Arthroplasty Today 6 (2020) 872–876

Contents lists available at ScienceDirect

Arthroplasty Today

journal homepage: http://www.arthroplastytoday.org/

Original Research

Where Do We Stand Today on Racial and Ethnic Health Disparities? An Analysis of Primary Total Hip Arthroplasty From a 2011–2017 National Database

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ARTICLE INFO

Article history:
Received 16 June 2020
Received in revised form
11 September 2020
Accepted 4 October 2020
Available online xxx

Keywords:
Race
Ethnicity
Health disparities
Total hip arthroplasty
30-Day adverse events

ABSTRACT

Background: Little is known about the persistence of health disparities in joint arthroplasty. The objective of this study was to update our knowledge on the state of racial and ethnic disparities in total hip arthroplasty (THA).

Methods: Patients undergoing primary, elective THA using the 2011-2017 American College of Surgeons National Surgical Quality Improvement Program were retrospectively reviewed. Five minority groups (non-Hispanic black or African American, Hispanic or Latino, Asian, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander) were compared with non-Hispanic whites. The primary outcomes were in the differences in demographic characteristics, comorbidities, perioperative characteristics, THA utilization, length of stay (LOS), and 30-day adverse events (mortality, readmission, reoperation, and complications).

Results: A total of 155,870 patients were identified with racial and ethnic data available on 134,961 (86.6%) of them. Non-Hispanic white patients comprised 74.5% of all THA procedures. Except for Asians, all minority groups were more likely to be younger, have a higher body mass index, and smoke tobacco ($P < .001$). There were higher rates of nonprimary osteoarthritis, procedure length exceeding 100 minutes, and comorbidities among all minority groups. All minority groups, except Asian and Hawaiians or Pacific Islanders, were more likely to require an LOS >2 days. Blacks were more likely to develop surgical or medical complications (odds ratio [OR]: 1.21 and 1.2, respectively), whereas Hispanics or Latinos were more likely to develop surgical complications (OR: 1.28). American Indians or Alaska Natives were more likely to undergo reoperations (OR: 1.91).

Conclusions: Health disparities persist among minority groups with respect to comorbidities, THA utilization, LOS, and complications. Blacks and Hispanics or Latinos appear to be the most impacted by these disparities.

Introduction

Total joint arthroplasty (TJA) is the gold standard treatment for debilitating osteoarthritis (OA), the leading cause of musculoskeletal-related disability in the United States [1]. Despite higher prevalence of symptomatic OA among racial and ethnic minorities [2], disparities have long been reported in the provision and outcomes of orthopaedic services including TJA [3]. Among the different minority groups, blacks and Hispanics have been the focus of previous studies. Specifically, blacks and Hispanics have been shown to underuse TJA, have higher postoperative complication and readmission rates, and report worse patient-reported outcome measures [4-7].

The Centers for Disease Control and Prevention, the American Academy of Orthopaedic Surgeons, and the National Institute of Arthritis and Musculoskeletal and Skin Diseases among other

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https://doi.org/10.1016/j.artd.2020.10.002

governing bodies have identified reducing health disparities as a major public health goal [8,9]. A fundamental obstacle in achieving this goal, as highlighted by the American Academy of Orthopaedic Surgeons, has been the lack of clinical research to adequately understand and effectively address health disparities [5]. Available data have been limited by analyses of patients from specific institutions [4,7,10,11], health-care systems [12-14], geographic regions [15], payer types [16,17], or minority groups [4,7,10,11,14,17,18], making generalizations difficult. Furthermore, there have been numerous changes and surgical advancements in the past decade, which aimed to improve health outcomes for all patients in general and those undergoing arthroplasty in particular. These include the Affordable Care Act, nationwide health promotion initiatives such as Healthy People 2020 and Movement is Life Caucus, and the myriad refinement in preoperative optimization, perioperative care, and postoperative rapid recovery protocols. The collective impact of those changes on eliminating health disparities related to TJA remains unknown.

The objective of this study was to update our knowledge on the scope of racial and ethnic disparities in primary total hip arthroplasty (THA) using a large, validated national surgical quality database that has been shown to be more reliable in tracking postoperative complications than claims-based databases [19,20]. Unlike previous studies, all 6 major racial and ethnic groups identified by the National Institutes of Health were analyzed. The specific study questions were as follows: (1) What differences in demographic, comorbid, and perioperative factors exist among the different population groups and (2) What differences exist in THA utilization, hospital length of stay (LOS), and 30-day adverse events (medical complications, surgical complications, readmissions, reoperations, and mortality)?

Material and methods

Institutional review board approval was not required as this study used a large sample of randomized and deidentified data. Data were obtained from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP), which abstracts information from patients' medical charts spanning the period of hospital admission up to 30 days after surgery. Currently, more than 600 hospitals nationwide participate in the ACS-NSQIP database, and the data are routinely audited to maintain high fidelity [19,21]. Our inclusion criteria included all patients for whom racial or ethnic data were reported who underwent primary, elective THA between 2011 and 2017, as defined by Common Procedural Terminology code 27130. To minimize potential coding inaccuracies, the International Classification of Diseases codes were reviewed to confirm that patients had received a preoperative diagnosis warranting arthroplasty.

A wide range of demographic, comorbid, and perioperative variables were collected. Demographic variables included age, sex, body mass index (BMI), self-reported racial or ethnic identification, functional status, and living environment. Racial status and ethnic status are reported separately in the ACS-NSQIP database; therefore, we prioritized ethnic classification over racial status for patients with dual identification (eg, Hispanic and black patients were classified as Hispanic), consistent with standard U.S. census data presentation [22]. Comorbidities included diabetes, hypertension, chronic kidney disease (CKD), anemia, chronic obstructive pulmonary disease, chronic heart failure, metastatic cancer, bleeding disorders, dyspnea, and ascites. Perioperative variables included surgical diagnosis, the length of the procedure, and laterality (unilateral vs bilateral).

The study outcomes were differences in demographic, comorbid, and perioperative factors; THA utilization; hospital LOS; and rates of 30-day adverse events (mortality, readmission, reoperation, and complications). Reoperation was defined as any unplanned operation that was not related specifically to the index surgery. Complications were categorized as either medical or surgical. Medical complications included sepsis or septic shock, cardiac arrest, myocardial infarction, stroke, acute renal insufficiency, pneumonia, and urinary tract infection. Surgical complications included wound infection, reintubation, ventilator use exceeding 48 hours, pulmonary embolism, and deep vein thrombosis.

Patients were divided into 6 racial or ethnic groups defined by the National Institutes of Health: Non-Hispanic white, non-Hispanic black or African American, Hispanic or Latino, Asian, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander. Comparisons were made using non-Hispanic white race as the control group. Values were presented as the mean and standard deviation for continuous variables or the frequency and percentage for binary variables. Data were extracted and analyzed using Stata 16.0 (Stata Statistical Software: Release 16; StataCorp LLC, College Station, TX). For categorical patient factors and 30-day adverse events, Pearson's chi-square test was first performed across all racial groups to detect differences. When statistically significant, individual chi-square tests were then performed to compare each specific racial or ethnic group to the control group (non-Hispanic white race), applying a Bonferroni adjustment because of multiple comparisons. An overall F-test of the one-way analysis of variance was used to detect overall differences among continuous patient factors and 30-day adverse events, with post hoc Dunnett tests used to assess specific case-control differences. Multivariable logistic regressions were then used to assess the impact of racial or ethnic status on various binomial 30-day adverse events, yielding an odds ratio (OR) for each case group. Multivariate linear regressions were conducted to define a correlation coefficient between the racial or ethnic status and mean LOS. Regressions for each case-control unit controlled for patient factors that had demonstrated significant baseline differences between those respective groups. Significance for all tests was defined as $\alpha = 0.05$ before Bonferroni adjustment.

Results

Among 155,870 patients undergoing elective THA from 2011 to 2017, racial data were available on 134,961 (86.6%) individuals. Non-Hispanic white patients comprised 74.5% of all THA procedures across the study period, including those performed on individuals with an unreported race. Compared with white patients, Asian patients were more likely to be older, have male gender, have a lower BMI, and be a nonsmoker ($P < .001$). In contrast, all other racial or ethnicity groups were likely to be younger, have a higher BMI, and smoke tobacco than whites. Blacks and Hispanics or Latinos were also more likely to be on chronic steroids and require functional assistance than whites ($P < .001$).

Diabetes, hypertension, chronic obstructive pulmonary disease, anemia, dyspnea, and CKD were the most common comorbidities present in the study cohorts, with blacks demonstrating the highest prevalence of these comorbidities ($P < .0001$). In all groups, primary OA was the most common indication for THA. Osteonecrosis was the second most common indication, although it was disproportionately higher in minority groups than in whites ($P < .001$). Among all groups, the majority of THAs were unilateral, although Asians underwent bilateral surgery with a relatively greater frequency (3.1%, $P < .001$). In addition, all races were more likely to exceed 100 minutes of operative time than whites ($P < .001$). Table 1 summarizes the baseline and perioperative characteristics of the study groups.

Table 1
Baseline and perioperative characteristics of the study cohorts.

Variable	Non-Hispanic white	Non-Hispanic black or African American	Hispanic or Latino	Asian	American Indian or Alaska Native	Native Hawaiian or Pacific Islander	*P* value
	Control group	Study groups					
N = 155,870[a]	116,129 (74.5%)	11,574 (7.4%)	4107 (2.6%)	2140 (1.4%)	594 (0.4%)	417 (0.3%)	–
Demographic characteristics							
Age (years)	65.3 ± 11.2	59.9 ± 11.7*	59.9 ± 13.0*	64.9 ± 12.6	58.4 ± 12.0*	61.7 ± 11.2*	**<.0001**
Sex							**<.0001**
Female	63,697 (54.8%)	6113 (52.8%)*	2122 (51.7%)*	1423 (66.5%)*	292 (49.2%)*	198 (47.5%)*	
Male	52,427 (45.2%)	5461 (47.1%)*	1985 (48.3%)*	717 (33.5%)*	302 (50.8%)*	219 (52.5%)*	
Body mass index (kg/m^2)	30.3 ± 6.3	31.7 ± 6.8*	30.8 ± 5.9*	26.9 ± 5.4*	31.2 ± 6.3*	31.6 ± 6.2*	**<.0001**
Current smoker	13,993 (12.1%)	2794 (24.1%)*	553 (13.5%)*	162 (7.6%)*	136 (22.9%)*	69 (16.6%)*	**<.0001**
Chronic steroid use	4038 (3.5%)	573 (5.0%)*	218 (5.3%)*	92 (4.3%)	28 (4.7%)	13 (3.1%)	**<.0001**
ASA classification	2.4 ± 0.6	2.5 ± 0.6*	2.4 ± 0.6	2.3 ± 0.6*	2.5 ± 0.6*	2.4 ± 0.6	**<.0001**
Functional status							**<.0001**
Independent	113,818 (98.4%)	11,237 (97.5%)*	3959 (97.0%)*	2064 (97.9%)	582 (98.0%)	399 (97.1%)	
Partially or completely dependent	1903 (1.6%)	293 (2.5%)*	121 (3.0%)*	44 (2.1%)	12 (2.0%)	12 (3.0%)	
Preoperative living environment							.298
Admitted directly from the home	115, 686 (99.7%)	11,510 (99.6%)	4095 (99.7%)	2133 (99.7%)	592 (99.7%)	415 (99.5%)	
Admitted from a facility	363 (0.3%)	51 (0.4%)	11 (0.3%)	7 (0.3%)	2 (0.3%)	2 (0.5%)	
Comorbidities							
Diabetes	12,966 (11.2%)	2123 (18.3%)*	696 (17.0%)*	306 (14.3%)*	79 (13.3%)	70 (16.8%)*	**<.0001**
Hypertension	65,071 (56.0%)	8040 (69.5%)*	2162 (52.6%)*	1225 (57.2%)	284 (47.8%)*	246 (58.9%)	**<.0001**
Chronic obstructive pulmonary disease	4692 (4.0%)	480 (4.2%)	111 (2.7%)*	33 (1.5%)*	17 (2.9%)	11 (2.6%)	**<.0001**
Chronic heart failure	311 (0.3%)	50 (0.4%)*	8 (0.2%)	3 (0.1%)	4 (0.7%)	3 (0.7%)	**.002**
Anemia	20,518 (18.5%)	3843 (34.4%)*	866 (22.1%)*	392 (19.1%)	143 (25.4%)*	79 (20.3%)	**<.0001**
Metastatic cancer	209 (0.2%)	23 (0.2%)	6 (0.2%)	4 (0.2%)	2 (0.3%)	1 (0.2%)	.929
Bleeding disorder	2549 (2.2%)	230 (2.0%)	74 (1.8%)	36 (1.7%)	5 (0.8%)	1 (0.2%)*	**.002**
Dyspnea	5280 (4.6%)	627 (5.4%)*	115 (2.8%)*	27 (1.3%)*	15 (2.5%)	4 (1.0%)*	**<.0001**
Ascites	23 (0.02%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	.589
Chronic kidney disease	2640 (2.4%)	577 (5.3%)*	100 (2.6%)	50 (2.5%)	5 (0.9%)	16 (4.4%)	**<.0001**
Perioperative characteristics							
Diagnosis							**<.0001**
Primary osteoarthritis	110,062 (94.5%)	10,168 (87.9%)*	3576 (87.1%)*	1894 (88.0%)*	510 (85.9%)*	381 (91.4%)	
Inflammatory arthritis	287 (0.3%)	48 (0.4%)*	54 (1.3%)*	12 (0.6%)*	8 (1.4%)*	1 (0.2%)	
Posttraumatic arthritis	665 (0.6%)	82 (0.7%)*	42 (1.0%)*	10 (0.5%)*	16 (2.7%)*	2 (0.5%)	
Childhood dysplasia	598 (0.5%)	50 (0.4%)*	70 (1.7%)*	37 (1.7%)*	8 (1.4%)*	4 (1.0%)	
Osteonecrosis	4517 (3.9%)	1226 (10.6%)*	365 (8.9%)*	187 (8.7%)*	52 (8.8%)*	29 (7.0%)	
Bilateral procedure	667 (0.6%)	87 (0.8%)	28 (0.7%)	66 (3.1%)*	2 (0.3%)	9 (2.2%)*	**<.0001**
Procedure length >100 minutes	37,798 (32.6%)	5146 (44.5%)*	1718 (41.8%)*	763 (35.7%)*	230 (38.7%)*	240 (57.8%)*	**<.0001**

ASA, American Society of Anesthesiologists physical classification system.
Values are presented as the mean and standard deviation for continuous variables or the frequency and percentage for binary variables. *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 study group as compared with the white race (control group). For nominal variables, overall *P* values and direct group comparisons were obtained using the chi-square tests. For continuous variables, overall *P* values were obtained from one-way analysis of variance (ANOVA) and direct group comparisons through a post hoc Dunnett test.
Significant *P*-values ($P < .05$) are bolded.
[a] Includes 20,909 (13.4%) patients undergoing elective THA with an unreported race or ethnicity.

Multivariate logistic regression analyses demonstrated notable disparities in 30-day adverse events among minority racial groups as compared with whites despite controlling for preoperative and perioperative factors. All groups, except Asian and Hawaiians or Pacific Islanders, were more likely to require an LOS >2 days. In addition, blacks were more likely to develop any complication (OR:

Table 2
Multivariate regression analysis of 30-day outcome measures relative to the white race.

Outcome	Non-Hispanic black or African American			Hispanic or Latino			Asian			American Indian or Alaska Native			Native Hawaiian or Pacific Islander		
	Study groups														
	OR	CI	*P*	OR	CI	*P*	OR	CI	*P*	OR	CI	*P*	OR	CI	*P*
Mortality	1.54	0.95 to 2.48	.073	1.20	0.49 to 2.96	.690	0.87	0.21 to 3.54	.845	1.78	0.24 to 12.9	.570	No observations		
Readmission	0.98	0.88 to 1.10	.856	1.06	0.88 to 1.27	.556	0.81	0.61 to 1.07	.146	1.18	0.76 to 1.84	.460	0.66	0.34 to 1.28	.221
Reoperation	0.90	0.78 to 1.04	.148	0.87	0.68 to 1.12	.286	0.82	0.57 to 1.19	.308	1.91	1.23 to 2.97	**.004**	0.96	0.47 to 1.94	.907
Length of stay (days)	0.18[a]	0.14 to 0.23	**<.001**	0.23	0.16 to 0.32	**<.001**	−0.08[a]	−1.18 to 0.14	.091	0.54	0.35 to 0.73	**<.001**	−0.10[a]	−0.31 to 0.12	.390
Inpatient stay (>2 days)	1.27	1.21 to 1.32	**<.001**	1.25	1.17 to 1.34	**<.001**	0.84	0.77 to 0.92	**<.001**	2.06	1.72 to 2.46	**<.001**	0.82	0.67 to 1.01	.062
Any complication	1.15	1.01 to 1.30	**.031**	1.21	0.98 to 1.50	.070	1.07	0.78 to 1.47	.674	0.76	0.39 to 1.48	.425	0.78	0.37 to 1.66	.527
Any surgical complication	1.21	1.04 to 1.40	**.015**	1.28	1.00 to 1.64	**.046**	1.19	0.81 to 1.73	.377	0.73	0.32 to 1.64	.443	0.98	0.44 to 2.20	.959
Any medical complication	1.20	1.00 to 1.45	**.052**	1.01	0.71 to 1.44	.968	0.81	0.47 to 1.40	.436	0.66	0.21 to 2.05	.468	0.58	0.14 to 2.34	.446

Regression output for all case groups was defined relative to the white race (control group). Patient factors previously demonstrating significant differences between the specific racial or ethnic group and white race (Table 1) were controlled for in the regression analyses.
Significant *P*-values ($P < .05$) are bolded.
[a] Values represent correlation coefficients from a multivariate linear regression.

1.15, 95% confidence interval [CI]: 1.01-1.30) including medical complications (OR: 1.2, 95% CI: 1.00-1.45) and surgical complications (OR: 1.21, 95% CI: 1.04-1.40). Hispanics or Latinos were more likely to develop surgical complications (OR: 1.28, 95% CI: 1.00–1.64). American Indians or Alaska Natives were more likely to undergo reoperations (OR: 1.91, 95% CI: 1.23-2.97). No differences were observed in 30-day readmission or mortality rates among the different groups. Table 2 summarizes the results of the multivariate regression analyses.

Discussion

Using a national patient safety database drawn between 2011 and 2017, our study demonstrated persistent disparities among all major U.S. racial and ethnic minorities compared with non-Hispanic whites. Significant differences were particularly noted in procedure utilization, baseline health profiles, LOS, and 30-day adverse events. Two patient groups appeared to be most affected: blacks and Hispanics who were more likely to experience a longer LOS and higher rates of adverse events even after controlling for demographic, comorbid, and perioperative differences. In contrast, Asians were the only minority group to demonstrate better outcomes than whites.

Non-Hispanic whites compromised the vast majority (74.5%) of patients who underwent primary THA despite comprising a relatively smaller proportion (60.6%) of the U.S. population in 2017 [22]. This finding appears to be discordant from the disproportionately higher rates of OA among minority groups; in a systematic review of literature, Irgit and Nelson [2] found the prevalence of OA was greater to or at least equal among blacks and Hispanics than among whites. Similarly, in a national probability sample of U.S. community-dwelling adults, Dunlop et al [23] found that OA-related disability was higher among Hispanics and African Americans than their white counterparts even when adjusting for age. The etiology of procedure underutilization is beyond the scope of this study but is likely multifactorial. Previous reports have identified a number of limiting factors including decreased health-care access, patient and surgeon bias, and patient distrust due to historical racial injustice [6,7]. Sparse health-care utilization may result in prioritizing other pressing medical issues over OA-related disability. Limited communication may hinder developing adequate patient-doctor rapport and reduce enthusiasm or trust in undergoing THA [6,24]. In addition, minority patients are more likely to be part of restrictive referral networks and to undergo THA at low-volume hospitals despite living close to high-volume hospitals [25,26]. Given that low-volume hospitals are associated with higher complication rates and poorer outcomes [27], this may further propagate the cycle of distrust and may explain their higher rates of lower postoperative satisfaction [7,13].

Despite previous efforts to increase awareness of health disparities among minorities and improve their access to TJA care, race and ethnicity remain significant risk factors for higher comorbidity burden and 30-day adverse events as demonstrated in this updated analysis. All racial and ethnic minorities except Asians were more likely to be younger, be obese, and smoke tobacco than whites. There were higher rates of chronic steroid use and functional dependence among blacks and Hispanics, which could be related to the higher rates of osteonecrosis seen in those patients. In addition, there were higher prevalence of major comorbidities, nonprimary OA indication for THA, and prolonged operative times across all minority groups. Interestingly, even after controlling for all preoperative and intraoperative differences, disparities in 30-day adverse events persisted. All minority groups aside from Asians and Hawaiians or Pacific Islanders were at a higher risk for LOS greater than 2 days than whites. There were also higher rates of 30-day surgical complications among Hispanics and blacks, the latter of whom also experienced higher rates of 30-day medical complications. Only American Indians or Alaska Natives demonstrated higher rates of 30-day reoperations.

Our results are consistent with previous studies demonstrating longer LOS and higher postoperative complication rates among minority patients. Stone et al [7] retrospectively reviewed 7208 primary TJAs at a single institution and found that the black race was an independent risk factor for a longer LOS and nonhome discharge than the white race. Lavernia and Villa [4] retrospectively reviewed 2010 primary TJAs at a single institution and reported worse pain, quality of life, general health, and disease-specific scores in minority patients than white patients. Previous studies have attributed these outcomes to minorities undergoing TJA at low-volume hospitals and delays in time to seek surgery [4,6,25,27]. Compared with low-volume hospitals, high-volume centers are more likely to employ surgeons and teams with more experience and skill and may use more efficient patient-care algorithms resulting in improved outcomes [28]. Cai et al [29] retrospectively reviewed the Medicare Provider Analysis and Review database and found that black patients were more likely to undergo TJA at low-quality hospitals, defined as those with higher risk-adjusted mortality and complication rates >80th percentile among all hospitals. In addition, minorities may present with a more complicated surgical anatomy secondary to higher comorbidities or unaccounted ethnic differences in the anatomy [10,24,30]. Greenberg et al [31] retrospectively reviewed the Consortium of Rheumatology Researchers of North America database and reported significantly higher comorbidities in black and Hispanic patients than in whites.

Although black-white disparities are most commonly used to gauge overall health-care disparities in the United States [32], our study highlights the fact that significant differences in disparities also exist between minority groups themselves, and these should not be combined into a singular entity when considering health-care policy. The present study also highlights the shortfalls of focusing only on comorbidities as determinants of 30-day adverse events. Race or ethnicity remained independent risk factors for 30-day adverse events even after controlling for differences in comorbid conditions. This underscores the role of social determinants of health (SDOH) [33]. The SDOH include socioeconomic status, educational level, access to health care, and neighborhood, which should be incorporated into any strategy to address health disparities. Examples of such strategies include broadening physician education surrounding minority cultural behaviors and beliefs, recognizing implicit bias toward certain patient groups, and improving communication skills [6,33]. Providing culturally appropriate information and services can assist patients in understanding and adhering to treatment options. Improving minority access to care and perioperative optimization holds significant value as studies have shown that in a universally insured and integrated health-care system, minorities have had outcomes similar to or better than whites after undergoing THA [13]. Seeking to improve patients' SDOH is the key of a comprehensive value-based approach to health care. Rather than dismiss the race and SDOH as nonmodifiable risk factors, preoperative optimization should be expanded to a more holistic approach that addresses all determinants of patient outcomes. Development of an optimization initiative should heavily involve stakeholders such as patients, physicians, and policy makers.

One of the major limitations of this study is that the ACS-NSQIP database does not capture information on patient attitudes or socioeconomic status, which may play a role in the utilization of health-care resources before arthroplasty and influence the rates of postoperative outcomes. In reality, health disparities are a complex

problem that is unlikely to be adequately addressed by any one of the large national databases available for investigation. As such, our study highlights a fundamental limitation affecting our ability to fully understand the root causes of health disparities.

A second limitation is that only 30-day adverse events were assessed, which could have underestimated the true extent of postsurgical adverse events. Third, 13.4% of patients who underwent THA and captured by the ACS-NSQIP database were excluded because of lack of data regarding racial or ethnic identification. Fourth, the data are limited to institutions participating in the ACS-NSQIP. Furthermore, no information is provided about those hospitals (eg, case volume, rural-urban location, hospital academic affiliation). Fifth, no conclusions can be made regarding the impact of programs that have been instituted to reduce the health disparities.

Conclusions

Racial and ethnic disparities continue to be a serious challenge in THA. Our findings demonstrate lower THA utilization, higher comorbidity profiles, longer operative time, prolonged LOS, and increased 30-day complications among all major racial or ethnic minorities except Asians. Blacks, Hispanics, and Native Americans or Alaskans are particularly affected. The persistence of disparities in 30-day adverse events despite controlling for all baseline differences calls for further studies to better understand underlying causes. Owing to the complexity of the reasons that contribute to racial disparities, national health databases should consider incorporating the SDOH.

Conflicts of interest

M.A. Harrington is a paid consultant for Zimmer Inc and is a board or committee member of the AAOS, AOA, and J Robert Gladden Orthopaedic Society; M.J. Halawi is a member of the editorial or governing board of *Arthroplasty Today and Journal of Bone and Joint Surgery*; and all other authors declare no potential conflicts of interest.

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