Outpatient Total Joint Arthroplasty: A Review of the Current Stance and Future Direction

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ABSTRACT

INTRODUCTION: The purpose of this review is to outline some of the major considerations when transitioning to performing total hip and knee arthroplasty in the outpatient setting. The review will discuss patient selections, peri-operative management pathways, and outcomes related to outpatient total joint arthroplasty (TJA).

PATIENT SELECTION: Appropriate patient selection is key to successful outpatient TJA. Multiple indices have been proposed to estimate patient risk before undergoing outpatient TJA.

PERIOPERATIVE MANAGEMENT: In order to provide a successful outpatient TJA experience, pre-operative education class and physical therapy session can set expectations and prepare the patient for the post-operative recovery at home. Specific anesthesia techniques focus on regional blocks, multi-modal pain control, and reduction of post-operative nausea and vomiting and rapid recovery protocols have been developed to provide early mobilization and physical therapy.

OUTCOMES: Nationwide analyses have found improved complication rates ranging from 1.3%–3% in outpatient TJA group compared to 3%–12% in the inpatient TJA group. Financial analyses have found significant cost savings for outpatient TJA mostly related to reduction in surgical floor care.

CONCLUSION: Outpatient TJA has the potential to improve patient experience with cost savings and no increased risk of complications in the appropriately selected patient population.

KEYWORDS: outpatient joint replacement, arthroplasty, outcomes, patient selection

INTRODUCTION

Over the last decade, considerable focus has been placed on the safety and feasibility of performing outpatient total joint arthroplasty (TJA). Momentum for this shift has been fueled largely by advancements in arthroplasty-related care and concerns over the current economic crisis in healthcare. In a 2015 report, the Center for Medicare and Medicaid Services pointed to joint replacement surgery as the single most expensive procedure covered by Medicare, costing over $6.5 billion for Medicare beneficiaries in 2013. Furthermore, the demand for TJA is projected to continue to rise at an astounding rate due to a combination of an aging population, the growing obesity epidemic, and an increased public awareness of the successful outcomes following joint replacement surgery.[1] It has been estimated that by 2030, total hip arthroplasty will increase by 174% to over 500,000 cases and total knee arthroplasty will increase by 673% to 3.48 million cases annually.[2] The majority of elective total joint replacements are still being performed in the inpatient setting. In retrospective analyses evaluating primary TJA, the national trends show only 0.7–1% were performed on an outpatient basis and only 6.2–16.5% of cases were discharged from the hospital within 24 hours.[3,4] However, with the growing interest in outpatient TJA in recent years, there has been an increase at certain institutions across the United States. Some projections estimate that 50% of TJA will be performed in the outpatient setting by 2026.[5]

Historically, it was not uncommon for patients to remain in the hospital for weeks following a joint replacement surgery.[6] Improvements in surgical techniques, peri-operative anesthesia and pain management protocols, as well as the implementation of rapid recovery programs, have led to significant reduction in the average hospital length of stay (LOS) following joint replacement surgery.[7,8] Previous literature has demonstrated a strong correlation between hospital length of stay and the total cost of joint arthroplasty, making duration of hospitalization a priority item for cost control.[9]

With the increasing prevalence of outpatient TJA, multiple studies have been performed to evaluate these procedures in regards to safety, hospital costs, complications, and patient selection. The purpose of this review is to outline some of the major considerations when deliberating the transition to performing total hip and knee arthroplasty in the outpatient setting. The review will discuss patient selections, peri-operative management pathways, and outcomes related to outpatient TJA.

PATIENT SELECTION

Though no consensus statement exists regarding a standardized protocol for patient selection, appropriate patient

selection is a critical element of ensuring a safe and successful outpatient TJA experience. Multiple studies have evaluated patients undergoing elective TJA in an effort to identify characteristics that make patients optimal candidates for outpatient TJA. They have found that patients discharged within 24 hours of TJA were more likely to be younger (<50 years), male, ASA class 1 or 2, and less likely to be morbidly obese (BMI <40) or taking steroids for a chronic condition ($p < 0.05$ for all comparisons).[10,11]

Alternatively, rather than evaluating which patients have successfully undergone outpatient TJA, other studies have evaluated which patients are at highest risk for complications and readmission. Notable risk factors include chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), hypertension, obesity, hypoalbuminemia, cirrhosis, chronic kidney disease and age greater than 65.[12,13,14] Indices have been proposed to estimate patient risk such as Charlson Comorbditiy Index (CCI) or the American Society of Anesthesiologists Score (ASA). Higher overall disease burden as graded by these scoring systems has been shown to be directly associated with increased complications after TJA.[14,15] These scoring systems are not specific to TJA patient populations and have not been found to be highly sensitive or specific. Therefore, a unique scoring system was developed to account for relevant medical comorbidities as they related to TJA.[16] The Outpatient Arthroplasty Risk Assessment (OARA) score consists of nine distinct medical categories that are summed and stratified in a binary fashion to predict safe vs. unsafe early discharge. In the original study, the OARA score had a higher positive predictive value than the ASA and CCI for predicting early and safe discharge home. In a recent update, the upper limit of the "safe discharge" score was increased, with a maintained near 100% positive predictive value for safe discharge home after TJA.[17]

Non-medical factors that are likely associated with improved rates of safe discharge after outpatient TJA include strong social support, home living situation such as bed and shower on a single floor, preoperative mobility status and the patient's motivation for same day discharge. These factors are more difficult to study, due to lack of reporting in national databases such as the National Inpatient Sample (NIS) or National Surgical Improvement Protocol (NSQIP). The Risk Assessment and Prediction Tool (RAPT) attempts to account for some of these factors including walking distance, use of a walking aid and presence of a caregiver at home. It has been shown to predict discharge to home in low-risk patients; however, it has not been evaluated for outpatient total joint arthroplasty.[18]

As the demand for outpatient total joint arthroplasty increases, further research is needed to identify the ideal prediction tool that will incorporate medical co-morbidities, patient-specific factors, and social influences to best identify which patients can undergo safe outpatient TJA.

PERIOPERATIVE CARE

Numerous studies have focused on improving the perioperative management of total joint replacement to facilitate enhanced recovery time, early mobilization, and reduced risk of re-admission following discharge. The phases of management can be broken down into preoperative management and education, intraoperative anesthesia protocols, surgical technique, and postoperative management. The combined consensus statement of the American Academy of Orthopaedic Surgeons (AAOS), the Hip Society, the Knee Society and the American Association of Hip and Knee Surgeons (AAHKS) emphasized a team approach ensuring the surgeon, anesthesiologists, and recovery unit staff work towards the same goal of safe discharge.[19]

1. Preoperative management and education

Once a patient is deemed medically appropriate for outpatient arthroplasty, the most important step is patient education. A preoperative education class can establish patient expectations for the day of surgery and immediately postoperatively, ensuring that the patient's safety will be maintained, allowing for questions to be answered and decrease anxiety related to the process.[20] Face-to-face education programs have been shown to decrease length of stay by a full day,[21] and have also decreased patient anxiety and pain.[22,23] The addition of a preoperative physical therapy session can help the transition back to home by giving instruction for performing basic mobility tasks after TJA. In a recent review of implementing outpatient TJA, all authors reported the use of a preoperative educational class and the majority reported requiring patients to attend a physical therapy session prior to surgery.[24]

2. Intraoperative Factors

Spinal anesthesia and regional blocks

Over the past few decades, advances in anesthesiology have allowed a transition of many surgical procedures to an outpatient setting including general surgery procedures such as cholecystectomy as well as orthopedic surgeries such as ACL reconstruction.[25,26] These improvements in anesthesia care range from the type of anesthetics used, adjunctive analgesia optimization, and medication advances. The most common reasons for delayed discharge after TJA were pain, postoperative nausea and vomiting (PONV) and hypotension.[27] Therefore, many of the anesthesia interventions taken in the perioperative period are focused on minimizing these complications. The majority of outpatient TJA cases utilize neuraxial anesthesia and regional blocks to limit PONV and improve pain control.[24] In the immediate postoperative period, spinal anesthesia had significantly decreased rates of nausea compared to general anesthesia, and was also associated with shorter length of stay in TKA.[28] Furthermore, spinal anesthesia has been shown to decrease rates of operative time, blood loss and DVT/PE compared to general anesthesia.[29]

Multimodal pain control

Multimodal pain control is a method of decreasing surgical pain at numerous points along the pain pathway from the site of injury to the brain.[30] This improves the patient's overall pain control and allows for improved mobility postoperatively.[31] Multimodal pain control utilizes a wide range of pre-operative medications including non-steroidal anti-inflammatory drugs (NSAID), narcotics, gabapentiniods, dexamethasone and acetaminophen.[24] In addition, spinal anesthesia and regional blocks are key components to multi-modal pain control.

Surgical factors

Minimally invasive surgery (MIS) techniques have evolved to limit blood loss, decrease soft tissue disruption, improve cosmetic appearance, and assist in faster patient recovery. These techniques are defined as using an incision 10–12cm or less for hips, and typically require specialized instrumentation for retraction and exposure. With the progression toward outpatient TJA, MIS techniques have been advocated.[20] Some of the advantages that have been reported include decreased pain, decreased length of stay and improved early range of motion after MIS THA.[36] However, the overall results of MIS have been mixed.[37] Several groups reported minimal difference between standard and MIS techniques in terms of recovery time, gait analysis and outcomes.[38-40] In order for MIS techniques to improve the transition to outpatient TJA, the surgeon must be skilled and experienced with MIS techniques.

3. Postoperative mobilization and rapid recovery protocols

A key component of postoperative care in outpatient TJA is early ambulation. In a review of outpatient protocols, all reporting authors utilized postoperative physical therapy in the recovery unit. Tasks included sit to stand, ambulating up to 100 feet, transferring to bathroom and navigating a flight of stairs.[24] An added benefit to early mobilization is a decrease in thromboembolic events.[41] Coupled with preoperative education, this approach is crucial to a successful outpatient practice.

Creating a safety net for patients that are discharged home is also important. Many centers choose to implement standardized home physical therapy and home nursing, in addition to follow-up phone calls or mobile phone total joint applications with the ability of the patient to discuss issues directly with their care team following discharge. Increased availability of administrative staff may be required to field phone calls or issues that may arise at home.[42]

OUTCOMES AND COMPLICATIONS

As the prevalence of outpatient TJA has increased, more studies have been performed to evaluate complications rates, rates of readmission, rates of reoperation, patient satisfaction, and health system costs in comparison to inpatient TJA. One retrospective analysis of the NSQIP database found that bleeding requiring transfusion was the most common complication in both outpatient and inpatient TJA, with a lower rate in the outpatient TJA group (6% vs 12%, $p<0.001$).[3] Further, the study found no difference in rate of wound complication or infection, venous thromboembolic event, cardiac arrest, or reintubation between the two groups. Complication rates have been found to be similar or improved in the outpatient TJA population. An analysis of the NSQIP database found the rate of serious adverse events was 1.3% in the outpatient TJA group, compared to 1.9% for the inpatient group.[10] In a separate analysis of the Medicare population, the outpatient TJA group had a lower 30-day complication rate (3% vs 12%, $p < 0.001$) and readmission rate (3% vs 4%, $p < 0.001$) when compared to the inpatient TJA group.[43]

A systematic review performed by Hoffman et al. reviewed all of the available literature on outpatient total joint arthroplasty. Over 1,000 patients were included in the analysis and they found that 94.5% of patients were able to be discharged the same day as planned. There were zero deaths in the entire cohort. Re-operation rates were 1.98% and readmission to the hospital was 0.89%. Based on all of the available literature at the time of systematic review, they concluded that outpatient total joint arthroplasty is safe for carefully selected patient populations.[24]

One critique of the available literature is that outpatient TJA is currently being performed on younger, healthier patients. It is not surprising that outpatient TJA patients have lower complication and readmission rates at this time. One single-surgeon analysis found similar rates of major and minor complications as well re-operation rates between inpatient and outpatient cohorts that were matched for age, gender, ASA score, and BMI.[44] While this single-surgeon analysis is encouraging, additional research will need to be performed to extrapolate this data.

One notable adverse event identified is an increased incidence of post-discharge blood transfusion when compared to the inpatient group ($p < 0.001$).[45] As discussed previously, outpatient TJA patients had lower rates of bleeding that required transfusion in the immediate peri-operative period. This higher rate of post-discharge blood transfusion is not unexpected and patients should be counseled on this risk.

In addition to providing a safe surgical process, maintaining or improving levels of patient satisfaction is important in establishing a successful outpatient TJA program. Dorr et al. evaluated patient satisfaction in their outpatient TJA group and found that 96% of patients in the group were satisfied with the decision to undergo outpatient surgery and would do so again.[49] In addition, patients were asked to keep independent diaries of daily living. At three weeks post-operatively, 82% of patients had returned to independent activities of daily living, 84% were driving, and

98% of patients were walking 1 mile. In addition, 87% of patients in this study reported that same day discharge gave them confidence.[49]

As the estimated number of TJA is expected to increase over the coming years, outpatient TJA has the potential to make a substantial impact on cost savings for the health system. Several studies have evaluated the cost-effectiveness of the recently developed outpatient TJA protocols. Cost-savings have been identified for both THA and TKA. One institution found that the average medical bill was approximately $4,000 less for outpatients undergoing THA.[50] In a different evaluation of the Medicare population, they found a mean savings of $8,527 for the outpatient TKA when compared to inpatient TKA, which is substantial given that Medicare pays for an estimated 55% of TKAs in the country.[1] The majority of savings is projected to come from surgical floor care, with small additional savings in pharmacy costs and physiotherapy.[48] When performed in the carefully selected and appropriately prepared patient, outpatient TJA can substantially reduce health care costs and hospital burdens.

CONCLUSION

Outpatient TJA has the potential to improve patient outcomes, improve patient satisfaction, and reduce health care costs nationwide. Until now, outpatient TJA has been performed in select patient populations. Further research on complications, readmission rates, and patient satisfaction will be paramount as outpatient TJA increases to ensure patient safety and positive outcomes. Initial results are promising, delivering a safe and effective outpatient TJA experience while reducing healthcare costs.

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