Total Joint Arthroplasty in a Stand-alone Ambulatory Surgical Center: Short-term Outcomes

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abstract

For decades, the average hospital stay following total joint arthroplasty (TJA) has been getting shorter. The historical standard was several weeks of hospitalization, yet improvements in perioperative care have reduced the average length of stay to a few days. Medicare recognizes a 3-day inpatient stay as the standard of care following hip or knee replacement. Yet continued advances in minimally invasive surgical techniques, short-acting general anesthetics, long-acting local anesthetics, and blood loss management have further improved the safety and recovery for TJA procedures. Thus, further reductions in postoperative hospitalization have been implemented around the country, with surgeons reporting successful same-day protocols, as defined by hospitalization discharge on the day of surgery. Although these studies have presented results of same-day TJA in the hospital setting, this study is the first to report on the perioperative adverse events and early outcomes of 51 consecutive TJA procedures performed in a stand-alone ambulatory surgical center (ASC). The ASC offers an ideal setting to perform such procedures in the properly selected patient population, obviating any form of postoperative hospitalization. Although 16 (31.4%) of 51 patients reported minor adverse events in the postanesthesia care unit, specifically nausea and/or pain, early intervention permitted 50 (98.0%) of 51 patients to be discharged home, on average 176 minutes after surgery, with 1 patient discharged to a rehabilitation facility as arranged prior to surgery. There were no major adverse events in the 90-day perioperative period, and although 1 (2.0%) patient was hospitalized for persistent incisional drainage, none required admission for pain. This study examines the strict eligibility criteria and perioperative analgesia protocols that permit successful outpatient TJA. [Orthopedics. 2016; 39(4):223-228.]

Ambulatory surgical centers (ASCs) offer surgeons an effective setting to perform procedures that do not require prolonged postoperative monitoring or an inpatient hospital stay. Advances in minimally invasive surgical techniques, short-acting general anesthetics, long-acting local anesthetics, and blood loss management have improved the safety and recovery for many orthopedic procedures. These changes to perioperative care have reduced the need for postoperative hospitalization in many surgical specialties. As a result, the number of procedures performed in the ambulatory setting has grown significantly. The health care market has been pushing for an increased quality of care at a lower cost. Ambulatory surgical centers provide an average 84% cost reduction in proce-
dures as compared with hospital outpatient departments.1

The orthopedic community has mirrored the broader surgical trend in performing more outpatient procedures in ASCs. Total joint arthroplasty (TJA) has historically been considered an inpatient procedure that requires close postoperative monitoring. Use of TJA as treatment for degenerative joint disease has increased substantially in past decades in both elderly and younger patients.2-9 With increasingly younger patients, refinements in surgical technique and perioperative management have made the transition to outpatient TJA a realistic goal. In addition, outpatient TJA has the advantage of being a more cost-effective procedure.10,11

Several studies have demonstrated that TJA performed in an outpatient setting is safe, effective, and efficient.12-17 These studies examined unicompartmental knee arthroplasty (UKA), total knee arthroplasty (TKA), and total hip arthroplasty (THA). Their results showed no significant difference in morbidity or functional recovery in the properly selected patient population. However, these studies were all performed within the safety net of hospital outpatient departments. Thus, patients who do not meet discharge criteria are easily transitioned to inpatient hospitalization.

The purpose of this study is to report the authors’ experience performing TJA in 51 consecutive patients within a single stand-alone ASC using an integrated anesthesia and orthopedic protocol. Secondarily, the authors identified common perioperative challenges and postoperative outcomes.

MATERIALS AND METHODS

A retrospective review of outpatient medical records and pre- and postoperative clinical charts was undertaken. From 2012 to 2014, a total of 51 consecutive patients underwent TJA, which included 22 THAs, 15 TKAs, and 14 UKAs. All surgeries were performed by 3 fellowship-trained adult reconstruction surgeons (M.S., D.A.H., S.K.). The direct anterior approach on a standard operating table was used for all patients undergoing THA, whereas patients undergoing TKA and UKA received a standard medial parapatellar arthrotomy.

The selection of patients for ambulatory surgery was based on a thorough evaluation of patients’ current and past medical history. Patients with a medical history significant for thromboembolic disease, major cardiovascular or cerebrovascular events, or cardiac arrhythmias were not candidates for outpatient TJA. Patients had standard preoperative evaluations that included electrocardiogram, complete metabolic panel, hemoglobin A1C in patients with diabetes mellitus, and complete blood counts. Surgeons applied stricter exclusion criteria as compared with their standard hospital-based TJA procedures to minimize risk of hospitalization and major adverse events.

Preoperative planning began with all patients selecting a coach—a family member or friend committed to attending preoperative evaluations and to stay with the patient for the first 72 hours postoperatively. Each patient met with a joint reconstruction coordinator to explain the logistics of the operative day, postoperative care, and home care. The patient also met with a physical therapist to review postoperative ambulation and therapy protocols. Finally, the patient met with an anesthesiologist to confirm that the patient was an appropriate candidate for outpatient TJA and to discuss the pain management protocol. These scheduled meetings ensured safe selection of patients, engagement of the coach, and multidisciplinary discussion of postoperative expectations.

All perioperative anesthesia was performed using an established protocol based on procedure. Patients undergoing THA received a lumbar epidural catheter in preoperative holding and propofol sedation intraoperatively. At the conclusion of the surgery, the epidural was removed. Patients undergoing TKA and UKA received a single-dose femoral nerve block, a single-dose tibial nerve block, and an adductor canal catheter block in preoperative holding. Initially, patients received femoral nerve catheters and single-shot sciatic blocks; however, the protocol evolved over time, based on current literature, into administering the adductor canal catheter and single-shot tibial block to reduce risk of postoperative falls. All patients were administered a general anesthetic intraoperatively.

A multimodal pain management protocol was administered to all patients. Preoperatively on the morning of surgery, patients received 1 dose each of celecoxib, oxycodone hydrochloride extended release, and gabapentin. Perioperatively, patients received 1 dose of intravenous (IV) acetaaminophen and 2 doses of IV dexamethasone. Intraoperatively, following implantation of components, a multimodal periarticular injection consisting of bupivacaine liposomal injectable suspension, epinephrine, morrhine, depomedrol, and cefazolin in 20 mL of normal saline was given. Postoperative pain protocol consisted of celecoxib, oxycodone hydrochloride extended release (for 7 days), and oxycodone for breakthrough pain.

The blood management protocol was uniform for all patients. One gram of tranexamic acid (TXA) was given prior to incision and at closure. No patient donated autologous blood or was given preoperative erythropoietin. Intraoperative red blood cell salvage was not used. A standard fluid management protocol was followed for all patients intra- and postoperatively. Approximately 1 to 2 L of IV fluids were given intraoperatively and were continued at a rate of 75 to 100 cc/hour for 2 to 4 hours postoperatively and then discontinued depending on the level of oral intake. Foley catheters were not used.

Patients were allowed to bear full weight immediately after THA, whereas patients undergoing TKA and UKA were full weight bearing in a knee immobilizer until their pain catheter was removed on
postoperative day 3. Postoperatively, all patients received 4 weeks of 325 mg of aspirin twice daily as venous thromboembolism (VTE) prophylaxis.

Patients received daily phone calls from the practice staff for a week to ensure that recovery was progressing as expected. Patients were seen daily at home by a physical therapist for the first week and then 3 times per week for 1 to 2 weeks until transition to outpatient therapy. Patients were also seen by a visiting nurse daily for the first week. Patients were seen in the office 1 week, 6 weeks, and 3 months postoperatively.

This study collected demographic information, including age, sex, body mass index (BMI), reason for undergoing joint arthroplasty, comorbidities, and preoperative American Society of Anesthesiologists (ASA) physical classification system.

Primary outcome measures included operative time, length of stay at the ASC, discharge to home vs rehabilitation facility, intraoperative complications, adverse events within the ASC, postoperative hospitalizations, and any postoperative complications, including VTE and cardiac events within 90 days postoperatively.

There was a uniform patient follow-up protocol. All patients were seen postoperatively at 1 week, 6 weeks, 3 months, and then annually. During follow-up visits, patients were evaluated clinically and asked about any hospitalizations or evaluations by medical doctors. All patients were successfully followed under this protocol.

All patients received a generic satisfaction survey via email or US Postal Service after their procedure from the ASC to determine their perception of the outpatient surgical experience. Questions asked the patients’ perceptions of their experience, ranging from the care and interaction of nursing, anesthesia, and the surgeon, to education and preparation for discharge, privacy, and overall experience. The patients were instructed to rate their experience with the following answers: strongly agree, agree, disagree, strongly disagree, and not applicable.

Data were analyzed using R software (R-project.org) for statistical analysis. Demographic and outcome measures were compared between the 2 groups using t tests for continuous outcome measures and chi-square tests for the binary outcome measures.

RESULTS

The 51 consecutive TJA cases included 22 THA, 15 TKA, and 14 UKA procedures. No patient was lost to follow-up. Average follow-up was 14.9 months. There was no significant difference in demographics between groups with regard to age, ASA class, BMI, and sex (Table).

The perioperative pain management protocol varied by procedure. In the THA group, 16 patients received epidurals with sedation, 2 patients received epidurals with general anesthesia, and 4 patients received general anesthesia alone. No patients in the THA group received nerve block, but all patients received periarticular liposomal bupivacaine injection. In the TKA group, all patients received general anesthesia. Initially, patients received femoral nerve catheters; however, after published accounts of increased falls, regional anesthesia was transitioned to a single-shot femoral nerve block and an adductor canal catheter. All patients received periarticular liposomal bupivacaine injection. In addition, 5 patients received a popliteal block and 10 patients received a sciatic block. The UKA group was similar to the TKA group, wherein all patients received general anesthesia, a femoral nerve block, and periarticular injection. A popliteal block was also administered to 8 of 14 patients, whereas a sciatic block was given to 4 of 14 patients.

There was no statistical difference in average operative time (time in to time out) for all groups. Average operative time was 132 minutes in the THA group, 130 minutes in the TKA group, and 130 minutes in the UKA group.

Average time from admission to discharge was similar for all procedures (Figure): 375 minutes in the THA group, 426 minutes in the TKA group, and 371 minutes in the UKA group. All cases were scheduled for the morning so that no patients required an overnight stay.

All 3 TJA procedures had adverse events in the immediate postoperative setting. There were 6 patients with postoperative nausea in the THA group, all of whom had an epidural. All patients responded with medication, and none experienced a significant delay in discharge or recurrent symptoms. Three patients had postoperative nausea in the TKA group, 2 patients required a repeat sciatic nerve block for pain, and 1 patient reported difficulty ambulating. None of these adverse events led to a significant delay in discharge or required hospitalization. The UKA group had 1 episode of nausea, and

### Table: Patient Demographics at the Ambulatory Care Center

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No.</th>
<th>Mean Age, y</th>
<th>No. F/M</th>
<th>Mean BMI, kg/m²</th>
<th>Mean ASA Physical Classification</th>
</tr>
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<tr>
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<td>28.7</td>
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<tr>
<td>TKA 15</td>
<td>5/10</td>
<td>54.6</td>
<td>32.0</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>UKA 14</td>
<td>6/8</td>
<td>61.1</td>
<td>30.4</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; F, female; M, male; THA, total hip arthroplasty; TKA, total knee arthroplasty; UKA, unicompartmental knee arthroplasty.

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3 patients required a repeat sciatic block for pain. None of the reported perioperative adverse events required prolonged care or hospitalization. There were no episodes of postoperative blood loss or refractory pain. No patients required a visit to the emergency department for uncomplicated pain, and there were no postoperative transfusions.

Following the procedure, 50 (98.0%) of 51 patients were discharged to home, whereas 1 patient in the THA group had preoperatively elected to go to a rehabilitation facility. One patient in the TKA group was admitted to the hospital with in 2 days of the procedure for persistent sanguineous drainage from the wound, which required repeat closure in the operating room. One patient in the THA group sustained a greater trochanter fracture at 3 weeks postoperatively without trauma. This went on to a stable fibrocartilaginous healing union and relied on a symptom-based trigger for transfusion. The blood management strategy used intraoperative techniques to minimize intraoperative blood loss. The blood management protocol effectively avoided transfusion for all patients undergoing UKA and TKA. By effectively identifying a lower risk population, the surgeons avoided postoperative hospitalizations associated with medical comorbidities. Similar studies looking at same-day TJA highlighted the importance of strict eligibility criteria.

Inclusion criteria in these studies included age (40 to 75 years for THA and 50 to 80 years for TKA), and exclusion criteria included BMI greater than 40 kg/m², history of myocardial infarction, pulmonary embolism or anticoagulant use within the past year, and patients with 3 or more significant comorbidities.

Pain management is a recognized barrier for same-day orthopedic procedures.

Figure: Overview of total joint arthroplasty cases at the ambulatory care center. Asterisk indicates only occurred in patients receiving epidural injection. Abbreviations: PACU, postanesthesia care unit; THA, total hip arthroplasty; TKA, total knee arthroplasty; UKA, unicompartmental knee arthroplasty.
particularly for arthroplasty surgery. Studies identify both orthopedic procedures and younger age as independent risk factors for higher reported pain. The current study examined a younger cohort than the standard TJA patient; thus, pain management was viewed as a primary challenge to outpatient TJA. Advances in pain management protocols allow surgical teams to overcome many of the obstacles. The authors’ team used periarticular blocks for all patients, including liposomal bupivacaine, which reduces narcotic pain requirements. Most patients received additional regional pain blocks, which also reduce postoperative pain and narcotic use. Patients received adductor canal catheterization to improve early mobilization and recovery as compared with femoral nerve catheterization. Finally, a multimodal postoperative analgesic regimen was followed, based on findings of improved pain scores, range of motion, and decreased hospital stay. The regimen included dexamethasone, nonsteroidal anti-inflammatory drugs, and short- and long-term opioid medication to provide a robust response to the pain of TJA. In combination, these medications effectively treated the postoperative pain and prevented any hospitalizations for pain control, nausea, or inability to progress.

Limitations exist with the patient satisfaction survey and data collection process that likely contributed to a low response rate of 37.3%. The survey was not specific to outpatient TJA and only measured 1 episode (date of procedure) in a broader period of comprehensive care. Finally, follow-up emails or reminder calls were not made to encourage a higher response rate. The authors’ practice will implement changes to address these issues to improve the response rate going forward. They are constructing comprehensive satisfaction surveys for both the ASC and the surgeons’ offices that are specific to patients undergoing outpatient TJA; they will be administered during scheduled follow-up interventions to improve response rate.

Although only 1 in 3 patients responded to the survey, the responses appeared consistent in support of outpatient TJA and in expressing that physical therapy and pain control were adequately addressed in the recovery room of the ASC. Furthermore, although the response rate of the satisfaction survey was not ideal, no patient was lost to follow-up in the surgeons’ offices; all patients were seen regularly during follow-up, where they were interviewed less formally about their experience with and perception of outpatient TJA. All surgeons reported that the patient feedback was overwhelmingly positive, and they had no reports of a significantly negative experience.

**Conclusion**

Advancements in surgical technique, anesthesia protocol, blood loss management, and rapid rehabilitation, combined with a growing need in a younger, healthy population, has decreased the need for hospitalization following TJA. The use of standalone ASCs for TJA is a natural progression. The ASC setting provides the additional advantage of offering high-quality care at a lower cost. This study suggests that TJA can be performed safely and effectively with good short-term clinical outcomes in appropriately selected patients using a combined surgical and anesthesia protocol.

**References**

18. Chidambaram R, Cobb AG. Change in the age distribution of patients undergoing primary hip and knee replacements over 13 years: an increase in the number of younger