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Original Article

Preoperative Opiate Use Independently Predicts Narcotic Consumption and Complications After Total Joint Arthroplasty

Joshua C. Rozell, MD [a], Paul M. Courtney, MD [b], Jonathan R. Dattilo, MD [a], Chia H. Wu, MD, MBA [a], Gwo-Chin Lee, MD [a, *]

[a] Department of Orthopaedic Surgery, University of Pennsylvania, Philadelphia, Pennsylvania
[b] Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, Illinois

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ABSTRACT

Background: Multimodal pain protocols have reduced opioid requirements and decreased complications after elective total hip arthroplasty (THA) and total knee arthroplasty (TKA). However, these protocols are not universally effective. The purposes of this study are to determine the risk factors associated with increased opioid requirements and the impact of preoperative narcotic use on the length of stay and inhospital complications after THA or TKA.
Methods: We prospectively evaluated a consecutive series of 802 patients undergoing elective primary THA and TKA over a 9-month period. All patients were managed using a multimodal pain protocol. Data on medical comorbidities and history of preoperative narcotic use were collected and correlated with deviations from the protocol.
Results: Of the 802 patients, 266 (33%) required intravenous narcotic rescue. Patients aged <75 years (odds ratio [OR], 1.85; 95% confidence interval [CI], 1.10-3.12; $P = .019$) and with preoperative narcotic use (OR, 2.74; 95% CI, 2.01-3.75; $P < .001$) were more likely to require rescue. Multivariate logistic regression analysis demonstrated that preoperative narcotic use (OR, 2.74; 95% CI, 2.01-3.75; $P < .001$) was the largest independent predictor of increased postoperative opioid requirements. These patients developed more inhospital complications (OR, 1.92; 95% CI, 1.34-2.76; $P < .001$). This was associated with an increased length of stay (OR, 1.59; 95% CI, 1.06-2.37; $P = .025$) and a 2.5-times risk of requiring oral narcotics at 3 months postoperatively (OR, 2.48; 95% CI, 1.61-3.82; $P < .001$).
Conclusion: Despite the effectiveness of multimodal postoperative pain protocols, younger patients with preoperative history of narcotic use require additional opioids and are at a higher risk for complications and a greater length of stay.

Multimodal pain protocols focus on minimization of opioid use while maximizing the effects of non-narcotic medications and other pain-relieving treatments. These protocols, which may include a preoperative oral pain medication cocktail, regional anesthesia, and/or intra-articular injection [1], combined with early mobilization initiatives have been associated with a reduced length of stay from an historic average of 4-12 days to 1-3 days [2,3]. Goals of multimodal pain protocols are to reduce inhospital complications associated with narcotic use, improve patient safety postoperatively, and maximize patient mobilization and return to function while encouraging patient convalescence.

However, not all patients may be responsive to multimodal pain protocols, and some will require supplemental opioid rescue. Specifically, patients who have a history of preoperative narcotic use are at risk for needing higher doses of opioids, intravenous (IV) opioid administration, and developing opioid-related adverse events (ORAEs), which can complicate the postoperative course and lead to increased length of stay and decreased satisfaction [4,5]. Patients who require increasing dosages of narcotics are more prone to complications such as nausea and vomiting, over-sedation, ileus, urinary retention, and poor rehabilitation progression [6,7].

Investigation was performed at Penn Presbyterian Medical Center, University of Pennsylvania, Philadelphia, PA.

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* Reprint requests: Gwo-Chin Lee, MD, Department of Orthopaedic Surgery, University of Pennsylvania, 3737 Market Street, 6th Floor, Philadelphia, PA 19104.

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Pivec et al [8] evaluated the effects of opioid use (n = 54) before THA and found that compared with matched controls, preoperative opioid users required higher postoperative narcotic dosages, had a longer hospital stay, and required narcotics for 6 weeks postoperatively. In addition, although THA was clinically beneficial to this patient population, the Harris hip scores were inferior compared with those of matched controls.

Minimizing complications and readmissions and maximizing patient satisfaction are the principal goals of every institutional quality improvement program. Although traditional risk-stratification initiatives have focused on medical comorbidities and other modifiable risk factors [9–11], the impact of opioid utilization after primary THA or TKA is relatively unknown. In an analysis of an administrative database, Sun et al [12] found that TKA was among one of the surgical procedures significantly associated with an increased risk for chronic opioid use after surgery. Therefore, the purposes of this study were to determine (1) what are the risk factors associated with increased opioid requirements after primary THA or TKA? and (2) what is the impact of preoperative narcotic use on length of stay, inhospital complications, and 90-day readmission rates?

Patients and Methods

We prospectively evaluated a consecutive series of 802 elective, primary THA (n = 273) and TKA (n = 529) patients at a single institution over a 9-month period. This study was approved and conducted according to the guidelines set by our institutional review board. Patients aged <18 years and those who underwent arthroplasty procedures for fracture or malignancy were excluded from the study. There were 324 men and 478 women with a mean age of 62.3 years (range, 20-92 years). Preoperative diagnosis for THA or TKA was osteoarthritis in the majority of patients in this group (>95%) with the remainder of patients undergoing surgical procedures for hip dysplasia, inflammatory arthritis, and post-traumatic arthritis. Analysis of the impact of severity of hip or knee arthritis, deformity, and case complexity was not performed owing to a lack of evidence that these factors independently affect postoperative pain severity [13,14]. The mean body mass index (BMI) was 33.1 kg/m^2 (range, 17-59 kg/m^2).

A query of our institutional electronic medical record (EMR) system (EPIC Systems Corporation, Verona, WI) identified 275 patients (34.3%) who had documented prior narcotic use or a narcotic prescription filled within 60 days of surgery. Of these patients, 133 (48.4%) patients used oxycodone or oxycodone/acetaminophen, 67 (24.4%) used tramadol, 38 (13.8%) used hydrocodone, 16 (5.8%) used codeine, 9 (3.3%) used hydromorphone, and 4 (1.5%) used morphine. There were also 3 patients who used a fentanyl patch, 8 methadone users, 8 long-acting morphine users, and 14 OxyContin users. Eight patients used long-acting narcotics alone (Table 1). Information regarding preoperative narcotic use was obtained solely from the EMR. The information was not cross-referenced against pharmacy, state, or insurer databases because of lack of access. Finally, patient comorbidities and length of stay were also recorded at the time of surgery. Readmission data were also tabulated for the 90-day postoperative period. Patient demographics are shown in Table 2.

All TKA procedures were performed through a medial parapatellar approach, whereas THA procedures were performed through either a posterior approach or an anterolateral/modified Hardinge approach. All knees received a periarticular injection at the time of surgery using a combination of morphine and 0.25% bupivacaine to the posterior capsule, periosteum, and the surrounding soft tissues, but there was variability in the number of patients receiving periarticular injections and injection sites for patients undergoing primary THA. Although this standardized injection mixture did not include an anti-inflammatory agent (ie, ketorolac), epinephrine, or steroids [15], several studies have shown other formulations with or without these ingredients to also be effective in reducing postoperative opioid use [16–18]. Postoperatively, low-risk patients received 325 mg of enteric-coated aspirin by mouth starting on postoperative day 1 for deep venous thrombosis (DVT) prophylaxis. Patients with a history of DVT or pulmonary embolism were transitioned from low-molecular-weight heparin to warfarin.

All patients were managed postoperatively using the same multimodal pain protocol. In the holding area preoperatively, the patient received acetaminophen 1000 mg, celecoxib 400 mg, gabapentin 300 mg, oxycodone 5 mg, and either long-acting morphine 30 mg or OxyContin 10 mg. If a patient was taking long-acting narcotics before surgery, their home dosage was given. Medications included in the postoperative protocol are gabapentin 300 mg twice daily, acetaminophen 1000 mg every 8 hours for 72 hours, celecoxib 200 mg twice daily, extended-release oxycodone 10 mg twice daily, and a short-acting narcotic of escalating dosages depending on the patient's pain level. For patients who were elderly (>75 years of age) or had documented prior narcotic use, or a creatinine clearance <30 mL/min, a modified order set was used utilizing similar medications but in varying dosages. The default short-acting narcotic for each of the protocols was oxycodone, but patients with intolerance to this medication were prescribed codeine, morphine, or hydromorphone if pain control was inadequate. Patients who underwent TKA also received an indwelling femoral nerve catheter administered for 24 hours. The anesthesia pain service was consulted for those patients whose pain was not controlled using the established protocol, and patient-controlled analgesia pumps were prescribed at their discretion for a maximum of 48 hours. Patients were mobilized with the assistance of physical therapists starting on the day of surgery and twice daily

Table 1
Preoperative Narcotic Consumption Data.

Narcotic	Number of Users (%)	Morphine Conversion Factor
Oxycodone	133 (48.4)	1.5:1
Tramadol	67 (24.4)	0.1:1
Hydrocodone	38 (13.8)	1:1
Codeine	16 (5.8)	0.15:1
Hydromorphone	9 (3.3)	5:1
Morphine	4 (1.5)	1:1
Long-acting morphine	8 (2.9)	1:1
Fentanyl	3 (1.1)	100:1
OxyContin	14 (5.1)	1.5:1
Methadone	8 (2.9)	3:1

Table 2
Patient Demographics for Those Included in the Study Population.

Variable	Value
Total patients	802
Male/female (%)	40.3/59.6
Total knee arthroplasty (%)	66.0
Total hip arthroplasty (%)	34.0
Mean age (y)	62.3
Mean body mass index (kg/m^2)	33.1
Preoperative narcotic users	275
Preoperative narcotic users (%)	34.3
Average morphine equivalents for preoperative narcotic users (per 24 h)	58.6
Congestive heart failure (% patients)	4.9
Chronic obstructive pulmonary disease (% patients)	4.1
Chronic kidney disease (% patients)	8.7
Diabetes mellitus (% patients)	21.0