

Multimodal Perioperative Analgesia Regimen to Improve Patient Outcomes After Total Knee Arthroplasty: A Multidisciplinary Quality Improvement Project

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Purpose: *The primary aim of this quality improvement project was to improve mobilization for patients after total knee arthroscopy by developing and implementing a standardized, evidence-based, multimodal analgesia regimen and patient-educational video. Secondary outcomes included opioid consumption, pain, and length of stay.*

Design: *A pre-post implementation design was used to compare two independent samples.*

Methods: *Patients were screened based on inclusion and exclusion criteria 1-2 weeks before surgery. The anesthesia provider made the final determination for inclusion. Data were collected by retrospective chart review.*

Findings: *Following implementation, patients displayed significantly improved mobilization, reduced opioid consumption, and reduced length of stay. Patient-reported pain scores were similar or significantly lower in the postimplementation group.*

Conclusion: *Variability of patient outcomes was reduced, and quality of care was improved by standardizing care and incorporating the best available evidence, consistent with organization's resources in the nonacademic-affiliated, community hospital setting.*

Keywords: *multimodal analgesia, total knee arthroplasty, early mobilization, quality improvement.*

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TOTAL KNEE ARTHROPLASTY (TKA) is one of the most common elective, inpatient procedures performed annually on American adults aged 45

years and older.¹ In 2013, over 700,000 TKAs were performed in the United States.² While TKA is a safe and effective surgery to improve pain,

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Conflict of interest: None to report.

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mobility, and quality of life related to advanced osteoarthritis, one third of patients report moderate to severe postoperative pain.^{3,4} Severe pain is associated with psychological and physiological harm, increased health care costs, and decreased patient satisfaction.^{5,6} Severe pain can also limit early mobilization, thus increasing risk for adverse effects of immobility including pneumonia, poor wound healing, and deep vein thrombosis.⁷ Early mobilization is a cornerstone of high-quality postoperative care and is associated with decreased pain, improved physical function, and decreased length of stay (LOS).^{7,8}

It is challenging to achieve optimal pain control while promoting early mobilization after TKA. Many commonly used analgesic techniques effectively reduce pain, but they may also impair mobilization due to reduced motor strength from a femoral nerve block or due to side effects of opioids such as nausea, vomiting, dizziness, or sedation.⁹ To maximize mobilization and pain control, a collaborative, multidisciplinary, evidence-based practice approach regarding analgesia and anesthesia is necessary. Researchers have achieved this balance by implementing standardized, evidence-based, multimodal anesthesia and analgesia regimens and by providing consistent education regarding this plan of care.¹⁰⁻¹²

Local Problem

The orthopaedic joint replacement center at Carondelet St. Joseph's Hospital, hereafter referred to as the Joint Center, has a protocol for care specific to each of the orthopaedic joint replacement procedures. A key element in the TKA care protocol is early ambulation and gait evaluation by a physical therapist within 24 hours after surgery, preferably on the same day of surgery. Physical therapists, occupational therapists, and nurses reported concerns regarding patient readiness and safety related to this early mobilization goal, which triggered further evaluation. A preliminary chart review of physical therapy evaluations for 100 consecutive patients beginning the first quarter of 2015 revealed that of the 36 patients evaluated on the same day of surgery, approximately 42% ($n = 15$) were physically unable to ambulate. Documented barriers to mobilization included quadriceps weakness related to an active femoral nerve block (49%), uncontrolled pain (11%), and opioid-

related adverse effects such as hypotension, dizziness, sedation, nausea, and vomiting (40%).

While the Joint Center has standardized many aspects of the TKA continuum of care, it did not have a standardized TKA multimodal analgesia regimen or a standardized approach for preoperatively educating patients about postoperative pain control. As a result, there was a great deal of variation in anesthesia and analgesia practices potentially contributing to the variability of patient mobilization outcomes. Literature suggests that high variability between care providers is associated with increased risk for errors, reduced productivity, increased cost, and inconsistent patient outcomes.^{13,14}

Review of the Literature

Historically accepted analgesia and anesthesia practices such as femoral nerve blocks and opioid-based regimens are associated with compromised early mobilization in TKA patients.^{8,15,16} Femoral nerve blocks are a commonly used analgesic approach for TKA and involve the injection of anesthetic medication near the femoral nerve.^{17,18} The procedure provides effective analgesia but has been associated with adverse events including nerve damage, quadriceps weakness, impaired balance, and falls.^{19,20} The incidence of nerve damage or neuropathy related to single shot femoral nerve block is reported between 0.7% and 2.66% for TKA patients.^{19,20} Kwofie et al¹⁹ conducted a blinded, randomized trial of 16 healthy volunteers and determined that femoral nerve blocks reduce quadriceps strength by as much as $95.1\% \pm 17.1\%$ and significantly impair balance ($P = .02$). Quadriceps strength and balance are necessary for safe ambulation.

Periarticular injections are suggested as a safe and effective alternative to femoral nerve blocks, demonstrating similar analgesic effects.^{8,9,15,16,21} Periarticular injection is the intraoperative infiltration of local anesthetic and analgesic medications directly into the surgical site before wound closure.^{18,22} Several studies have displayed additional benefits of periarticular injections compared with femoral nerve blocks such as early pain reduction, improved mobility, and decreased opioid consumption.^{8,23} Periarticular injection is recommended in clinical practice guidelines and

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