Have All Races Experienced Reductions in Complication Rates following Total Hip Arthroplasty? A NSQIP Analysis Between 2011 and 2019

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INTRODUCTION: Despite numerous articles in the orthopaedic literature evaluating racial and ethnic disparities, inequalities in total joint arthroplasty outcomes remain. There also remains inconsistencies in the literature regarding the association of race with postoperative outcome inequalities partly due to variations in comorbidity assessment and utilized time frames. While the National Surgical Quality Improvement (NSQIP) database has been previously utilized to highlight these disparities, no previous analysis has evaluated how the rate of various perioperative complications has changed over recent years when segregating by patient race. Specifically, we evaluated if all races have experienced decreases in 1) medical complications, 2) wound complications, 3) venous thromboembolism (VTE), and 4) readmission/reoperation rates following total hip arthroplasty (THA) over recent years.

METHODS:

Current Procedural Terminology (CPT) code 27130 (total hip arthroplasty) was utilized to identify all THA procedures conducted between 2011 and 2019. Patients were segregated according to race and various demographics were collected. Linear regression was utilized to evaluate changes in each complication rate between 2011 and 2019. A multivariate regression was then conducted for each complication to evaluate whether race independently was associated with each outcome. Medical complications included myocardial infarction (MI), renal insufficiency, urinary tract infection (UTI), and acute renal failure. VTE included rates of pulmonary embolism (PE) and deep vein thrombosis (DVT). Wound complications captured wound dehiscence, superficial surgical site infection (SSI), and deep SSI. A *p*-value <0.05 was considered statistically significant.

RESULTS:

Our analysis included a total of 212,091 patients undergoing primary THA **(Table 1)**. This included 182,681 (85.76%) White, 19,267 (9.04%) Black, 5,928 (2.78%) Hispanic, and 4,215 (1.98%) Asian patients. We found that for UTI, acute renal failure, and superficial SSI, White patients experienced significant reductions between 2011 and 2019. However, this was not consistent across all races **(Table 2)**. Likewise, while the overall and isolated White cohorts experienced reductions in readmissions over our study period, there were no changes seen for Black, Hispanic, and Asian patients. Black race was associated with a significantly increased risk of acute renal failure (OR: 2.03, 95% CI: 1.17 to 3.34; *p*=0.008), renal insufficiency (OR: 2.33, 95% CI: 1.62 to 3.28; *p*<0.001), DVT (OR: 1.34, 95% CI: 1.07 to 1.66; *p*=0.01), and PE (OR: 1.76, 95% CIL: 1.36 to 2.24; *p*<0.001) (**Table 3).**

DISCUSSION AND CONCLUSION:

Our analysis highlights specific complications for which further interventions are necessary to reduce inequalities across races. Specifically, all races have not experienced comparable reductions in medical complication, readmission, and superficial SSI rates. These include medical optimization, increased patient education, and continued efforts at understanding how social factors may impact related care inequalities. Future study is needed to evaluate specific interventions that can be applied at the health systems level to ensure all patients undergoing THA receive the highest quality of care regardless of race. These studies should explore methods of addressing social determinants of health (SDOH) as well as biases that may impact the provision of care as well as perioperative management.

Table 1. Characteristics of Cohorts Stratifying by Patient Race.

Variable	Asian, N = 4,215*	Black, N = 19,267*	Hispanic, N = 5,928*	White, N = 182,681*
Age Category				
18-29	51 / 4,215 (1.2%)	310 / 19,267 (1.6%)	104 / 5,928 (1.8%)	684 / 182,681 (0.4%)
30-39	116 / 4,215 (2.8%)	617 / 19,267 (3.2%)	259 / 5,928 (4.4%)	2,369 / 182,681 (1.3%)
40-49	276 / 4,215 (6.5%)	2,198 / 19,267 (11%)	661 / 5,928 (11%)	8,880 / 182,681 (4.9%)
50-59	830 / 4,215 (20%)	5,784 / 19,267 (30%)	1,503 / 5,928 (25%)	37,449 / 182,681 (20%)
60-69	1,425 / 4,215 (34%)	6,304 / 19,267 (33%)	1,782 / 5,928 (30%)	63,946 / 182,681 (35%)
70-79	1,040 / 4,215 (25%)	3,151 / 19,267 (16%)	1,177 / 5,928 (20%)	48,279 / 182,681 (26%)
80-89	431 / 4,215 (10%)	844 / 19,267 (4.4%)	396 / 5,928 (6.7%)	18,485 / 182,681 (10%)
90+	46 / 4,215 (1.1%)	59 / 19,267 (0.3%)	46 / 5,928 (0.8%)	1,649 / 182,681 (0.9%)
Sex				
Female	2,697 / 4,214 (64%)	10,280 / 19,267 (53%)	3,173 / 5,928 (54%)	100,980 / 182,672 (55%)
BMI	27.34 (5.67)	31.61 (6.74)	30.53 (5.90)	30.15 (6.31)
ASA Physical Classification System				
1-No Disturb	240 / 4,215 (5.7%)	349 / 19,267 (1.8%)	183 / 5,928 (3.1%)	5,733 / 182,681 (3.1%)
2-Mild Disturb	2,468 / 4,215 (59%)	8,730 / 19,267 (45%)	3,177 / 5,928 (54%)	97,395 / 182,681 (53%)
3-Severe Disturb	1,451 / 4,215 (34%)	9,673 / 19,267 (50%)	2,443 / 5,928 (41%)	75,939 / 182,681 (42%)
4-Life Threat	52 / 4,215 (1.2%)	509 / 19,267 (2.6%)	124 / 5,928 (2.1%)	3,573 / 182,681 (2.0%)
5-Moribund	0 / 4,215 (0%)	1 / 19,267 (<0.1%)	0 / 5,928 (0%)	31 / 182,681 (<0.1%)
None assigned	4 / 4,215 (<0.1%)	5 / 19,267 (<0.1%)	1 / 5,928 (<0.1%)	130 / 182,681 (<0.1%)
Modified Charlson Comorbidity Index				
0-2	2,598 / 4,215 (62%)	14,114 / 19,267 (73%)	4,103 / 5,928 (69%)	107,515 / 182,681 (59%)
3-4	1,550 / 4,215 (37%)	4,800 / 19,267 (25%)	1,723 / 5,928 (29%)	70,788 / 182,681 (39%)
5+	67 / 4,215 (1.6%)	353 / 19,267 (1.8%)	102 / 5,928 (1.7%)	4,378 / 182,681 (2.4%)
Principal Anesthesia Technique				
Epidural	30 / 4,215 (0.7%)	244 / 19,267 (1.3%)	35 / 5,928 (0.6%)	1,070 / 182,671 (0.6%)
General	1,965 / 4,215 (47%)	11,523 / 19,267 (60%)	3,637 / 5,928 (61%)	96,437 / 182,671 (53%)
Local	1 / 4,215 (<0.1%)	4 / 19,267 (<0.1%)	0 / 5,928 (0%)	40 / 182,671 (<0.1%)
MAC/IV Sedation	349 / 4,215 (8.3%)	2,516 / 19,267 (13%)	580 / 5,928 (9.8%)	21,681 / 182,671 (12%)
None	0 / 4,215 (0%)	4 / 19,267 (<0.1%)	0 / 5,928 (0%)	31 / 182,671 (<0.1%)
Other	2 / 4,215 (<0.1%)	24 / 19,267 (0.1%)	2 / 5,928 (<0.1%)	98 / 182,671 (<0.1%)
Regional	44 / 4,215 (1.0%)	223 / 19,267 (1.2%)	61 / 5,928 (1.0%)	3,877 / 182,671 (2.1%)
Spinal	1,824 / 4,215 (43%)	4,724 / 19,267 (25%)	1,512 / 5,928 (27%)	59,419 / 182,671 (33%)
Unknown	0 / 4,215 (0%)	5 / 19,267 (<0.1%)	1 / 5,928 (<0.1%)	18 / 182,671 (<0.1%)
Operative Time	101.52 (43.23)	104.46 (43.28)	103.23 (43.49)	92.67 (38.81)

*n / N (%); Mean (SD)

Table 2. Changes in Complication Rates (As Percentages) Across Races from 2011 to 2019.

Complications		Overall			White			Black			Hispanic			Asian		
		2011	2019	p-value	2011	2019	p-value	2011	2019	p-value	2011	2019	p-value	2011	2019	p-value
Medical Complications	Myocardial Infarction	0.002	0.002	0.342	0.002	0.002	0.402	0.005	0.003	0.208	0.01	0.002	0.917	0	0.003	0.316
	Acute Renal Failure	0.001	<0.001	0.186	0.001	<0.001	0.046	0.004	0.001	0.529	0	0	1	0	0	N/A
	Renal Insufficiency	<0.001	<0.001	0.152	<0.001	<0.001	0.023	0.004	<0.001	0.221	0	<0.001	0.308	0	0	0.333
	Urinary Tract Infection	0.01	0.008	0.020	0.01	0.008	0.036	0.015	0.006	0.036	0.025	0.01	0.029	0.025	0.01	0.048
Venous Thromboembolism	Deep Vein Thrombosis	0.004	0.004	0.942	0.004	0.004	0.989	0.007	0.004	0.158	0	0.004	0.308	0	0.005	0.324
	Pulmonary Embolism	0.003	0.003	0.607	0.002	0.003	0.053	0.007	0.004	0.075	0	0.002	0.343	0	0.002	1
Wound Complications	Deep SSI	0.002	<0.001	0.175	0.002	<0.001	0.048	0.006	0.001	0.056	0	0.001	1	0	0	0.205
	Superficial SSI	0.01	0.002	<0.001	0.01	0.002	0.002	0.01	0.002	0.005	0.03	0.005	0.118	0.008	0.002	1
	Wound Dehiscence	0.002	0.002	1	0.002	0.003	0.956	0.004	0.003	0.662	0	0.002	0.136	0.008	0	1
Readmission/Reoperation	Readmission	0.009	0.004	<0.001	0.009	0.004	0.003	0.008	0.01	0.984	0.025	0.029	0.917	0.029	0.029	0.059
	Reoperation	0.02	0.018	0.342	0.02	0.019	0.096	0.028	0.031	0.948	0	0.034	0.294	0.07	0.01	0.294

Table 3. Multivariate Regression for How Race is Associated with Evaluated Outcomes.

Outcome			Race		
			Black	Hispanic	Asian
Medical Complications	Myocardial Infarction	OR	0.77	0.85	0.58
		95% CI	0.51, 1.11	0.42, 1.51	0.21, 1.26
		p-value	0.18	0.61	0.23
	Acute Renal Failure	OR	2.03	1.59	0
		95% CI	1.17, 3.34	0.49, 3.84	N/A
		p-value	0.008	0.36	0.98
	Renal Insufficiency	OR	2.33	0.79	0.8
		95% CI	1.62, 3.28	0.24, 1.86	0.13, 2.51
		p-value	<0.001	0.63	0.75
	Urinary Tract Infection	OR	0.92	1.22	1.18
		95% CI	0.72, 1.10	0.92, 1.58	0.85, 1.60
		p-value	0.37	0.15	0.3
Wound Complications	Deep SSI	OR	1.08	0.9	0.85
		95% CI	0.80, 1.43	0.48, 1.53	0.33, 1.74
		p-value	0.59	0.71	0.69
	Superficial SSI	OR	0.82	0.74	0.69
		95% CI	0.46, 0.81	0.44, 1.14	0.34, 1.22
		p-value	<0.001	0.2	0.24
	Wound Dehiscence	OR	1.04	1.25	0.75
		95% CI	0.70, 1.50	0.62, 2.24	0.18, 1.92
		p-value	0.82	0.5	0.59
Venous Thromboembolism	Deep Vein Thrombosis	OR	1.34	1.39	0.48
		95% CI	1.07, 1.66	0.94, 1.97	0.21, 0.93
		p-value	0.01	0.08	0.054
	Pulmonary Embolism	OR	1.76	1.55	0.78
		95% CI	1.36, 2.24	0.97, 2.35	0.33, 1.52
		p-value	<0.001	0.051	0.51
Readmission/Reoperation	Readmission	OR	1.07	0.91	0.75
		95% CI	0.95, 1.10	0.78, 1.05	0.61, 0.91
		p-value	0.085	0.2	0.005
	Any Reoperation	OR	0.88	0.82	0.78
		95% CI	0.79, 0.98	0.66, 1.00	0.60, 1.01
		p-value	0.026	0.051	0.069