

# Total Knee Arthroplasty in the Ambulatory Surgery Center Setting

## Best Practices for Cost Containment and Clinical Care Delivery

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As the current population continues to increase in age, so does the degeneration of the musculoskeletal system and the development of knee osteoarthritis. Total knee arthroplasty (TKA) will be the treatment of choice when it comes to improving physical function and decreasing pain associated with osteoarthritis of the knee. The global push for more cost-effective healthcare services has led to new models of care and payment delivery methods such as performing TKA in the ambulatory surgery center (ASC) setting. With deeply invasive surgical procedures such as TKA being done in the ASC setting, orthopaedic nurses must be mindful of best practices that will promote quality and safety while considering the importance of using current evidence to guide nursing practice when promoting appropriate patient selection and effective patient education of self-management of postoperative care pertaining to TKA being performed in the ASC setting. This is critical to consider during a time when financial profits in the ASC setting may take a front seat to the delivery of high-quality and safe patient care.

It is projected that, by the year 2040, up to 78 million or 26% of individuals older than 18 years will be diagnosed with arthritis, and for many individuals with osteoarthritis of the knee, total knee arthroplasty (TKA) will be the treatment of choice for promoting optimal physical functionality, decreasing pain, and improving overall quality of life (Hootman et al., 2016). The push for more cost-effective delivery of healthcare services is greater than ever and the balance between cost containment and value of healthcare services continues to be a challenging one. This is especially so when it comes to the delivery of orthopaedic care that involves surgical procedures such as TKA, which is a costly surgical procedure, where the cost varies from facility to facility and is based upon multiple factors from billing practices and implant price to geographical location (American Association of Hip and Knee Surgeons, 2019). Therefore, the emergence of performing TKA surgeries in the ambulatory surgery center (ASC) setting is quickly becoming more commonplace, as it serves to address the push for more cost-effective healthcare while the desire for high-quality care and patient safety remains a topic of importance.

As more invasive and more in-depth surgical procedures such as TKA are being performed in the ASC setting, orthopaedic nurses should be mindful of best practices that will promote quality and safety while considering the importance of using current evidence to guide nursing practice. Orthopaedic nurses should be active participants in assisting orthopaedic surgeons and healthcare organizations with the development of policies and protocols that promote best practices in appropriate patient selection for TKA in the ASC setting, while delivering effective patient education related to the self-management of postoperative TKA pain. Furthermore, orthopaedic nurses are instrumental in developing and providing the delivery of pre- and post-operative patient education related to the key TKA self-care measures that patients and their caregivers should be knowledgeable of to promote high-quality, positive patient outcomes. This article discusses best practices for orthopaedic nurses to consider, as it relates to performing TKA in the ASC setting.

### Background Related to Cost and Ambulatory Surgery Center Use

With the introduction of the Patient Protection and Affordable Care Act (PPACA) in 2010 came the push for

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The authors have disclosed that they have no financial interests to any commercial company related to this educational activity.

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DOI: 10.1097/NOR.0000000000000725

lower healthcare cost and increased quality of care for all Americans (U.S. Department of Health and Human Services, 2016). The ACA has also led to the introduction of legislation known as the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), which consists of the Quality Payment Program (QPP), alternative payment models (APMs), and the merit-based incentive payment system (Centers for Medicare & Medicaid [CMS], 2016). The MACRA QPP legislation presents a shift from the fee-for-service model of payment to fixed bundled payments. This has fueled the development of various care delivery models in orthopaedics that generate cost savings while promoting value, quality, and sustainability in a collaborative manner among providers, healthcare organizations, and third-party payers of healthcare services. An example of APMs and fixed payment bundles in the specialty of orthopaedics is the Comprehensive Joint Replacement (CJR) model.

The CJR model has also created interest in other modes of cost-effective care delivery. One example of this includes the use of ASC settings for TKA in patients who are younger than 65 years (i.e. non-Medicare patients). From 2003 to 2010, there was a significant increase in individuals aged 45 to 64 years undergoing TKA, rising from 26% to 42%. Concurrently, the average length of hospital stay decreased from 4.0 days to 3.3 days in 2010, with the most extended period of stay being in patients older than 65 years at 4.1 days and the shortest length of stay, 3.1 days, being among individuals younger than 44 years (Agency for Healthcare Research and Quality, 2016; Steiner et al., 2012). Based on this data, the average age for primary TKA and the length of stay following TKA are both declining.

Beginning January 1, 2020, the CMS began fee-for-service reimbursement to ASCs for Medicare beneficiaries who undergo TKA. According to the CMS's final outpatient rule, TKA does not put a Medicare beneficiary at risk for safety concerns when performed in the ASC setting. The CMS also stated in the final rule that they do not anticipate many fee-for-service Medicare beneficiaries older than 65 years would undergo a TKA in an ASC versus a hospital-based outpatient or inpatient setting due to the fact that few Medicare beneficiaries are ideal candidates because of increased age coupled with the presence of comorbidities and increased body mass index (BMI). In addition, the CMS stated in their final rule that physicians should use reasonable clinical judgment when determining an appropriate operative setting for each individual patient undergoing TKA. The various comments from hospitals on the proposed rule from the CMS showed evidence of concerns about financial conflicts of interest among physicians who personally own ASCs and stand to profit financially from TKAs being performed there (CMS, 2019).

In the literature, ASC settings are often promoted as being more cost-effective and efficient for minimally invasive surgeries when compared with hospital-based outpatient surgery departments. However, conflicting literature still exists related to the safety and quality

standards associated with performing deeper and more invasive operations such as TKA in an ASC setting when compared with hospital-based outpatient surgery departments. There is a lack of long-term data showing superior patient outcomes in patients undergoing TKA in the ASC setting compared with the hospital setting. There is also a lack of sufficient literature that shows the regulatory aspect of ASC settings to be equal to or more rigorous than hospital-based outpatient surgery settings. Therefore, further research that focuses on patient outcomes and the development of best practices supported by current high-level evidence must be considered when it comes to the promotion of desirable postoperative outcomes and the minimization of postoperative challenges and complications following discharge from an ASC setting.

## Best Practices in Preoperative Screening and Patient Selection

With a financial focus on cost savings and improved quality when conducting TKAs in the ASC setting, it is critical that best practices in surgical optimization are followed as to avoid unintended negative consequences and patient harm while also promoting effective and efficient use of existing resources. The fundamental aspects that should be considered to promote surgical optimization that encourages positive outcomes among patients undergoing TKA in the ASC setting include the consideration of appropriate patient selection and preoperative screening, clearly detailed protocols that support effective patient self-management of postoperative pain, and patient education that focuses on general postoperative self-care measures in the home setting. A vital aspect of patient teaching that should be considered is the prevention and recognition of postoperative complications and safe self-management of postoperative pain in the patient's residential setting. There should also be close consideration of the American Society of Anesthesiologists (ASA) physical status classification system as to better identify and categorize a patient's physiological state in a predictive manner to highlight the areas of increased perioperative and postoperative risks, as this can assist with determining the appropriateness of conducting TKA in the ASC setting (ASA, 2020).

Once a patient has been determined to be an ideal candidate for TKA in the ASC setting, optimization of existing resources should take place. Coordination of care between the patient's surgeon, primary care provider, and any additional specialty providers, such as endocrinologists, cardiologists, or pulmonologists, is necessary to best optimize the patient prior to having surgery in the ASC setting. As pointed out by Krause et al. (2018), all patients should be evaluated by their primary care provider or other key specialty providers for surgical clearance prior to having a TKA, and all chronic medical conditions should be optimized prior to TKA taking place.

The key to developing an evidence-based, comprehensive, and systematic approach to appropriate and effective preoperative patient selection for TKA in the

ASC involves clear identification of patients who are at high risk for postoperative complications, to include those at a greater risk for postoperative hospital admission and patients who are physically and cognitively unable to provide sufficient and adequate self-care management during the immediate postoperative period in the home setting. The development of a formalized preoperative screening checklist may help to identify patients who are at a higher risk for experiencing perioperative and postoperative adverse outcomes and might benefit from a brief postoperative inpatient hospital stay.

Nussenbaum et al. (2018) conducted a retrospective comparative study between veteran patients undergoing TKA and total hip arthroplasty (THA) without the use of a formal preoperative screening criteria list and those undergoing TKA and THA after the implementation of a formal preoperative screening criteria list. The preoperative screening criteria evaluated patient demographics and existing patient comorbidities and included a hemoglobin A<sub>1c</sub> equal to or less than 7, BMI equal to or less than 35, hemoglobin equal to or greater than 11, and an albumin level equal or greater than 3.5. This study found that the percentage of perioperative and postoperative complications decreased from 35.4% to 14.8% after implementing the preoperative screening criteria list, and the rates for surgical site infection between both TKA and THA patients decreased from 4.4% to 1.3%. From the findings of this study, it can be clearly reasoned that implementing a preoperative screening criteria list can serve to identify patients at greater risk for perioperative and postoperative complications who would not be ideal candidates for TKA in the ASC setting.

Krause et al. (2018) identify the implementation of exclusion criteria to be of great benefit. The exclusion criteria are categorized into three separate categories, with the first category being the complexity of surgery such as bilateral TKA or complex fracture fixation. The more complex the surgery, the greater the exclusion for having the surgery in the ASC setting (Krause et al., 2018). The second exclusion category is the patient's age. Although the optimal age cutoff remains a topic of debate, most patients who are ideal candidates for having TKA in the ASC setting are younger than 65 years (Krause et al., 2018). Within the literature, there exists ongoing research and much debate with regard to the safety of having a TKA in the ASC setting in patients older than 65 years. Evidence suggests that patients

older than 75 may be at higher risk for intraoperative and postoperative complications, but there is yet to be an identified consensus for optimal age cutoff (Courtney et al., 2018).

The third exclusion category identified by Krause et al. (2018) is the presence of patient comorbidities and preexisting health conditions that should exclude patients from having a TKA in the ASC setting. These conditions include diabetes mellitus (type 1 or 2) with a hemoglobin A<sub>1c</sub> more than 7%, bleeding disorders, ASA classification greater than 2, poorly controlled cardiac or pulmonary comorbidities, chronic opioid consumption, functional neurological impairments, chronic or end-stage renal disease, reduced preoperative cognitive function, and BMI more than 30 kg/m<sup>2</sup>. According to Krause et al. (2018), roughly 50% of the population in need of TKA have a BMI of more than 30, thus making inclusion for TKA in the ASC setting inappropriate for a majority of the patients. Table 1 list the exclusion criteria recommended by Krause et al. (2018) to be considered when conducting TKA preoperative screening and consideration of TKA in the ASC setting.

There are varying opinions on the BMI threshold for TKA in the ASC setting. A study conducted by Berger et al. (2009) used a BMI of greater than 40 kg/m<sup>2</sup> as part of their exclusion criteria. Courtney et al. (2018) suggest that a BMI of more than 35 kg/m<sup>2</sup> in Medicare patients (individuals older than 65 years) presents a high risk for complications. Nussenbaum et al. (2018) used BMI more than 35 kg/m<sup>2</sup> when screening for consideration of elective TKA. Although the optimal exclusion cutoff for BMI may not be known, patients with a BMI more than 40 kg/m<sup>2</sup> are classified as ASA Class III, and are generally considered to be high risk for perioperative complications, while patients with a BMI of less than 30 kg/m<sup>2</sup> are considered to be much lower risk.

These recommended BMI parameters should be taken into consideration when determining if the ASC setting is appropriate for a patient to undergo TKA. However, the variations in BMI threshold show that a holistic approach should be used to assess the patient while considering the impact of the patient's BMI on their overall present state of health and how it might influence the patient's outcome during the 48- to 72-hour postoperative period. Table 2 shows the BMI ranges as they relate to the ASA classes and associated risks.

**TABLE 1. PREOPERATIVE SCREENING EXCLUSION CATEGORIES FOR TKA IN THE ASC SETTING**

Complexity of Surgery	Patient's Age	Patient Comorbidities
Bilateral TKA	Older than 65 years while considering overall health status	Diabetes mellitus (types 1 and 2) with hemoglobin AC >7% History of bleeding disorders
Complex fracture fixation	Older than 75 years while considering overall health status	ASA classification >2 Poorly controlled cardiac or pulmonary comorbidities Chronic or end-stage renal disease BMI >30 Overall reduced preoperative cognitive function

**Note.** ASA = American Society of Anesthesiologists; ASC = ambulatory surgery center; BMI = body mass index; TKA = total knee arthroplasty. This table was designed by the authors by adapting information from "Outpatient Total Knee Arthroplasty: Are We There Yet? (Part 1)" by A. Krause, Z. Sayeed, M. El-Orthmani, V. Palakonda, W. Mihalko, & K. Saleh, 2018, *Orthopedic Clinics of North America*, 49(1), 1–6.



**TABLE 2. RELATIONSHIP OF BMI AND ASA CLASSIFICATIONS WHEN CONSIDERING THE ASC SETTING FOR ELECTIVE TKA WITH ASSOCIATED RISKS**

Obesity: >30 BMI <40	Morbid Obesity BMI ≥40
<p>ASA Class II—presence of mild systemic disease</p> <p>Lower associated increased risk</p> <p>Associated Risks</p> <p>Increased risk for:</p> <ul style="list-style-type: none"> <li>• Hospital admission</li> <li>• Prolonged intraoperative time</li> <li>• Anesthesia challenges related to sufficient oxygenation and airflow</li> <li>• Subcutaneous infection</li> <li>• Periprosthetic joint infection</li> <li>• Poor wound healing/wound dehiscence</li> <li>• Pulmonary embolism</li> <li>• Urinary tract infection</li> <li>• Renal insufficiency</li> <li>• Increased pain</li> <li>• Component loosening or failure</li> </ul>	<p>ASA Class III—presence of severe systemic disease</p> <p>Higher associated increased risk</p>

*Note.* ASA = American Society of Anesthesiologists; ASC = ambulatory surgery center; BMI = body mass index; TKA = total knee arthroplasty. This table was designed by the authors by adapting information from *ASA Physical Status Classification System* by American Society of Anesthesiologists, 2020, <https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system>, and “The Outcomes of Total Knee Arthroplasty in Morbidly Obese Patients: A Systematic Review of the Literature” by L. Boyce, A. Prasad, M. Barrett, S. Dawson-Bowling, S. Millington, S. Hanna, & P. Achan, 2019, *Archives of Orthopaedic Trauma Surgery*, 139(4), 553–560.

Special attention should also be given to patients with a history of obstructive sleep apnea (OSA). As outlined in the Society for Ambulatory Anesthesia consensus statement on OSA and ambulatory surgery, Joshi et al. (2012) state that patients with known OSA may be considered for surgery in the ASC setting only if comorbid conditions are optimized and the patient is able to use a continuous positive airway pressure device after discharge. Identifying patients with undiagnosed OSA is critical, and if patients are suspected as having OSA, it is recommended to treat them as if they do have OSA rather than not (Joshi et al., 2012).

## Best Practices in Patient and Caregiver Education

Patient and caregiver active involvement throughout the perioperative period is one of the most important factors when considering TKA in the ASC setting. Surgeons, nurses, and physical therapists should all participate in educating patients and their caregivers about realistic expectations in both the peri- and postoperative periods. It is paramount to be mindful of the patient's and caregiver's comprehension of the education being delivered to ensure optimal proficiency in self-management skills and techniques with a particular focus being put on postoperative care following discharge from the ASC setting. Improving a patient's ability to manage their own postoperative care improves outcomes, reduces anxiety among patients and their caregivers, and decreases overall costs. Understanding and optimizing the social factors that affect a patient's ability to self-manage their care is

equally as important as optimizing medical comorbidities prior to TKA in the ASC (Krause et al., 2018).

A study conducted by Giardina et al. (2020) that researched the influence of preoperative education on patients electing to undergo TKA found that the delivery of patient education prior to surgery allows for more a patient-centered approach that is more individualized and tailored toward the patient's specific needs. In addition, this study also validated that the delivery of personalized preoperative patient education plays a key role in building patient confidence and competence in their postoperative self-care.

The potential for postoperative complications following TKA is unavoidable due to the overall nature of the surgical procedure, which means patient education should also focus on the prevention and early recognition of postoperative complications. The most common postoperative complications are patient falls, surgical site infections, venous thromboembolism, and intraoperative injuries to the nerves and blood vessels of the operative extremity (Smith et al., 2017). There is no doubt that these potential complications can negatively influence patient outcomes and increase the cost of care. For patients undergoing TKA in the ASC setting, the postoperative care that has historically been delivered in the inpatient hospital setting by skilled nursing staff will now be replaced by patient self-care measures in conjunction with caregiver assistance. Therefore, it is critical that patients undergoing TKA in the ASC environment along with their caregivers are thoroughly educated during the preoperative phase on the aspects of standard postoperative care management. This includes recognizing complications during the 24- to 72-hour postoperative period because the patient will be discharged home the same day or within 12–24 hours after the surgery.

A retrospective review by Pelt et al. (2018) compared the outcomes of patients who underwent total joint arthroplasty (TJA) before and after the design and implementation of a formalized patient education and self-care management program. The overall goal of this program was to decrease postoperative discharges to postacute rehabilitation centers (PARCs) and increase postoperative discharge to the patient's home setting while also decreasing the incidence of hospital readmissions and repeat surgical procedures. The authors developed a series of patient education videos that are accessible on the practice's YouTube channel and website. The nine videos cover what patients should expect the week before surgery, the day of surgery, the expected duration of hospitalization, and when to expect discharge to home.

As part of this formalized patient education and self-management care program, the authors also revised their existing joint replacement class that patients are required to attend preoperatively to include a more comprehensive and interdisciplinary approach involving the nursing care manager, physical therapists, and a pain management specialist. Patients were strongly advised to attend the class with a family member or caregiver. The program included a care navigation process that consisted of preoperative phone calls

to patients to remind them to attend the required preoperative joint replacement class and discuss various needs the week before surgery. Subsequent phone calls included a call to the patient the day before surgery, discussion of the patient's plans following discharge home from the surgery, a discussion and scheduling of postoperative follow-up appointments, and addressing and questions or concerns that the patient had (Pelt et al., 2018).

In addition to the previously mentioned points, Pelt et al. (2018) implemented as part of their formalized patient education and self-care management program, they also expanded the availability of staff during after clinic hours in an attempt to prevent postoperative patients from going to the emergency department. Available staff included physician assistants, nurse practitioners, and fellows. They also provided more training and education of the revised care pathway to the all of the nursing staff involved in caring for the patients undergoing TJA. Pelt et al. (2018) revealed an overall reduction in postoperative admissions to PARCs from 34% before implementation of the patient education program and revised care pathway to 14% after implementation of the program. Also noted was a reduction in hospital readmissions from 5.6% before to 3.03% following program implementation.

The findings from the study conducted by Pelt et al. (2018) can easily be applied to patients undergoing TKA in the ASC setting. This study shows the importance of incorporating a comprehensive patient education program combined with staff education and increased utilization of staff to promote a more patient-centered, interdisciplinary approach in delivering patient care during the 24- to 72-hour postoperative phase following TKA. All of the points mentioned in this study are also applicable to TKA patients in the ASC setting being discharged home on the same day as surgery. A comprehensive program with the various aspects detailed by Pelt et al. (2018) can serve to improve the quality and safety of care delivery while lowering the cost of care.

The specific processes in an ASC setting that ensure preoperative education was delivered prior to surgery taking place in the ASC setting can be a challenging endeavor.

The ASC may, as part of a quality improvement plan, create a checklist to verify preoperative teaching and education for patients undergoing TKA took place prior to the day of surgery. However, the onus will fall back to the orthopaedic surgeon to ensure the patient is adequately prepared from the standpoint of patient education delivery prior to TKA in the ASC.

## Best Practices in Patient-Managed Postoperative Pain

When it comes to patient-managed postoperative TKA pain following discharge from the ASC setting, there should be consideration of the development of a patient-managed pain protocol that is both safe and effective and includes appropriate prescribing and patient-caregiver education that is comprehensive and practical.

The protocol should also be realistic when it comes to patients and caregivers being able to reasonably follow and comply with the prescribed pain protocol. It is critical for the prescribing clinician to gather a comprehensive patient history related to previous effective self-pain management practices, while also reviewing and considering the concurrent use of other controlled prescriptions such as opiates and benzodiazepines.

A randomized controlled trial conducted by Wilson et al. (2016) investigated the effect of an individualized preoperative education intervention for patients undergoing TKA and found that delivering patient education that is generalized in nature is not sufficient when it comes to preparing the patient to effectively self-manage specific postoperative symptoms such as pain and nausea. These researchers also recommended that an individualized and consistent approach to patient self-management of postoperative pain be initiated during the preoperative period as to allow for sufficient time to address patient questions and concerns prior to surgery in the ASC setting. Wilson et al. (2016) also encourage further research to identify patient barriers to receiving effective preoperative education and support related to patient self-management of postoperative symptoms and promotion of functional outcomes following TKA, in addition to determining whether barriers are present among healthcare providers when it comes to delivering detailed, patient-centered education in the preoperative period.

Education about the patient's self-management of postoperative TKA pain in the residential setting should be initiated during the preoperative counseling period. There should be a clear understanding between the clinician and the patient, and the caregiver—if applicable, that stresses both the clinician's and patient's accountability and responsibility of effective and appropriate postoperative pain management in the patient's residential setting following TKA being performed in the ASC setting. Providing this education to patients and caregivers during the preoperative phase is an ideal time to determine whether the patient and their caregiver fully comprehend the management of postoperative TKA pain in the home setting while assessing for their ability to safely comply with the recommendations.

Patients and their caregivers should also be thoroughly educated on the self-assessment of postoperative TKA pain as a guide to determining the need and frequency for self-medicating postoperative pain. Over self-medication of postoperative TKA pain in the home setting may serve to increase the patient's risk for respiratory depression and possible death if the patient and their caregiver are not educated appropriately on how to self-assess and self-manage the level of postoperative TKA pain that is experienced. A practical approach would be teaching patients and their caregivers about the appropriate use of a numerical pain scale rating and how to appropriately self-medicate according to the level of pain that they are experiencing. In addition, a device or pain log may help patients and caregivers to adequately monitor and manage TKA postoperative pain. In a study by Mordecai et al. (2016),

a medical device that allowed patient's to self-report pain while offering self-help interactive options was reported to be useful by 80% of patients experiencing pain.

There are many possible variations of patient self-management postoperative pain protocols; however, the common evidence-based findings that are often incorporated into these protocols include nonsteroidal anti-inflammatory drugs and Cox 2 inhibitors, in addition to strong opioids with corresponding patient-controlled analgesia to address severe pain and weaker opioids for the presence of moderate to mild pain. The benefit of a multimodal approach to patient's self-management plan for postoperative pain includes the incorporation of both long- and short-term opioids as to maintain pain at a lower level while preventing exacerbations of severe pain, in addition to using different classes of medications, which serves to disrupt the signaling of pain that takes place at different points along the nociceptive pathway (Samuels & Woodward, 2016).

The nonpharmacologic self-guided postoperative pain management modalities that might also be used include neuromodulation in the form of neuromuscular electrical stimulation, transcutaneous electrical nerve stimulation, and cryotherapy. However, Wittig-Wells et al. (2015) conducted a study that found short-term application of cryotherapy for a single, 30-minute application combined with analgesics had no significant impact on decreasing postoperative pain when compared with analgesic use only. In this study, they concluded that consistent sequential applications of cryotherapy might be more likely to decrease pain by helping to decrease postoperative swelling of the knee.

According to Samuels and Woodward (2016), opportunities to improve postoperative pain self-care exist due to the presence of a fragmented pain management trajectory that leads to increased variability in the pain outcomes of patients receiving TKA in the ASC setting. A patient-centered pain management approach that is enhanced by technology can promote a guided path to patient self-managed pain control that begins in the preoperative phase and goes through the entire recovery phase while providing an effective, efficient, and detailed approach for pain management. This is critical, as once the patient is home, they or a caregiver must provide the needed self-care during the immediate postoperative period, as there are no healthcare providers to provide bedside care or other skilled expertise (Samuels & Woodward, 2016).

## Conclusion

It is critical for the policies and procedures in healthcare organizations to support cost-effective delivery of surgical orthopaedic care that also puts the quality and safety of patient care ahead of financial profits. Orthopaedic nurses play a key role in advocating for high-quality care and patient safety in the ASC setting for patients undergoing TKA while collaborating with members of the healthcare team to devise policies and

protocols that promote appropriate patient selection for TKA in the ASC setting. Adequate patient and caregiver education related to postoperative patient self-care management from the standpoints of pain control and early recognition of postoperative complications in the home setting is an additional key role of the orthopaedic nurse who is providing preoperative education and counseling to patients electing to have TKA in an ASC setting.

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