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Patient race and ethnicity are associated with higher unplanned 90-day emergency department visits and readmissions but not 10-year all-cause complications or reoperations: a matched cohort analysis of primary shoulder arthroplasties

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Background: Within orthopedic surgery, there remain limited data evaluating the impact of racial and socioeconomic disparities on outcomes of primary shoulder arthroplasty (SA) over time. As such, we analyzed both short- and longer-term outcome differences in complications, reoperations, and revision surgery of primary SA when performed in non-White patients when compared to a matched cohort of White patients who had undergone SA.

Methods: Over a 39-year period (1981-2020), an institutional Total Joint Registry Database was utilized to identify all non-White patients (Asian/Pacific Islander, Black, Hispanic or Latino, American Indian/Alaska Native, other) who underwent primary SA with a minimum of 2 years of follow-up. The search identified 275 primary SA (46 hemiarthroplasties, 97 anatomic total shoulder arthroplasties, and 132 reverse total shoulder arthroplasties). The ethnicity composition was 8.7% Asian, 27.3% Black, 37.8% Hispanic, 12.4% American Indian, and 13.8% other. This cohort was matched 1:2 according to age, sex, diagnosis, implant, and surgical year to a control group of 550 White patients who had undergone SA. The rates of medical and surgical complications, reoperations, revisions, and implant survivorship were assessed. The mean follow-up time was 6.3 years (range, 2 to 40 years).

Results: Comparisons between the non-White and White matched cohorts demonstrated a higher rate of tobacco use (14.2% vs. 10.5%; $P < .001$), diabetes (21.5% vs. 11.8%; $P < .001$), length of stay (1.9 vs. 1.6 days; $P = .014$), and a lower rate of private commercial insurance (27.3% vs. 44.5%; $P < .001$ in the non-White cohort. Within the first 90 days after surgery, non-White patients had a higher rate of emergency department visits (5.5% vs. 0.9%; $P < .001$) and unplanned readmissions (2.9% vs. 0.7%; $P = .014$). After the first 90 postoperative days, there were no differences regarding medical (1.8% vs. 0.7%; $P = .135$) or surgical complications (12.0% vs. 13.6%; $P = .446$). Ten-year survivorship free of all-cause complication (76.8% vs. 81.5%; $P = .370$), reoperation (84.9% vs. 89.8%; $P = .492$), and revision (89.3% vs. 91.4%; $P = .715$) were similar between the non-White and White cohorts.

Discussion: After accounting for age, sex, and surgical indication, patient race and ethnicity were not associated with an increased risk of long-term all-cause complications, reoperations, or revision surgery after primary SA. However, within the first 90 postoperative days, non-White patients had a higher likelihood of unplanned emergency room visits and readmissions.

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Over the last 10 years there has been an increase in resources dedicated to investigating racial and socioeconomic disparities in the field of health care.[8,17,22,34] In orthopedic surgery, several programs have been recently developed to address the existing disparity gap between patient populations.[6,28] However, there are still significant reports of disparities in minority groups and those

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with a lower socioeconomic status.[1,10,19,27] Within orthopedics, a majority of studies focus on the widening disparities in healthcare utilization of total joint arthroplasty that is not shared equally among races.[2,7,18,39] However, more recently there has been additional data from other subspecialties presenting outcome differences based on race and socioeconomic status.[3,11,20,31,43]

With respect to shoulder arthroplasty (SA), there have been recent investigations assessing differences in outcomes regarding race, insurance status, and socioeconomic status. Specifically, several investigations have demonstrated decreased rates of SA utilization in Black patients compared to White patients.[5,12,13,26,33] Additionally, a few studies have observed worse short-term outcomes (longer hospital stays, increased surgical site infection, increased readmission rates, etc.) in this population.[5,24,33] These studies have primarily been limited to the use of national insurance claims databases, which leads to analyses focusing on short-term outcomes and differences between Black and White patients.[37,41]

As such, the present study aimed to build on the current literature by presenting a longitudinal analysis of outcomes after SA based on race/ethnicity. Specifically, we analyzed both short- and longer-term outcome differences in complications, reoperations, and revision surgery of primary SA when performed in minority patients when compared to a matched cohort of White patients who had undergone SA.

Methods

This retrospective cohort study was approved by our institutional review board and utilized a prospectively maintained institutional Total Joint Registry Database.[35] All adult patients who underwent a primary SA between January 1981 and July 2020 were identified (n = 11,063). Next, an institutional natural language processing data screening tool was utilized to identify the self-reported race/ethnicity that was recorded prior to the first clinic visit in the electronic medical record (EMR). A manual EMR review was then performed to confirm the patient's self-reported race, preoperative surgical indication, insurance status, and final follow-up. Patients were then categorized as Asian American and Pacific Islander, Black or African American, Hispanic or Latino, American Indian and Alaska Native, and non-Hispanic White. The "other' subgroup consisted of non-Hispanic White patients with a self-reported race that could not be classified within the aforementioned groups.

All non-White SA (n = 323) with confirmed self-reported race/ethnicity were collected. Exclusions were then applied to those with less than 2 years of clinical follow-up (n = 23), death prior to 2 years of follow-up (n = 12), primary oncologic reconstructions (n = 7), and SA for a concurrent native septic shoulder (n = 6). The final non-White study cohort consisted of 275 primary shoulder replacements in the form of 46 (16.7%) hemiarthroplasties, 97 (35.3%) anatomic total shoulder arthroplasties (aTSA), and 132 (48.0%) reverse total shoulder arthroplasties (rTSA). The non-White SA group included 24 (8.7%) Asian, 75 (27.3%) Black, 104 (37.8%) Hispanic, 34 (12.4%) American Indian, and 38 (13.8%) other SA with a mean age of 62.8 ± 15.4 and a body mass index of 30.2 ± 7.5.This cohort was then matched 1:2 according to age, sex, operative indication, implant type, and surgical year to a control group of 550 White SA.

All shoulder replacements were performed by one of 21 upper extremity surgeons utilizing a standard deltopectoral approach in the beach chair position. The decision between the various prosthetic types was based on surgeon experience and preference. Factors involved in the decision-making included patients' underlying diagnosis, baseline activity level, physical examination, rotator cuff tendon integrity, and glenoid wear. All final individual medical records were then reviewed to obtain relevant clinical data: complications, reoperations, and revision surgery (exchange or placement of new components).

Statistical analysis

The statistical analysis was performed utilizing SAS (SAS Studio, version 3.81; SAS Institute Inc., Cary, NC, USA) and R (RStudio version 3.2.0; R Core Team, R Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics were reported as mean and standard deviation for continuous variables with count and percentage for categorical variables. Baseline characteristics and surgical data were compared between the non-White and White cohorts using Kruskal-Wallis tests for continuous variables and χ^2 test for categorical variables, respectively. Univariable logistic regression was utilized to assess an association between risk factors and 90-day postoperative outcomes. Afterward, the association between risk factors and complications, reoperations, and revisions were analyzed using univariable Cox regression models. Survivorship free of any complication, reoperation, or revision were independently assessed using the Kaplan-Meier Method. All statistical tests were two-sided, with significance set at a level of $P < .05$.

Results

Comparisons between the non-White and White matched cohorts demonstrated a higher rate of tobacco use (14.2% vs. 10.5%; $P < .001$), diabetes (21.5% vs. 11.8%; $P < .001$), hypertension (59.0% vs. 50.7%; $P = .026$), and length of stay (1.9 vs. 1.6 days; $P = .014$) in the non-White cohort. The non-White cohort also demonstrated lower rates of English as a primary language (82.5% vs. 96.4%; $P < .001$), private commercial insurance (27.3% vs. 44.5%; $P < .001$), and follow-up (4.8 vs. 7.0 years; $P < .001$). No other differences were observed in age, sex, body mass index, SA indication, implant, anesthesia time, operating room time, and discharge disposition (Table I).

Within 90 days of their SA, the non-White cohort had higher rates of emergency department (ED) visits (5.5% vs. 0.9%; $P < .001$) and hospital readmissions (2.9% vs. 0.7%, $P < .001$). The reasons for unplanned returns are listed in Table II. Notably, the non-White group had higher returns due to recalcitrant pain (2.2% vs. 0%; $P < .001$), superficial wound infection (2.2% vs. 0.4%; $P = .012$), instability (1.5% vs. 0%; $P = .005$), and acromial or scapular spine fractures (1.5% vs. 0%; $P = .045$).

Beyond 90 days, there were no differences between the two cohorts with respect to medical complications (1.8% vs. 0.7%; $P = .135$), surgical complications (12.0% vs. 13.6%; $P = .446$), all-cause complications (13.1% vs. 14.4%; $P = .370$), all-cause reoperations (7.6% vs. 9.1%; $P = .492$), or all-cause revision surgery (5.1% vs. 8.2%; $P = .715$). Furthermore, there were no notable differences between the types of medical and surgical complications sustained by the non-White and White cohorts (Table III). Kaplan-Meier survivorship demonstrated no differences in rates of all-cause complications at 2 years (91.3% vs. 90.5%), 5 years (87.3% vs. 88.1%), or 10 years (76.8% vs. 81.5%; $P = .370$) (Figs. 1 and 2); no differences in rates of all-cause reoperations at 2 years (95.0% vs. 95.6%), 5 years (92.1% vs. 93.3%), or 10 years (84.9% vs. 89.8%; $P = 0.492$) (Fig. 3); and no differences in rates of revision surgery at 2 years (96.6% vs. 96.5%), 5 years (94.9% vs. 94.0%), or 10 years (89.3% vs. 91.4%; $P = .715$) between the two cohorts, respectively (Fig. 4, Table IV).

A logistic regression analysis was utilized to assess risk factors that were associated with all-cause complications, reoperations, and revision surgery and are listed in Table V. Notable associations were smoking with reoperations (hazard ratio [HR], 2.06 [95% confidence interval (CI), 1.18-3.87]; $P = .018$) and revision surgery

Table I
Baseline demographic, comorbidities, and clinical characteristics of SA by race.

	Non-White (N = 275)	White (N = 550)	*P* value
Age, y	62.8 (15.41)	63.6 (14.10)	.456
Sex			>.999
Male	129 (46.9%)	258 (46.9%)	
Female	146 (53.1%)	292 (53.1%)	
BMI, kg/m2	30.2 (7.5)	30.6 (6.7)	.208
English as primary language	227 (82.5%)	530 (96.4%)	**<.001**
Comorbid conditions			
ASA score	2.5 (0.6)	2.5 (0.6)	.803
Tobacco use	39 (14.2%)	58 (10.5%)	**<.001**
Alcohol use	14 (5.2%)	41 (7.5%)	.066
Drug use	7 (2.6%)	6 (1.1%)	.111
Diabetes	59 (21.5%)	65 (11.8%)	**<.001**
Hypertension	161 (59.0%)	279 (50.7%)	**.026**
Heart condition	57 (20.7%)	130 (23.6%)	.347
Kidney disease	34 (12.4%)	39 (7.1%)	**.019**
History of cancer	55 (20.0%)	89 (16.2%)	.173
Insurance			**<.001**
Private	75 (27.3%)	245 (44.5%)	
Medicare	152 (55.3%)	284 (51.6%)	
Medicaid	21 (7.6%)	4 (0.7%)	
Self	7 (2.5%)	1 (0.2%)	
Other/uninsured	9 (3.3%)	16 (2.9%)	
SA indication			>.999
Osteoarthritis	126 (45.8%)	252 (45.8%)	
Rotator cuff tear arthropathy	86 (31.3%)	172 (31.3%)	
Avascular necrosis	25 (9.1%)	50 (9.1%)	
Acute fracture	14 (5.1%)	28 (5.1%)	
Inflammatory OA	14 (5.1%)	28 (5.1%)	
Malunion/Nonunion	10 (3.6%)	20 (3.6%)	
Implant			>.999
Hemi	46 (16.7%)	92 (16.7%)	
aTSA	97 (35.3%)	194 (35.3%)	
rTSA	132 (48.0%)	264 (48.0%)	
Anesthesia time, min	175.7 (68.9)	173.1 (56.7)	.762
OR time, min	103.0 (60.90)	95.6 (47.91)	.264
Length of stay, d	1.9 (1.8)	1.6 (1.2)	**.014**
Discharge disposition			.566
Home	243 (88.4%)	493 (89.6%)	
Home with healthcare services	10 (3.6%)	17 (3.1%)	
Facility	22 (8.0%)	40 (7.3%)	
Follow-up, y	4.8 (4.3)	7.0 (5.1)	**<.001**

SA, shoulder arthroplasty; *BMI*, body mass index; *ASA*, American Society of Anesthesiologists; *OA*, osteoarthritis; *Hemi*, hemiarthroplasty; *aTSA*, anatomic total shoulder arthroplasty; *rTSA*, reverse total shoulder arthroplasty; *OR*, operating room.
All values are reported as the number and percentage except or as the mean (standard deviation).
Bold values represent statistical significance ($P < .05$).

(HR, 1.96 [95% CI, 1.01-3.84]; $P = .048$), private insurance with higher reoperations (HR, 1.81 [95% CI, 1.13-3.02]; $P = .018$), and rotator cuff arthropathy with all-cause complications (HR, 2.13 [95% CI, 1.01-4.48]; $P = .047$).

Discussion

The relationship between race, socioeconomic status, and patient outcomes has become an area of increasing investigation in addition to representing an avenue for improvement within clinical care. This matched cohort study demonstrated that non-White patients undergoing a primary SA had a higher likelihood of unplanned emergency room visits and hospital readmissions within the first 90 postoperative days. However, over time both non-White and White patients demonstrated similar risks of all-cause complications, reoperations, and revision surgery after primary SA.

Within the SA literature, analyses on race and socioeconomic status have been previously performed primarily utilizing national

Table II
Details regarding the 90-day postoperative adverse events between cohorts.

Variables	Non-White (N = 275) (%)	White (N = 550) (%)	*P* value
ED visits and readmissions	23 (8.4)	9 (1.6)	**<.001**
ED visits	15 (5.5)	5 (0.9)	**<.001**
Readmissions	8 (2.9)	4 (0.7)	**.014**
Etiologies of unplanned returns			
Recalcitrant shoulder pain	6 (2.2)	0 (0)	**<.001**
Sickle cell crisis	1 (0.4)	0 (0)	.157
Superficial wound infection	6 (2.2)	2 (0.4)	**.012**
Instability	4 (1.5)	0 (0)	**.005**
Acromial or scapular spine fracture*	2 (1.5)	0 (0)	**.045**
Healthcare-associated pneumonia	1 (0.4)	1 (0.2)	.617
Arrhythmia	1 (0.4)	0 (0)	.157
Acute kidney injury	1 (0.4)	0 (0)	.157
Cerebrovascular accident/stroke	1 (0.4)	0 (0)	.157
Myocardial infarction	1 (0.4)	0 (0)	.157
Prosthetic joint infection	0 (0)	1 (0.2)	.479
Arthrofibrosis	0 (0)	1 (0.2)	.479
Aortic dissection	0 (0)	1 (0.2)	.479
Pulmonary embolus	0 (0)	1 (0.2)	.479
Acute cholelithiasis	0 (0)	1 (0.2)	.479
Complications	17 (6.2)	20 (3.6)	.177
Surgical complications	14 (5.1)	15 (2.7)	.217
Medical complications	4 (1.5)	4 (0.7)	.325
Reoperations	5 (1.8)	5 (0.9)	.270
Revision surgery	4 (1.5)	4 (0.7)	.325

ED, emergency department.
All values are reported as the number and percentage except.
Bold values represent statistical significance ($P < .05$).
*Proportions calculated based on reverse total shoulder arthroplasty alone.

Table III
Details regarding complications and reoperations between cohorts.

Variables	Non-White (N = 275) (%)	White (N = 550) (%)	*P* value
All-cause complications	36 (13.1)	79 (14.4)	.370
Medical complications	5 (1.8)	5 (0.7)	.135
Acute cholelithiasis	0 (0)	1 (0.2)	.479
Acute kidney injury	1 (0.4)	0 (0)	.157
Arrhythmia	1 (0.4)	0 (0)	.157
Aortic dissection	0 (0)	1 (0.2)	.479
Cerebrovascular accident/stroke	1 (0.4)	0 (0)	.157
Healthcare-associated pneumonia	1 (0.4)	1 (0.2)	.617
Myocardial infarction	1 (0.4)	0 (0)	.157
Pulmonary embolus	0 (0)	1 (0.2)	.479
Surgical complications	33 (12.0)	75 (13.6)	.446
Noninfectious complications	27 (9.8)	65 (11.8)	.390
Acromial or scapular spine fracture*	7 (5.3)	11 (4.2)	.609
Aseptic component loosening	4 (1.5)	17 (3.1)	.160
Glenoid	3 (1.1)	15 (2.7)	.129
Humerus	0 (0)	2 (0.4)	.317
Notching and polyethylene wear*	1 (0.8)	0 (0)	.327
Arthrofibrosis	2 (0.7)	4 (0.7)	>.999
Greater tuberosity resorption	0 (0)	2 (0.4)	.317
Instability	6 (2.2)	6 (1.1)	.217
Neural palsy or neuropathy	1 (0.4)	2 (0.4)	>.999
Periprosthetic fracture	3 (1.1)	7 (1.3)	.822
Progressive glenoid arthrosis†	1 (2.2)	6 (6.5)	.273
Rotator cuff failure‡	3 (2.1)	10 (3.5)	.426
Subscapularis failure‡	1 (0.7)	7 (2.4)	.207
Infectious complications	6 (2.2)	10 (1.8)	.721
Prosthetic joint infection	2 (0.7)	5 (0.9)	.788
Superficial wound complication	4 (1.5)	5 (0.9%)	.477
All-cause reoperations	21 (7.6)	50 (9.1)	.492
All-cause revision surgery	14 (5.1)	45 (8.2)	.715

Data are presented as number (percentage).
*Proportions calculated based on reverse total shoulder arthroplasty alone.
†Proportions calculated based on hemiarthroplasty alone.
‡Proportions calculated based on hemiarthroplasty and anatomic total shoulders.

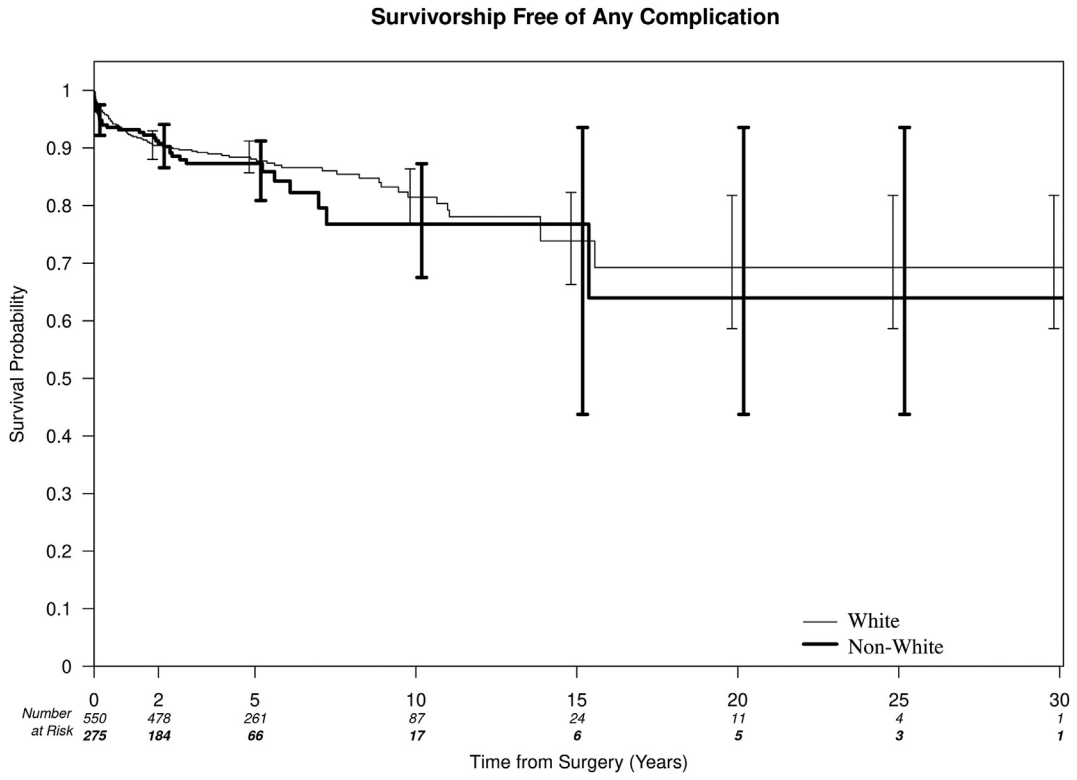

Figure 1 Kaplan-Meier survivorship free of any complication across all cohorts up to 30 years after shoulder arthroplasty. The error bars represent the 95% confidence intervals.

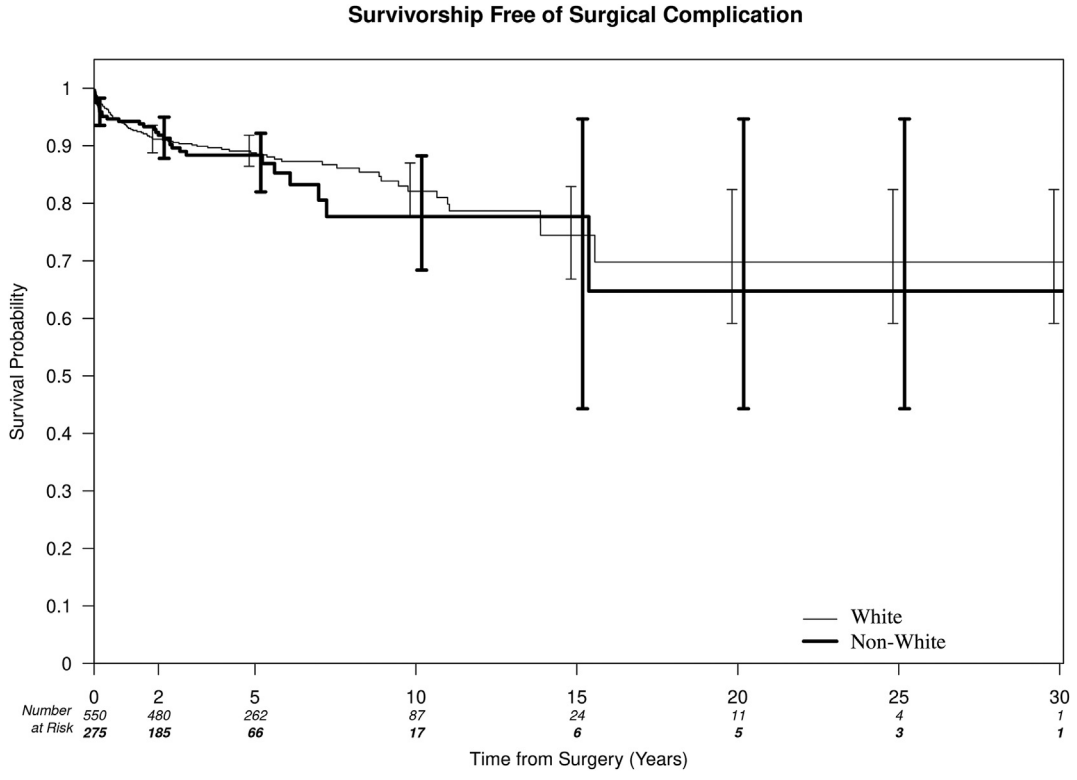

Figure 2 Kaplan-Meier survivorship free of any surgical complication across all cohorts up to 30 years after shoulder arthroplasty. The error bars represent the 95% confidence intervals.

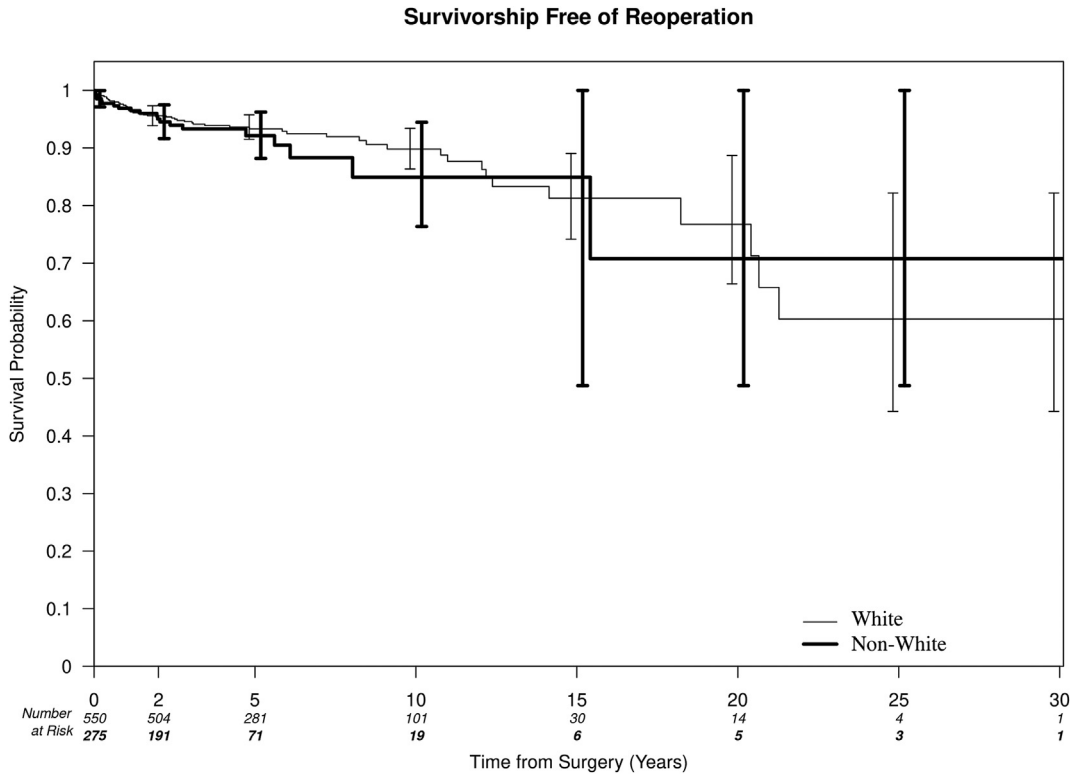

Figure 3 Kaplan-Meier survivorship free of any reoperation across all cohorts up to 30 years after shoulder arthroplasty. The error bars represent the 95% confidence intervals.

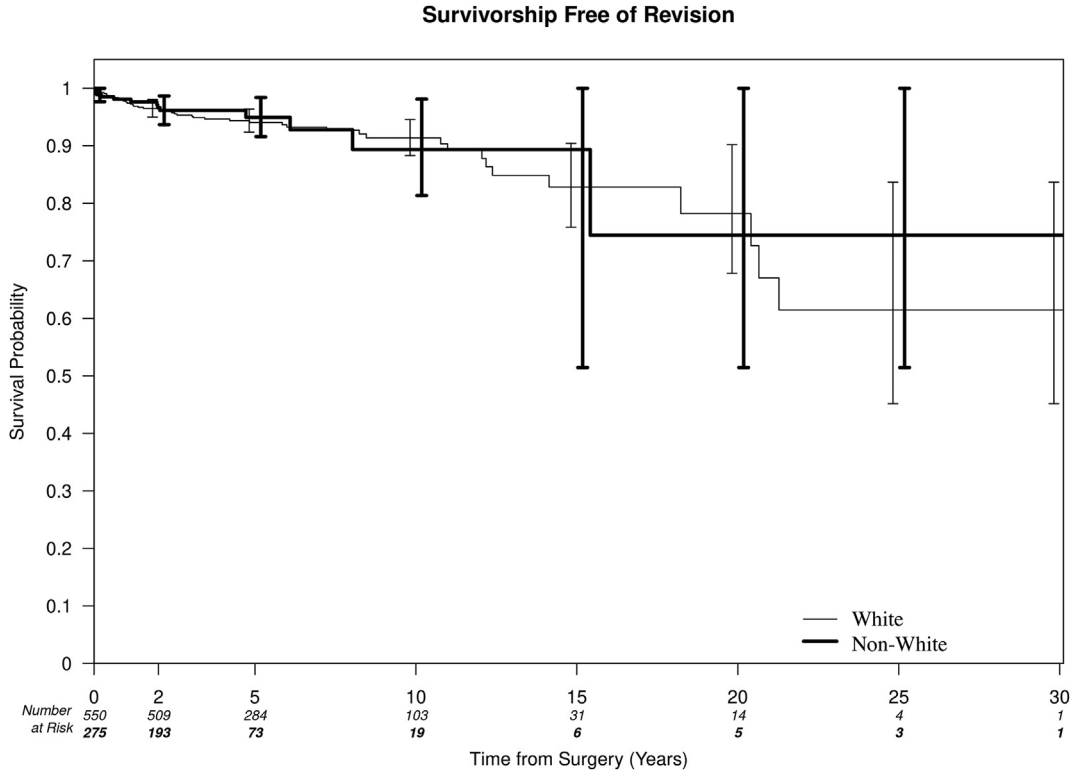

Figure 4 Kaplan-Meier survivorship free of any revision across all cohorts up to 30 years after shoulder arthroplasty. The error bars represent the 95% confidence intervals.

Table IV
Survivorship free of any complication, reoperation, or revision.

Strata	1 y (95% CI)	2 y (95% CI)	5 y (95% CI)	10 y (95% CI)	HR (95% CI)	*P* value
Survivorship free of complication						
Non-White	93.2% (90.1, 96.3)	91.3% (87.8, 94.8)	87.3% (83.0, 91.9)	76.8% (67.5, 87.3)	1.23 (0.81, 1.80)	.370
White	92.9% (90.7, 95.1)	90.5% (88.01, 92.9)	88.1% (85.3, 90.9)	81.5% (76.8, 86.4)	1.0 (ref.)	
Survivorship free of reoperation						
Non-White	96.9% (94.8, 99.0)	95.0% (92.3, 97.8)	92.1% (88.2, 96.2)	84.9% (76.4, 94.5)	1.20 (0.71, 2.01)	.492
White	97.2% (95.9, 98.6)	95.6% (93.9, 97.3)	93.3% (91.1, 95.5)	89.8% (86.3, 93.4)	1.0 (ref.)	
Survivorship free of revision						
Non-White	98.1% (96.5, 99.8)	96.6% (94.4, 99.0)	94.9% (91.6, 98.4)	89.3% (81.4, 98.1)	0.89 (0.49, 1.60)	.715
White	97.6% (96.3, 98.9)	96.5% (95.0, 98.1)	94.0% (92.0, 96.2)	91.4% (88.3, 94.5)	1.0 (ref.)	

CI, confidence interval; *HR*, hazard ratio.

Table V
Univariate Cox proportional hazard analysis for complications, reoperations, and revisions.

Variable	All-cause complications		Reoperations		Revision	
	HR*	*P* value	HR*	*P* value	HR*	*P* value
Race						
White	1.00 (reference)	–	1.00 (reference)	–	1.00 (reference)	–
Non-White	1.23 (0.81, 1.80)	.370	1.20 (0.71, 2.01)	.492	0.89 (0.49, 1.60)	.715
Smoking	1.43 (0.83-2.30)	.218	2.06 (1.18-3.87)	**.018**	1.96 (1.01-3.84)	**.048**
Diabetes	1.45 (0.84-2.21)	.207	1.38 (0.72-2.56)	.354	1.53 (0.80-2.97)	.196
Hypertension	0.88 (0.61-1.32)	.509	0.81 (0.50-1.38)	.368	0.91 (0.54-1.57)	.721
Kidney disease	0.75 (0.35-1.64)	.468	0.54 (0.17-1.78)	.292	0.44 (0.11-1.87)	.250
Insurance						
Medicare	1.00 (reference)	–	1.00 (reference)	–	1.00 (reference)	–
Private	0.97 (0.66-1.40)	.867	1.81 (1.13-3.02)	**.018**	1.56 (0.91-2.70)	.104
Medicaid	0.56 (0.11-2.90)	.485	1.43 (0.27-7.70)	.667	1.64 (0.30-8.93)	.563
Self	0.54 (0.03-9.18)	.670	0.93 (0.05-17.01)	.963	0.91 (0.05-17.1)	.949
Other/uninsured	1.21 (0.51-3.04)	.627	1.1 (0.30-4.2)	.866	0.23 (0.01-4.04)	.31
SA indication						
Osteoarthritis	1.00 (reference)	–	1.00 (reference)	–	1.00 (reference)	–
RCA	2.13 (1.01-4.48)	**.047**	1.92 (0.74-4.86)	.184	1.74 (0.62-4.93)	.292
Fracture	1.22 (0.78-1.83)	.442	0.75 (0.41-1.44)	.343	0.79 (0.41-1.50)	.486
Other	0.96 (0.51-1.82)	.9104	1.05 (0.49-2.2)	.908	0.77 (0.33-1.96)	.578
Hemi	1.00 (reference)	–	1.00 (reference)	–	1.00 (reference)	–
aTSA	0.63 (0.38-1.03)	.068	0.71 (0.39-1.37)	.248	0.69 (0.36-1.36)	.262
rTSA	0.82 (0.51-1.33)	.426	0.69 (0.37-1.34)	.248	0.73 (0.37-1.52)	.380

SA, shoulder arthroplasty; *RCA*, rotator cuff tear arthropathy; *Hemi*, hemiarthroplasty; *aTSA*, anatomic total shoulder arthroplasty; *rTSA*, reverse total shoulder arthroplasty; *HR*, hazard ratio.
Bold values represent statistical significance ($P < .05$).
*Values are presented as the HR, with the 95% CI in parentheses.

insurance claim databases. In 2021, Best et al[5] utilized the National Inpatient Sample to examine racial differences in patients undergoing total SA. Specifically, they observed an increase in disparity of total SA utilization by 12.5/100,000 between Black and White patients between 2012 and 2017. Similarly, Farley et al[13] demonstrated that the exponential increase in SA utilization was not shared equally among races. Furthermore, they observed this across both aTSA and rTSA individually. When Black patients were compared with White patients, the disparity for aTSA utilization was 150% in 2011 and 197% in 2017; similarly, for rTSA utilization, disparity was 118% in 2011 and 124% in 2017. For Hispanic patients, the aTSA disparity utilization was 169% in 2011 and 262% in 2017; similarly, for rTSA it was 112% in 2011 and 103% in 2017.

Outside of utilization, notable disparities in patient outcomes following primary SA have also been observed as a function of race and socioeconomic status.[5,24,33] Similar to the present study, Garcia et al[14] observed a 45% higher likelihood of a 90-day ED visit in Black patients compared to White patients after an elective primary total SA; Ling et al[24] found that Black or African American race was independently associated with higher rates of 30-day readmission (odds ratio [OR]: 1.42, $P = .025$) after adjusting for significant confounders. On a national scale, Black patients have also been reported to experience increased odds of pulmonary embolism (OR: 1.97), surgical site infection (OR: 2.19), and mortality (OR: 2.88) in the short-term postoperative period compared to White patients.[5] Likewise, Hispanic patients experienced longer length of stay, higher care cost, and incidences of acute renal failure and blood loss anemia following rTSA.[40]

Within our study, recalcitrant pain, superficial wound infection, instability, and acromial or scapular spine fractures were notable differences between non-White and White patients regarding reasons for a return to the ED or hospital for readmission. In review of these cases, specifically those presenting with recalcitrant pain and no clear complication, we did not observe a clear identifiable pattern that led to a return. We did note that 6 of the 23 patients with unexpected returns did not speak English as their primary language, and this was likely more evident within 3 of the 6 patients who presented with recalcitrant shoulder pain. It is also possible that our non-White cohort, which had a higher rate of diabetes, hypertension, and kidney disease, was possibly affected by their increased comorbidities; however, we acknowledge that there could be additional underlying reasons that were not medically documented.

In the literature, many factors are proposed as to why non-White patients seek additional care after orthopedic procedures. Commonly, these are proposed to stem from comorbid conditions, as there is a link between preoperative comorbidity status and

worsened postoperative outcomes.[16,25,29,38] However, adjusted analyses accounting for comorbid conditions have also demonstrated that we should consider patients levels of social support, coping strategies, access to providers, language barriers, and physician implicit bias.[4,9,15,36,42] This represents an opportunity to lessen this disparity moving forward through team-based approaches that address physical, mental, and social health, additional provider training, better communication practices, and more diligent approaches to early postoperative care of non-White patients.

Unique to the current data within the SA literature, the present study aimed to also evaluate the longitudinal effect of race and ethnicity on primary SA over time. In our analysis, we observed that both non-White and White patients demonstrated similar risks of all-cause complications, reoperations, and revision surgery after primary SA. This provides further context to highlight the importance of the early postoperative period as a critical time to help address healthcare disparities. Furthermore, in the current era of value-based care, early postoperative outcome differences, unplanned returns to the ED, or hospital readmission greatly increase the cost of healthcare to both patients and the system. As such, active awareness and recognition of healthcare disparities are required to renew and strengthen initiatives to help deliver more equitable care after SA,and orthopedic procedures in general.

The findings of this observational study represent associations, not causations, and should be interpreted with consideration of the following limitations. First, this is a retrospective analysis of an institutional total joint registry spanning several decades. This allowed for heterogeneity in SA techniques, postoperative protocols, and patient communication practices. Second, certain elements of our data such as race/ethnicity were self-reported, based on standard racial/ethnic groupings, and subject to accurate entry into the EMR. Therefore, this analysis may not be completely representative of the entire cohort of patients within our SA registry. Moreover, the structured racial/ethnic categories do not comprehensively capture the sociocultural and genetic diversity that exists across these groupings.[21] Third, a subanalysis of non-White patients based on individual self-reported race/ethnicity (Black, Hispanic, etc.) was not performed to avoid being further underpowered to detect differences given the relatively small number of the overall non-White cohort and the subsequently even smaller number within the categorical breakdown. Fourth, the analysis aimed to address certain confounding variables through cohort matching based on age, sex, operative indication, implant type, and surgical year. However, we were not able to adjust the analysis further based on insurance status, comorbidities, annual household income, or other markers for socioeconomic status due to the limited number of outcome events for each variable we aimed to adjust for. Notably, within this cohort, private insurance was not observed to be associated with all-cause complications but was associated with higher rates of reoperations, which is contrary to the literature on primary SA.[23,30,32] It is unclear whether the matching process influenced these results; therefore, we focused on race and ethnicity as our variables of interest.

Conclusion

After accounting for age, sex, and surgical indication, patient race and ethnicity were not associated with an increased risk of long-term all-cause complications, reoperations, or revision surgery after primary SA. However, within the first 90 days, non-White patients had a higher likelihood of unplanned emergency room visits and hospital readmissions.

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