Does Patient Race, Ethnicity, or Socioeconomic Status Impact Surgical Decision Making? Analysis of a Common Pediatric Orthopaedic Surgical Procedure

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Introduction

Racial and ethnic minority patients continue to experience disparities in orthopedics. Several studies have indicated that minority and low-income patients experience higher rates of nonoperative treatment and delayed surgery for a variety of orthopedic conditions[1-5]. One study surprisingly found higher rates of percutaneous pinning of supracondylar humerus (SCH) fractures among Black and Hispanic patients[6]. This study was conducted over 15 years ago and was limited to an inpatient database. Furthermore, there is a lack of current literature evaluating racial and ethnic disparities in outpatient surgical decision making for common pediatric fractures that can be variably treated with non-operative or operative management. The aim of this study was to examine whether patient race, ethnicity, or insurance status was associated with differences in operative rate for type II SCH fractures.

Methods

This retrospective cohort study at a single tertiary pediatric hospital evaluated patients between the ages of 2-12 years old who were initially evaluated at an outpatient orthopedic clinic visit for a type II SCH fracture between 2013-2021. Patients with type I or III SCH fracture patterns, open injuries, polytrauma, vascular injuries, or underlying skeletal dysplasia were excluded. Inpatient encounters were excluded given that the surgeon often may have provided surgical decision making without face-to-face interaction with the patient. Diagnosis was confirmed based on radiographic reports, operative notes, and ICD9/10 codes. Demographic, injury, and treatment characteristics were collected for each patient. Operative versus nonoperative intervention was confirmed based on a data query combined with corresponding CPT codes. Surgical treatment, as defined by closed reduction with percutaneous pinning or open reduction with internal fixation, was grouped as a single cohort and compared with the cohort of fractures that were treated nonoperatively. Fisher exact and $\chi 2$ tests were performed to evaluate the difference in operative rate by race, ethnicity, and insurance status.

Results

A total of 1539 patients with type II SCH fractures were available for study with a mean age of 5.8 +/− 2.6 years. 155 patients (10%) were treated with operative intervention, whereas 1384 patients (90%) were treated nonoperatively. There were 866 patients (56%) who were initially stabilized at an outside facility prior to surgical evaluation at one of the institution's outpatient orthopedic clinics (Table 1). There was no difference operative rate between patients who were first stabilized at an outside facility compared to those first evaluated at an outpatient orthopedic clinic (11% versus 9%, $p = 0.13$). There was no difference in the proportion of patients who underwent operative intervention for treatment of their type II SCH based on the patient's race, ethnicity, or insurance status (Table 2). Non-white surgeons had a higher operative rate than white surgeons (14% versus 8%, $p = 0.001$), however, when controlling for surgeon race there was no difference in the operative rate based on patient race, ethnicity, or insurance status (Table 3).

Discussion

Multiple studies have demonstrated racial and ethnic disparities of surgical outcomes[7-9], however there is a lack of current literature evaluating disparities in outpatient surgical indications for pediatric fractures[10,11]. A prior study demonstrated that Black and Hispanic patients were more likely to undergo closed reduction with percutaneous pinning of SCH fractures compared to White patients[6]. However, this study was conducted over 15 years ago and was limited to an inpatient database. Given that outpatient visits may represent a significant number SCH fractures, our results are necessary to elucidate the decision making in this area to be more representative of the entire population of patients with these injuries. It is important

Table 1. Demographics of Pediatric Type II Supracondylar Humerus Fracture

Variable		Total Population (n=1539)
Age at Injury (y)		5.76 +/− 2.56
Age at Injury (y)		
	<5	784
	6 to 9	603
	10 to 12	152
Sex		
	Male	763 (49%)
	Female	776 (51%)
Race		
	White	908 (59%)
	Black	174 (11%)
	Asian	99 (6%)
	South Asian	27 (2%)
	American Indian/Native Alaskan/Hawaiian	7 (0.5%)
	Multiracial	42 (3%)
	Other	264 (17%)
	Refused	18 (1.5%)
Ethnicity		
	Non-Hispanic	1380 (90%)
	Hispanic	136 (9%)
	Refused	23 (1%)
Payor		
	Commercial	1092 (71%)
	Medicaid	391 (25%)
	Self-Pay	19 (1.5%)
	Government (Tricare)	10 (1%)
	Other	27 (1.5%)
Mechanism of Injury		
	Low energy fall	590 (39%)
	High energy fall	214 (14%)
	Sport	50 (3%)
	Passenger in Body Powered Vehicle	35 (2%)
	Passenger in Motorized Vehicle	12 (1%)
	Direct Blow	15 (1%)
	Not Reported	623 (40%)
Treating Surgeon Race		
	White	1103 (72%)
	Non-White	436 (28%)

Data are given as mean +/− standard deviation or n (%)

Table 2. Demographic Differences in Treatment Type for Type II Supracondylar Humerus Fractures

Variable		Nonoperative Intervention (n=1384)	Operative Intervention (n=155)	P value
Race				0.865
	White	812 (89.4%)	96 (10.6%)	
	Black	157 (90.2%)	17 (9.8%)	
	Asian	92 (92.9%)	7 (7.1%)	
	South Asian	26 (96.3%)	1 (3.7%)	
	American Indian/Native Alaskan	6 (86%)	1 (14%)	
	Multiracial	39 (92.9%)	3 (7.1%)	
	Other	235 (89%)	29 (11%)	
	Refused	17 (94.4%)	1 (5.6%)	
Ethnicity				0.53
	Non-Hispanic	1242 (90%)	138 (10%)	
	Hispanic	120 (88%)	16 (12%)	
	Refused	22 (96%)	1 (4%)	
Payor Status				0.906
	Commercial	980 (90%)	112 (10%)	
	Medicaid	352 (90%)	39 (10%)	
	Self-Pay	18 (95%)	1 (5%)	
	Government (Tricare)	10 (100%)	0 (0%)	
	Other	24 (89%)	3 (11%)	

Data are given as adjusted percentage receiving procedure and significance level from Pearson Chi Square Test

to understand that our study only included type II SCH fractures, while Slover et al. included all operatively managed SCH fractures (types II-IV). Current treatment guidelines recommended treating type III and IV fractures with surgery, whereas type II fractures could be treated with either casting or surgical intervention[12]. Given that surgeons could treat type II fractures either operatively or nonoperatively, there was a greater opportunity for bias in decision making relative to the other fracture types. It is unclear if our results are due to changes in treatment over time or due to different decision making for patients in the outpatient setting.

There have also been disparities in pediatric orthopedic care based on insurance status including longer time to initial evaluation and surgery[13-16], and higher risk of being lost to follow up[17,18]. However, few studies have readdressed surgical decision making for pediatric fractures based on insurance status[10]. Our study revealed there was no difference in the proportion of patients who received operative treatment based on insurance status. However, one must be aware that there may be unrecognized differences in surgical decision making based on hospital type and region.

This study has several limitations. Our study's operative rate differs from the literature surrounding operative treatment of type II SCH fractures. Epidemiologic studies have reported an operative rate ranging from 5-48%[19,20]. Over the past few years there has been a shift to treating type II SCH fractures with operative intervention[12]. Our study likely underestimates the overall operative rate as we only included patients who were initially seen in the outpatient setting. Since the majority of type II SCH fractures are first evaluated in the Emergency Department there are likely many patients who received operative intervention that were not included in this study. There is also potential for co-treatment and selection bias since over half of our cohort was initially stabilized at an outside facility. Our results are unlikely to have been skewed by this occurrence as the operative rate for patients who were initially stabilized at an outside facility did not differ from those who were first seen in an orthopedic clinic.There is also potential for reporting bias via misclassification of race and ethnicity as this data is self-reported. Future geographically diverse multicenter studies are needed to explore this issue on a national level.

Conclusion

Outpatient clinical decision making for type II SCH fractures is not disproportionately influenced by patient race, ethnicity, or insurance status. It is paramount to continue efforts to elucidate and eliminate disparities in fracture care based on race and socioeconomic status in order to optimize care for all populations.

Table 3. Demographic Differences in Treatment Type for Type II Supracondylar Humerus Fractures by Surgeon Race

3A – Operative rates for Non-White Surgeons

Variable	Nonoperative Intervention(n=374)	Operative Intervention (n=62)	P value
Race			0.404
White	222 (87%)	34 (13%)	
Black	44 (86%)	7 (14%)	
Asian	20 (91%)	2 (9%)	
South Asian	6 (86%)	1 (14%)	
American Indian/Native Alaskan	1 (50%)	1 (50%)	
Multiracial	10 (77%)	3 (23%)	
Other	68 (84%)	13 (16%)	
Refused	3 (75%)	1 (25%)	
Ethnicity			0.929
Non-Hispanic	335 (86%)	55 (14%)	
Hispanic	35 (85%)	6 (15%)	
Refused	4 (80%)	1 (20%)	
Payor Status			0.843
Commercial	262 (85%)	45 (15%)	
Medicaid	94 (85%)	16 (15%)	
Self-Pay	6 (86%)	1 (14%)	
Government (Tricare)	4 (100%)	0 (0%)	
Other	8 (100%)	0 (0%)	

3B – Operative Rates for White Surgeons

Variable	Nonoperative Intervention (n=1010)	Operative Intervention (n=93)	P value
Race			0.364
White	590 (90%)	62 (10%)	
Black	113 (92%)	10 (8%)	
Asian	72 (93%)	5 (7%)	
South Asian	20 (100%)	0 (0%)	
American Indian/Native Alaskan	5 (100%)	0 (0%)	
Multiracial	29 (100%)	0 (0%)	
Other	167 (91%)	16 (9%)	
Refused	14 (100%)	0 (0%)	
Ethnicity			0.333
Non-Hispanic	907 (92%)	83 (8%)	
Hispanic	85 (90%)	10 (10%)	
Refused	18 (100%)	0 (0%)	
Payor Status			0.711
Commercial	718 (91%)	67 (9%)	
Medicaid	258 (92%)	23 (8%)	
Self-Pay	12 (100%)	0 (0%)	
Government (Tricare)	6 (100%)	0 (0%)	
Other	16 (84%)	3 (16%)	

Data are given as adjusted percentage receiving procedure and significance level from Pearson Chi Square Test

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