

# Integrative Review for Patients With Bilateral Total Knee Replacement

## A Call for Nursing Practice Guidelines

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**BACKGROUND:** The aim of this joint project between the National Association of Orthopaedic Nurses and the Association of Rehabilitation Nurses was to develop nursing practice guidelines for patients who experience bilateral knee arthroplasty (BTKA) across the continuum of care. No guidelines existed and an integrative review was completed to address this gap.

**METHODS:** An integrative review of refereed quantitative and qualitative research in published and gray literature was completed to answer the clinical questions: (1) What is the scope of evidence-based nursing interventions for patients undergoing BTKA? (2) What are patients' experiences with BTKA across the care continuum? The scope of the literature search was patients with bilateral and unilateral total knee arthroplasty. An evidence-based system was used to rate the strength of studies that met the criteria for inclusion in this review.

**RESULTS:** The search method identified 588 potential titles but the analysis of the abstracts supported only 128 studies for possible inclusion in this project. The authors independently reviewed these studies and concluded that 126 studies did not meet the inclusion criteria and 2 quantitative studies were eligible for inclusion.

**CONCLUSIONS:** Understanding which interventions are most effective for pain management, functional gains, quality of life, and other nurse-sensitive outcomes is best derived from empirical studies. Most likely, BTKA nursing care is being guided by clinical experts and not by empirical nursing evidence. In the absence of empirical evidence, it is feasible that nurses can extrapolate findings from other studies to guide and support the care of BTKA patients. Research recommendations include the exploration of early mobilization interventions, development of nursing care bundles, and evaluation of patient-centered outcomes at the points of transitional care.

## Introduction

Osteoarthritis is the most common form of arthritis and is commonly seen as "a wear and tear of the body's joints" (Centers for Disease Control and Prevention, 2017, para 1). This form of arthritis is the primary clinical indication for total knee replacements (Gademan,

Hofstede, Vliet Vlieland, Nelissen, & Marang-van de Mheen, 2016). It is estimated that between 2000 and 2010 there were more than 5.2 million total knee arthroplasty (TKA) procedures in the United States (Williams, Wolford, & Bercovitz, 2015), and the number of procedures per year will reach 1.4 million by 2020 (Hart et al., 2016). The increasing demand for TKA in the United States is due to rising incidences of obesity and osteoarthritis as well as the aging of the population (Gademan et al., 2016).

Bilateral arthroplasty may be an option for patients with moderate to severe arthritis in both knees. Vulcano, Memtsoudis, and Della Valle (2013) reported that in patients undergoing unilateral TKA, about 20% have severe pain in the contralateral knee and 10% undergo contralateral TKA surgery within 1 year. Between 4% and 6% of all TKAs are bilateral procedures (Memtsoudis et al., 2009; Memtsoudis, Mantilla, Parvizi, Stundner, & Mazumdar, 2013). Memtsoudis et al. examined trends in bilateral total knee arthroplasty (BTKA) and found that between 1990 and 2004, use of BTKA more than doubled for the entire population and tripled for women (Memtsoudis, Besculides, Reid, Gaber-Bayis, & della Valle, 2009; Memtsoudis, Hargett, et al., 2013). For patients with symptomatic bilateral osteoarthritis, there are two types of BTKA—one-stage or two-stage. In

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one-stage procedures, both knees are replaced during one anesthetic event. During the one anesthesia period, both knees may be replaced sequentially by one surgical team (BTKA) or—simultaneously by two surgeons—often referred to as simultaneous BTKA (Regan, Phillips, & Magri, 2013). In two-stage replacement approaches, there are two separate anesthesia administrations. Same admission–staged BTKA refers to two separate surgeries during one hospitalization (Meehan, Blumenfeld, White, Kim, & Sucher, 2015). Staged BTKA occurs as two separate knee replacement surgeries, commonly 3 or more months apart (Meehan et al., 2015).

Advantages to one-stage BTKA included one anesthesia event, patient satisfaction, and lower cost because the patient is hospitalized only once (Vulcano et al., 2013). The lower cost for hospitals was due to a reduction in total length of stay, decrease in laboratory tests, and fewer ancillary and professional charges (Vulcano et al., 2013). Studies suggest that one-stage BTKA has a lower incidence of knee infections (Bohm et al., 2016). A study of more than 23,800 unilateral, one-stage, and two-stage cases identified important demographic differences between these two types of BTKA: one-stage BTKA was associated with a younger population with fewer preoperative comorbid conditions (Bohm et al., 2016).

Complications from BTKA varied and were dependent on the general health of the individual patient (Meehan et al., 2015). Complications for patients undergoing one-stage BTKA included unexpected returns to the surgical suite, pulmonary embolism, and deep wound infections (Hart et al., 2016). A comparative retrospective review of unilateral ( $n = 6790$ ) vs one-stage BTKA ( $n = 1771$ ) by Hart et al. (2016) suggested that one-stage BTKA had a slightly higher risk of complications when compared with the unilateral TKA.

However, Bohm et al found that patients who underwent one-stage BTKA—when compared with two-stage BTKA—experienced higher rates of blood transfusion and cardiac complications within 90 days of surgery. Consensus about morbidity and mortality rates between one-stage and two-stage procedures has not been reached (Bohm et al., 2016). Although meta-analyses have been undertaken, the studies included tend to be small retrospective studies; there is concern about using retrospective data, as they are prone to selection bias (Bohm et al., 2016). Many researchers have concluded that the overall evidence about BTKA is inconclusive; therefore, more robust and rigorous prospective studies about BTKA are needed (Bohm et al., 2016; Meehan et al., 2015).

Surgeons have recommended the development of practice guidelines for BTKA, but given the lack of consensus about benefits and risks for this surgical procedure and the dearth of strong empirical evidence, the development of guidelines has not progressed (Memtsoudis & Lui, 2013). One of the limitations of data for knee arthroplasty is that it is primarily retrospective, and the inherent bias found in this type of data is not fully accounted for in these studies (Kim, Meehan, & White, 2011). The extraction of postoperative complications, morbidity and mortality, and readmission rates across institutions is dependent on medical coding. Published coding accuracy for total knee replacements is unavailable (Bohm et al., 2016). Medical records do not account

for unanticipated changes such as cancellation of the second operation with a two-stage BTKA (Kim et al., 2011). Thus, biases in retrospective sample selection exist because of errors in surgical classification of procedures (Meehan et al., 2015). These biases create problems when comparing one-stage and two-stage BTKA, and this ultimately diminishes the value of the evidence.

These types of selection biases also exist in studies that examine the rehabilitation phase of care. Chu and et al. (2016) extracted retrospective data from the Functional Independence Measure tool to conclude that patients demonstrated gains during their rehabilitation stay after undergoing one-staged BTKA. As with the previously discussed studies, retrospective data weakened the strength of the evidence and its usefulness to practice. Changing the research design to prospective trials is recommended for the development of clinical practice guidelines for this population (Hart et al., 2016).

## Aim

The aim of this joint project between the National Association of Orthopaedic Nurses (NAON) and the Association of Rehabilitation Nurses (ARN) was to develop nursing practice guidelines for patients who experience BTKA across the continuum of care—from preoperative care to postoperative rehabilitation setting. The search for evidence primarily focused on nursing interventions that affected patient outcomes for this specific patient population.

## DESIGN

This integrative review employed a systematic approach to examine refereed quantitative and qualitative research published in the literature or available to the authors in gray literature. An integrative review entails comprehensive appraisals of qualitative and quantitative research studies for the purpose of summarizing evidence (Doolen, 2017).

## PICOT QUESTION

The first step was to search the literature for relevant evidence about patients experiencing BTKR using a structured format to develop a clinical question. Two clinical questions for this search were created with the recommended PICOT format (e.g., *P*, patient or population; *I*, intervention or issue of interest; *C*, comparison group or intervention; *O*, outcomes; *T*, time (Melnik & Fineout-Overholt, 2011). Table 1 provides the PICOT components used to search the evidence.

The clinical questions for this integrative review were as follows: (1) What is the scope of evidence-based nursing interventions for patients undergoing BTKA? (2) What are patients' experiences with BTKA across the care continuum? For this review, a nursing intervention was defined as a nurse-driven treatment or action to improve patient outcomes such as pain and physical mobility. The scope of the literature search was patients with bilateral and unilateral TKA. Unilateral TKA was used to capture evidence that compared unilateral TKA with BTKA. Based on the PICOT questions, discussions focused on the development of a comprehensive list of key

**TABLE 1. PICOT COMPONENTS FOR THE DEVELOPMENT OF THE CLINICAL QUESTION FOR RESEARCH STUDIES**

PICOT Component	Bilateral Total Knee Replacement
P, patient population	Patients with BTKA. The BTKA is a one-stage or two-stage procedure.
I, Issue of interest	Nursing interventions from current research studies for patients with BTKA.
C, Comparison	Current standard of care for patients with unilateral total knee arthroplasty.
O, Outcomes	Outcomes from current research studies examining nursing interventions for patients with BTKA.
T, Time	Time for which patients with BTKA are observed for outcomes that are directly related to the nursing interventions.

search terms. Inclusion and exclusion criteria were established before searching the evidence using the combinations of key clinical terms provided in Table 2. The inclusion criteria used for this review were as follows:

1. Refereed journal/periodical/gray literature.
2. Available in English text.
3. Published between 2006 and 2016.
4. Focus on nursing interventions for patients experiencing BTKA.
5. Rating I through VI on the Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions (Melnik & Fineout-Overholt, 2011).

Table 3 presents the Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions (Melnik & Fineout-Overholt, 2011). The characteristics for Levels of Evidence I through VII are listed. This evidence-based rating scale is used to organize the evidence, rate the strength of the evidence, and prioritize the evidence. Exclusion criteria were established as follows:

1. Nonrefereed publications.
2. Commentaries.
3. Non-English publications.
4. Interventions outside the scope of nursing practice.
5. Level of Evidence VII on the Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions (Melnik & Fineout-Overholt, 2011).

Quantitative and qualitative studies that potentially met the inclusion criteria were identified by searching five electronic databases: Academic Search Premier, CINAHL Complete, Clinical Key, Journals at OVID, and PubMed Health. The authors also searched the Virginia Henderson Global Nursing e-Repository of Sigma Theta Tau International, a gray literature site.

## DATA EXTRACTION

Articles were initially identified using a template that included search date, database, key terms used, number of hits, number of excluded and included articles,

**TABLE 2. COMBINATION OF KEY SEARCH TERMS**

Arthroplasty, bilateral total knee replacement, and acute care
Arthroplasty, bilateral total knee replacement, and ambulatory care
Arthroplasty, bilateral total knee replacement, and nursing interventions
Arthroplasty, bilateral total knee replacement, and physical therapy
Arthroplasty, bilateral total knee replacement, knee—rehabilitation
Arthroplasty, replacement, knee and rehabilitation—methods
Bilateral and total knee replacement
Nursing care bilateral total knee arthroplasty
Nursing care bilateral total knee arthroplasty and patient-centered
Nursing care total knee replacement and bilateral total knee replacement
Nursing interventions and bilateral total knee arthroplasty
Osteoarthritis and arthroplasty, bilateral total knee replacement
Patient-centered care and bilateral total knee replacement
Total knee replacement and nursing—assessment
Total knee replacement and nursing interventions
Total knee replacement and nursing—practice

primary author, publication date, and title. The first two authors independently reviewed titles and then read the associated abstracts to identify studies that met criteria for full review. After a preliminary data sheet was created from the titles and abstracts, the authors analyzed each of the recommended studies for its potential contribution toward the scope of nursing interventions and patient experience with BTKA.

## SEARCH OUTCOMES

Figure 1 presents the flow of evidence selected in each phase of the review. After extending the publication date

**TABLE 3. RATING SYSTEM FOR THE HIERARCHY OF EVIDENCE FOR INTERVENTION/TREATMENT QUESTIONS<sup>a</sup>**

Level of Evidence	Characteristics
I	Systematic review or meta-analysis of all relevant RCTs
II	One or more randomized controlled trials
III	Controlled trial (no randomization)
IV	Case-control or cohort studies
V	Systematic review of descriptive studies and qualitative studies
VI	Single descriptive or qualitative studies
VII	Opinion of authorities and/or reports of expert committees

<sup>a</sup>From *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice* (2nd ed.), by B. M. Melnik and E. Fineout-Overholt, 2014, Philadelphia, PA: Lippincott. Reprinted with permission.

to 2006, the search method identified 588 potential titles, but the analysis of the abstracts supported only 128 quantitative studies for possible inclusion in this project. The first two authors independently reviewed these studies and concluded that 126 quantitative studies did not meet the inclusion criteria and two studies were eligible for inclusion. No qualitative nursing studies, nor gray literature were identified. Studies were excluded if they focused on BTKA medical interventions (rather than nursing interventions), medical complications, and comparison of one-stage and two-stage BKA medical care. The scope of studies in the Virginia Henderson Global Nursing e-Repository of Sigma Theta Tau International was primarily limited to nursing care for patients undergoing unilateral knee replacement. There were very few Level I-VI nursing studies in the databases.

INCLUDED EVIDENCE

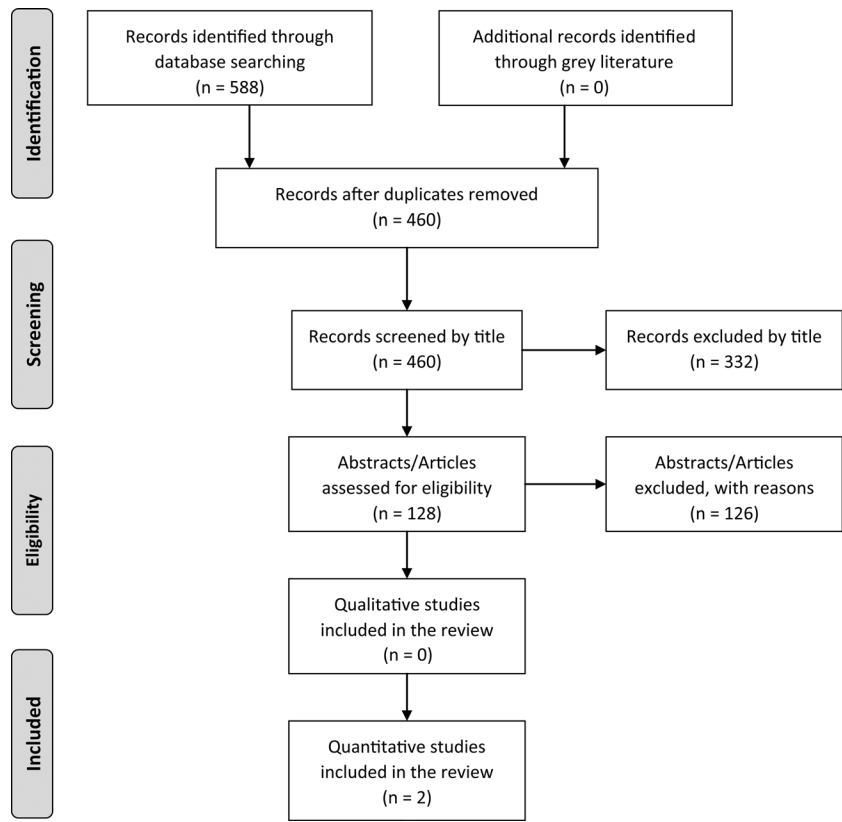
Hardwick, Pulido, and Adelson (2012) examined the effectiveness of healing touch as a pain intervention for patients who had undergone BTKA. Healing touch is an energy therapy modality that promotes self-healing, enhances the body’s natural energy fields, and uses intentional actions to promote mindfulness (Anderson, Friesen, Swengros, Herbst, & Mangione, 2017). The subjects (*N* = 41) were randomly assigned to either the control group that received standard pain interventions or the intervention group that received standard pain interventions along with healing touch. Measures

for this cohort study included the pain visual analog scale, State-Trait Anxiety Inventory, gait distance, and degree of knee flexion. Although the findings of this Level IV study did not demonstrate statistical significance for pain, anxiety, opioid usage, gait distance, or knee flexion between the two groups, to the best of our knowledge this is the only nursing research that specifically examined a nurse-driven intervention for patients with BTKA. The study’s findings suggest the need for a replication study with a larger sample.

Sun, Li, Yuan, and Zhou (2015) retrospectively examined pain levels of patients (*N* = 87) after BTKA. Patients’ ratings of postoperative pain after two-stage BTKA demonstrated that postoperative pain levels were higher at 24 and 48 hours after the second arthroplasty than pain levels after the first surgery (Sun et al., 2015). The finding from this Level VI retrospective study by Sun et al. (2015) suggested the enhancement of pain management for patients having the second TKA within 6 months of the first surgical procedure. This finding could have applicability to nursing interventions for pain management; however, limitations to this study include small sample size (*N* = 87), the use of retrospective data for analysis of pain levels, and limited generalizability of the findings.

Discussion

More than 99% of the studies reviewed addressed medical regimens, medical treatment options, and/or medical



**FIGURE 1.** Flowchart of evidence selection process. From “Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement,” by D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group, 2009, *PLoS Medicine*, 6(7), p. e1000097. doi:10.1371/journal.pmed1000097. Retrieved from <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000097>.



complications. The nursing literature was limited to less than 1% of the published evidence. The abstracts did not provide the evidence to support nursing practice guidelines for nurses caring for patients with BTKA. There was insufficient evidence to answer the two PICOT questions.

The lack of nursing research for BTKA is problematic. Understanding which interventions are most effective for pain management, functional gains, quality of life, and other nurse-sensitive outcomes is best derived from empirical studies. Most likely, nursing care is guided by clinical experts and not by empirical nursing evidence specific for this population. In the absence of empirical evidence, it is feasible that nurses can extrapolate findings from other studies to guide and support the care of BTKA patients.

Some empirical nursing evidence from unilateral knee replacement and general orthopaedic clinical practice guidelines are applicable to patients undergoing BTKA. For example, Barksdale and Yager (2014) developed a clinical nursing guideline for peripheral nerve blocks (PNB) in upper and lower extremities. Because the effects of a lower extremity PNB decrease motor and sensory sensation, fall prevention strategies such as an assessment of the lower extremity muscle strength and the use of a gait belt are recommended practice for unilateral knee replacement (Barksdale & Yager, 2014). These interventions can be applied to the patient with two-stage BTKA. Other nursing interventions to promote early mobilization, improve pain control, and minimize postoperative complications can be extrapolated from this guideline to the care of BTKA patients receiving PNB.

Related nursing research findings from single nursing research studies may also be extrapolated for the care of BTKA patients. The study by Damar, Bilik, Karayurt, and Ursavas (2017) examined elderly patients' fear of falling after total knee and hip replacement. Patients with high pain and high anxiety scores had greater fear of falling (Damar et al., 2017). Given nurses' role in assessing and managing pain and anxiety, nurses can address these factors through comprehensive assessment of pain and anxiety levels and focused nursing interventions prior to the first ambulation. Pertinent nursing interventions include passive range of motion, bed exercises, and graded mobilization to reduce fear of falling prior to first ambulation (Damar et al., 2017).

Patient teaching is an essential nursing intervention; however, this review did not reveal published research that examined educational strategies for patients undergoing BTKA. Instead, nurses may apply findings from unilateral TKA studies to use for this population. Jones et al. (2011) examined the effectiveness of an interprofessional preoperative education program to reduce length of stay for patients undergoing knee arthroplasty. The findings from this prospective comparative Level IV study suggest that patients' length of stay can be reduced when robust, interprofessional preoperative education is given to patients undergoing knee arthroplasty. This finding can be used for one-stage or two-stage knee arthroplasty.

The American Academy of Orthopaedic Surgeons (AAOS, 2015) clinical practice guidelines on surgical

management of patients with osteoarthritis of the knee can be used to inform nursing practice. Recommendations for surgical care in these guidelines are based on a systematic review of evidence with the strength of the evidence rated from strong to limited and an expert consensus rating if no empirical evidence is available. Although these recommendations are not specific to BTKA, nurses may consider some of the findings when caring for this population. Major recommendations for surgical management include the identification of risk factors such as body mass index, chronic pain, cirrhosis, diabetes, depression, and anxiety (AAOS, 2015). The AAOS (2015) guidelines provide guidance applicable to the nursing care of BTKA around the pivotal role nurses play in educating patients about diet, pain, management of chronic diseases, and mental health strategies to reduce stress and anxiety. AAOS (2015) also provides recommendations to implement early mobilization for pain management and functional gains, which are applicable in the nursing care of BTKA.

The lack of nursing studies to create nursing practice guidelines for patients undergoing BTKA is challenging for patients and the nursing profession. Total knee arthroplasty is one of the most common orthopaedic surgeries—with more than 700,000 cases performed in 2014 (Agency for Healthcare Quality and Research, 2017) of which approximately 42,000 are bilateral knee arthroplasties. This rate is nearly double that from 2000 to 2010, and in this same period, the mean age of patients was reduced from 68.9 years of age to 66.2 years of age (Williams et al., 2015). Men were discharged home more frequently than women. More women undergoing the procedure transitioned to long-term facilities (Williams et al., 2015). Simultaneous BTKA increased by 57% during the period of 1999 to 2008 in the United States (Chu et al., 2016; Memtsoudis, Hargett, et al., 2013).

The absence of clinical practice guidelines for patients undergoing BTKA is not unique to nursing. Physicians debated the issue of best practice guidelines for this population in 2012 (Memtsoudis, Mantilla, et al., 2013). Expert physicians in the specialties of orthopaedics, anesthesia, perioperative medicine, and epidemiology gathered at the Consensus Conference on Bilateral Total Knee Arthroplasty Group to determine whether clinical recommendations could be reached through expert consensus using the most current literature and applying the Delphi process (Memtsoudis, Hargett, et al., 2013). This strategy was employed because of the lack of robust data from randomized trials for patients undergoing BTKA (Memtsoudis, Mantilla, et al., 2013). The majority of this expert group's work is not based on Level I or II evidence but instead based on consensus from experts, which is Level VII evidence. Recommendations included a thorough preoperative screening process, consideration of postoperative monitoring at a higher level of care such as a step-down or intensive care unit, and the use of venous thrombosis prophylaxis (Memtsoudis, Hargett, et al., 2013). Overall, this panel of experts agreed that the lack of research is an impediment to creating guidelines that address best surgical candidates, timing of surgery, pain control, and rehabilitation (Memtsoudis, Mantilla, et al., 2013).

## NURSING IMPLICATIONS

Nurses play an important role across the care continuum from preoperative care to rehabilitation settings for patients undergoing BTKA. A nursing research agenda for this population needs to generate evidence-based care across the continuum. Meaningful research is best driven by collaboration between clinical nurses, nurse leaders, and nurse researchers. An agenda should be aligned with the needs of the patient, nurses, and nurse leaders of a healthcare system (Dols, Bullard, & Gembo, 2010). Recommended nursing research priorities for patients undergoing BTKA include the following:

- Determine the efficacy of healing touch as a pain modality; determine the optimal frequency of healing touch as an intervention.
- Understand factors associated with pain management for patients undergoing one-stage versus two-stage BTKA.
- Examine interventions for early mobilization of patients.
- Implement healthcare system-level nursing interventions to support transitions of care across the continuum.
- Evaluate patient-centered outcomes at each transition point in the care continuum.
- Develop multimedia and interprofessional interventions for patient-centered education across the care continuum.
- Develop BTKA nursing care bundles across the care continuum.
- Evaluate nursing interventions to address complications associated with BTKA.
- Explore patient and caregiver experiences with BTKA across the care continuum.

## Summary

The aim of this joint project between the NAON and the ARN was to develop nursing practice guidelines across the continuum for patients who undergo BTKA. There were few nursing research studies about this population in the databases searched: Academic Search Premier, CINAHL Complete, Clinical Key, Journals at OVID, and PubMed Health. The Virginia Henderson Global Nursing e-Repository of Sigma Theta Tau International also lacked studies that met the criteria. Despite including literature published between 2006 and 2016, a period of 10 years, only two studies met the inclusion criteria of Level of Evidence I through VI. Although it is feasible that limiting studies to English language-only could have excluded pertinent research, we still conclude that, nursing practice guidelines for this population are not feasible at this time due to the lack of evidence.

Nurses are essential providers in all levels of care for this population, yet we have minimal empirical evidence to guide best practice. This is challenging to nursing practice especially considering the growing number of patients undergoing BTKA procedures with predictions of substantial increases over the next decade. Only when nurses are challenged to develop research questions about patients with BTKA procedures, design and

implement research studies to answer essential research questions, and disseminate their findings will they be in a position to create nursing practice guidelines for patients undergoing BTKA procedures.

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