Outpatient Total Joint Arthroplasty

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Abstract

Purpose of Review Outpatient total joint arthroplasty (OTJA) allows for a safe, cost effective pathway for appropriately selected patients. With current pressures on arthroplasty surgeons and their associated institutions to reduce costs per episode of care, it is important to define the steps and challenges associated with establishing an outpatient arthroplasty program.

Recent Findings Several studies have outlined techniques of selecting patients suitable for this type of postoperative pathway. With emerging concerns about patients who undergo outpatient arthroplasty being at increased risk of medical complications, which may lessen projected cost savings, it is important to identify value-based strategies to optimize patient recovery after OTJA.

Summary This article reviews digital techniques for patient selection and data collection, operating room efficiency systems, and provides a summary of methods to build and maintain value in outpatient total joint replacement within the framework of bundled payment reimbursement.

Keywords Outpatient total joint arthroplasty · Patient stratification · Episode of care management

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Introduction

Outpatient total joint arthroplasty (OTJA) is a means of providing safe, cost effective care for select patients indicated for unicompartmental knee arthroplasty (UKA), total knee arthroplasty (TKA), or total hip arthroplasty (THA). Establishing a successful OTJA program involves meticulous attention to detail and anticipation of potential complications. In addition to preparing the surgery center, surgeons must also establish procedure to optimize anesthetic technique, pain management, blood management, rehab and physiotherapy, and patient safety [1]. Despite the immense amount of planning required, the rate of arthroplasty procedures done in the outpatient setting is increasing. Between 2012 to 2015, there was a 47% increase in elective OTJA, and it is expected that there will be a 77% growth in OTJA over the next 10 years, with inpatient TJA growing only 3% during the same period (Fig. 1) [2].

In 2014, Medicare paid \$50,000 per TJA hospitalization, totaling approximately \$7 billion paid out that year [3]. In 2011, the Center for Medicare and Medicaid Services (CMS) introduced the Bundled Payment for Care Improvement (BPCI) with the goal of establishing a payment model that would lead to “higher quality, more coordinated care at a lower cost to Medicare” [4]. This model incentivizes improving quality while cutting costs in order to improve the value generated per unit arthroplasty procedure. In practice, this payment model promotes two primary goals: first, to reduce nonessential operating room (OR) and hospital services and minimize adverse events requiring increased length of stay, readmission, and/or discharge to inpatient rehab units, and second, to better coordinate care for arthroplasty patients between the inpatient and outpatient settings. By streamlining the surgical procedure and eliminating the postoperative stay, OTJA accomplishes both goals.

Bundling orthopedic knee and hip procedures requires a different approach from traditional fee-for-service practice.

Fig. 1 Primary hip and knee replacement growth across settings [2]

US Market, 2016–2026

Bundles include all areas of the surgical process beginning with the surgical consult and in most cases ending 90 days after the surgical procedure. Paramount to episodic bundling best practice is the preoperative clinical and social risk screening to identify risks for high cost and low quality and managing these risk factors prior to surgery. Understanding the patient's risks is a proactive way to effectively manage and eliminate all risk factors reducing cost and increasing quality of the patient's surgical outcome.

A successful bundled program for total joint procedures requires a cultural shift in the way a case is managed including predictive risk assessments/scoring and shared decision-making. Figure 2 outlines the components of a bundled payment program.

Organizations that participate in bundled payments risk significant financial loss. This is because the bundle assumes that care for all patients will be covered by the single bundle payment. However, a small subset of patients, termed “avalanche events” or “bundle busters,” can have increased cost of care due to multiple-comorbidities or complications resulting in hospital re-admissions and this can cost between \$100,000 to \$150,000 per admission [5]. These patients, when mismanaged, fall outside the organization's process and capabilities. Organizations looking to become “best in class” have the opportunity to reduce the risk factors for every patient prior to surgery, which will result in the most optimized and low-risk patients. These results in a reduced expense to the bundled payment with high-quality outcomes and increased patient satisfaction. In our experience, identification of the patients' clinical and social risk factors has been critically important in determining the most important risk mitigation interventions prior to OTJA.

Although the future of the CMS BPCI initiative for TJA is uncertain, there is bipartisan support in congress for the cost savings promoted by the Comprehensive Care for Joint Replacement (CJR) program [6]. As further evidence that the ways in which we provide care to arthroplasty patients are changing, the Advisory Panel on Outpatient Payment unanimously recommended that CMS move the CPD code for TKA (27447) from inpatient-only status to hospital outpatient department (HOPD) status in August 2016 [7]. No matter

the location of the surgery, it is the responsibility of the surgeon to take all measures necessary to keep costs down without compromising patient outcomes or experiences.

Insurance Contracting

Patient and ambulatory surgery center (ASC) insurance contracting is critical to make certain that the insurance pre-approval process identifies any facility-fee reimbursement issues as well as non-covered patient costs. It is not uncommon for some insurers to consider TJA performed at an ASC an “out of network” procedure, as opposed to the “in-network” TJA performed the local hospital. It is critical for the ASC to obtain credentialing for OTJA and do a thorough pro-forma based upon payer mix, meet with the payers, and negotiate a bundled payment rate for each TJA procedure.

For Medicare patients, insurance contracting can discourage OTJA. Currently, CMS will reimburse UKA for same day discharge and allows overnight stays or admissions under “observation” class, for less than 24 h without penalty. Conversely, many hospitals are charged an early discharge penalty for outpatient TKA. Identifying these situations ahead of time can help minimize undue financial burden on the patient and is an essential component of a comprehensive screening program for OTJA.

Patient Selection and Screening

Establishing patient selection criteria is the most critical aspect of OTJA, with several articles written in the past year outlining the necessary criteria to avoid complications. Sibbia et al. reviewed a series of 381 TKAs and found that older age, female gender, ASA scores of III/IV, history of atrial fibrillation, and prior TKA were associated with increased hospital costs and increased length of stays [8]. Berger et al. reported on 5373 TJAs between 2004 and 2013 and confirmed that patients who received medical clearance and the coordinated

Fig. 2 Organizing the episode of care

efforts of a dedicated postoperative caregiver and a discharge planner have better outcomes after TJA [9].

The only way to ensure a consistent and manageable episode of care is to mandate that each patient has a detailed risk assessment prior to their surgical event. Risk assessments give the surgical team accurate, updated information on the patient's risks of perioperative complications. This information also helps the surgeon determine whether a patient can safely proceed with OTJA; they are better candidates for inpatient TJA, or further medical evaluation and optimization are necessary prior to surgery.

Unlike traditional medical risk stratification for TJA, it is important to evaluate anxiety levels and social support for patients being considered for OTJA. Even patients without diagnosed anxiety disorder are often concerned about postoperative pain, being able to care for themselves, and mobility, especially if they live alone. A study of the effect of psychological support on patients indicated for primary TJA published by Tristano et al. demonstrated that patients who received psychological support had a lower incidence of anxiety and depression than those who did not [10]. Additionally, THA patients who received psychological support reached their physical therapy goals 1.2 days sooner than those who did not receive any psychological support [10]. Patients being considered for OTJA, who are required to manage their own pain control, physical therapy, and self-care, are even more likely to benefit from a strong psychological support. Identifying patients who already have strong social support vs. those who do not is thus extremely beneficial.

A detailed clinical and social assessment such as the General Anxiety Disorder-7 (GAD-7), which is a self-

reported questionnaire for screening and measuring general anxiety disorder, is a useful tool and can be used in concert with other tools for screening overall health, such as the revised cardiac risk index (RCRI). For example, a patient may have three identified risk factors:

- High body mass index (BMI)
- Symptomatic chronic heart failure
- Anxiety

These risk factors need to be properly managed and tracked until they are clinically capable of proceeding with surgery. Possible interventions for this patient may be setting up an appointment with a dietician, working with their primary care physician and cardiologist to manage congestive heart failure (CHF), and setting them up with psychotherapy prior to their visit. Risk calculations and historical data tell us the obese patients have higher risk for readmissions and complications [11]. If these issues are not managed, this patient could become one of the “bundle busters,” and experience complications and/or costly readmissions that may have been avoidable with more thorough preoperative optimization.

Making sure the patient is healthy, properly managed, and ready for surgery is the difference between a successful and unsuccessful bundled program. Organizations may be able to manage a low volume of bundled patients without detailed protocols, process, and technologies. However, once the volume increases, it quickly becomes more difficult for providers to keep up with all patients and understand how each of them is responding to their medical management. Reactive

management, responding after a complication or readmission has occurred, is not advisable when caring for large groups of patients; anticipatory management enables adherence to the OTJA strict protocols.

Data collection and outcome measures are very important and can be accomplished with a software program (Fig. 3). Tracking volume, surgical outcomes, and patient progress help surgeons identify successful practices and areas for improvement. A “total joint coordinator,” “nurse manager,” or “case manager” must be assigned to every patient to make certain that the surgeons’ and patients’ needs are being met. Additionally, this individual ensures that the necessary staff and service line resources have been coordinated successfully. This individual must do a patient home assessment, which is part of the software program (Fig. 3) to make certain that the home caregiver is competent to tend to the needs of the patient in the first 48 to 72 h postoperatively. This person also helps coordinate preoperative multidisciplinary patient education and preoperative physical therapy, to ensure patients in the best possible condition before surgery [12]. Home physical therapy can be instituted by video learning tools or utilizing a mobile physical therapist making home visits.

Cautions—Identifying Patients Who Are Not Candidates for OTJA

Published literature is mixed on medical comorbidities associated with perioperative complications and readmissions following OTJA. In their retrospective study of 110 patients who underwent OTJA at a center accustomed to rapid rehab protocols and minimally invasive techniques, Berger et al. found that inadequate pain control and completing surgery late in the day were most strongly associated with preventing

same-day discharge [10]. They found no differences in BMI, average age, body weight, or medical comorbidities between patients who underwent OTJA and those who required inpatient stay [13]. They also found that for patients undergoing TKA, compared to UKA, history of myocardial infarction within 1 year, BMI > 40, and greater than three medical comorbidities were most strongly associated with increased risk of readmission [14].

In their review of 1012 patients undergoing elective TJA, Courtney et al. found that chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), congestive heart failure (CHF), and cirrhosis were identified as independent risk factors for late (> 24 h) postoperative complications [15]. As such, the authors do not recommend OTJA for patients with any of these comorbidities. They proposed a 6-point risk assessment model (AUC = 0.738) to help determine a patient’s candidacy for short stay TJA; patients without any of the aforementioned risk factors have a 3.1% probability of developing late complications, while the presence of one risk factor elevates the patient’s risk to 10% [15].

These studies, rather than providing steadfast indication and contraindication criteria for patients undergoing outpatient TJA, serve to underscore the importance of thorough preoperative medical evaluation. Also, established protocols for therapy and pain control are essential to help patients be successfully discharged from ASCs; disorganized postoperative treatment can derail OTJA for even the most medically and psychologically optimized patient.

ASC Facility and Staff Preparation

While careful patient selection is essential to minimize risks and ensure optimal candidates for OTJA surgery, ambulatory

Fig. 3 Data collection and outcome measures

Why Does This Matter?

The Right Patient Volume

- Better Outcomes
- Industry is favoring the center of excellence model
- Higher performance, higher referrals
- Low performance, scrambling to obtain volume

Competitors are Adjusting Fast

- Travel for surgery
- Ultra competitive market

Manage Medium and Low Performing Patients

- Paramount for clinical success to learn how to manage these patients and get them to high performance

care facilities also pose new challenges and considerations for surgeons. These include the following:

- Training staff to be proficient on multiple procedures as well as each surgeon's exact procedure preferences and instrument sequencing
- Minimizing instruments to be sterilized for time and cost savings
- Timely turnover of operating rooms to maximize OR utilization and patient throughput

In an ambulatory care facility, outpatient total joint replacement requires an efficient and streamlined OR and central processing. Two areas, staff training and instrumentation, significantly impact the success of outpatient total joint replacement procedures and the ability to reduce costs. At the same time, the use of clinically proven hip and knee implants can help reduce the risk of complications.

While not unique to an ambulatory care setting, staff training in a high-volume, time-sensitive environment is vital to achieving the benefits offered by OTJA. The ability to train staff on a surgeon's specific procedure and instrument sequencing can affect procedure duration, and staff trained on a surgeon's preferred patient setup and room layout can facilitate faster OR turnover. Enabling easy and fast access to instructions for robotic or other complex equipment also supports procedure efficiency and speed.

Not only is staff competence improved with easy access to training and self-testing prior to procedures, ensuring proficiency in the OR also saves time in an ambulatory environment. When systems and programs are put in place to support the needs of each surgeon, the procedures performed and instrument sequencing, surgeon's confidence in outpatient OR staff increases.

The ability to reduce costs is a significant driver for the increase in OTJA. Streamlining the OR via the standardization of instrument trays can decrease setup time and reduce the costs associated with sterilizing instruments that go unused. With the ability to only pull the instruments a surgeon uses, with back-up instruments sterilized and ready but unopened, outpatient total joint replacement procedures can save the costs of sterilizing unused instruments while also reducing procedure time.

Technology-Enabled Improvements Facilitate Outpatient Total Joint Replacement

Advancements in technology-enabled solutions can help ensure outpatient OR staff proficiency and facilitate efficiency in OTJA procedures. These digital solutions leverage the convenience of self-guided, personalized training for staff prior to procedures and can also be deployed to help training in other

areas of the outpatient facility, such as central processing. Digital solutions can also support the streamlining and standardization of instrument trays to help decrease instrumentation setup time and reduce costs associated with sterilizing unused instrumentation.

Interactive Training

With the ability to deliver interactive training modules that rapidly onboard staff and reinforce protocols and procedures, while also enabling customized training for surgeon-specific preferences and instrument sequencing, digital solutions build OR staff competency. By digitizing surgeon preference cards and procedure instrument sequencing, these assets can be placed online for staff to review and facilitate an interactive experience that leverages gaming technology. This allows training and reinforcement, to take place anywhere, anytime, at staff convenience. Flexible solutions that support on-site training as well as remote access to training modules and can support a breadth of content for procedure types and protocols in one place can empower staff and increase confidence in an outpatient environment. The benefits of interactive training platforms for outpatient total joint replacement include the following:

- Decreased OR time
- Decreased time to onboard staff
- Reinforce protocols and procedure preferences prior to a case
- Improve staff competence
- Increase surgeon confidence in staff

Streamlined Instrumentation

Instrument utilization identification is used to streamline and standardize instrument trays, which can help decrease setup time and reduce the costs associated with sterilizing unused instruments. By "right-sizing" trays based upon surgeon and procedure requirements, streamlining trays for outpatient total joint replacement also helps ensure that shelf space is optimized for the reduced footprint in ambulatory facilities. Technology platforms designed to streamline and standardize instrument trays can as follows:

- Help decrease setup time
- Reduce costs associated with sterilizing unused instruments
- Maximize shelf space
- Provide a visual platform for tray assembly and special instructions
- Document and validate proper tray inspection

One example of a cloud-based technology to improve outpatient OR efficiency and enhance patient care is a surgeon specific suite called Virtual BackTable (S2 Interactive, Smith and Nephew, Andover, MA) that combines digital interactive training and instrument utilization identification to help improve staff competency and streamline trays to reduce instrumentation and sterilization costs.

In one pilot study, using S2 technology resulted in a 60% reduction in instrument tray processing costs, with an estimated savings of \$83,000 per year for just one tray [15]. At the same time, the technology also facilitates improved workflow and support for compliance and quality protocols.

In OTJA procedures, the costs of instrument processing and implant waste can quickly add up and impact the very cost-saving benefits both surgeons and patients seek to realize through OTJA. In addition, the inefficiencies associated with insufficiently trained staff and large instrument inventories can also impact the potential cost benefits that can be achieved in an ambulatory environment. Regardless of the solution, technology can play an important role in supporting the realization of the time and cost saving benefits that outpatient total joint replacement can offer.

Intraoperative Considerations: Minimizing Adverse Events

Multimodal pain management pathways have become the standard of care for TJA in the inpatient and outpatient settings [16, 17]. It is of particular importance for patients undergoing outpatient TJA that an effective anesthesia program be in place to control pain, minimize adverse reactions to anesthesia, such as nausea, and allow rapid mobilization after surgery. Ideally, pain and anesthesia pathways should be established by a team consisting of anesthesiologists, surgeons, and pain management physicians and should combine oral medications and local anesthetics. These protocols would reduce the need for oral medications and prevent peripheral sensitization by neurogenic blockade [11].

Adductor canal blocks are the procedure of choice for patients undergoing either TKA or UKA, and short-acting spinal blocks are effective for THA. Short-acting spinal anesthetic agents often consist only of local anesthetics, such as lidocaine or ropivacaine, which helps minimize the potential nausea, sedation, and pruritus, that occur with longer-acting anesthetics containing opioids [18]. Injection of the capsular and soft tissue structures by the surgeon may include one of various reported “cocktails,” often consisting of a combination of narcotics, local anesthetics, and non-steroidal anti-inflammatory drugs (NSAIDs) and/or the utilization of a liposomal bupivacaine injection. Another important aspect of perioperative care is preventing dehydration, which can exacerbate postural hypotension and therefore delay postoperative

mobilization necessary for discharge. Utilizing these techniques allows the patient to be ambulatory within a few hours after surgery without significant pain. Cold therapy has been shown to be beneficial in the early postoperative period as well.

It is important to avoid significant blood loss and bleeding at the time of surgical intervention, both in the interest of preventing symptomatic anemia, and also because blood is a noxious stimulus and massive hemarthrosis can cause significant pain delaying progress with physical therapy [19]. Some OTJA surgeons avoid using a tourniquet completely during TKA and keep a tourniquet in place to inflate only if any untoward bleeding ensues during the procedure [20]. If using a tourniquet for a TKA, it is important to release the tourniquet prior to closure and coagulate all major bleeders prior to soft tissue injection of using one of the anesthetic “cocktails” or a bupivacaine liposomal injection. Regional anesthesia, by precipitating a hypotensive state, also helps decrease blood loss, especially from cut bone surfaces in UKA and TKA [21, 22]. The use of perioperative tranexamic acid (TXA), which has been used successfully in primary and revision TJA without a corresponding increase in the incidence of thromboembolic events [23, 24], is critically important to minimize blood loss. Any unexpected blood loss will slow patients’ recovery after surgery and can lead to the conversion of an OTJA case to an inpatient stay.

Outcomes

In the last 10 years, many arthroplasty surgeons have made the move toward performing OTJA for patients without serious medical or psychiatric comorbidities. Published literature has shown that OTJA can be safely performed without negatively affecting patient outcomes or patient perceptions of the quality of their care.

With the development of fast-track arthroplasty programs, expedited recovery programs, such as OTJA, have been shown to improve efficiency while maintaining low-revision rates, improved quality of life and functionality, and high-patient satisfaction scores [25]. OTJA programs have demonstrated the ability to maintain the positive outcomes of the fast-track programs without undue increase in risk to patients.

In their study comparing rates of perioperative complications between patients who underwent inpatient and outpatient UKA, Bovonratwet et al. reported no significant differences in complication rate or 30-day readmission rate between the matched patient groups [26]. Dorr et al. reported on a series of patients offered outpatient THA and found that, though outpatient surgery offered no objective physical benefits, such as accelerated functional recovery, it did not result in any medical complications or readmissions [27]. Their results demonstrated that THA could safely be performed for a select

group of patients and that these patients were also willing to accept the responsibilities associated with outpatient surgery, underscoring the importance of patient engagement in care to a successful outcome. Six weeks after surgery, 87% of patients reported that going home the day of surgery increased their confidence in their hip replacement [27].

Aynardi et al. compared outcomes and costs between patients who underwent inpatient THA and those who had outpatient THA. All surgeries were performed by the same surgeon through the same approach, and there were no significant differences between the two groups with respect to complications or blood loss. Importantly, the authors reported that the non-itemized bill charged to the patient or third-party payer was nearly \$7000 less for the outpatient cases [28]. Similarly, a case control study conducted by Huang et al. comparing costs for inpatient and outpatient TKA demonstrated that outpatient TKA, on average, resulted in 30% cost savings for the hospital per episode of care without a significant increase in complications or readmissions [29]. These results demonstrate that, so long as the infrastructure is in place for outpatient arthroplasty and patients are appropriately selected, OTJA can be considered a means of cost savings for hospitals and can thus increase value of care within a bundled-payment reimbursement model.

Conclusions

OTJA is economically and practically feasible and yields excellent outcomes in carefully selected patients. A well-designed OTJA program provides safe surgical care with equivalent patient-reported outcomes, such as anxiety, depression, satisfaction, and pain, compared to standard “fast track patients” that require a 1-day hospitalization [30, 31]. Furthermore, OTJA programs generate cost savings by improving OR efficiency via surgeon-specific instrumentation and online training tools and improving post-anesthesia care and pain control. Postoperative home physical therapy training, either by a therapist or with modules accessible by the patient’s cell phone, facilitate safe, timely pre-habilitation and rehabilitation, and obviate the need for patient transfer to a skilled nursing or extended care facility. It is critical to understand that patient stratification and case management are of paramount importance in the success of the procedure, as well as controlling the total cost of the episode of care. Choosing the wrong patient can cause an “avalanche” case or “bundle buster,” which reaffirms that, without appropriate patient selection and monitoring, the remainder of the care pathway will be doomed to failure.

Rigorous medical screening and optimization, along with multi-specialty care programs to control pain, limit blood loss, minimize adverse reactions to anesthesia, and mobilize more quickly, help patients recover from surgery more quickly and

avoid unnecessary medical interventions. Though not all patients will be candidates for OTJA, the future of total joint arthroplasty will involve a movement to the outpatient setting for the average patient. By shifting the setting of postoperative care from hospitals to patients’ homes, costs to patients are less [32] and help patients become more engaged in their care. Building a successful OTJA endeavor requires the input of a multidisciplinary team and allows surgeons to affect the way comprehensive care is delivered to arthroplasty patients.

Compliance with Ethical Standards

Conflict of Interest All authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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