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# Implementation of Outpatient Total Joint Arthroplasty in Canada: Where We are and Where We Need to Go

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**Abstract:** Total joint arthroplasties (TJA) are successful procedures for the treatment of end-stage hip and knee arthritis. Length of stay in hospitals after these procedures has been steadily decreasing over time, with outpatient procedures (discharge on the same day as surgery) introduced in the US within the last 20 years. Reducing length of stay after TJA can provide cost savings. Centres in Canada have started to utilize outpatient TJA procedures, but we have identified some barriers that may have limited their implementation. We have summarized the current literature for outpatient TJA and discussed potential solutions for the current barriers.

**Keywords:** total knee arthroplasty, total hip arthroplasty, outpatient, implementation, barriers

## Introduction

Total joint replacements are common procedures for the treatment of end-stage arthritis of the hip and knee; typically, with excellent outcomes. In 2016/17, over 55,900 hip and 67,000 knee procedures were performed in Canada, representing a five-year increase of 17.8 percent and 15.5 percent respectively.<sup>1</sup> These procedures represent a significant economic burden on the Canadian health care system, which will continue to increase as the population ages.

One avenue to reduce costs is to decrease the length of stay in hospital for these procedures. Outpatient joint replacements (where the patient is discharged from hospital on the same day as surgery) have become popular in the United States.<sup>2</sup> In Canada the current median length of stay for hip and knee replacements is three days.<sup>1</sup> Some surgeons have started to implement outpatient procedures into their practice, but barriers to outpatient care pathways have stood in the way of widespread implementation.

A difficulty with evaluating the outpatient arthroplasty literature is the definition used by various groups. Many papers will define outpatient arthroplasty as discharge from hospital within 12 or 24 hrs of surgery, which would include patients whom stay overnight in hospital (depending on the timing of surgery). A study by Bovonratwet et al investigated different definitions of inpatient and outpatient status using the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database as it provides an “inpatient” or “outpatient” status variable as well as a distinct hospital length of stay variable.<sup>3</sup> They demonstrated

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that only 12% of hip replacement patients and 11% of knee replacement patients coded as “outpatient” in the database were discharged on the same day as surgery. It’s important to distinguish between true outpatient surgery, discharge on the same day as surgery, and those whom stay overnight to ensure accurate interpretation of study results.

This paper will discuss some of the current barriers that exist in limiting the implementation of outpatient procedures and provide suggestions for how to facilitate the adoption of outpatient total joint replacement procedures. We will also discuss how to best implement outpatient surgery within the current health care structures.

## Outpatient Arthroplasty

Over the past decade, total hip and total knee arthroplasties (THA and TKA) have transitioned to an outpatient setting, meaning that patients are discharged from hospital on the same day as their procedure.<sup>2</sup> This was initially performed primarily in the US but is now being increasingly performed in Canada and Europe as well.<sup>4</sup>

## International Experience

Success of outpatient THA and TKA has been reported in several studies and is summarized by Pollock et al in a systematic review.<sup>2</sup> All studies discussed in the review were conducted in the US, except for one that investigated outpatient unicompartmental knee arthroplasty in Canada. The authors found the studies reported similar complication rates between outpatient and inpatient groups with significantly lower associated costs for the outpatient group. Of the two studies that evaluated patient satisfaction,<sup>5,6</sup> both reported high satisfaction rates among patients who underwent outpatient THA, with satisfaction defined as willing to be discharged as outpatients again, and patient-reported outcomes were not different between groups. A limitation of this review is the quality of the studies included. Using the Cochrane Risk of Bias Assessment Tool for Non-Randomized Studies of Interventions for comparative studies and the Effective Public Health Practice Project Quality Assessment Instrument for non-comparative studies, the authors noted moderate to high risk of bias for most comparative studies and moderate to weak quality for most non-comparative studies.<sup>2</sup>

A more recent study by Gromov et al (2019) found a similar rate of complications and readmissions within 90-days of surgery compared between a prospective cohort of

outpatient THA and TKA patients and a matched cohort of patients whom stayed at least one night in hospital.<sup>7</sup> They found six percent of outpatients and four percent of inpatients were readmitted within 90-days of surgery with an odds ratio of 1.6 (95% confidence interval 0.7–4), though no patients were readmitted within 48 hrs of surgery.<sup>7</sup>

Another recently published study, by Nowak and Schemitsch, has also attempted to investigate safety concerns with outpatient TKA and found opposing results to those mentioned above.<sup>8</sup> They performed a retrospective review of the NSQIP database to evaluate the effect of length of stay on complications and readmissions within 30-days of surgery. They found outpatient TKA (length of stay of zero days) to increase the risk of major complications (odds ratio 1.8, 95% confidence interval 1.0–3.2), though it did not increase the risk of readmission ( $p=0.55$ ) compared to patients with a length of stay of two days.<sup>8</sup>

There is one randomized control trial published in the literature, conducted by Goyal et al in the US.<sup>9</sup> This multi-centre study randomized a total of 220 patients undergoing THA through a direct anterior surgical approach to be discharged as outpatients, within 12 hrs of surgery, or inpatients, minimum one-night stay. They reported 76 percent of those randomized to the outpatient group ( $n=112$ ) were discharged as planned. When an overnight stay was necessary, the reasons included: dizziness, pain, patient preference, nausea, ambulatory dysfunction and urinary retention. For the inpatient group ( $n=108$ ), 75 percent were discharged as planned, with 16 percent electing to leave on the day of surgery after meeting all required discharge criteria. They found the patients who elected to leave early were younger and predominantly male compared to those discharged as planned in the inpatient group. Greater pain was reported in the outpatient group on day one post-surgery, but no differences were found in pain at any other time point. Likewise, rates for complications, readmissions, emergency room visits, clinic visits, or work effort required from the surgeons’ office staff were no different between groups. Overall, they found outpatient THA to be safe, but suggest that facilities need to ensure that beds are available if patients are unable to meet discharge criteria on the day of surgery. They also suggest that pain management education and appropriate perioperative medication use are important to control patient pain on the first day post-surgery. Weaknesses of this study were that patients could choose to switch to the other group if they wanted,

whether for medical reasons or for personal preference, and that the study was not adequately powered to detect a difference in complication rates.<sup>9</sup>

Most of the studies reviewed have investigated outpatient arthroplasty in narrowly selected young, healthy patients,<sup>4,6,9,10</sup> making it uncertain as to the fraction of the general arthroplasty population in whom outpatient surgery may be considered an option. However, a study by Gromov et al (2017) in Denmark investigated the feasibility of outpatient arthroplasty in a consecutive series of unselected patients using a standardized surgical protocol, posterolateral surgical approach for THAs, and medial parapatellar approach for TKAs.<sup>11</sup> They found that, of 557 patients referred to the centres involved in the study, 54 percent were potentially eligible for outpatient surgery after screening and almost 15 percent were discharged on the day of surgery. Two main factors significantly increased the odds of not being discharged on the same day of surgery including female sex and surgeries scheduled later in the day. The authors also identified lack of social support or social network as a factor which excluded 25% of patients whom otherwise were eligible for outpatient surgery. They also found the inability to safely mobilize post-surgery to be the most common reason for patients not to be discharged on the day of surgery. The authors suggested that ensuring available caregiver support and supporting safe mobilization would be excellent targets for optimizing the number of patients eligible for same day discharge.<sup>11</sup> While including an unselected group of patients in this study is a strength as it allows for an accurate estimation of the true percentage of patients potentially eligible for outpatient pathways in the general population, the authors acknowledged that they did not screen based on body mass index (BMI) or distance from the hospital. Increased BMI and greater distance from hospital were both found to negatively impact whether a patient was discharged on the day of surgery even though all were deemed eligible to be outpatients. These factors would have exaggerated the number of patients unable to be discharged as outpatients in comparison to other studies which would deem these patients ineligible.<sup>11</sup>

## Canadian Experience

Outpatient arthroplasty has not seen widespread adoption in Canada and is currently only offered in a few centres. The only published study conducted in Canada investigated costs between outpatient and inpatient TKA in

2017;<sup>12</sup> however, there are four prospective studies in progress according to clinicaltrials.gov.<sup>13–16</sup>

Huang, Ryu and Dervin in Canada conducted a case-control study to investigate costs between same day discharge TKA and standard inpatient TKA.<sup>12</sup> They found same day discharge to be less costly in every case-control match with a median savings of 30 percent, approximately \$3200 CAN, for those undergoing same day discharge.<sup>12</sup> This is the only currently published study conducted in Canada.

One currently running study is being conducted in Montreal, Quebec to investigate a cohort of patients undergoing fast-track THA and TKA (return home in less than 24 hrs) in comparison to a historical control of patients who underwent surgery with the usual intervention in the past and the standard length of stay.<sup>13</sup> The groups will be compared for adverse events, cost, and patient-reported outcomes. The study is estimated to have finished in September 2019 and there have been no results reported yet.

In London, Ontario there is a randomized control trial comparing patients discharged as outpatients after THA to those discharged one day post-surgery.<sup>14</sup> The study compares the groups for patient satisfaction, cost, adverse events, patient-reported outcomes, and caregiver involvement. Uniquely, to help avoid biases in patient reported outcomes, patients enrolled in this study are blinded to the fact that they are part of a randomized trial, until the end of the study. The study is expected to finish in July 2022; preliminary data from this study was published in a thesis by Pollock.<sup>17</sup> Based on a sample of 45 patients who had completed the study, he reported a significantly shorter length of stay in the outpatient group and significantly lower costs in the outpatient group from a Ministry of Health and hospital perspective.<sup>2</sup>

In Ottawa, Ontario, a study is being conducted investigating the feasibility of outpatient TKA.<sup>15</sup> They developed a new protocol that includes a less invasive surgical approach, the use of tranexamic acid during surgery to reduce blood loss, and a cold compression device to help reduce swelling and pain post-surgery. The aim of the study is to investigate the effect of this new protocol on length of stay, analgesic use, range of motion, quadriceps strength, patient satisfaction, health care resource requirement, and time to return to work and is expected to finish in July 2019.<sup>15</sup>

A second study currently being conducted in Ottawa, Ontario is investigating the use of an adductor canal block

for pain control after outpatient TKA.<sup>16</sup> They are randomizing patients undergoing outpatient TKA to either receive a ropivacaine or saline infusion in the adductor canal for the first 96 hrs after surgery and will compare the groups for quality of recovery and is expected to finish in March 2020.<sup>16</sup>

These current studies will add valuable information regarding the safety, patient-reported outcomes and costs of outpatient arthroplasty and inform whether existing evidence will translate to a Canadian setting with similar results.

## Cost Savings

Performing THA and TKA through an outpatient pathway is expected to decrease the overall cost of providing the procedures as well as alleviate bed management pressures. Outpatient discharge protocols remove most of the associated inpatient costs of the procedures leading to an overall reduction in cost. Outpatients are not usually admitted to the inpatient floor and thus the associated nursing, pharmacy, physiotherapy and occupational therapy costs are not incurred. Several studies support cost savings with outpatient arthroplasty.<sup>2,10,12,18–20</sup> A systematic review performed by Crawford et al found seven studies addressing cost with an overall savings between 17.6 percent and 57.6 percent for outpatient procedures relative to inpatient.<sup>10</sup> Of the seven studies included in the review, three investigated hip or knee arthroplasty. Bertin found a mean cost of \$19,021.24 USD for outpatient THA versus \$23,087.38 USD for inpatient THA<sup>18</sup> and Aynardi et al found a mean cost of \$24,529 USD at an outpatient centre for THA compared to \$31,327 USD at an inpatient hospital.<sup>19</sup> Lovald et al looked at costs for TKA and found a mean savings of \$8527 USD in an outpatient group compared to the reference group which stayed in hospital an average of three to four days.<sup>20</sup> Studies conducted in Canada including Huang, Ryu and Dervin and Pollock also reported significant cost savings in their outpatient cohorts.<sup>12,17</sup> Overall, there is a consensus in the literature that outpatient discharge protocols provide cost savings for arthroplasty procedures.

## Need for Future Studies

Key studies that would fill the current gaps in the literature would include a randomized control trial with blinded participants to assess the true safety of the procedure in all eligible patients, and a study evaluating the ideal candidate for outpatient arthroplasty by assessing readiness

for discharge on the day of surgery in all patients undergoing TKA or THA as the first or second case of the day. A full economic evaluation is also needed, to assess both costs and effects to determine the true value of outpatient procedures as there is some worry that the proposed cost savings may just be shifted to increased readmissions and healthcare use after discharge.<sup>21,22</sup> It may also be of benefit to investigate anaesthetic use in outpatient programs as there are a wide variety of anesthetics that are currently in use and the ideal anaesthetic is, as of yet, undetermined.<sup>23</sup>

## Implementation in the Canadian Setting

In Canada, there are few centres that utilize an outpatient discharge protocol. There are several factors defined in the implementation science literature that may play a role in why so few sites have implemented these pathways including those at the provider, patient and organization levels.

## Provider Factors

A key provider level barrier is the complexity of coordination. Outpatient protocols require effective coordination of many disciplines, which can be very challenging. From our experience, we have had to encourage coordination between surgeons, physiotherapists, occupational therapists, nurses and anaesthesiologists to ensure all services are able to adjust their processes to support an outpatient pathway. In addition, all groups need to be equally invested in the success of the protocol and willing to adapt practices. These changes can include preoperative physiotherapy assessments to ensure patients are able to be safely discharged on the day of surgery as there may not be enough time to adequately educate patients on the day of surgery. Nursing duties that would typically be performed on the ward such as education for wound care need to be performed in other locations, by a different set of nurses, adding additional complexity.

Similar barriers were reported by Alawadi et al when looking at the implementation of an early recovery pathway after colorectal cancer.<sup>24</sup> They found health care providers to be resistant to change, but that effective teamwork and communication can facilitate these pathways. Funding models, teamwork and communication would ensure all health care providers involved in the service of these procedures are focused on the same goals to provide the best possible care within shorter time frames to facilitate these early recovery pathways. Zikmund-Fisher et al



also reported the need for buy in from all stakeholders when they studied the implementation of Choosing Wisely<sup>®</sup> recommendations among primary care providers.<sup>25</sup> These are not unique barriers to specific settings, procedures or practices.

## Patient Factors

Patient level barriers can include a lack of education and unrealistic expectations. A study by Meneghini and Ziemba-David looked at patient perceptions of outpatient arthroplasty and found that of the 110 patients surveyed, only 3 expected to be discharged on the same day and over 50 percent expected to stay two or more nights in hospital.<sup>26</sup> However, more than 50 percent of men and 30 percent of women reported being comfortable with outpatient surgery.<sup>26</sup> This large discrepancy signals a need for adequate patient education prior to surgery to make sure that patients are aware of the option for outpatient arthroplasty when it is available. A study by Churchill et al at our institution interviewed patients discharged as outpatients after THA and reported unrealistic expectations from the patients for speed of recovery as well as what to expect for post-operative pain.<sup>27</sup>

Another significant patient factor is the presence of a caregiver post-surgery. Gromov et al (2017) excluded a large proportion of patients from outpatient discharge in their study because they lived alone.<sup>11</sup> Lack of social support can also be a significant barrier for implementation of early recovery pathways.<sup>24</sup> Our experience has shown that the mere presence of a caregiver may not be enough, there must also be adequate education of the caregiver whether this occurs preoperatively or just prior to discharge. The study by Churchill et al reported that the presence of the caregiver when providing discharge instructions to patients may be important, as patients reported difficulties remembering what they had been told.<sup>27</sup> Appropriate access to home care services in the first few weeks post-surgery also helps caregivers and patients to feel more comfortable.

## Organization Factors

Organizational barriers can include a lack of administration support, safety, lack of incentive, and funding. Administratively, for patients to be discharged as outpatients, they must be booked as the first or second case of the day to ensure there is enough time for the patient to recover from anaesthesia, meet with physiotherapy, and receive the proper education from nursing staff. Surgery

performed later in the day is reported as significantly increasing the odds of being unable to discharge patients home as outpatients.<sup>11</sup>

There is also a concern for safety with outpatient pathways due to a lack of high-quality prospective studies comparing outpatient to standard inpatient pathways. Pollock et al, in their systematic review, found a moderate to high risk of bias for most studies they included.<sup>2</sup> As stated before, there is currently only one published randomized control trial in the literature comparing these groups of patients.<sup>9</sup> However, studies that are currently ongoing show promise for adding high quality evidence to the existing literature supporting outpatient procedures.<sup>13-16</sup>

## Potential Solutions

As detailed above there are many challenges to implementing and sustaining an effective outpatient pathway for TKA and THA. There are three potential solutions to support a discussion and successful implementation of an outpatient pathway: patient education, teamwork and communication, and modifiable peri-operative factors.

**Patient Education.** There is mixed evidence for the effectiveness of patient education. In a review of the literature by McDonald et al they found that preoperative patient education had no effect on postoperative pain, mobility, length of stay or function after total joint arthroplasty.<sup>28</sup> Culliton performed a randomized control trial to compare standard patient education with e-learning videos in addition to standard education in a 2016 doctoral thesis.<sup>29</sup> They found no difference in patient satisfaction or expectations between the groups. Aydin et al also found no effect of preoperative patient education for most outcomes, except a slight decrease in patient anxiety.<sup>30</sup> They also pointed out that length of stay may not change regardless of how well-informed or motivated patients are as there are multiple factors that affect the ability to mobilize early such as pain management and availability of staff. However, as Edwards, Mears and Barnes pointed out in their paper, much of the education material provided to patients is presented above their reading level.<sup>31</sup> They suggest that patient education may be effective if material is presented at a fourth-grade reading level, there are group classes involving a health care provider and a caregiver is present with the patient. While there is no good evidence for patient education being effective, there is room for improvement in the education that is currently being provided to patients.

Teamwork and Communication. Effective interdisciplinary communication can be difficult to implement, but several studies have found ways to overcome the existing barriers. The two key methods that have been suggested include frequent team meetings and standardized care plans. Frequent meetings help to foster support,<sup>31</sup> increase the quality of care and keep open communication between team members,<sup>32–34</sup> which has been found to be a predictor of understanding patient care goals.<sup>32</sup> Meetings also provide an opportunity to plan for the day<sup>33</sup> and increase predictability, which has been associated with staff satisfaction and moral.<sup>34</sup> Standardized care plans designed by the interdisciplinary team can increase the collaboration between the team members and help to ensure that all members are on the same page.<sup>35</sup> Interdisciplinary tools such as these can improve the communication between all team members and clarify the work that is needed for the patients.<sup>36</sup> In the case of outpatient arthroplasty these plans can ensure that all patients receive the same care regardless of the amount of time spent in the hospital.

Modifiable peri-operative factors. A review by Galbraith, McGloughlin and Cashman looked at the implementation of enhanced early recovery pathways for arthroplasty in the literature.<sup>37</sup> They found modifiable peri-operative factors including education, discharge planning, physiotherapy, pre-medication, anaesthesia, blood loss reduction, early mobilization, and venous thromboembolic prophylaxis among others<sup>28</sup> contributed to the success of outpatient pathways. Our institution has already implemented many changes in these areas, including preoperative blood management, peri-articular injection of analgesia and tranexamic acid, as well as a standardized protocol for venous thromboembolic prophylaxis, prior to the implementation of outpatient pathways. These changes have helped to facilitate these pathways and exemplify the multi-disciplinary team coordination required to implement them.

## Conclusion

There are many provider-, patient- and organization-level barriers suggested that may be hindering the implementation of outpatient arthroplasty procedures in Canada. Most of these barriers can be overcome with communication between the various care providers combined with adequate patient and caregiver education. Communication is essential for establishing new pathways within hospitals and to ensure efficient patient care within a shorter timeline prior to discharge. Education for patients and

caregivers could alleviate safety concerns and ensure they are comfortable with managing their own pain and dressing changes as well as reduce unnecessary trips to the emergency room when concerns arise. A key incentive of its implementation for hospitals is the proposed cost savings, which can help alleviate the large economic burden arthroplasty procedures represent by reinvesting cost savings into arthroplasty programs to provide more procedures and reduce waitlists. Ultimately, many patients believe that home is the best place to recover,<sup>28</sup> however more research is required to fully elucidate the effects of outpatient discharge on patient safety and cost savings as there are currently no high-quality randomized control trials or full economic analyses published in the literature. With committed leadership, this paradigm shift in the post-operative care of arthroplasty patients is imminently possible in collaboration with patients, caregivers, allied health care workers and other key stakeholders.

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