

Racial Differences in Perioperative Pain Management After Total Knee Arthroplasty

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Racial differences have been reported in the utilization of total knee arthroplasty (TKA), and there exists differences in pain management between African American and Caucasian patients. There are insufficient data concerning racial differences in perioperative pain management for patients after TKA for osteoarthritis of the knee. This is a retrospective study of 804 African American patients who had primary TKA between 2013 and 2022 at a single academic medical center. Patients were matched, 2:1, to Caucasian patients having TKA using American Society of Anesthesiologists score, age, gender, and body mass index. Demographic data and perioperative variables, including pain scores, morphine equivalents required at multiple time points, operative time, length of stay, and opioid refills were evaluated. A significantly higher proportion of African American than Caucasian patients had opioid medication prescribed within 90 days preoperatively (38% African American vs. 22% Caucasian patients). African American patients had significantly higher preoperative pain scores (3.28 vs. 2.26) than Caucasian patients and received significantly higher doses of morphine equivalents both preoperatively and postoperatively. The proportion of African American patients with opioid medication refills within 90 days postoperatively was significantly higher than Caucasian patients (73% vs. 33%). However, African American patients received significantly less intraoperative morphine equivalents. The reasons for the racial differences in perioperative pain management after TKA at one medical center are unknown and require additional study. However, these results suggest that pain management protocols, including standardized opioid medication, be implemented for patients of all races after primary TKA. (Journal of Surgical Orthopaedic Advances 34(3):152-155, 2025)

Key words: pain, opioid, racial differences, total knee arthroplasty, prescription

The nonoperative treatment of knee osteoarthritis (OA) may include opioid medication, in addition to nonsteroidal anti-inflammatory drugs, corticosteroid injections, and knee braces.¹ There have been important changes in the use of opioid medication both before and after elective primary total knee arthroplasty (TKA), to hopefully decrease the prevalence of addiction, overdose, and diversion of unused medication.²⁻⁴ Previous studies have reported racial differences in the management of pain after a variety of surgical procedures.⁵⁻¹¹ There are differences in the rate of utilization of TKA to treat OA of the knee among patients of different races, and differences in outcomes after surgery are also reported.^{10,12-17} However, to the authors' knowledge, differences in perioperative pain management between African American and Caucasian patients after primary TKA have not been studied.

It has been suggested that the relative lack of diversity of orthopaedic surgeons could influence or change the diagnosis and treatment of musculoskeletal disorders in African American patients.¹⁸ Several studies have reported that pain in African American patients may not be accurately evaluated and treated, possibly due to biases related to skin color or nociception.¹⁹⁻²¹ The purposes of this study were to evaluate racial differences in the pre- and postoperative care of patients after primary TKA at one academic medical center. The authors asked the following questions: (1) Are there differences in the management of knee pain prior to planned TKA between African American and Caucasian patients, as measured by the

amount of opioid medication and the patient-reported visual analogue scale (VAS) pain scores? (2) Are there differences between African American and Caucasian patients with regard to postoperative VAS pain scores, and opioid and nonopioid medication refills?

Patients/Methods

Following Institutional Review Board approval, a retrospective review of the Epic computerized medical record system identified all primary TKAs performed by five fellowship-trained surgeons at one tertiary care center between December 2013 and December 2022. The current procedural terminology code 27447 was utilized. The patients were then stratified by race, and 804 African American patients were identified. These patients were then matched, 2:1, to a cohort of Caucasian patients using the demographics of age, sex, body mass index (BMI), and American Society of Anesthesiologists (ASA) scores.

Preoperative Pain Management

Preoperative pain management data collected included the prescription of opioid medication within 90 days prior to TKA (per the patient's medication list on arrival to the preoperative area), highest preoperative pain score using the VAS scale, and preoperative morphine equivalents received in the preoperative area.

Intraoperative Pain Management

Intraoperative data collected included the length of TKA and total anesthesia time in minutes, opioid medication use intraoperatively in morphine equivalents, and the frequency of the use of a peripheral nerve block.

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TABLE 1. Demographics and preoperative variables for patients undergoing total knee arthroplasty stratified by African American and Caucasian patients

	African American (n = 804)	Caucasian (n = 1608)	p-Value
Age	64.1	64.8	
Sex (F)	553 F (69%)	1,117 F (69%)	
BMI	33.8	33.6	
ASA	2.56	2.54	
Preoperative opioids (90 days)	304 (38%)	351 (22%)	< 0.001
Highest preoperative pain score	3.28	2.26	< 0.001
Preoperative morphine equivalents	19.9	17.5	< 0.001

Bold text indicates statistical significance.

F, female; BMI, body mass index

TABLE 2. Intraoperative variables for patients undergoing total knee arthroplasty stratified by African American and Caucasian patients, including procedure minutes, anesthesia minutes, peripheral nerve block use, and intraoperative opioid medications

	African American (n = 804)	Caucasian (n = 1608)	p-Value
Procedure minutes	119.2	105.1	< 0.001
Anesthesia minutes	183.1	163.5	< 0.001
Opioid given intra-operatively?	392 (48%)	723 (45%)	0.086
Intraoperative morphine (mg)	16.26	16.34	0.018
Peripheral nerve block?	790 (98.2%)	1,561 (97%)	0.147

Bold text indicates statistical significance.

Postoperative Pain Management and Refills

Postoperative data recorded included the postanesthesia care unit (PACU) pain score, morphine equivalents administered, and postoperative morphine equivalents at 6, 24, and 48 hours. The use of ketorolac within 24 hours postoperatively, length of hospital stay, and number of opioid refills within 90 days postoperatively were also recorded. The exact number of patient refills was determined by searching qualifying patient charts (those noted to have had at least one refill) for visit notes or provider messages regarding refill requests.

Statistical analysis

Statistical analysis was performed using R Studio (R-Tools Technology Inc., Richmond Hill, Ontario, Canada) package. Kruskal-Wallis tests were used for comparison testing of continuous variables, presented as means. Chi-square tests, used to compare categorical variables, are presented as percent. A p -value < 0.05 was considered statistically significant.

Results

The cohort of 804 African American patients was matched to a cohort of 1,608 Caucasian patients for the study. There were no statistically significant differences between the cohorts in mean patient age (64 and 65 years, respectively), patient gender (69% of both cohorts were female), mean BMI (34 in both cohorts), and mean preoperative ASA score (2.5 in both cohorts). However, 304 (38%) African American

TABLE 3. Postoperative variables for patients immediately postoperatively including visual analogue pain scores, morphine equivalents, and other pain medication measures, including 90-day opioid refills. Outcomes are stratified by African American and Caucasian patients

	African American (n = 804)	Caucasian (n = 1608)	p-Value
PACU Pain Score	3.63	3.72	0.535
Length of stay (days)	2.96	2.5	< 0.001
PACU morphine (mg)	17.9	15.9	0.149
Postprocedure morphine (mg) (6 hours)	29	25.6	< 0.001
Postprocedure morphine (mg) (24 hours)	78.2	70.5	< 0.001
Postprocedure morphine (mg) (48 hours)	117.3	99.4	< 0.001
Toradol within 24 hours (y/n)	313 (39%)	425 (26%)	< 0.001
Opioid refills 90 days after (y/n)	584 (73%)	600 (33%)	< 0.001

Bold text indicates statistical significance.

PACU, postanesthesia care unit; y, yes; n, no

patients and 351 (22%) Caucasian patients were prescribed opioid medication within 90 days of TKA ($p < 0.001$). African American patients also had significantly higher preoperative mean pain scores (3.28 vs. 2.26, $p < 0.001$). African American patients received significantly higher mean preoperative and postoperative morphine equivalents (19.9 mg vs. 17.5 mg, $p < 0.001$) (Table 1).

African American patients had significantly longer mean operative time (119 vs. 105 minutes, $p < 0.001$) and longer mean anesthesia times (183 vs. 163, $p < 0.001$). There was no significant difference between African American and Caucasian patients in the use of a peripheral nerve block (98% and 97%, respectively). African American patients did receive less mean morphine equivalents intraoperatively (16.26 mg vs. 16.34 mg, $p < 0.05$) (Table 2).

There was no significant difference in mean PACU pain scores or mean PACU morphine equivalents between the cohorts. African American patients had significantly longer mean hospital stay (2.96 days vs. 2.5 days, $p < 0.001$). At 6, 24, and 48 hours postoperatively, African American patients received more mean morphine equivalents (Table 3). African American patients were more likely than Caucasian patients to receive Toradol within 24 hours (39% vs. 26%, $p < 0.001$). The proportion of African American patients with opioid refills within 90 days postoperatively was significantly higher than Caucasian patients (73% vs. 33%, $p < 0.001$).

Discussion

Orthopaedic surgeons account for a greater number of opioid prescriptions than emergency room physicians or general surgeons.¹⁰ The misinterpretation of pain experienced by African American patients by a variety of health care providers has been extensively reported.^{5,6,13,18,21} African American patients are less likely to receive aggressive treatment for different types of pain (acute, chronic noncancer related, cancer related, etc.), less likely to be prescribed opioids after emergency room visits, and those prescribed opioids are subjected to stringent conditions, such as drug testing.²¹ Several studies have reported the decreased utilization of TKA for the treatment of knee OA by African American patients compared with Caucasian patients.^{13,17,22-24} However, there are insufficient data concerning differences in periop-

erative pain management between African American and Caucasian patients having primary TKA for knee OA.

This study has several limitations. The study is retrospective, and there is potential for human error with documentation in the electronic medical record. This study reports the treatment of patients having primary TKA at a single academic medical center, and the results may not be generalizable to other patient populations or medical centers. Furthermore, there were no set criteria per each surgeon and their medical team for postoperative pain control or for thresholds for postoperative opioid refills, as patients may request refills virtually, by telephone, or in person from the surgeon or an advanced practice provider. These patients were also not evaluated after 90 days follow up. However, the purpose of this study was to assess only the perioperative outcomes after TKA when pain is likely the greatest. The large sample sizes of both cohorts and 1:2 ratio of matching African American to Caucasian patients should help mitigate other possible confounding variables, such as duration of symptoms and other treatments used for knee OA. However, this matching does not account for other potential confounders like socioeconomic status and previous pain management history that may significantly influence preoperative pain levels, opioid use, and postoperative recovery. Finally, although many of these results are statistically significant, this may not correlate to clinical significance, such as with intraoperative morphine equivalents.

To the authors' knowledge, this is the first study to compare perioperative pain management and opioid medication use between African American and Caucasian patients having a primary TKA for OA of the knee. In a United States database study of > 290,000 patients, Okike et al. reported that TKA utilization was less by African American than Caucasian patients, even after accounting for similar health insurance.²⁴ Hausmann et al. reported decreased utilization of TKA for African American veterans compared with Caucasian veterans.²⁵ The studies of Wu et al.²⁶ and Amen et al.¹⁷ both reported decreased TKA utilization by African American patients than Caucasian patients in an outpatient setting. This decreased utilization of TKA for the treatment of knee OA by African American patients has been reported to account for 72,000 quality-adjusted life-years.¹ Several studies have reported poorer outcomes, including lower patient satisfaction, residual stiffness, higher pain scores postoperatively, and decreased physical function after TKA for African American patients compared with Caucasian patients.^{1,13,16,27}

Racial differences in the management of pain after elective surgical procedures have been reported in adult populations.^{5,9,10,21,28,29} In a systematic review of pain after primary TKA, Goodman et al. reported that African American patients had less relief of pain, decreased WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) pain scores, and health-related quality of life, compared with Caucasian patients.³⁰ In a study of 16,779 patients undergoing total joint arthroplasty at one academic center over 9 years, Holbert et al. reported that racial disparities in discharge disposition and length of stay decreased over this time span.¹⁸

In a systematic review, Green et al. reported significant differences in pain management between African American and Caucasian patients, including pain related to cancer, pain after operative fixation for limb fractures, and generalized pain in nursing homes.⁵ Reyes et al., in a systematic review of racial disparities related to the treatment of OA of the knee, reported that African American patients were less likely than Caucasian patients to be provided prescription opioid medication.¹ However, in a retrospective study of opioid prescriptions after eight common orthopaedic pro-

cedures, O'Sullivan et al. reported no difference in postoperative opioid prescriptions between Caucasian and African American patients.¹⁰

In the present study, African American patients were more likely to receive oral opioid medication preoperatively for the pain of knee OA, had higher preoperative VAS pain scores, and had a significantly higher proportion of patients with opioid refills at 90 days postoperatively. These findings are different from other studies, in which African Americans were less likely to be provided opioids in the perioperative setting.^{5,27} African American patients were more likely to have higher preoperative pain scores, and this could be related to more advanced disease or other unmeasured variables. It was surprising that there was a greater proportion of African American patients on oral opioid medication preoperatively. One possible cause is that African American patients are less likely to be offered other alternatives for the treatment of OA of the knee, such as corticosteroid injection.²⁶ There was no difference in the frequency of use of spinal anesthesia between the cohorts, but the intraoperative morphine equivalents administered were less for African American patients compared with Caucasian patients. To the authors' knowledge, this study is the first to quantitatively analyze differences in pain medication administration in the perioperative setting after primary TKA.

There are insufficient data on racial differences in the management of pain after primary TKA. These differences are likely not intentional, but may reflect a complex interplay of implicit bias, false notions about biologic differences among Caucasian and African American patients, and possibly a subtle lack of empathy.^{1,20,31} In a study of empathy, or a lack thereof, in pain management, Drwecki et al. reported that empathy bias leads to racial differences in pain management, and this issue merits further discussion.³¹ To address implicit bias, each medical center should be committed to collecting data concerning racial differences, establish educational programs to emphasize empathy during delivery of care, and utilize clinical guidelines to minimize any individual discretion for bias. There should be increased emphasis on the training of minorities and females to help decrease racial disparities in musculoskeletal care.³¹

Additional studies are needed to confirm the findings of this study. However, to minimize any unfortunate differences between patients of different races in the management of pain after primary TKA, an algorithmic protocol, including opioid and nonopioid medication use, should be instituted.

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