Review Article

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"Outpatient"—Same-calendar-day Discharge Hip and Knee Arthroplasty

Ryan D. Scully, MD
Jason E. Kappa, MD
J. Stuart Melvin, MD

Abstract

As the length of stay for hip and knee arthroplasty has decreased over the years, "outpatient," or same-calendar-day discharge has become increasingly common. Outpatient arthroplasty offers several possible benefits over traditional inpatient arthroplasty, including potential for cost reductions, faster rehabilitation, improved patient satisfaction, and reduced reliance on hospital resources. Despite these possible benefits, concerns remain over feasibility and patient safety. To date, multiple studies have demonstrated that, for select patients, "outpatient" hip and knee arthroplasty can be safe and effective and yield complication and readmission rates similar to inpatient procedures at potentially significant cost savings. Successful outpatient pathways have emphasized careful patient selection, detailed patient education, enlistment of strong social support, utilization of multimodal analgesia and strong "episode ownership," and involvement on behalf of the surgical team. As outpatient hip and knee arthroplasty becomes increasingly common, continued investigation into all aspects of the surgical episode is warranted.

From the United States Naval Hospital (Dr. Scully), Yokosuka, Japan, and Department of Orthopedic Surgery (Dr. Kappa), George Washington University School of Medicine, Washington, DC, and Washington Orthopaedics & Sports Medicine (Dr. Melvin), Gildenhorn Institute for Bone and Joint Health, Sibley Memorial Hospital, Washington, DC.

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Over the years, the introduction of rapid recovery clinical pathways for hip and knee arthroplasty has led to dramatic reductions in hospital length of stay. In addition, the recent removal of total knee arthroplasty (TKA) and total hip arthroplasty (THA) from the Medicare Inpatient-Only list and increasing pressures for cost containment and value have led surgeons to offer same-calendar-day discharge (SCDD) arthroplasty to select patients with increasing frequency. As this trend becomes more common, it is important to reflect on the current protocols, techniques, and data to clarify patient selection and allocation of healthcare resources with the goal of maximizing patient outcomes and safety.

Defining Outpatient Arthroplasty

The definition of "outpatient" arthroplasty is quite variable, making interpretation of the literature difficult. Some arthroplasty surgeons offer outpatient arthroplasty with a SCDD. However, current regulations in the United States may allow for patients to remain in the hospital or ambulatory surgery center (ASC) overnight under "observation" status and still retain "outpatient" status. In some cases, patients can still be considered "outpatient" after spending two nights in the hospital. Bovonratwet et al[1] evaluated THA and TKA patients in the NSQIP database from 2005 to 2014. Twelve percent of the

Table 1

OARA Score

Comorbidity Areas	Possible Points
General medical	180
Hematological	325
Cardiac	385
Endocrine	165
Gastrointestinal	185
Neurologic/psychological	185
Renal/urology	220
Pulmonary	250
Infectious disease	65

OARA, Outpatient Arthoplasty Risk Assessment
Reproduced with permission from: Table 2, Meneghini RM, Ziemba-Davis M, Ishmael MK, Kuzma AL, Caccavallo P: Safe selection of outpatient joint arthroplasty patients with medical risk stratification: the outpatient arthroplasty risk assessment score. *J Arthroplasty* 2017;32[8]:2325-2331.

THA patients and only 11% of the TKA patients labeled "outpatient" had a length of stay of 0 days. These distinctions in the definition of "outpatient" are important as the comparison of pathways, techniques, and results for SCDD versus a patient who stays one or two nights at a healthcare facility may be different. Except when otherwise specified, this article will discuss patients undergoing hip or knee arthroplasty with a SCDD to home.

Transition to Outpatient Arthroplasty

Patient Perceptions

There is currently limited understanding of the patient's perspective regarding outpatient arthroplasty. Adelani and Barrack[2] evaluated survey data collected on 346 TKA patients, of which only 3.2% underwent an outpatient TKA. The average LOS for the group was 1.2 days. Most patients felt they would have been unable to have the surgery as an outpatient. Furthermore, only 4.9% of the group thought they definitely would have been able to go home on a SCDD. When asked about perceived benefits of outpatient surgery, the leading responses were avoid infection (57.3%), better sleep (46.9%), and quieter recovery (42.7%). The leading concerns about SCDD were pain, being unable to get to the bathroom, falling, and not having enough help at home.

A similar study performed by Meneghini et al surveyed 110 patients who underwent total joint arthroplasty on their knowledge and perceptions of outpatient arthroplasty. Most patients expected to stay 1 to 2 days after surgery. Respondents were asked about their comfort level with SCDD or within 23 hours of surgery. Thirteen percent felt very comfortable, 21.3% comfortable, and 20.4% very uncomfortable. Similar to the respondents from the work of Adelani and Barrack, the majority cited decreased risk of hospital-acquired infection and faster recovery as advantages to SCDD. In response to questions about patient factors and characteristics that would determinate suitability for outpatient arthroplasty, patients consistently mentioned overall health, safe home environment and support, and attitude/motivation. Importantly, most patients felt that ASCs and hospitals were equally safe for surgery.[3]

Patient Selection

There is a consensus that careful patient selection is a critical factor for safe SCDD.[4] The ideal patient is relatively young and healthy with solid social support. In an attempt to determine which patients may safely undergo same-day discharge, Menegehini et al developed the Outpatient Arthroplasty Risk Assessment (OARA).[5] Currently, the OARA is the only risk assessment tool specifically addressing this purpose. The OARA stratifies patients by nine separate comorbidity areas to generate a risk category (Table 1). The ability of the OARA to predict successful early discharge was compared with that of the CCI and the ASA-PS. A retrospective review of 1,120 joint replacements was performed. The positive predictive value of the OARA was 81.6% for the same or next day discharge, whereas the PPVs of the ASA-PS and CCI scores were 56.4% and 70.3%, respectively. Patients with low OARA (<59) were twice as likely to be discharged early. A coordinated program of patient education and expectation management increased OARA early discharge predictability to 2.7 times.[5] A follow-up study of 2,051 primary joint replacements found that OARA scores of up to 79 had a PPV of 98.8%, specificity of 99.3%, and false positive rate of 0.7%.[6]

Other guidance has been derived from studying risk factors for readmission or complications. Sher et al[7] performed a NSQIP study of approximately 121,000 THA and TKA patients from 2011 to 2014. Approximately 6% of patients were discharged home within 24 hours of surgery. These patients were more likely to be younger and male with an ASA < 2 and body mass index (BMI) < 40. Age > 80, smoking, bleeding diatheses, and ASA of 3 or 4 were identified as independent predictors for an adverse event or readmission. Courtney and Boniello[8] retrospectively

reviewed patients who underwent THA and TKA and found most major medical complications (84%) occurred greater than 24 hours postoperatively. Independent risk factors for a medical complication postoperatively were identified as CHF, COPD, CAD, and cirrhosis. The authors concluded that patients with these risk factors should not be considered for outpatient arthroplasty. A summary of predictors of outpatient discharge is demonstrated in Table 2.[7]

Another concept that may prove to be useful with patient selection is the perioperative surgical home (PSH). The PSH has been used with in-patient arthroplasty delivering patient-centered optimization, risk stratification, multidisciplinary involvement, and standardization of care.[9] Moore et al reviewed 325 consecutive TKA patients treated in a PSH pathway and found that lower BMI and fewer allergies predicted SCDD, whereas older age, higher BMI, and later surgery start time led to inpatient admission.[10] Additional data are needed to fully assess the application of the PSH concept to outpatient arthroplasty.

Table 2

Risk Factors for Total Hip Arthroplasty/Total Knee Arthroplasty Patients Discharged Home With LOS ≤1

Risk Factor	Odds Ratio (95% CI)	*P*
Age 50-59	0.72 (0.66-078)	<0.0001
Age 60-69	0.62 (0.58-0.68)	0.0053
Age 70-79	0.48 (0.44-0.53)	<0.0001
Age >80	0.32 (0.27-0.37)	<0.0001
Male gender	1.76 (1.68-1.85)	<0.0001
Hispanic	0.72 (0.61-0.84)	0.67
African-American	0.76 (0.68-0.85)	0.48
Asian	0.72 (0.59-0.88)	0.79
Functional status	0.87 (0.67-1.14)	0.32
History of smoking	1.04 (0.97-1.12)	0.24
BMI >40	0.69 (0.63-0.76)	<0.0001
Pulmonary disease	1.14 (0.97-1.33)	.10
Diabetes	0.80 (0.74-0.87)	<0.0001
Cardiac disease	0.60 (0.52-0.70)	<0.0001
Hypertension	0.90 (0.86-0.95)	<0.0001
History of stroke	0.48 (0.25-0.94)	.031
Chronic steroids	0.81 (0.70-0.94)	.0066
Bleeding disorder	0.76 (0.62-0.92)	.0059
Hypoalbuminemia	0.70 (0.56-0.90)	.0036
ASA class 3/4	0.73 (0.69-0.77)	<0.0001
Severe adverse event	0.50 (0.34-0.76)	.001

Reproduced with permission from: Table 2, Sher A, Keswani A, Yao DH, Anderson M, Koenig K, Moucha CS: Predictors of same-day discharge in primary total joint arthroplasty patients and risk factors for post-discharge complications. *J Arthroplasty* 2017;32[9]:S150-S156.

Pre-Operative Evaluation

Although many aspects of the preoperative evaluation and patient optimization to be discussed may be familiar, one of the major differences to keep in mind lies in the infrastructure, implementation, and execution of these pathways. Often inpatient joint replacement used hospital staff and resources for patient optimization; however, successful SCDD programs will likely involve building and maintaining this infrastructure through an ASC or surgeon's practice.

Nevertheless, a widely accepted standardized protocol for the preoperative evaluation and education of outpatient arthroplasty patients does not currently exist. Regardless, there is agreement on many key factors.[8,11,12] In a 2018 position statement, the American Association of Hip and Knee Surgeons and American Academy of Orthopaedic Surgeons felt that some hip and knee replacements could be appropriately performed in the outpatient setting and emphasized the following essential outpatient program elements:[12]

1. Patient selection
2. Patient education and expectation management
3. Good social support
4. Clinical and surgical team expertise and experience
5. Conducive facility environment to optimizing surgical outcomes
6. Evidence-based pathways for pain management, blood conservation, wound management, mobilization, and VTE prophylaxis

Patient selection requires thorough medical screening in conjunction with medical specialists when needed. Medical comorbidities and modifiable risk factors should be optimized before surgery. In addition to medical history, patients must also be evaluated of physical and cognitive functions. Outpatient arthroplasty is contraindicated in patients with poor balance or cognitive impairment.[12] In addition, psychiatric conditions such as major depression and generalized anxiety disorder are independent risk factors for postoperative complications.[13]

Social support is an indispensable component of successful SCDD. Preoperatively, it is imperative to understand a patient's living situation and social support network with a focus on who

will be available to directly assist in the patient's recovery. The surgeon's team should proactively engage and educate the patient and his/her social support network. Patients lacking strong social support are contraindicated for SCDD.

The importance of patient education for optimizing hip and knee arthroplasty outcomes has been well established and begins with the surgeon.[14,15] Outpatient hip and knee arthroplasty education requires consistent messaging from all team members. The safety and benefits of SCDD should be discussed to help allay concerns and improve patient confidence.[16] The patient and family should receive advice or an in-home visit to convey the ideal home environment for a safe recovery, especially as it relates to stairs in the home, toileting, and ambulation hazards. Digital platforms for patient education, such as videos, websites, and patient engagement apps may prove beneficial. Finally, it is important to consistently communicate appropriate expectations to the patient regarding anticipated pain, mobility, and safety. Expectations can affect functional outcomes and satisfaction after TJA.[17]

Pain Management

Historically, TJA has been associated with significant postoperative pain, which can slow recovery and prolong length of stay, with knee arthroplasty more often experiencing higher levels of acute postoperative pain than hip arthroplasty.[18] Traditional techniques relied on general anesthesia and narcotics for postoperative analgesia. Over the years, however, rapid recovery pathways incorporating various multimodal pain protocols have been implemented, leading to expedited discharge and facilitating the transition to SCDD.

The first component to perioperative pain control relies on patient education. This discussion should include information on spinal and regional anesthesia techniques to prepare patients for the operative experience. In addition, information about expected postoperative pain, swelling, and mobility as well as techniques to manage pain, especially when regional anesthesia wears off at home, can help limit ER visits and readmission.[19]

Outpatient arthroplasty relies heavily on multimodal pain control with an emphasis on minimizing or avoiding narcotics.[20] Multimodal protocols achieve this with medications and techniques that block pain signals via multiple mechanisms of action. Multimodal pain pathways begin preoperatively, typically with combinations of acetaminophen, nonsteroidal anti-inflammatory medications and gabapentinoids. To date, no single preoperative regimen has been shown superior.

Neuraxial Anesthesia

Increased implementation of neuraxial anesthesia has facilitated transition to outpatient arthroplasty. Multiple studies have examined the use of neuraxial anesthesia for joint replacement with most demonstrating lower rates of superficial infection, transfusion, and thromboembolic and cardiac events and decreased length of stay.[21-25]

In the setting of outpatient joint replacement, neuraxial anesthesia, particularly when combined with regional or periarticular anesthesia, can lower immediate postoperative pain scores and short-term complications. However, it is also important to be able to modulate the effects of the neuraxial anesthesia to avoid delays in mobilization and discharge because of hypotension, urinary retention, and prolonged lower extremity motor and sensory blockade. "Short-acting" spinals used for outpatient arthroplasty often use isobaric ropivacaine, bupivacaine, or mepivacaine, all with no additives or narcotic. Along these lines, surgical efficiency needs to be precise and predictable to avoid the spinal wearing off before surgery completion.

Regional Anesthesia

Regional nerve blocks can be an effective tool for perioperative pain control. Overall, regional anesthesia reduces opioid consumption and need for deep sedation, thereby limiting nausea, urinary retention, and respiratory depression.[26] However, femoral and sciatic blocks should be avoided for outpatient arthroplasty because of the requirement for rapid mobilization and the increased fall risk.[27] A more appropriate alternative is the adductor canal block (ACB). Because the quadriceps is unaffected, patients with ACB have been shown to have better motor function and perform better with early physical activity.[28]

Periarticular Injection (PAI)

An effective and more targeted approach involves direct periarticular injection of the operative field. This avoids motor blockade and minimizes the risk of nerve damage while reducing cost and logistical issues associated with regional blocks. PAI typically involves injection of a "cocktail" of long-acting local anesthetic with the addition of opioid, ketorolac, epinephrine, or clonidine.[29] The injection technique is critical and involves numerous small injections of the posterior capsule, periosteum, arthrotomy, and subcutaneous tissues for knees and pericapsular tissues for hips.[30] Multiple studies have shown PAI to provide significant reductions in postoperative pain and opioid consumption for TKA and THA.[30-33] Thus, PAI can be an effective component of multimodal analgesia in the setting of SCDD that can eliminate the logistical burden and risk of regional anesthesia with similar efficacy.

In short, a comprehensive multimodal pain pathway, including

premedication, neuraxial anesthesia with regional anesthesia or PAI leads to reduced pain, improved early mobility, and reduced opioid consumption.

Complication Management and Prevention

Management of immediate postoperative complications is critical to the transition to SCDD. Among these, urinary retention, hypotension, and nausea are common, immediate postoperative barriers that must be anticipated and managed for safe and efficient SCDD.

Postoperative urinary retention (POUR) is commonly reported after arthroplasty with reports ranging from 5 to 70%. Risk factors include increasing age, male gender, spinal anesthesia, prostate pathology, intraoperative placement of an indwelling catheter, and improper perioperative fluid management.[34,35] Previously, indwelling catheters were inserted routinely, but given the risk of UTI, and longer lengths of stay, attempts have been made to limit their use. Halawi et al found placement of a urinary catheter to be the most significant risk factor for developing POUR in their cohort of arthroplasty patients (OR 71 and 20 for THA and TKA, respectively). In circumstances where an indwelling catheter is required, the authors recommended discontinuing the catheter at the end of the case.[35] Ultimately, prevention is likely key with appropriate fluid management, avoiding intrathecal narcotics and minimizing indwelling catheters. Once surgery is complete, multiple protocols have been proposed to monitor for and manage POUR, but there is no consensus for management.[34] Most pathways agree that ability to void postoperatively should be achieved before discharge. Failures are treated variably, ranging from hospital admission to discharge with indwelling catheter and urology follow-up.

Hypotension is also a common cause for failure of SCDD. Again, a key component of hypotension prevention is the limitation of sedation and narcotics. Another important factor is the avoidance of long-acting spinal anesthetics to minimize the duration of the sympathectomy. In addition, most protocols recommend aggressive fluid resuscitation after surgery to prevent orthostasis. Although fluid resuscitation has to be balanced with the risk of postoperative hyponatremia, for which, older age and preoperative hyponatremia are risk factors.[36] Another measure to minimize hypotension includes perioperative off label administration of tranexamic acid to limit blood loss.[37,38]

Prevention and management of postoperative nausea and vomiting (PONV) is important for SCDD. This process also begins with reducing narcotic consumption, as outlined above. Additional measures include the use of prophylactic anti-emetics and/or corticosteroid. Bustos et al[39] studied the use of low-dose perioperative dexamethasone and demonstrated a significant reduction in the need for rescue ondansetron with a concomitant reduction in the overall LOS. Although perioperative dexamethasone has demonstrated low-risk side effects, it has been shown to elevate blood glucose and insulin requirements on post-op day zero.[40] Transdermal scopolamine has also been shown to reduce PONV (14.4% vs. 29.3%); however, scopolamine should be avoided in patients older than 75, acute angle glaucoma, and a history of urinary retention.[41]

In addition to anticipating and managing immediate postoperative complications, frequent postdischarge communication and eliminating barriers to communication are important. Scheduled phone calls or electronic communications, early in-home PT and/or early follow-up visits will maintain "patient touches" to improve satisfaction, allow early intervention for complications, and likely reduce readmissions and ER visits. This may require work flow changes and additional infrastructure borne by an ASC or surgeon's practice and should be considered in future studies of cost and effort for the SCDD episode of care.

Patient Mobilization

Another critical component of SCDD is adequate and safe mobilization in the immediate postoperative period. Like other components of SCDD arthroplasty, there is variability among protocols in the literature; however, all require patients to be able to ambulate independently with or without an assistive device.[42,43] A summary of various protocols is displayed in Table 3. The use of formal in-home, on-site, or outpatient physical therapy, whether used preoperatively, postoperatively, or both, remains variable and is an active area for research.

Outcomes

Owing to the varying definitions of "outpatient" joint arthroplasty in the literature, it can be difficult to tease out results specifically for SCDD hip and knee arthroplasty. Often, the results may not distinguish between patients with an overnight stay and those with SCDD. In addition, it must be remembered that there is inherent selection bias in nearly all studies regarding outpatient joint replacement because surgeons generally reserve outpatient joint replacement for younger, healthier patients. Pollock et al performed a systematic review to evaluate the safety of outpatient joint replacement. Although the overall quality of studies was limited, the authors noted an overall low rate of complications for outpatients and concluded that

Table 3

Postoperative Rehabilitation Protocol and DVT Prophylaxis

Author	Year	Same-Day Post-op PT	Milestones for Same-day PT	Postoperative DVT Prophylaxis	Postoperative Home PT	Postoperative Outpatient PT
Berger[44]	2007	Yes	Independently transfer from chair to stand, supine to stand, stand to chair, and stand to supine; ambulate 100 ft; and ascend/descend 1 flight stairs	Aspirin 325 mg bid PO for 3 wk	Yes	Yes
Berger et al[19]	2009	Yes	Independently transfer from chair to stand, supine to stand, stand to chair, and stand to supine; ambulate 100 ft; and ascend/descend 1 flight stairs	Aspirin 325 mg bid PO for 3 wk	Yes	Yes
Berger[45]	2009	Yes	Independently transfer from chair to stand, supine to stand, stand to chair, and stand to supine; ambulate 100 ft; and ascend/descend 1 flight stairs	Aspirin 325 mg bid PO for 3 wk	NR	NR
Kolisek et al[42]	2009	Yes	Ambulate, weightbear as tolerated, "slide and flex, tighten, extend" protocol (SAFTE exercises)	Enoxaparin or Fondaparinux	No	No
Dorr et al[37]	2010	Yes	Ambulate twice with PT	Aspirin 325 mg bid PO for 1 mo	No	No
Chen et al[38]	2013	Yes	Independently transfer from chair to stand, supine to stand, stand to chair, and stand to supine; ambulate 100 ft; and ascend/descend 1 flight stairs	Aspirin 325 mg bid PO for 3 wk	Yes	Yes
Gondusky et al[46]	2014	Yes	Weight-bearing activity training with physical therapist and anesthesia clearance required for discharge	Enoxaparin QD for 10 d or Aspirin 325 mg QD PO for 6 wk	Yes	Yes
Cross and Berger[47]	2014	Yes	Independently transfer from chair to stand, supine to stand, stand to chair, and stand to supine; ambulate 100 ft; and ascend/descend 1 flight stairs	Aspirin 325 mg bid PO for 3 wk	Yes	Yes
Parcells et al[48]	2016	NR	NR	Aspirin 325 mg bid PO for 3 wk Aspirin 325 mg bid PO for 4 wk	Yes	Yes
Goyal et al[49]	2017	Yes	Walk 80 fee, walk up and down stairs, perform bathroom transfers, perform ADLs	NR	NR	NR

ADLs, activities of daily living; BID, twice daily; DVT, deep vein thrombosis; NR, not reported; PO, per os (orally); QD, daily
Reproduced with permission from: Table 4, Hoffmann JD, Kusnezov NA, Dunn JC, Zarkadis NJ, Goodman GP, Berger RA: The shift to same-day outpatient joint arthroplasty: a systematic review. *J Arthroplasty* 2018;33[4]:1265-1274.

these surgeries are safe in selected patients.[50]

Goyal et al conducted a prospective, randomized study comparing inpatient and outpatient THA at two high-volume centers. Inclusion criteria were patients younger than 75 years, no chronic opioids, ambulatory without a walker, and BMI < 40. Patients with chronic anemia, limited social support, and history of cardiopulmonary disease requiring inpatient admission were excluded. One hundred twelve patients were randomized to outpatient THA and 108 to inpatient. SCDD was achieved in 75% of the outpatient group. Reasons for delay of discharge were dizziness, hypotension, pain, patient preference, nausea, difficulty in ambulating, and urinary retention. Of note, 18 patients from the inpatient

group met SCDD criteria and were discharged the day of surgery. The outpatient group reported higher pain scores on postoperative day 1, but there was no difference in pain scores at 4 weeks. Preoperative and postoperative (4-week) Harris hip scores were not different between groups. In addition, there was no difference in reoperation, readmission, or healthcare provider visits (emergency department and office) between the two groups.[49]

Multiple retrospective case series and case–control studies have also demonstrated the safety of outpatient THA and TKA with low complication and readmission rates.[44,45,51–54] However, it should be noted that these studies were often from high-volume centers with significant outpatient joint replacement expertise, and patients were often younger and healthier in the outpatient cohorts. Further studies with control groups and randomization are needed to fully understand outcomes.

Lovecchio et al in a NSQIP database study noted a higher rate of medical complications (anytime 10.0% vs 6.7%, postdischarge 6.3% vs. 1.1%) in outpatient THA and TKA patients but no difference in the readmission rate. Outpatients were defined as a hospital stay < 24 hours. Bleeding requiring transfusion and VTE requiring treatment were the most common complications. Serious complications, such as sepsis, pneumonia, and myocardial infarction, were rare in both groups.[55] Springer et al in a retrospective cohort reported increased unplanned 30-day admissions in outpatient hip and knee arthroplasty (11.7% vs. 6.6%) although the difference did not reach significance.[56] An additional propensity matched NSQIP analysis was performed by Nelson et al, and although the authors only included THA patients, they reported no difference in adverse events or readmission in outpatients (<24-hour hospital stay). Furthermore, the authors noted a lower rate of transfusion in outpatients.[57] Courtney et al in a NSQIP database study also reported a lower rate of bleeding requiring transfusion in "hospital defined" outpatient TJA, whereas no significant difference was observed in any other 30-day complication. In fact, after controlling for confounding variables, outpatient arthroplasty was neither a risk factor for readmission nor reoperation and was actually a negative risk factor for complications.[8] In a subsequent NSQIP study of patients over 65 years old, Courtney et al[58] found that TKA can be safely performed as an outpatient in a subset of healthy Medicare patients with a complication rate similar to an inpatient stay. In addition, Greenky et al[59] found similar results for THA in a NSQIP study of patients aged 65 or older, demonstrating lower 30-day complication and readmission rates for outpatients. Finally, in a matched cohort study comparing inpatient THA and TKA with SCDD THA and TKA, Gromov et al[60] found comparable readmission rates with no readmissions attributable to SCDD.

Outpatient Arthroplasty in the Ambulatory Surgery Center Setting

As "outpatient" joint replacement has become more common, these cases are increasingly being performed in freestanding ASCs. Although the shift to ASCs offers potential benefits for costs, efficiency, and patient satisfaction, investigation of the safety and outcomes remains paramount.

Multiple initial studies have reported favorable outcomes, low complication rates, and excellent patient satisfaction. Hoeffel et al reported 1,000 consecutive THA and TKA procedures with SCDD to an attached "recovery suite" for an overnight stay. This protocol resulted in low rates of infection (0.8%) and readmission (1.5.%).[51] Additional authors have reported excellent outcomes with SCDD directly to home from an ASC, concluding that joint replacement can be safely performed with low complication and readmission rates with direct to home SCDD from an ASC.[52,61,62]

Two study groups have presented retrospective matched cohorts comparing hip and knee arthroplasty in an ASC with a hospital outpatient setting. Darrith et al reported a single surgeon's results comparing 243 consecutive SCDD ASC hip and knee arthroplasty cases with a matched consecutive series of 243 hospital inpatient cases. The ASC and hospital cases had a similar readmission rate of 2.1% and no difference in complication rates.[54] Sershon et al compared 965 consecutive patients undergoing SCDD THA either at an ASC or a hospital outpatient setting. No differences were found regarding 90-day complications, revisions, and reoperation or readmission rates. The authors concluded that THA can be safely performed in both ASC and hospital outpatient settings.[53] Finally, Carey et al used the MarketScan database to compare outcomes in matched near-elderly (age 55 to 64) patients among inpatient, hospital outpatient, and ASC settings for THA and TKA and found readmission, complications, and payments to be lower for outpatients compared with inpatients. ASCs were found to have lower readmissions and complications when compared with hospital outpatients.[63]

Kelly et al sought to investigate patient satisfaction between the inpatient and outpatient settings. Their survey study of 64 outpatient ASC hip and knee arthroplasty cases and 102 inpatient hip and knee arthroplasty cases found high satisfaction among both groups, but the most favorable responses were more common among outpatient surgery in the ASC.[64]

Although successful outpatient arthroplasty has been reported in the ASC setting, it is important to place extra emphasis on preoperative planning. With storage and sterilization capacity often limited at ASCs, careful forethought should be given to intraoperative complication management (i.e., fracture, contaminated instruments) and the ability to convert or change implants. The ASC should have the ability to handle standard intraoperative complications in a manner similar to a hospital surgical theater. Moreover, technically challenging cases with anticipated lengthy surgical times or complex equipment should likely be avoided. Finally, similar forethought is required to plan for perioperative medical complications with a transfer agreement or plan in place at ASCs for these situations.

Cost Analysis

Evaluation of the financial differences between outpatient and inpatient TJA is complicated by multiple factors, including inherent regional and healthcare system differences, population differences (payer type, reimbursement rates), and individual provider preferences. In addition, the transition toward outpatient arthroplasty is highlighting the fact that costs and resources that were often embedded or absorbed by the hospital, such as patient education, medical clearance, navigators, communication platforms, are being shifted to surgeon practices and outpatient facilities. Future research is needed to better understand these shifts and changes in costs and resources as well as to appropriately identify and compensate the work and effort involved. However, taking into consideration these current limitations in the published literature, the potential economic benefit of outpatient arthroplasty has been repeatedly cited. Bertin was one of the first to highlight the cost savings associated with outpatient arthroplasty, comparing 10 outpatient THA patients with 10 inpatient THA patients. The average bill for outpatients was $4,000 less than for the inpatients. Inpatients saw higher charges from medications, laboratory studies, boarding, nursing, and therapy.[65] Aynardi et al compared 119 "outpatient" (<24-hour stay) THA patients with 78 inpatient THA patients. The average ultimate cost for outpatients was nearly $7,000 less than for inpatients ($24,529 versus $31,327). Without the comparison of itemized charges, it is difficult to determine the source of the cost savings.[66]

Lovald et al studied TKA patients within the Medicare 5% sample. Patients were stratified into groups based on the length of stay: outpatient (<24-hour stay), 1 to 2 days, 3 to 4 days, or ≥ 5 days. Outpatients and 1-to-2–day stay netted $8,527 and $1927 in savings respectively compared with a 3-to-4–day stay.[67]

Carey et al used the MarketScan database to investigate the differences in cost among outpatient arthroplasty in an ASC, outpatient arthroplasty in a hospital outpatient department, and inpatient arthroplasty. The results showed that total episode cost for arthroplasty in an ASC was 12.8% and 14.8% lower, respectively, compared with inpatient TKA and THA.[63]

For appropriately selected patients, the literature to date demonstrates the potential for significantly reduced costs for arthroplasty in the outpatient setting. Further study, especially comparing itemized charges and using larger samples, will be important.

Summary

Increasing institutional and societal pressures for cost savings and efficiency coupled with a growing emphasis on patient outcomes and satisfaction has created an environment favorable for transition to SCDD "outpatient" total joint arthroplasty. Multiple studies have demonstrated the feasibility, safety, and efficacy of hip and knee arthroplasty in the outpatient setting. Key components of successful SCDD pathways center on rigorous patient selection, education, multidisciplinary care, multimodal analgesia, and adequate infrastructure to support safe discharge home. For the appropriate patient, outpatient arthroplasty seems to be safe, affords similar outcomes to inpatient arthroplasty, and potentially provides significant cost savings. Further study is needed to better define patient selection as well as to ensure patient safety and excellent outcomes.

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References

References printed in **bold type** are those published within the past 5 years.

Levels of evidence are described in the table of contents. In this article, references 28, 29, 31, and 49 are level I studies. References 14, 18, 21, 24, 32, 33, 41, 50, and 60, are level II studies. References 1, 2, 3, 5, 7, 8, 11, 13, 15, 19, 22, 23, 25, 27, 34, 35, 39, 42, 43, 53, 55-59, 63-67 are level III studies. References 6, 9, 10, 12, 17, 20, 26, 30, 36, 37, 38, 40, 44-48, 51, 52, 54, 61, and 62 are level IV studies. References 4 and 16 are level V report or expert opinion.

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