projects in the past regarding the issue of elapsed time on the waiting list; the sense was that making time on the a list part of the weighted criteria introduced more problems than it solved; having “bent over backwards” to avoid problems such as bumping more urgent patients, it now seems, as exhibited during the days of the Patient Charter in the UK, that adopting MAWTs could produce the same dilemma.

The final “gaps” in this report are *intentional*. The fact is that there are two more phases to come in this project, with one especially looking at wait list solutions. First, in the context of this current report, how can prioritization and MAWTs contribute to the reduction of wait lists and / or times for hip and knee replacement? Further, what will be the significance and practical outworking of:

- Appropriate targets for staged improvement in waiting lists, e.g., a gradual reduction in MAWTs for each urgency level (the current approach in the UK), or a gradual increase in the percentage of people being serviced within their assigned benchmark time.
- Enhanced short-term funding of surgeries and long-term investment in the staff base and operating room resources to achieve those targets.
- Tested methods for managing, monitoring and public reporting on waiting lists, including the role of modern computer simulation and communications.
- Demand-side changes that can affect waiting lists, e.g., earlier diagnosis of arthritis to allow effective non-surgical interventions, prevention of fractures and other underlying causes, better prosthetics and surgical techniques to increase the duration of good outcomes and reduce revision rates, and more use of surgical interventions that are short of total joint replacement.
- Increased cost containment for hip and knee replacement, including the use of minimally-invasive surgery, so that, with the same budget, more people can benefit more quickly from an intervention which is distinctively powerful within all of health care.

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Appendix A: Reasons Reported for Primary Total Hip and Knee Replacement Procedures

The Canadian Joint Replacement Registry Report for 2005 indicates the following reasons for primary total hip and knee replacement procedures.³⁹³

Canadian Joint Replacement Registry 2005 Report		
Primary Hip and Knee Replacement Procedures		
by Diagnosis Grouping		
Reason	Hip	Knee
Degenerative Osteoarthritis	81.0%	92%
Osteonecrosis	5.0%	1%
Inflammatory Arthritis	4.0%	5%
Acute Hip Fracture	3.0%	
Childhood Hip Problem	2.0%	
Old Hip Fracture	2.0%	
Post-traumatic Osteoarthritis	1.0%	2%
Other	1.0%	1%

³⁹³ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJJR) 2005 Report, 2005.*

Appendix B: Reasons Reported for Revising Total Hip and Knee Replacement Procedures

The Canadian Joint Replacement Registry Report for 2005 indicates the following reasons for total hip and knee replacement revision procedures.³⁹⁴

Canadian Joint Replacement Registry 2005 Report		
Reasons for Hip and Knee Revision Procedures		
Reason	Knee	Hip
Aseptic Loosening	49.0%	57%
Osteolysis	22.0%	30%
Poly wear	36.0%	24%
Instability	13.0%	15%
Infection - two stage	11.0%	10%
Bone fracture	4.0%	8%
Implant fracture	9.0%	4%
Infection - single stage	3.0%	3%
Pain of Unknown Origin	11.0%	1%
Unresurfaced Patella	3.0%	
Patella Fracture	3.0%	
Patella Maltracking	2.0%	
Extensor Mechanism	1.0%	
Other	15.0%	5%

Note: Percentages do not add up to 100% because more than one reason for revision can be recorded.

³⁹⁴ Canadian Institute for Health Information Total Hip and Total Knee Replacements in Canada. *Canadian Joint Replacement Registry (CJJR) 2005 Report, 2005.*

**Appendix C: WCWLP Hip and Knee Replacement Surgery Priority
Criteria Score and Descriptor Guide**

Appendix C.2

Hip and Knee Replacement Surgery Priority Criteria Score and Descriptor Guide

PLEASE PRINT CLEARLY

Provincial Health Care Number: _____

Patient Name: _____

Patient Age: _____ Sex (circle one): **M** **F**

(tick one box) Left Hip Right Hip Left Knee Right Knee

(tick one box) Primary Revision

Diagnosis: _____

Surgeon's Name: _____ Phone: _____

Date: _____

Patients must be on appropriate non-surgical treatment prior to evaluation (e.g. medications, walking aids, shoe inserts)

Please check the box that most accurately describes the patient's current situation

1. Pain on motion (e.g. walking, bending): *

None/mild (0)

Moderate (6)

Severe (13)

2. Pain at rest (e.g. while sitting, lying down, or causing sleep disturbance): *

None (0)

Mild (3)

Moderate (8)

Severe (11)

* Take into account usual duration, intensity, and frequency of pain, including need for narcotic vs. non-narcotic medication.

3. Ability to walk without significant pain:

- Over 5 blocks (0)
- 1-5 blocks (0)
- Less than 1 block (4)
- Household ambulator (7)

4. Other functional limitations (e.g. putting on shoes, managing stairs, sitting to standing, sexual activity, bathing, cooking, recreation or hobbies):

- No limitations (0)
- Mild limitations - able to do most activities with minor modifications or difficulty (4)
- Moderate limitations - able to do most activities with modification or assistance (11)
- Severe limitations - unable to perform most activities (19)

5. Abnormal findings on physical exam related to affected joint (e.g. deformity, instability, leg length difference, restriction of range of motion on examination):

- None/mild (0)
- Moderate (5)
- Severe (10)

6. Potential for progression of disease documented by radiographic findings (e.g. recurrent dislocation, x-ray evidence of protrusion, significant bone loss, component wear, impending fracture): **

- None (0)
- Mild (4)
- Moderate (11)
- Severe (20)

** Predominantly applies to revisions, use in primary cases only in special circumstances (e.g. ligament instability, bone loss)

7. Threat to patient role and independence in society (i.e. ability to work, give care to dependants, live independently (difficulty must be related to affected joint)):

- Not threatened but more difficult (0)
- Threatened but not immediately (10)
- Immediately threatened or unable (20)

**8. All things considered, how would you rate the urgency or relative priority of this patient?
(Draw a line across the scale.)**



WCWL Maximum Acceptable Wait Time Project Hip and Knee Replacements

Hip and Knee Replacement Priority Criteria Score: Descriptor Guide

The following items correspond to the WCWL Hip and Knee Replacement Surgery Priority Criteria Score (PCS). The descriptor statements are to be used as a guide and do not represent a complete list of clinical indicators.

Item #1: Pain on Motion (e.g. walking, bending)	
1. None/mild pain on motion	<ul style="list-style-type: none"> ❖ Patient can move about including walking and bending. They may experience some pain but it does not prevent any activity. ❖ They usually do not require pain medication.
2. Moderate pain on motion	<ul style="list-style-type: none"> ❖ Patient can move about including walking or bending. They experience pain most of the time which limits their activities to some degree. For example, patients experience trouble walking up and down stairs or may be uncomfortable standing for long periods of time. ❖ They occasionally need pain medication.
3. Severe pain on motion	<ul style="list-style-type: none"> ❖ Patient cannot walk or bend without experiencing pain. The pain restricts their activities in a major way. For example, patients experience pain walking up and down stairs and may not be able to stand for long periods of time. ❖ They need pain medication most of the time.

Item #2: Pain at Rest (e.g. while sitting, lying down, or causing sleep disturbances)	
1. No pain at rest	<ul style="list-style-type: none"> ❖ Patient does not experience pain when they are sitting or lying down.
2. Mild pain at rest	<ul style="list-style-type: none"> ❖ Patient experiences some pain but it does not disturb their rest when they are sitting or lying down. ❖ Pain does not cause sleep disturbance.
3. Moderate pain at rest	<ul style="list-style-type: none"> ❖ Patient experiences pain most of the time which disturbs their rest when they are sitting or lying down. ❖ Pain may cause some sleep disturbance and patient may need to take pain medication occasionally.
4. Severe pain rest	<ul style="list-style-type: none"> ❖ Patient cannot rest in a sitting or lying position without experiencing pain. ❖ Patient often gets up in the middle of the night to take pain medication

Item #3: Ability to Walk Without Significant Pain	
1. Over 5 blocks	<ul style="list-style-type: none"> ❖ Patient can walk over 5 blocks without needing to stop due to pain.
2. 1-5 blocks	<ul style="list-style-type: none"> ❖ Patient can walk between 1 and 5 blocks but then must stop due to the pain.
3. Less than 1 block	<ul style="list-style-type: none"> ❖ Patient cannot walk more than 1 block due to pain.

<p>4. Household ambulator</p>	<ul style="list-style-type: none"> ❖ Patient needs a walking aid, such as crutches or a wheel chair, to walk outside the home. Patient uses furniture for support to walk inside the home.
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<p>Item #4: Other Functional Limitations</p>	
<p>1. No functional limitations</p>	<ul style="list-style-type: none"> ❖ Patient can perform all of their daily tasks such as putting on their shoes, climbing stairs, going from sitting to standing, bathing, cooking and recreation activities. They usually do not require assistance. ❖ They usually do not need to make minor modifications to complete a task.
<p>2. Mild functional limitations</p>	<ul style="list-style-type: none"> ❖ Patient can perform most of their daily tasks such as putting on their shoes, climbing stairs, going from sitting to standing, bathing, cooking and recreation activities. They usually do not require assistance. ❖ They may need to make some minor modifications for certain tasks; for example, they may have to take their time climbing stairs or use a cane to get from the sitting to standing position.
<p>3. Moderate functional limitations</p>	<ul style="list-style-type: none"> ❖ Patient can perform most of their daily tasks such as putting on their shoes, climbing stairs, going from sitting to standing, bathing, cooking and recreation activities with modifications. For example, they may require a higher chair with arms for sitting and a bath seat for bathing. ❖ They require assistance some of the time.
<p>4. Severe functional limitations</p>	<ul style="list-style-type: none"> ❖ Patient is unable to perform most of their daily tasks such as putting on their shoes, climbing stairs, going from sitting to standing, bathing, cooking without assistance. ❖ They require assistance most of the time. Patient can no longer participate in recreation or hobbies.

<p>Item #5: Abnormal Findings on Physical Exam Related to Affected Joint</p>	
<p>1. None/mild</p>	<ul style="list-style-type: none"> ❖ (Knee) Patient does not have any physical deformities such as knock knee or bowleg. ❖ (Hip) Patient is able to straighten their legs and has full range of motion. For example, their leg can be straightened when laying down. Patient can spread their legs apart.
<p>2. Moderate</p>	<ul style="list-style-type: none"> ❖ (Knee) Patient shows some level of deformity such as knock knee and bow leg. ❖ (Hip) Patient has difficulty straightening and bending their legs. For example, the patient's leg remains slightly bent when lying down. Patient has difficulty spreading their legs apart.
<p>3. Severe</p>	<ul style="list-style-type: none"> ❖ (Knee) Patient has marked deformity such as knock knee and bowleg. ❖ (Hip) Patient cannot fully bend, straighten or spread apart their legs.

<p>Item #6: Potential for Progression of Disease Documented by Radiographic Findings (Primary: first replacement; Revision: subsequent replacement on the same joint)</p>	
<p>1. None</p>	<ul style="list-style-type: none"> ❖ Patient is booked for a primary hip or knee replacement (i.e. not a revision) with no signs of protrusion or bone loss. (Note: Protrusion

	occurs when the ball of the joint pushes through the socket)
2. Mild	<ul style="list-style-type: none"> ❖ Patient is booked for a primary replacement but shows early signs of protrusion or bone loss which are barely noticeable on the X-rays. ❖ Patient is booked for a revision and small amount of bone loss is evident in two consecutive X-rays.
3. Moderate	<ul style="list-style-type: none"> ❖ Patient is booked for a primary replacement and signs of protrusion or bone loss are clearly noticeable on the X-rays. ❖ Patient is booked for a revision and a large hole is evident in the bone. There is minimal change in bone loss over two consecutive X-rays.
4. Severe	<ul style="list-style-type: none"> ❖ Patient is booked for a primary replacement and there are marked signs of protrusion or bone loss on the X-rays. ❖ Patient is booked for a revision and there is significant bone loss over two consecutive X-rays. The X-ray may also show signs that the original hip/knee prosthesis is breaking down. Patient may also experience a “squeaking” noise when they walk. This occurs when the metal parts of the prosthesis rub together where the plastic has worn out.
<p>Notes: Item #6 predominantly applies to revisions, use in primary cases only on special circumstances (e.g. ligament instability, bone loss)</p>	

Item #7: Threat to Patient Role and Independence in Society	
1. Not threatened but more difficult	<ul style="list-style-type: none"> ❖ With the present level of disability, patient can continue to work with minor adjustments. ❖ With the present level of disability, patient can care for dependents but sometimes requires help. ❖ With the present level of disability, patient can continue to live independently but requires some help with jobs such as gardening and cleaning.
2. Threatened but not immediately	<ul style="list-style-type: none"> ❖ With the present level of disability, patient may not be able to continue to work. ❖ With the present level of disability, patient requires significant help in caring for dependents. ❖ With the present level of disability, patients living in a house with multiple floors may have to consider moving to an apartment to avoid stairs.
3. Immediately threatened or unable	<ul style="list-style-type: none"> ❖ With the present level of disability, patient can no longer work. ❖ With the present level of disability, patient is unable to care for dependents even with help. ❖ With the present level of disability, patient can no longer live independently and will have to be placed with relatives or moved to a care facility.