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Where Do We Stand Today on Racial and Ethnic Health Inequities? Analysis of Primary Total Knee Arthroplasty from a 2011–2017 National Database

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Abstract

Background The objective of this study was to present contemporary national data on the state of racial and ethnic disparities pertaining to primary total knee arthroplasty (TKA) in the USA.

Methods The 2011–2017 National Surgical Quality Improvement Program was used to capture all patients who underwent primary TKA. The study outcomes were differences in demographic, comorbidity burden, perioperative factors, procedure utilization, hospital length of stay (LOS), and 30-day outcomes. The five major minority groups as defined by the National Institutes of Health were compared to non–Hispanic Whites.

Results In total, 262,954 patient records were analyzed, with racial identification available on 230,712 patients (87.7%). White patients accounted for 72.5% of all TKA procedures. There were higher rates of diabetes, hypertension, anemia, and prolonged surgery times among racial and ethnic minorities ($p < 0.001$). Baseline disparities were especially pronounced among non–Hispanic Blacks/African Americans who were also like to have higher rates of tobacco smoking and CHF ($p < 0.001$). After controlling for baseline differences, significant disparities in outcomes persisted, especially among Blacks/African Americans and Hispanics/Latinos who had higher odds for experiencing complications and readmissions ($p < 0.001$). All racial and ethnic groups, except Asians, had longer LOS ($p < 0.001$). Asian patients had significantly lower rates of readmissions, reoperations, and overall complications ($p < 0.001$).

Conclusion Racial and ethnic disparities remain a public health challenge for patients undergoing TKA. While initiatives aimed at improving preoperative disease-burden and comorbidity profiles represent an important step, they alone are insufficient to fully account for or eliminate the disparities in TKA outcomes.

Keywords Knee arthroplasty · Race · Ethnicity · Disparities · Outcomes

Introduction

Racial and ethnic disparities have been reported throughout the medical literature including joint arthroplasty [1]. Health disparities are defined as differences in healthcare measures or outcomes within a subset of the general population [2]. A 2016 survey of orthopedic surgeons demonstrated low awareness of racial and ethnic disparities with only 9% of those who were surveyed believing that such differences exist [3]. In an attempt to mitigate health inequalities, multiple policy and orthopedic-specific initiatives were launched over the past several years [4, 5]. Despite such efforts, there have been emerging reports suggesting persistent to worsening disparities in outcomes for total knee arthroplasty (TKA) [6–8]. For example, certain minorities have been shown to experience higher levels of postoperative pain [9], prolonged hospitalization [10], discharge to post-acute facilities [11], emergency room visits [12], readmissions [12], complications [7], and mortality [13].

As the demand for TKA continues to grow and the racial/ethnic composition of the USA changes, health inequities pose a major public health concern. Efforts to monitor and address these discrepancies are therefore critical. There is currently a paucity of recent information on the national state of

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racial and ethnic disparities. Prior studies were based on specific hospital systems [11], geographic regions [14], or minority groups [13]. Therefore, the current study sought to utilize a large, nationally representative patient sample to provide updated information on the state of TKA disparities across the six major racial and ethnic groups designated by the National Institutes of Health. The specific aims were determining the differences in demographic, comorbidity burden, perioperative factors, procedure utilization, hospital length of stay, and 30-day postsurgical outcomes between the different groups.

Methods

This study utilized a large deidentified national dataset; as such, an institutional review board approval was not required. The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP), a national chart-based database utilized by over 600 hospitals, was used to capture all patients with a self–reported race and/or ethnicity who underwent primary, elective TKA between 2011 and 2017, as identified by common procedural terminology (CPT) code 27447. The NSQIP database spans hospital admission to 30 days postoperatively. The International Classification of Diseases (ICD) codes were referenced to verify patients had received a suitable diagnosis for TKA.

Patients were classified into one of six major racial and ethnic groups, which reflected those defined by the National Institutes of Health: non–Hispanic White (control group), non–Hispanic Black/African American, Hispanic/Latino, Asian, American Indian/Alaskan Native, and Native Hawaiian/Pacific Islander. Of note, patients are able to self–report racial and ethnic status separately in the ACS–NSQIP dataset. As such, we prioritized the consideration of Hispanic ethnicity (e.g., patients reporting as Black race and Hispanic ethnicity are classified here as Hispanic), consistent with the standard presentation of US census data.

A robust set of demographics, comorbid, and perioperative variables were collected. Demographic variables included age, sex, body mass index (BMI), self-reported racial/ethnic identification, functional status, and pre-operative living environment. Comorbid conditions included diabetes, hypertension, chronic kidney disease (CKD), anemia, chronic obstructive pulmonary disease (COPD), chronic heart failure (CHF), metastatic cancer, bleeding disorders, dyspnea, and ascites. Anemia was defined using the World Health Organization cutoffs of < 120 g/L for females and < 130 g/L for males. CKD was defined as having a creatinine level > 1.5 mg/dL, consistent with prior NSQIP papers. [15] Perioperative variables included surgical diagnosis, length of surgery, and laterality (unilateral vs. bilateral).

The primary study outcomes were differences in demographic, disease burden, perioperative factors, TKA utilization, hospital length of stay (LOS), and 30-day post-discharge readmission, reoperation, complication, and mortality rates. Reoperation was defined as any unplanned operation that was not specifically related to the index surgery. Readmission was defined as any unplanned readmission within the 30-day postoperative period. Complications were categorized as medical or surgical. Medical complications included sepsis or septic shock, myocardial infarction (MI), cardiac arrest, stroke, acute renal insufficiency, pneumonia, and urinary tract infection (UTI). Acute renal insufficiency was defined as renal failure following surgical intervention or that requiring dialysis. Surgical complications included wound infection, reintubation, ventilator use exceeding 48 h, pulmonary embolism (PE), and deep vein thrombosis (DVT).

Broad differences in categorical patient factors and outcome measures across racial/ethnic groups were first detected using Pearson's chi-square test. When statistical significance was reached, subsequent chi-square tests were conducted between specific group pairings, with a Bonferroni adjustment applied for multiple comparisons. To detect differences in continuous patient factors or outcome measures, an overall F-test of one-way analysis of variance (ANOVA) test was utilized, followed by post hoc Dunnett tests to assess specific racial/ethnic pairings. Multivariable linear regressions (continuous outcome metrics) or logistic regressions (binary outcome metrics) were utilized to define the effect of racial/ethnic status on each specific outcome measure. Regressions for each case-control unit controlled for patient factors that had demonstrated significant baseline differences between the respective groups.

Data were analyzed using Stata 16.0 (Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC). Significance for all tests was defined as $\alpha = 0.05$, prior to any adjustments for multiple comparisons.

Results

Of the 262,954 patients meeting inclusion criteria, 230,712 (87.7%) self–reported racial/ethnic status and were included for analysis. There were 190,630 non-Hispanic White, 19,496 non–Hispanic Black/African American, 12,767 Hispanic/Latino, 5569 Asian, 1348 American Indian/Alaskan Native, and 902 Native Hawaiian/Pacific Islander patients. When considering all patients, including those with an unreported race or ethnicity, non–Hispanic Whites composed 72.5% of all TKA procedures over the study period. All groups were significantly younger and had higher BMI than non–Hispanic White patients, except for those of Asian race who were likely to be older and have lower BMI ($p < 0.001$). There was a nearly twofold higher rate of tobacco smoking among non–

Hispanic Black/African American and American Indian/Alaskan Native patients relative to non–Hispanic Whites ($p < 0.001$).

Overall, hypertension, diabetes, anemia, COPD, and CKD were the most commonly observed comorbid conditions. Compared with non-Hispanic Whites, all minority groups had higher rates of diabetes ($p < 0.001$), anemia ($p < 0.001$), and hypertension ($p < 0.001$, except American Indians/Alaskan Natives). Native Hawaiians/Pacific Islanders and Non–Hispanic Blacks/African Americans had nearly twofold higher rates of CKD ($p < 0.001$), the latter group also had higher rates of CHF ($p < 0.001$). Overall, minority groups had lower rates of COPD, dyspnea, and bleeding disorders particularly Hispanics/Latinos ($p < 0.001$). Primary osteoarthritis was the most common indication for TKA in all groups followed by post-traumatic arthritis. Non–Hispanic White patients, except Asians and Native Hawaiians/Pacific Islanders, were less likely to undergo bilateral procedures ($p < 0.001$). All minority groups had longer operative times compared with non–Hispanic Whites ($p < 0.001$). Tables 1 and 2 summarize the baseline demographic, comorbid, and perioperative characteristics of the study cohorts.

After controlling for all the aforementioned differences among respective case-control pairs, multivariable regression analyses confirmed significant disparities in several outcomes. All minority groups, except Asians, had longer LOS ($p < 0.001$). The mean LOS was 2.64 ± 2.53 days for non-Hispanic Whites, 2.90 ± 2.39 days for non–Hispanic Blacks, 2.82 ± 2.62 days for Hispanics/Latinos, 2.73 ± 1.89 days for Asians, 3.26 ± 2.96 days for American Indians/Alaskan Natives, and 2.83 ± 2.80 days for Native Hawaiians/Pacific Islanders.

Table 1 Baseline demographics of the study cohorts

Variable	Non–Hispanic White Control group	Non–Hispanic Black/African American Case groups	Hispanic/Latino	Asian	American Indian/Alaskan Native	Native Hawaiian/ Pacific Islander	*p* value
$N = 262{,}954^{\dagger}$	190,630 (72.5%)	19,496 (7.4%)	12,767 (4.9%)	5569 (2.1%)	1348 (0.5%)	902 (0.3%)	–
Demographic characteristics							
Age (years)	66.9 ± 9.4	63.1 ± 9.7*	65.6 ± 9.8*	68.8 ± 8.8*	62.9 ± 9.8*	65.2 ± 9.4*	*< 0.0001*
Sex							*< 0.0001*
Female	115,588 (60.6%)	14,004 (71.8%)*	8203 (64.3%)*	3747 (67.3%)*	828 (61.4%)	475 (52.7%)*	
Male	75,033 (39.4%)	5491 (28.2%)*	4563 (35.7%)*	1821 (32.7%)*	520 (38.6%)	427 (47.3%)*	
Body mass index (kg/m^2)	33.0 ± 6.8	35.4 ± 7.4*	33.1 ± 6.4*	29.1 ± 5.4*	33.9 ± 6.5*	34.0 ± 7.1*	*< 0.0001*
Current smoker	15,256 (8.0%)	2760 (14.2%)*	1021 (8.0%)	184 (3.3%)*	228 (16.9%)*	80 (8.9%)	*< 0.0001*
Chronic steroid use	6516 (3.4%)	847 (4.3%)*	472 (3.7%)	178 (3.2%)	75 (5.6%)*	16 (1.8%)*	*< 0.0001*
ASA classification	2.5 ± 0.6	2.6 ± 0.6*	2.5 ± 0.6	2.4 ± 0.5*	2.6 ± 0.6*	2.5 ± 0.6	
Functional status							*< 0.0001*
Independent	187,530 (99.0%)	19,133 (98.6%)*	12,398 (97.8%)*	5395 (98.4%)*	1325 (98.4%)	872 (99.0%)	
Partially or completely dependent	1916 (1.0%)	281 (1.5%)*	276 (2.2%)*	88 (1.6%)*	22 (1.6%)	9 (1.0%)	
Preoperative living environment							0.672
Admitted directly from home	189,973 (99.8%)	19,441 (99.8%)	12,730 (99.8%)	5546 (99.7%)	1344 (99.7%)	900 (99.9%)	
Admitted from a facility	469 (0.3%)	41 (0.2%)	31 (0.2%)	18 (0.3%)	4 (0.3%)	1 (0.1%)	

Values are presented as mean and standard deviation (continuous variables) or as frequency and percentage (nominal variables). Right–column *p* values indicate significant overall differences among all racial groups for a particular patient factor, and an asterisk (*) denotes attribution of that significance to a particular case group compared with White race (control group). For nominal variables, overall *p* values and direct group comparisons are obtained from the contingency chi-square tests with a Bonferroni adjustment. For continuous variables, overall *p* values are obtained from an overall F-test of one–way analysis of variance and direct group comparisons through a post hoc Dunnett test. *ASA*, American Society of Anesthesiologists physical classification system. † Includes 32,244 (12.3%) patients undergoing elective TKA with an unreported race/ethnicity. *p* values reflected in bold font indicate statistical significance

Table 2 Baseline comorbidities and perioperative characteristics of the study cohorts

Variable	Non–Hispanic White Control group	Non–Hispanic Black/ African American Case groups	Hispanic/ Latino	Asian	American Indian/ Alaskan Native	Native Hawaiian/ Pacific Islander	*p* value
$N = 262{,}954^{\dagger}$	190,630 (72.5%)	19,496 (7.4%)	12,767 (4.9%)	5569 (2.1%)	1348 (0.5%)	902 (0.3%)	–
Comorbidity characteristics							
Diabetes	31,130 (16.3%)	4930 (25.3%)*	3491 (27.3%)*	1529 (27.5%)*	307 (22.8%)*	252 (28.0%)*	*< 0.0001*
Hypertension	123,400 (64.7%)	15,340 (78.7%)*	8606 (67.4%)*	3981 (71.5%)*	822 (61.0%)*	617 (68.4%)	*< 0.0001*
Chronic obstructive pulmonary disease	7095 (3.7%)	728 (3.7%)	272 (2.1%)*	87 (1.6%)*	48 (3.6%)	11 (1.2%)*	*< 0.0001*
Chronic heart failure	513 (0.3%)	87 (0.5%)*	27 (0.2%)	11 (0.2%)	6 (0.5%)	2 (0.2%)	*< 0.0001*
Anemia	30,578 (16.8%)	5417 (28.9%)*	2414 (20.0%)*	1217 (22.9%)*	320 (25.2%)*	162 (18.9%)	*< 0.0001*
Metastatic cancer	170 (0.1%)	5 (0.0%)*	5 (0.0%)	5 (0.1%)	1 (0.1%)	0 (0.0%)	*0.028*
Bleeding disorder	4529 (2.4%)	328 (1.7%)*	225 (1.8%)*	90 (1.6%)*	23 (1.7%)	15 (1.7%)	*< 0.0001*
Dyspnea	11,082 (5.8%)	1213 (6.2%)	402 (3.2%)*	115 (2.1%)*	41 (3.0%)*	16 (1.8%)*	*< 0.0001*
Ascites	34 (0.0%)	3 (0.0%)	1 (0.0%)	0 (0.0%)	1 (0.1%)	1 (0.1%)	0.119
Chronic kidney disease	4685 (2.6%)	919 (5.0%)*	272 (2.3%)	143 (2.8%)	38 (3.0%)	34 (4.2%)*	*< 0.0001*
Perioperative characteristics							
Diagnosis							*< 0.0001*
Primary osteoarthritis	188,189 (98.7%)	19,147 (98.2%)*	12,540 (98.2%)*	5503 (98.8%)*	1303 (96.7%)*	892 (98.9%)	
Inflammatory arthritis	626 (0.3%)	129 (0.7%)*	99 (0.8%)*	39 (0.7%)*	17 (1.3%)*	4 (0.4%)	
Posttraumatic arthritis	1815 (0.9%)	220 (1.1%)*	128 (1.0%)*	27 (0.5%)*	28 (2.1%)*	6 (0.7%)	
Bilateral procedure	5690 (3.0%)	465 (2.4%)*	235 (1.8%)*	229 (4.1%)*	24 (1.8%)*	36 (4.0%)	*< 0.0001*
Procedure length (minutes) > 100	60,498 (31.7%)	8789 (45.1%)*	4798 (37.6%)*	1999 (35.9%)*	476 (35.3%)*	400 (44.3%)*	*< 0.0001*

Values are presented as mean and standard deviation (continuous variables) or as frequency and percentage (nominal variables). Right–column *p* values indicate significant overall differences among all racial groups for a particular patient factor, and an asterisk (*) denotes attribution of that significance to a particular case group compared with White race (control group). For nominal variables, overall *p* values and direct group comparisons are obtained from contingency chi-square tests with a Bonferroni adjustment. For continuous variables, overall *p* values are obtained from an overall F-test of one–way analysis of variance and direct group comparisons through a post hoc Dunnett test. † Includes 32,244 (12.3%) patients undergoing elective TKA with an unreported race/ethnicity. *p* values reflected in bold font indicate statistical significance

Non–Hispanic Black/African Americans had significantly higher rates of readmission (OR 1.14, CI 1.05–1.24, $p = 0.003$) and overall complications (OR 1.15, 95% CI 1.05–1.26, p = 0.003), especially surgical complications (OR 1.23, 95% CI 1.11–1.37, $p < 0.001$). Similarly, Hispanics/Latinos also experienced higher rates of overall adverse events (OR 1.17, 95% CI 1.05–1.31, $p = 0.006$) including surgical complications (OR 1.23, 95% CI 1.08–1.39, $p = 0.002$). Asians had significantly lower rates of readmissions (OR 0.66, CI 0.54–0.81, $p < 0.001$), reoperations (OR 0.54, 95% CI 0.37–0.78, $p < 0.001$), and overall complications (OR 0.81, 95% CI 0.66–0.98, $p = 0.037$). Table 3 summarizes the results of the multivariate regression analyses relative to non-Hispanic White race.

Discussion

In this study, we sought to present an updated national analysis on the state of health inequities among the major US racial and ethnic groups in the setting of TKA outcomes. Overall, minorities had higher rates of diabetes, hypertension, anemia, non-primary osteoarthritis, and increased operative times. Multivariate logistic regression analyses were used to control for differences in assessed demographic, comorbid, and perioperative characteristics. All minority groups except Asians had longer LOS. Additionally, Blacks/African Americans and Hispanics/Latinos had higher rates of 30-day adverse events, particularly surgical complications. Blacks/African Americans were also at higher risk for 30-day readmissions. Interestingly, Asian race was protective against 30-day complications, readmissions, and reoperations despite sharing a similar prevalence of comorbid and perioperative characteristics with other groups.

Many of our findings are consistent with previous reports. Zhang et al. [7], in a retrospective review of a national administrative database collected from eight states between 2001 and 2008, found that Hispanic, Black, Native-American, and mixed-race minorities had lower arthroplasty utilization rates,

Table 3 Multivariate regression analysis of 30–day outcome measures relative to non-Hispanic White race

Variable	Non-Hispanic White	Non–Hispanic Black/African American			Hispanic/Latino			Asian			American Indian/Alaskan Native			Native Hawaiian/Pacific Islander		
	Control group	Case groups														
	OR/Coef.	OR/ Coef.	CI	*p*	OR / Coef.	CI	*p*	OR / Coef.	CI	*p*	OR / Coef.	CI	*p*	OR / Coef.	CI	*p*
Mortality	1.0	1.03	0.68–1.56	0.894	1.01	0.60–1.71	0.969	0.61	0.23–1.65	0.330	1.23	0.31–4.98	0.769	2.11	0.52–8.53	0.295
Readmission	1.0	1.14	1.05–1.24	*0.003*	1.07	0.96–1.19	0.211	0.66	0.54–0.81	*< 0.001*	0.81	0.57–1.14	0.224	0.75	0.47–1.18	0.210
Reoperation	1.0	1.09	0.96–1.25	0.191	0.94	0.78–1.12	0.481	0.54	0.37–0.78	*0.001*	0.91	0.54–1.51	0.705	0.71	0.34–1.50	0.373
Length of stay (days)†	0.0	0.14	0.10–0.18	*< 0.001*	0.15	0.10–0.20	*< 0.001*	0.04	−0.03 – 0.11	0.304	0.67	0.53–0.81	*< 0.001*	0.18	0.01–0.36	*0.043*
Inpatient stay (>2 days)	1.0	1.15	1.13–1.20	*< 0.001*	1.12	1.08–1.17	*< 0.001*	1.02	0.96–1.08	0.539	1.96	1.74–2.21	*< 0.001*	1.21	1.05–1.39	*0.010*
Any complication	1.0	1.15	1.05–1.26	*0.003*	1.17	1.05–1.31	*0.006*	0.81	0.66–0.98	*0.037*	0.79	0.53–1.17	0.235	1.02	0.66–1.58	0.929
Any surgical complication	1.0	1.23	1.11–1.37	*< 0.001*	1.23	1.08–1.39	*0.002*	0.83	0.66–1.05	0.125	0.83	0.53–1.30	0.417	1.07	0.65–1.75	0.801
Any medical complication	1.0	1.01	0.86–1.19	0.866	1.03	0.84–1.25	0.783	0.71	0.50–1.00	0.051	0.69	0.34–1.39	0.303	1.27	0.66–2.46	0.477

Multivariate logistic regressions were utilized to yield odds ratios for binary outcome variables and multivariate linear regressions were employed to yield coefficients (indicated by †) for continuous outcome measures. Regression output for all case groups was defined relative to non–Hispanic White race (control group). Patient factors previously demonstrating significant differences between the specific case group and White race (Table 1) were controlled for in their respective regression analyses. *p* values reflected in bold font indicate statistical significance

yet higher mortality and complication rates. Singh et al. [16], in an 18-year analysis of Medicare data, demonstrated decreased TKA utilization, increased 30-day readmission, and decreased rate of home discharge among Black patients. Furthermore, Ibrahim et al. [13], in their review of a Veterans Affairs database, found that Black patients had a higher risk for both non-infection and infection-related complications following TJA. This was further supported by Shahid et al. [17] who found that Black patients undergoing TJA were more likely to experience worse outcomes, such as higher inpatient mortality rates and longer LOS.

Assessing the root causes for health inequities is challenging and multifactorial. A discussion of racial disparities in health outcomes would be incomplete without a discussion of the social determinants of health (SDH), such as income, wealth, and education [18]. While race is not a direct corollary of socioeconomic status, various studies have demonstrated associations between race and SDH, such as income [19–21]. In fact, it has been shown that income inequality has significantly increased in the last two decades and that Blacks, Hispanics, and American Indians remain on the lower tier of the income structure [21]. These findings are relevant, as Goodman et al. [22] showed that there was an important relationship between the community poverty level and patient-reported outcomes after TKA. In another study, Amen et al. [23] demonstrated that compared with White patients undergoing TJA, Black/African Americans had lower median salaries and lower to worsening outcomes. Other SDH that have been shown to influence TJA outcomes include educational level [24–26], insurance status [27], and access to specialty care [28]. Minority patients may lack the information to seek TJA or may not have adequate insurance to cover the costs of surgery. This limited access to specialists is further compounded by the fact that physicians are likely to refer within their healthcare networks, which may not be accessible to minority patients [28]. Thus, lower income populations may be left in networks that lack access to specialty care, further contributing to disparities in TJA utilization [29]. Losina et al. [30] found that non-White, poor, and less-educated patients from rural areas as well as patients from urban areas with high prevalence of impoverished or foreign-born citizens/minorities were more likely to be overlooked by high-volume hospitals. Consequently, they were more likely to undergo TKA at low-volume centers where outcomes can be less optimal [31].

Our study demonstrates there continue to be significant disparities in TKA outcomes and that these inequities are not limited to Black patients. The majority of other published literature has focused on specific racial or geographic populations—the strength of our study is we evaluated the major US racial and ethnic minorities using a database that is representative of the US population. Our analysis shows that, with the exception of the Asian population, all other major racial and ethnic minorities had increased comorbidities and longer hospital stays and that Black and Hispanic patients had higher complications.

One of the advantages of this study is that unlike previous investigations that focused on Blacks and/or Hispanics, we assessed all the six major racial and ethnic groups as designated by the National Institutes of Health. In addition to demonstrating persistent disparities in TKA outcomes compared with the White race, our study found that inequities were also present among the different minority groups. Interestingly, while Asians shared similar rates of certain comorbid conditions and perioperative characteristics compared with Black and Hispanics, they had significantly higher 30-day outcomes. In fact, Asian had decreased 30-day complications, readmissions, and reoperations compared with White race. This finding further highlights that disparities cannot be explained by baseline comorbidities alone and that future studies should factor in social determinants of health. For example, previous studies have shown that Asian race was associated with higher socioeconomic scale [21].

The major limitation of this study is that variables captured in the ACS-NSQIP database are not comprehensive. In particular, there was no data regarding insurance payer type, mental health, surgeon volume, and hospital volume. This has significantly limited our ability to inform additional conclusions apart from the persistence or racial and ethnic disparities. However, this limitation in itself is an important finding and it highlights a pervasive obstacle facing our ability to inform an effective analysis on this topic. This obstacle is that most of our national databases have primarily focused on select risk factors and do not collect socioeconomic information. Additionally, outcomes in the ACS-NSQIP are limited to the first 30 postoperative days. Therefore, our study may have underestimated the true rates of adverse outcomes among minority patients.

In conclusion, we found higher comorbidity profiles, longer hospitalization, and increased 30-day complication rates among non-White and non-Asian patients. This calls the need for further research to address the continuing inequalities in TKA outcomes. As in other areas of healthcare, orthopedics is not practiced in isolation. Having greater understanding of the current state of public health and ongoing racial and socioeconomic disparities will help guide further measures to improve care; and clarifying the etiology of these disparities will allow us as physicians to better advocate for public policies to improve the health outcomes of all patients.

Compliance with Ethical Standards

Conflict of Interest Drs. Cusano and Venugopal declare that they have no conflict of interest. Mr. Gronbeck declares that he has no conflict of interest. Dr. Harrington is a paid consultant for Zimmer Inc. and a board member in the AAOS, AOA, and J Robert Gladden Orthopaedic Society. Dr. Halawi declares that he is on the editorial boards for JBJS and Arthroplasty Today.

Ethical Approval This article does not contain any studies with human participants performed by any of the authors. Furthermore, the study was IRB-exempt.

Informed Consent Not applicable.

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