Racial disparities in peri-operative complications following primary total hip arthroplasty

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ABSTRACT

Background: This study assesses if post-operative outcomes following THA vary by racial groups.
Methods: A review of the ACS-NSQIP database was performed to compare THA patient outcomes from 2008 to 2016 according to race.
Results: During the study period, 117,389 THA patients were identified. Blacks were at significantly increased risk of peri-operative complications in comparison to non-Hispanic Whites, including serious medical morbidity (+27%), and prolonged length of stay (+53%).
Conclusions: Despite multivariate control and propensity-matched analysis of important risk factors, race independently predicts longer operative times and higher rates of discharge to non-home facilities.

1. Introduction

Total hip arthroplasty (THA) procedure volumes have increased over the past several decades, and are among the most commonly performed surgeries in the United States.[1,2] This procedure has demonstrated long lasting positive functional improvements and pain relief to a wide variety of demographic groups.[3–6] Additionally, it has been proven to be one of the most cost effective procedures for patients with advanced hip arthritis.[7] However, the rate of post-operative complication may not be equivalent when comparing outcomes between racial groups.

Racial disparities have been previously demonstrated between non-Hispanic White and Black racial groups in post-operative complications in procedures such as congenital heart surgery,[8] neurological procedures,[9,10] and appendectomies.[11] Similar trends have been observed in total joint arthroplasty (TJA), specifically in regards to the Black population. For several types of TJA, Black patients have shown reduced utilization rates and higher complication rates compared to non-Hispanic White populations – most notably with increased length of stay.[12–14] There is evidence to suggest that 30-day readmission rates are increasing in the Black population.[15] Similar racial disparities have been observed in Hispanic populations.[16]

The NSQIP is a surgical database with over 150 patient-specific variables, including preoperative risk factors, intraoperative variables, and 30-day post-operative mortality and morbidity outcomes for a population spanning participating institutions across the United States. Each institution has a certified reviewer to verify validity of the data collected prior to entry into the database.[17]

To our knowledge, there are no prior studies evaluating the impact of race on surgical complications with the quantity of cases available from the most recent years of NSQIP. Our goal was to evaluate if differences existed in post-surgical outcomes and care based on self-identified race using the NSQIP database. We hypothesized that Black, Hispanic, and Asian patients would have higher mean operative time, length of stay, re-operation rate, mortality and morbidity rate, and a lower rate of discharge to home. However, we expected some of these differences to be mitigated when controlling for medical comorbidities via propensity score matching and multivariate analysis.

2. Materials and methods

The 2008 to 2016 NSQIP database was accessed, and patients undergoing total hip arthroplasty were identified using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) coding system. Patients undergoing total hip arthroplasty as a treatment for fracture were excluded from the study. Over 400 participating hospitals contributed to the NSQIP database.[17]

Self-identified race was used as a discrete variable to group patients having undergone the procedure. Additional categorical information analyzed included sex, advanced age (≥70 years old), functional status

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(independent, partially dependent, or totally dependent), American Society of Anesthesiologists (ASA) classification, diabetes, obesity (BMI > 30 kg/m^2), hypertension medication use, arthritis diagnosis (osteoarthritis or rheumatoid arthritis), smoking history, general anesthesia, COPD, chronic steroid use, dialysis dependence, and cancer diagnosis. Pre-operative laboratory value cutoffs utilized included low hematocrit (< 30), high creatinine (≥ 2 mg/dL), low albumin (< 3.5 g/dL), low platelets (< 100 billion cells/L), and high bilirubin (≥ 2 mg/dL).

The primary outcome measures of this study included death or serious morbidity within 30 days of surgery. Serious morbidity was defined as surgical site infection, cardiac complication requiring intervention, respiratory complication requiring intervention, postoperative blood transfusion, sepsis, deep venous thrombosis (DVT), or pulmonary embolus (PE). Time variables including operative time, length of stay, discharge location, readmission or reoperation within 30 days were assessed. Outcome variables compared each racial group (Black, Hispanic, and Asian) with the "control" group (non-Hispanic Whites).

Univariate analysis was performed using Chi-square or Fischer's Exact test to compare categorical data and *t*-test to compare means for continuous data. A p-value of less than 0.05 was deemed significant. A reverse-stepwise multivariate logistic regression model incorporating all significant univariate factors was used to determine the impact of race on primary and secondary outcomes. Covariates were included for analysis if the p-value for the covariate effect in the model was < 0.05 after inclusion of all other covariates.

Propensity score matching was used to eliminate the effect of confounding variables on outcome differences between groups and as a supplement to the multivariate model for comparison. A propensity score was determined based on the relative contribution of each covariate included in the multivariate model. A matched dataset was derived for each control:case analysis using 1:1 nearest neighbor matching with a caliper set at 1×10^{-7}. This propensity-matched dataset then underwent univariate evaluation of risk factors to confirm adequacy of the matching algorithm. Finally, simple logistic regression was used within the matched dataset to derive a propensity-matched risk for outcomes of interest comparing each racial group to the control, the non-Hispanic white group.[18] Stata version 14.2 (Statacorp, College Station, TX) was used for all statistical analyses.

This study was reviewed and was deemed exempt by institutional review board.

3. Results

3.1. Patient demographics

Our survey of the NSQIP database yielded a total of 117,389 individuals undergoing total hip arthroplasty (THA) for arthritis. Of these, 104,693 (89.18%) identified as Non-Hispanic White, 9,968 (8.49%) as Black, 905 (0.77%) as Hispanic, and 1,823 (1.55%) as Asian.

Comparison between each racial group and the Non-Hispanic White group using Pearson Chi-Squared test revealed statistically significant differences in a variety of demographic variables, and also in the distribution of comorbidities at presentation[Insert Table 1].

3.2. Univariate analysis

Out of the 117,389 patients in the NSQIP database, 12,604 (10.74%) experienced serious medical morbidity, with a total of 157 (0.13%) deaths within 30 days of surgery. Serious morbidities included surgical site infection (n = 11, 0.01%), respiratory dysfunction (n = 208, 0.18%), cardiac complications (n = 1,106, 0.94%), postoperative anemia requiring transfusion (n = 11,412, 9.72%), or sepsis diagnosis (n = 342, 0.29%). Notably, postoperative transfusion accounted for the vast majority of these negative outcomes.

Significant unadjusted differences were observed when comparing Black, Hispanic, and Asians to the non-Hispanic White reference group. Blacks were more likely to experience death or a serious morbidity when analyzed as a whole as a result of their surgery. Differences were seen in operative time and length of stay between each racial group and the reference group. We observed differences in discharge location, with non-Hispanic Whites having higher discharge rates to home when compared to the Black and Hispanic groups. There was no significant difference in discharge location between non-Hispanic White and Asian patients (Insert Table 2).

Further analysis of operative time showed that non-Hispanic White patients had the lowest mean operative time (94.0 min) compared to Black (105.0 min), Hispanic (105.3 min), and Asian (99.0 min) patients. Similar trends were observed when comparing BMI, with the non-Hispanic White group having significantly lower BMI (30.2) than the Black (31.7) and the Hispanic (31.1) groups Insert Table 3.

3.3. Propensity score-matched model

Propensity score-matching was performed to create three separate cohorts comparing non-Hispanic White and Black patients, non-Hispanic White and Hispanic patients, and non-Hispanic White and Asian patients with total cohort sizes of 18,748, 1,704, and 3,442, respectively. This matching demonstrated acceptable control of covariates compared with the overall cohort (Insert Table 4).

Univariate analysis on our propensity score-matched cohort showed that serious medical co-morbidities and total length of hospital stay was higher among black patients compared with non-Hispanic Whites. Additionally, Black and Hispanic groups experienced discharge to a non-home facility at a higher rate than the non-Hispanic White group. It was also noted that the Asian group had a significantly lower rate of readmission and reoperation rate than non-Hispanic white group (Insert Table 5).

3.4. Multivariate model

In a logistic, reverse stepwise regression model, there was a similar significant association between patient race and increased death or serious medical morbidity when comparing Black to non-Hispanic White patients (p < 0.001). These differences were not seen in regards to the other races examined. However, differences were seen in operative time, with all racial groups having increased procedural time in comparison to the non-Hispanic white reference group. Additionally, Black and Hispanic ethnicity was associated with decreased discharge rates to home (p < 0.001). [Insert Table 6.].

4. Discussion

Using the NSQIP database to assemble a large, national cohort of American THA patients, we were able to evaluate the impact of race on 30-day post surgical complications, and other important perioperative quality metrics. When using propensity score matched comparisons between racial groups, significant differences between Black and non-Hispanic Whites were observed in serious medical morbidity, rate of prolonged operative time, total length of stay exceeding 5 days, and discharge to non-home facility. Disparities between Hispanic and non-Hispanic Whites were observed for rate of prolonged operative time and discharge to non-home facility. Asians had higher rates of prolonged operative time compared to non-Hispanic Whites, but had significantly lower readmission and reoperation rates within 30 days of THA. These discrepancies were all confirmed with multivariate analysis.

Similar disparities with complication rates between Black, Hispanic and non-Hispanic White patients have been shown in the literature, however a comprehensive study comparing multiple racial groups using our rigorous statistical methodology has not been previously attempted. Additionally, our report of decreased rate of readmission and re-

Table 1
Comparative demographics for patients undergoing total hip replacement grouped by race.

	Overall n (%)	White THA n (%)	Black THA n (%)	P Value*	Hispanic THA n (%)	P Value*	Asian THA n (%)	P Value*
Total	117389 (100)	104693 (89.18)	9968 (8.49)		905 (0.77)		1823 (1.55)	
Sex				0.001		0.152		< 0.001
Male	52949 (45.11)	47252 (45.13)	4669 (46.84)		430 (47.51)		598 (32.8)	
Female	64440 (54.89)	57441 (54.87)	5299 (53.16)		475 (52.49)		1225 (67.2)	
Age				< 0.001		< 0.001		0.657
< 70 yr	77447 (65.97)	67579 (64.54)	7985 (80.1)		715 (79.01)		1168 (64.04)	
≥ 70 yr	39964 (34.04)	37134 (35.46)	1984 (19.9)		190 (20.99)		656 (35.96)	
Functional status				< 0.001		< 0.001		0.287
Independent	114271 (97.34)	102039 (97.8)	9635 (97.09)		862 (95.67)		1735 (97.31)	
Partially Dependent	2571 (2.19)	2207 (2.12)	279 (2.81)		38 (4.22)		47 (2.64)	
Totally Dependent	105 (0.09)	93 (0.09)	10 (0.1)		1 (0.11)		1 (0.06)	
ASA class				< 0.001		0.355		< 0.001
Low	67463 (57.47)	60949 (58.21)	4766 (47.81)		513 (56.69)		1235 (67.71)	
High	49946 (42.55)	43762 (41.79)	5203 (52.19)		392 (43.31)		589 (32.29)	
Comorbidities								
Obesity (BMI > 30 kg/m^2)	54750 (46.64)	48179 (46.01)	5630 (56.48)	< 0.001	484 (53.48)	< 0.001	457 (25.05)	< 0.001
Diabetes	13532 (11.53)	11374 (10.89)	1754 (17.64)	< 0.001	160 (17.76)	< 0.001	244 (13.41)	0.001
Hypertension Medications	67537 (57.53)	59126 (56.46)	6916 (69.38)	< 0.001	450 (49.72)	< 0.001	1045 (57.32)	0.464
Arthritis				0.013		< 0.001		0.183
Osteo	105683 (90.03)	95151 (99.67)	8299 (99.51)		714 (98.21)		1519 (99.48)	
Rheumatoid	374 (0.32)	312 (0.33)	41 (0.49)		13 (1.79)		8 (0.52)	
Smoking History	15720 (13.39)	13000 (12.41)	2459 (24.67)	< 0.001	114 (12.6)	0.869	147 (8.06)	< 0.001
General Anesthesia	66106 (56.31)	58305 (55.74)	6430 (64.6)	< 0.001	527 (58.23)	0.133	844 (46.3)	< 0.001
COPD	4788 (4.08)	4323 (4.13)	409 (4.1)	0.902	27 (2.98)	0.084	29 (1.59)	< 0.001
Chronic Steroid Use	4352 (3.71)	3680 (3.51)	514 (5.16)	< 0.001	75 (8.29)	< 0.001	83 (4.55)	0.017
Dialysis	272 (0.23)	165 (0.16)	94 (0.94)	< 0.001	4 (0.44)	0.033	9 (0.49)	< 0.001
Cancer	361 (0.31)	313 (0.3)	32 (0.32)	0.7	7 (0.77)	0.01	9 (0.49)	0.134
Low Hematocrit (< 30)	1134 (0.97)	871 (0.86)	241 (2.48)	< 0.001	12 (1.37)	0.101	10 (0.56)	0.172
High Creatinine (≥ 2 mg/dL)	7868 (6.7)	6881 (6.77)	745 (7.68)	0.001	80 (9.15)	0.005	162 (9.05)	< 0.001
Low Albumin (< 3.5 g/dL)	2615 (2.23)	2240 (2.21)	321 (3.31)	< 0.001	25 (2.86)	0.19	29 (1.62)	0.093
Low Platelets (< 100 billion cells/L)	689 (0.59)	608 (0.58)	63 (0.63)	0.521	6 (0.66)	0.746	12 (0.66)	0.667
High Bilirubin (≥ 2 mg/dL)	59411 (50.61)	53044 (50.66)	4936 (49.51)	0.029	386 (42.65)	< 0.001	1045 (57.29)	< 0.001

*All P Values indicate comparisons to White THA reference group.

Table 2
Univariate analysis of all total hip arthroplasty complications by race.

	Overall n (%)	White THA n (%)	Black THA n (%)	P Value*	Hispanic THA n (%)	P Value*	Asian THA n (%)	P Value*
Death or serious morbidity	12604 (10.74)	10961 (10.79)	1273 (13.12)	< 0.001	110 (12.59)	0.089	260 (13.42)	< 0.001
Death	157 (0.13)	137 (0.13)	16 (0.16)	0.438	1 (0.11)	0.866	3 (0.16)	0.694
Serious morbidity	12572 (10.71)	10931 (10.76)	1273 (13.12)	< 0.001	110 (12.59)	0.083	258 (14.41)	< 0.001
Surgical Site Infection	11 (0.01)	9 (0.01)	2 (0.02)	0.27	0 (0)	0.779	0 (0)	0.688
Respiratory	208 (0.18)	177 (0.17)	28 (0.28)	0.012	1 (0.11)	0.669	2 (0.11)	0.539
Cardiac	1106 (0.94)	953 (0.91)	129 (1.29)	< 0.001	13 (1.44)	0.098	11 (0.6)	0.17
Postop Transfusion	11412 (9.72)	9930 (9.48)	1136 (11.4)	< 0.001	97 (10.72)	0.207	249 (13.65)	< 0.001
Sepsis	342 (0.29)	290 (0.28)	44 (0.44)	0.004	5 (0.55)	0.118	3 (0.16)	0.363
Time variables								
Operative Time				< 0.001		< 0.001		< 0.001
Expected	99989 (85.18)	90009 (85.96)	7760 (77.84)		715 (79.01)		1505 (82.51)	
Long Operative Time	17422 (14.84)	14704 (14.04)	2209 (22.16)		190 (20.99)		319 (17.49)	
Total length of stay				< 0.001		0.001		0.023
0–5 days	110492 (94.12)	98889 (94.44)	9072 (91)		831 (91.82)		1700 (93.2)	
> 5 days	6919 (5.89)	5824 (5.56)	897 (9)		74 (8.18)		124 (6.8)	
Discharge To				< 0.001		0.007		0.587
Non-Home Facility	26194 (22.31)	22738 (23.14)	2826 (29.93)		232 (27.07)		398 (22.59)	
Home	84138 (71.67)	75532 (76.86)	6617 (70.07)		625 (72.93)		1364 (77.41)	
Readmission Within 30 Days	3968 (3.38)	3503 (3.6)	381 (4.11)	0.013	37 (4.36)	0.239	47 (2.75)	0.062
Required Reoperation	2224 (1.89)	1970 (2.01)	213 (2.26)	0.099	18 (2.1)	0.844	23 (1.31)	0.038

*All P Values indicate comparisons to White THA reference group.

Table 3
Comparison of average operative variables by race.

	White THA	Black THA	P Value*	Hispanic THA	P Value*	Asian THA	P Value*
Operative time, min	94.0	105.0	< 0.001	105.3	< 0.001	99.0	< 0.001
Age, years	65.0	59.5	< 0.001	57.7	< 0.001	64.7	0.3636
Length of Stay, days	2.7	3.0	< 0.001	2.9	0.0119	2.7	0.9532
Body Mass Index, kg/m^2	30.2	31.7	< 0.001	31.1	< 0.001	26.8	< 0.001

*All P Values indicate comparisons to White THA reference group.

Table 4
Patient characteristics of propensity score matched cohorts.

	White (vs. Black) n (%)	Black n (%)	P Value	White (vs. Hispanic), n (%)	Hispanic n (%)	P Value	White (vs. Asian) n (%)	Asian n (%)	P Value
Sex			1			0.961			1
Male	4420 (47.15)	4420 (47.15)		409 (48)	408 (47.89)		565 (32.83)	565 (32.83)	
Female	4954 (52.85)	4954 (52.85)		443 (52)	444 (52.11)		1156 (67.17)	1156 (67.17)	
Age			1			0.953			1
< 70 yr	7510 (80.12)	7510 (80.12)		673 (78.99)	672 (78.87)		1109 (64.44)	1109 (64.44)	
≥ 70 yr	1864 (19.88)	1864 (19.88)		179 (21.01)	180 (21.13)		612 (35.56)	612 (35.56)	
Inpatient									
Functional status			1			0.891			1
Independent	9167 (97.79)	9167 (97.79)		825 (96.83)	824 (96.71)		1681 (97.68)	1681 (97.68)	
Partially Dependent	203 (2.17)	203 (2.17)		27 (3.17)	28 (3.29)		40 (2.32)	40 (2.32)	
Totally Dependent	4 (0.04)	4 (0.04)					0 (0)	0 (0)	
ASA class			1			0.961			1
Low	4551 (48.55)	4551 (48.55)		488 (57.28)	489 (57.39)		1172 (68.1)	1172 (68.1)	
High	4823 (51.45)	4823 (51.45)		364 (42.72)	363 (42.61)		549 (31.9)	549 (31.9)	
Comorbidities									
Obese (BMI > 30 kg/m^2)	5338 (56.94)	5338 (56.94)	1	456 (53.52)	456 (53.52)	1	434 (25.22)	434 (25.22)	1
Diabetes	1637 (17.46)	1637 (17.46)	1	152 (17.84)	152 (17.84)	1	222 (12.9)	222 (12.9)	1
Hypertension Medication	6500 (69.34)	6500 (69.34)	1	421 (49.41)	422 (49.53)	0.961	981 (57)	981 (57)	1
Smoker	2259 (24.1)	2259 (24.1)	1	108 (12.68)	108 (12.68)	1	139 (8.08)	139 (8.08)	1
COPD	346 (3.69)	346 (3.69)	1	26 (3.05)	26 (3.05)	1	23 (1.34)	23 (1.34)	1
Chronic steroid	423 (3.51)	423 (3.51)	1	66 (7.75)	66 (7.75)	1	70 (4.07)	70 (4.07)	1
Dialysis	31 (0.33)	31 (0.33)	1	2 (0.23)	2 (0.23)	1	3 (0.17)	3 (0.17)	1
Cancer	15 (0.16)	15 (0.16)	1	2 (0.23)	2 (0.23)	1	7 (0.41)	7 (0.41)	1
Low Hematocrit (< 30)	136 (1.45)	136 (1.45)	1	7 (0.82)	7 (0.82)	1	6 (0.35)	6 (0.35)	1
High Creatinine (≥ 2 mg/dL)	645 (6.88)	645 (6.88)	1	74 (8.69)	74 (8.69)	1	150 (8.72)	150 (8.72)	1
Low Albumin (< 3.5 g/dL)	251 (2.68)	251 (2.68)	1	20 (2.35)	21 (2.46)	0.874	20 (1.16)	20 (1.16)	1
Low Platelets (< 100 billion cells/L)	41 (0.44)	41 (0.44)	1	4 (0.47)	3 (0.35)	0.705	5 (0.29)	5 (0.29)	1
High Bilirubin (≥ 2 mg/dL)	4639 (49.49)	4639 (49.49)	1	370 (43.43)	369 (43.31)	0.961	984 (57.18)	984 (57.18)	1

Table 5
Outcomes of propensity score matched cohorts.

	White (vs. Black) n (%)	Black n (%)	P Value	White (vs. Hispanic) n (%)	Hispanic, n (%)	P Value	White (vs. Asian) n (%)	Asian n (%)	P Value
Death or serious morbidity	949 (10.12)	1170 (12.48)	< 0.001	94 (11.03)	101 (11.85)	0.594	212 (12.32)	247 (14.35)	0.079
Death	9 (0.1)	13 (0.14)	0.393	0 (0)	0 (0)	1	1 (0.06)	3 (0.17)	0.317
Serious morbidity	947 (10.1)	1170 (12.48)	< 0.001	94 (11.03)	101 (11.85)	0.594	212 (12.32)	245 (14.24)	0.097
Surgical Site Infection	2 (0.02)	1 (0.01)	0.557	0 (0)	0 (0)	1	0 (0)	0 (0)	1
Respiratory	16 (0.17)	22 (0.23)	0.33	1 (0.12)	1 (0.12)	1	3 (0.17)	2 (0.12)	0.654
Cardiac	59 (0.63)	117 (1.25)	< 0.001	5 (0.59)	12 (1.41)	0.088	9 (0.52)	11 (0.64)	0.654
Post Operative Transfusion	876 (9.34)	1043 (11.13)	< 0.001	87 (10.21)	88 (10.33)	0.936	198 (11.5)	236 (13.71)	0.051
Sepsis	20 (0.21)	35 (0.37)	0.043	1 (0.12)	4 (0.47)	0.179	6 (0.35)	2 (0.12)	0.157
Time variables									
Operative Time			< 0.001			0.01			< 0.001
Expected Operative Time	7978 (85.11)	7329 (78.18)		719 (84.39)	678 (79.58)		1520 (88.32)	1421 (82.57)	
Long Operative Time (1 SD > Mean)	1396 (14.89)	2045 (21.82)		133 (15.61)	174 (20.42)		201 (11.68)	300 (17.43)	
Total length of stay			< 0.001			0.198			0.235
0–5 days	8860 (94.52)	8610 (91.85)		804 (94.37)	791 (92.84)		1633 (94.89)	1617 (93.96)	
> 5 days	514 (5.48)	764 (8.15)		48 (5.63)	61 (7.16)		88 (5.11)	104 (6.04)	
Discharge			< 0.001			< 0.001			0.527
Discharged to Non-Home Facility	1903 (21.07)	2689 (29.45)		158 (19.04)	223 (26.71)		382 (22.94)	373 (22.03)	
Discharged to Home	7130 (78.93)	6442 (70.55)		672 (80.96)	612 (73.29)		1283 (77.06)	1320 (77.97)	
Readmission Within 30 Days	326 (3.64)	355 (3.96)	0.267	36 (4.37)	34 (4.11)	0.791	60 (3.65)	40 (2.4)	0.036
Required Reoperation	201 (2.23)	206 (2.26)	0.894	20 (2.41)	17 (2.04)	0.608	37 (2.23)	22 (1.3)	0.041

Table 6

Impact of race on outcomes compared to non-hispanic whites after multivariate analysis.

Outcomes	Black		Hispanic		Asian	
	OR	P Value*	OR	P Value*	OR	P Value*
Complications						
Death or serious morbidity	1.27	< 0.001	1.08	0.594	1.19	0.08
Death	1.45	0.396	N/A	N/A	3.00	0.341
Serious morbidity	1.27	< 0.001	1.08	0.594	1.18	0.098
Time Variables						
Long Operation Time	1.59	< 0.001	2.95	0.006	1.60	< 0.001
Length of Stay > 5 days	1.53	< 0.001	1.29	0.199	1.19	0.235
Reoperation	1.01	0.894	0.84	0.608	0.58	0.044
Readmission Within 30 Days	1.09	0.267	0.94	0.791	0.65	0.038
Discharge Home	0.64	< 0.001	0.65	< 0.001	1.05	0.527

*All P Values indicate comparisons to White THA reference group.

operation among Asians has not been previously reported.

Discrepancies in rates of discharge to home compared to non-home facility were observed between both Black and Hispanic groups when compared to the non-Hispanic White group. Differences in discharge disposition between blacks and non-Hispanic Whites have been confirmed in previous studies.[19] Discharge to a non-home facility following elective procedures has been shown to worsen clinical outcomes,[20] and is associated with increased risk of complications and 30-day readmissions.[21] This discrepancy in discharge location could be influencing differences observed in our cohort.

A limitation of our study was that our assessment of complications only included the first 30 days after THA. Additionally, our study was limited because the majority of patients (89.18%) were listed as non-Hispanic White. The relatively few number of Black, Hispanic, and Asian patients limited our ability to make substantial claims when comparing populations. This is most likely in part due to the differences in utilization rates of arthroplasty in the United States.[13] Additional factors, such as socioeconomic status, social support and regional differences in care could not be controlled for in this study, but undoubtedly play a role in healthcare related racial disparities. In addition, it is difficult to determine whether differences in trust, compliance or racial bias are a contributing factor to the differences noted.

Despite the NSQIPs limitations, including likely under-reporting of morbidities, using the NSQIP has been shown to be a reliable method of examining short-term complications following surgery.[22,23] Furthermore, since the majority of surgical complications occur within 30 days of the original surgery, we do not believe that including long-term complications would have altered our results dramatically. Additionally, any potential underreporting among surgeons is likely to be consistent across racial groups. The NSQIP dataset is limited to general medical and administrative complications such as reoperation and readmission, so analysis of complications specific to THA, such as dislocation and periprosthetic fracture were unable to be evaluated. The dataset also lacks patient reported outcome or functional outcome measures.

Our results show profound differences in surgical outcomes based on race, even after controlling for comorbidities. Identification of patients at greater risk of complications can provide physicians a better estimate of operative risks. This work opens up the possibility for further study of these differences, as well as assessing the consistency of trends across a variety of both elective and non-elective surgical procedures. Future research may focus on identifying differences in functional and patient reported outcomes between racial groups following THA.

Declaration of competing interest

Mr. Johnson has nothing to disclose.
Dr. Sloan has nothing to disclose.
Dr. Serra Lopez has nothing to disclose.
Dr. Andah has nothing to disclose.
Dr. Sheth reports consultation fees from Zimmer Biomet, consultation fees from Medacta, consultation fees from Smith and Nephew, outside the submitted work.
Dr. Nelson reports consultation fees from Exactech, consultation fees from Zimmer Biomet, outside the submitted work.

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