Hispanic Patients Undergoing Spinal Fusion for Neuromuscular Scoliosis Sustain Health Inequalities

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Abstract:

Introduction: Pre- and postoperative optimization remains a complex process impacted by various demographic factors. Our study aims to identify and describe those demographic factors associated with poor outcomes after spinal fusion with instrumentation in neuromuscular scoliosis to reduce health disparities and improve postoperative outcomes.

Methods: A retrospective analysis was conducted using Healthcare Cost and Utilization Project data from 2016 to 2020, encompassing a random sample of 20% of procedures in the United States. Data included demographic and hospital variables, including days from admission to the procedure, length of stay, recovery time, total charge, discharge disposition, and mortality rates. In addition to ANOVA, Chi-Squares, and t-tests, multiple-linear and multiple-logistic regression models were designed and run to generate adjusted odds ratios.

Results: Compared to non-Hispanic patients (N=1829), Hispanic patients (N=431) had spinal fusion with instrumentation at younger ages (12.9 vs. 14.1 years old, p=0.011) and had significantly different household incomes with less representation in the 75th to 100th percentile (16.8% vs. 26.5%, p<0.001). Additionally, Hispanic patients were more likely to be Medicaid users (67.2% vs. 46.0%, p<0.001). Hispanic patients undergoing spinal fusion with instrumentation had longer lengths of stay (LOS) (10.0 vs. 7.6 days, p<0.001), longer periods from admission to surgery (wait time) (1.6 vs. 1.0 days, p=0.046), and longer recovery times (8.5 vs. 6.7 days, p<0.001).

Conclusions: Hispanic patients with NMS often have longer lengths of stay, longer periods between admission and surgery, and longer recovery times than non-Hispanic patients. This difference in hospital courses and surgical timing could be an effect of disparities in healthcare access and socioeconomic standing. Further efforts are required to both understand and reduce barriers to healthcare access in the Hispanic patient population undergoing spinal fusion with instrumentation.

Keywords:
Scoliosis, Neuromuscular, Neuromuscular Scoliosis, Demographic, Hispanic, Health, Inequalities, Spinal Fusion, Instrumentation

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Introduction

Neuromuscular scoliosis (NMS) is an *abnormal* spinal curvature resulting from various etiologies, including brain, spinal cord, and muscular disorders[1)]. Spinal fusion surgery was established as the most used technique for treating NMS, especially for patients with severe spinal curvatures or those who exhibit signs of rapid progression[2)]. However, access to comprehensive management remains difficult, placing underserved populations at risk for worse outcomes.

Both the utilization and the costs of corrective surgeries involving spinal fusion for NMS have seen a steadily increasing trend in the past two decades[3)]. Notably, between 2002 and 2011, a study using the Nationwide Inpatient Sample database found a 93% increased incidence of spinal fusion for NMS alongside inflation-adjusted cost increases of 75%[3)]. This rise of surgical advances may have allowed access to these procedures in previously ineligible patients

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facing greater NMS severity and a higher burden of comorbidities[4]. While many factors like implant choice and graft options could potentially influence the increased costs, lengths of stay remain a notable driver of costs and target for quality improvement[5]. A better understanding of the social factors influencing health determinants must be emphasized in this evolving landscape. The patient pool of NMS remains diverse and often requires complex considerations of comorbidities for optimized care. Characteristics such as age, sex, body mass index (BMI), multi-staged procedures, severe lung disease, and cardiac risk factors add to the already high risk (33%-75%) of developing perioperative complications following spinal instrumentation[3,6-8]. Notwithstanding ample documentation regarding complication rates relating to the surgical management of NMS, there exists a paucity in the literature describing the relationship between many demographic factors and NMS pathophysiology and healthcare.

Currently, several limitations with commonly used outcome measures prevent a well-informed discussion on the outcomes of NMS management with spinal fusion[2]. In studies that sought to elucidate health disparities in NMS patients, the variability in selected reportable outcomes and demographic variables jeopardizes accurate understanding[8]. The lack of comprehensive investigation of outcomes experienced by patients with various social, racial, ethnic, environmental, and other characteristics allows persistent health disparities in patients with NMS.

We hypothesize that historically underserved Hispanic and Black populations in our study will suffer disproportionate rates of medical burden. Our study primarily aims to identify and describe the demographic and socioeconomic factors associated with poor outcomes and hospital variables after spinal fusion with instrumentation in NMS to reduce health disparities.

Materials and Methods

The Healthcare Cost and Utilization Project (HCUP) was queried for all surgeries from 2016 to 2020 using codes specific for surgical procedures involving spinal fusion procedures for neuromuscular scoliosis. After properly excluding incomplete and missing variables, the sample was divided into cohorts based on decider variables such as race, ethnicity, insurance status, and income brackets. Next, statistical analysis was done using R Foundation for Statistical Computing software version 4.20 and the International Business Machines Statistical Package for the Social Sciences. Confidence intervals were set at 95%, with a p-value of 0.05 considered statistically significant.

Each group then underwent analysis to compare other variables such as concurrent diagnosis, including age, gender, household income, rural or urban setting, and payer type, and hospital variables, including days from admission to the procedure, length of stay, recovery time, total charge, discharge disposition, and mortality rates. Recovery time was defined as the time from surgery to discharge. Further, multiple-logistic regression models were created to elucidate relationships between predictive variables like socioeconomic or demographic characteristics and quality-centered hospital variables like recovery time, length of stay, and total hospital charge. A gamma regression model was used for length of stay and total hospital charges as the data did not meet normality and was positively skewed.

Categorical results are reported as counts with column percentages. Continuous data are reported as means standard deviations, with standard errors given where appropriate. A comparison of normally distributed data was performed with independent sample *t*-tests. For nonnormally distributed data, the Wilcoxon rank-sum test was performed. The Fisher's Exact Test or Chi-Square with Kendall Tau assessed categorical variables. Where appropriate, residuals were assessed for normal distribution, and no multicollinearity was observed.

Results

Demographics

Our study included 2,460 patients with NMS (50.5% female [n=1242] and 49.5% [n=1218] male) from 2016 to 2020. Our sample population included 12.4% (n=431) who identified as Hispanic patients and 12.4% (n=305) as Black patients. These ethnic and racial categories were not mutually exclusive and are based on self-reported data collected from participating hospitals. The average age of our sample population was 13.8 (Table 1). The total charge was the only variable significantly different across time across all the demographic and hospital variables analyzed in this study ($p=0.002$) (Table 1). The mean total charge in 2016 was $243,224.2, which increased yearly to result in a mean total charge in 2020 of $312,250.5 (Fig. 1).

Sub-group analysis

Hispanic patients who received spinal fusion with instrumentation for NMS were younger than their non-Hispanic counterparts (12.9 vs. 14.1, $p=0.011$) (Table 2). Black patients' mean age was not significantly different than their nonBlack counterparts. Hispanic patients had significantly different household incomes with less representation in the 75th to 100th percentile (16.8% vs. 26.5%, $p<0.001$) compared to non-Hispanic patients (Table 2). Black patients were overrepresented in the 0-25th percentile of household income compared to nonBlack patients (42.8% vs. 22.2%, $p<0.001$) (Table 3). Additionally, Medicaid was the method of payment in a greater percentage for both Hispanic (67.2% vs. 46.0%, $p<0.001$) and Black patients (72.4% vs. 46.5%, $p<0.001$) compared to non-Hispanic and nonBlack patients, respectively (Table 2, 3).

Hispanic patients undergoing spinal fusion with instrumentation had longer lengths of stay (LOS) (10.0 vs. 7.6 days, $p<0.001$), longer periods from admission to surgery

Table 1. Study Demographics and Hospital Variables by Year.

Demographic		***2016***	***2017***	***2018***	***2019***	***2020***	***p-value***
Total Number, N (%)		477 (19.4)	463 (18.8)	546 (22.2)	514 (20.9)	460 (18.7)	
Age, Mean (SD)		13.7 (8.5)	14.2 (8.6)	13.9 (8.8)	13.9 (8.5)	13.2 (6.4)	0.374
Gender, N (%)	Female	229 (48.0)	238 (51.4)	264 (48.4)	263 (51.2)	248 (53.9)	0.333
	Male	248 (52.0)	225 (48.6)	282 (51.7)	251 (48.8)	212 (46.1)	
Black, N (%)		48 (11.5)	56 (13.2)	71 (13.9)	65 (13.6)	65 (15.2)	0.636
Hispanic, N (%)		82 (19.6)	77 (18.2)	100 (19.5)	107 (22.3)	65 (15.2)	0.091
Household Income by Zipcode, N (%)	0–25th p^{th}	119 (25.7)	93 (20.4)	143 (26.9)	132 (26.2)	104 (22.8)	0.105
	26th–50th p^{th}	98 (21.1)	122 (26.8)	122 (22.9)	131 (26.0)	133 (29.2)	
	51st–75th p^{th}	125 (26.9)	117 (25.7)	147 (27.6)	118 (23.4)	113 (24.8)	
	76th–100th p^{th}	122 (26.3)	123 (27.0)	120 (22.6)	123 (24.4)	106 (23.3)	
Rural/Urban, N (%)	Rural	28 (6.0)	23 (5.0)	21 (3.9)	25 (4.9)	37 (8.1)	0.057
	Urban	442 (94.0)	437 (95.0)	518 (96.1)	481 (95.1)	422 (91.9)	
Payer, N (%)	Medicaid	243 (51.4)	226 (48.9)	274 (50.2)	264 (51.5)	233 (50.7)	0.971
	Medicare	7 (1.5)	9 (2.0)	12 (2.2)	11 (2.1)	9 (2.0)	
	Other	24 (5.1)	26 (5.6)	39 (7.1)	31 (6.0)	25 (5.4)	
	Private Insurance	195 (41.2)	199 (43.1)	215 (39.4)	201 (39.2)	189 (41.1)	
	Self-pay	4 (0.9)	2 (0.4)	6 (1.1)	5 (1.0)	4 (0.9)	
Hospital Variables		***2016***	***2017***	***2018***	***2019***	***2020***	***p-value***
Wait Time, Mean (SD)		0.8 (5.7)	1.2 (5.7)	1.3 (7.3)	1.3 (7.5)	0.9 (5.4)	0.679
Length of Stay, Mean (SD)		7.9 (9.3)	8.1 (10.1)	8.1 (11.1)	8.7 (12.2)	7.7 (10.0)	0.671
Recovery Time, Mean (SD)		7.1 (6.9)	7.0 (7.8)	6.9 (7.0)	7.3 (9.0)	6.8 (8.3)	0.847
Operation Ratio, Mean (SD)		0.04 (0.1)	0.06 (0.2)	0.04 (0.2)	0.05 (0.2)	0.04 (0.1)	0.332
Total Charge, Mean (SD)		243224.2 (170455.9)	264822.2 (181078.3)	269074.4 (221305.3)	298852.3 (341521.2)	312250.5 (446850.0)	**0.002**
Discharge Disposition, N (%)	Adverse DC	25 (5.3)	47 (10.2)	52 (9.5)	37 (7.2)	30 (6.5)	0.131
	Home DC w/ care	50 (10.5)	53 (11.5)	56 (10.3)	56 (10.9)	46 (10.0)	
	Routine DC	400 (84.2)	362 (78.4)	438 (80.2)	421 (81.9)	384 (83.5)	
	Mortality		1 (0.2)		2 (0.4)		

Note: Total number is given as N (%) with percent of the total population. All continuous variables are given as Mean (Standard Deviation); all categorical variables are given as N (column percent)

Legend: pth=percentile, wait time=days from admission to procedure, DC=discharge, w/=with

(wait time) (1.6 vs. 1.0 days, p=0.046), and longer recovery times (8.5 vs. 6.7 days, p<0.001) compared to non-Hispanic patients. Hispanic patients' mean total hospital charges were significantly higher than non-Hispanic counterparts ($345,744.6 vs. $264,202.3, p<0.001) (Table 2).

Black patients did not have significant differences in hospital variables, including length of stay, surgical wait time, and recovery time compared to nonBlack counterparts. Black patients' mean total hospital charges were significantly lower than nonBlack counterparts ($243,854.2 vs. $285,438.5, p<0.001) (Table 3).

Holding all other predictive variables constant with regression analysis, Hispanic patients' odds of increased recovery time were 1.3 times higher (95% CI [1.1, 1.4]), odds of longer lengths of stay were 1.3 times higher (95% CI [1.1, 1.5]), and odds of increased hospital charges were 1.2 times higher (95% CI [1.1, 1.3]). Similarly, other payer (not Medicaid, not self-pay) status had 1.2 times risk of prolonged recovery time (95% CI [1.0, 1.5]), 1.3 times risk of longer length of stay (95% CI [1.0, 1.6]), and 1.5 times risk of higher total hospital charges (95% CI [1.3, 1.7]) (Fig. 2, 3, 4). Holding other variables constant and compared to the 26^{th}-50^{th} percentile median income, patients in the 0-25^{th} quartile had a 1.2 times increased risk of longer lengths of stay (95% CI [1.0, 1.6]). Patients in the 51^{st}-75^{th} percentile also had a 1.2 times increased risk of longer lengths of stay (95% CI [1.0, 1.4]) (Fig. 3).

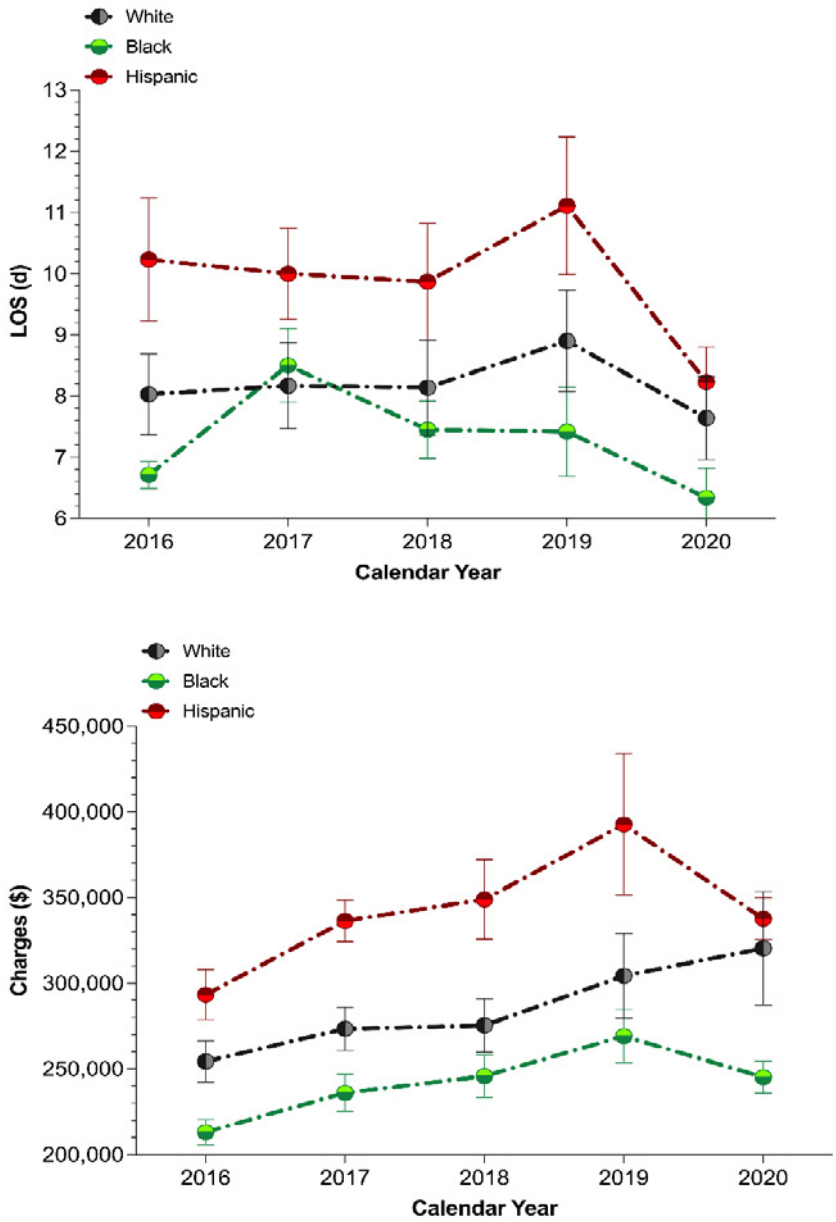

Figure 1. Length of stay and hospital charges by race over time.

Discussion

Our study found that Hispanic patients undergoing NMS spinal fusion faced longer wait times between admission and procedure, overall length of stays, recovery times, and higher overall hospital charges compared to their non-Hispanic counterparts. These findings for Hispanic patients are consistent with our hypothesis that this demographic faces disproportionate challenges when receiving medical care for NMS. Additional analyses indicate that independent of the other variables (including payer status and household income) that we controlled for, in Fig. 2, 3, 4, patients of Hispanic ethnicity had increased odds of increased recovery time, length of stay, and total hospital charges. Similar findings were not observed in Black patients. At least in the study's parameters, Hispanic ethnicity predicts adverse hospital quality outcomes independent of payer status and household income by zip code. When considering these findings in the setting of national trends indicating increased utilization of spinal fusion and total hospital costs, it is paramount this disparity and the factors influencing it be addressed to prevent this vulnerable population from suffering further[3].

While more information is needed to understand better what factors may be at play, socioeconomic differences remain a visible and important area for improvement in health outcomes. As of 2021, 19% of all Medicaid and CHIP enrollees identified as Hispanic[9]. Compared to nonHispanic patients, a higher proportion of Hispanic patients in our cohort were insured by Medicaid and had household incomes in the lowest quartile. When considering the staggering total surgical costs, the burden can become unimaginable and potentially preventive of optimal care for these patients[5]. These findings indicate a socioeconomic disparity that remains a

Table 2. Hispanic vs. Not Hispanic Demographics and Hospital Variables.

Demographic		***Hispanic***	***Not Hispanic***	***Total***	***p-value***
Total Number, N (%)		431 (19.1)	1829 (80.9)	2260 (100.0)	
Age, Mean (SD)		12.9 (6.1)	14.1 (8.8)	13.856 (8.3)	**0.011**
Gender, N (%)	Female	214 (49.7)	930 (50.9)	1144 (50.6)	0.694
	Male	217 (50.4)	899 (49.2)	1116 (49.4)	
Household Income by Zipcode, N (%)	0–25th pth	119 (28.5)	436 (24.3)	555 (25.1)	**<0.001**
	26th–50th pth	108 (25.9)	450 (25.0)	558 (25.2)	
	51st–75th pth	120 (28.8)	436 (24.3)	556 (25.1)	
	76th–100th pth	70 (16.8)	476 (26.5)	546 (24.7)	
Rural/Urban, N (%)	Rural	11 (2.6)	110 (6.1)	121 (5.4)	**0.007**
	Urban	409 (97.4)	1707 (94.0)	2116 (94.6)	
Payer, N (%)	Medicaid	289 (67.2)	840 (46.0)	1129 (50.0)	**<0.001**
	Medicare	3 (0.7)	43 (2.4)	46 (2.0)	
	Other	33 (7.7)	103 (5.6)	136 (6.0)	
	Private Insurance	96 (22.3)	829 (45.4)	925 (41.0)	
	Self-pay	8 (1.9)	12 (0.7)	20 (0.9)	
Hospital Variables		***Hispanic***	***Not Hispanic***	***Total***	***p-value***
Wait Time, Mean (SD)		1.6 (8.4)	1.0 (5.9)	1.1 (6.4)	**0.046**
Length of Stay, Mean (SD)		10.0 (13.8)	7.6 (9.6)	8.1 (10.6)	**<0.001**
Recovery Time, Mean (SD)		8.5 (10.1)	6.7 (7.0)	7.0 (7.7)	**<0.001**
Operation Ratio, Mean (SD)		0.0 (0.2)	0.0 (0.2)	0.0 (0.2)	0.557
Total Charge, Mean (SD)		345744.6 (376156.4)	264202.3 (274566.3)	279823.0 (298367.0)	**<0.001**
Discharge Disposition, N (%)	Adverse DC	27 (6.3)	157 (8.6)	184 (8.2)	0.277
	Home DC w/ Care	48 (11.1)	205 (11.2)	253 (11.2)	
	Routine DC	356 (82.6)	1466 (80.2)	1822 (80.7)	
	Mortality	0 (0.0)	3 (0.2)	3 (0.1)	0.915

Note: Total number is given as N (%) with percent of the total population. All continuous variables are given as Mean (Standard Deviation); all categorical variables are given as N (column percent)

Legend: pth=percentile, wait time=days from admission to procedure, DC=discharge, w/=with

possible area for improvement and consideration.

Another potential modulator of Hispanic patients' burdens may be found in medical comorbidities. Given the younger occurrence of spinal fusion in Hispanic patients (Table 2), particular concern arises in the issues of pediatric obesity and asthma.

Despite recent stabilization on a national scale, the incidence of obesity continues to increase within the Hispanic population. In the 6-11-year-old population, Hispanic children are twice as likely to be obese relative to their nonHispanic counterparts[10]. With these ages approaching the mean age of surgery for our Hispanic population, control of this comorbidity is extremely important in this population. Obesity is an independent predictor of both 30- and 90-day readmission in the pediatric setting. These increasing rates further exacerbate risks for younger patients who undergo surgical management for NMS[11,12]. Furthermore, Hispanic patients face a markedly increased risk of experiencing major medical complications associated with obesity, such as impaired wound healing[11].

Another important comorbidity at play may be the inherent link between NMS, lung function, and pulmonary complications in settings of childhood asthma risk[13]. In moderate-severe scoliosis, spinal curvatures can reduce chest wall compliance and predispose to chronic respiratory failure[14]. These respiratory issues may synergize[15]. This is concerning, knowing Hispanic patients have a higher asthma prevalence and/or morbidity compared to White Americans[16,17]. Patients with these comorbidities should be accurately identified before surgery to reduce the risk of respiratory complications. Early identification could allow for possible solutions to prevent respiratory complications after spinal fusion surgery. These include the preoperative assessment of vital capacity, effective cough, and hypoventilation

Table 3. Black vs. Not Black Demographics and Hospital Variables.

Demographic		*Black*	*Not Black*	*Total*	*p-value*
Total Number, N (%)		305 (13.5)	1955 (86.5)	2260 (100.0)	
Age, Mean (SD)		13.030 (7.0)	13.985 (8.5)	13.856 (8.3)	0.062
Gender, N (%)	Female	158 (51.8)	986 (50.4)	1144 (50.6)	0.702
	Male	147 (48.2)	969 (49.6)	1116 (49.4)	
Household Income by Zipcode, N (%)	0–25th p^{th}	130 (42.8)	425 (22.2)	555 (25.1)	**<0.001**
	26^{th}–50th p^{th}	64 (21.1)	494 (25.9)	558 (25.2)	
	51^{st}–75th p^{th}	62 (20.4)	494 (25.9)	556 (25.1)	
	76^{th}–100th p^{th}	48 (15.8)	498 (26.1)	546 (24.7)	
Rural/Urban, N (%)	Rural	9 (3.0)	112 (5.8)	121 (5.4)	0.057
	Urban	296 (97.1)	1820 (94.2)	2116 (94.6)	
Payer, N (%)	Medicaid	220 (72.4)	909 (46.5)	1129 (50.0)	**<0.001**
	Medicare	4 (1.3)	42 (2.2)	46 (2.0)	
	Other	16 (5.3)	120 (6.1)	136 (6.0)	
	Private Insurance	63 (20.7)	862 (44.1)	925 (41.0)	
	Self-Pay	1 (0.3)	19 (1.0)	20 (1.0)	
Hospital Variables		***Black***	***Not Black***	***Total***	***p-value***
Wait Time, Mean (SD)		0.6 (3.7)	1.2 (6.8)	1.089 (6.4)	0.146
Length of Stay, Mean (SD)		7.3 (7.9)	8.2 (10.9)	8.069 (10.6)	0.163
Recovery Time, Mean (SD)		6.8 (6.1)	7.1 (8.0)	7.024 (7.7)	0.541
Operation Ratio, Mean (SD)		0.0 (0.1)	0.0 (0.2)	0.0 (0.2)	0.209
Total Charge, Mean (SD)		243854.2 (172958.5)	285438.5 (313109.5)	279823.0 (298367.0)	**0.024**
Discharge Disposition, N (%)	Adverse DC	33 (10.8)	151 (7.7)	184 (8.2)	0.133
	Home DC w/ Care	29 (9.5)	224 (11.5)	253 (11.2)	
	Routine DC	243 (79.7)	1579 (80.8)	1822 (80.7)	
	Mortality	1 (0.3)	2 (0.1)	3 (0.1)	0.872

Note: Total number is given as N (%) with percent of the total population. All continuous variables are given as Mean (Standard Deviation); all categorical variables are given as N (column percent)

Legend: pth=percentile, wait time=days from admission to procedure, DC=discharge, w/=with

with pre-existing noninvasive ventilation support[18]. With insufficient data to support the return of lung function after spinal fusion in NMS, identifying and mitigating these risks remains a way to reduce potential disparities in this population[19].

One area to mitigate hospital costs and improve quality measures is safely shortening the length of stay and improving recovery time. Of note, the observed prolonged length of stay for Hispanics in this study is not an isolated phenomenon; similar findings have even been presented after adjusting for procedure type, and other patient and hospital factors where outcomes remained poor for Hispanic patients[20]. Safely addressing this particular disparity is challenging given the extensive risk of comorbidity and thus postoperative complications[3].

One possible solution to these prolonged recovery times and lengths of stays may involve a "rapid recovery pathway"; this management option has already been implemented in some centers following the surgical treatment of adolescent idiopathic scoliosis (AIS), and offers a two-day improvement on length of stay with no notable increases in complication rates[21]. While NMS is an inherently more complicated etiology than AIS, implementing these tracks for NMS may be fruitful. For example, NMS patients with smaller curves and less complex surgeries exhibited shorter lengths of hospitalization and, as such, could represent a patient population amenable to these pathways[22]. Considering the high burden of hospital charges that would increase with the greater use of spinal fusion, accelerated recovery protocols may also reduce overall hospital charges, sometimes by as much as 22%[21,23,24]. By modulating inpatient quality measures like the length of stay and hospital charges, these accelerated recovery pathways could mitigate the burden of such a procedure for underserved populations.

While Black patients in this study demonstrated an overrepresentation of patients in the 0-25^{th} percentile income, an

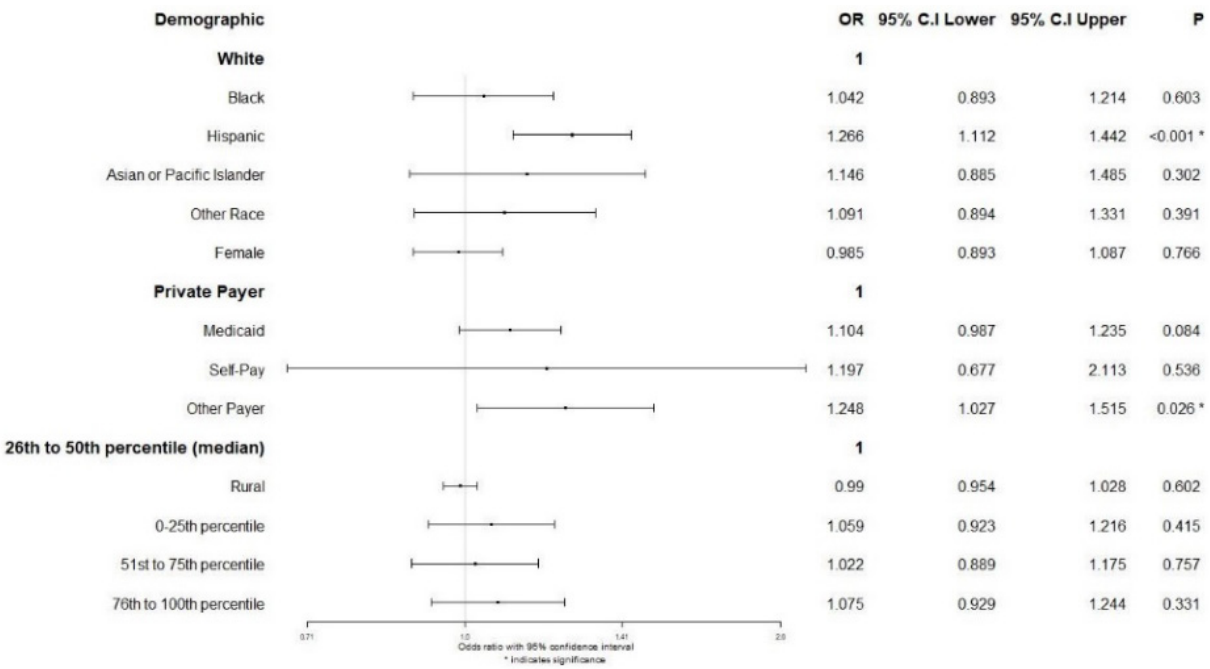

Figure 2. Recovery time regression analysis.

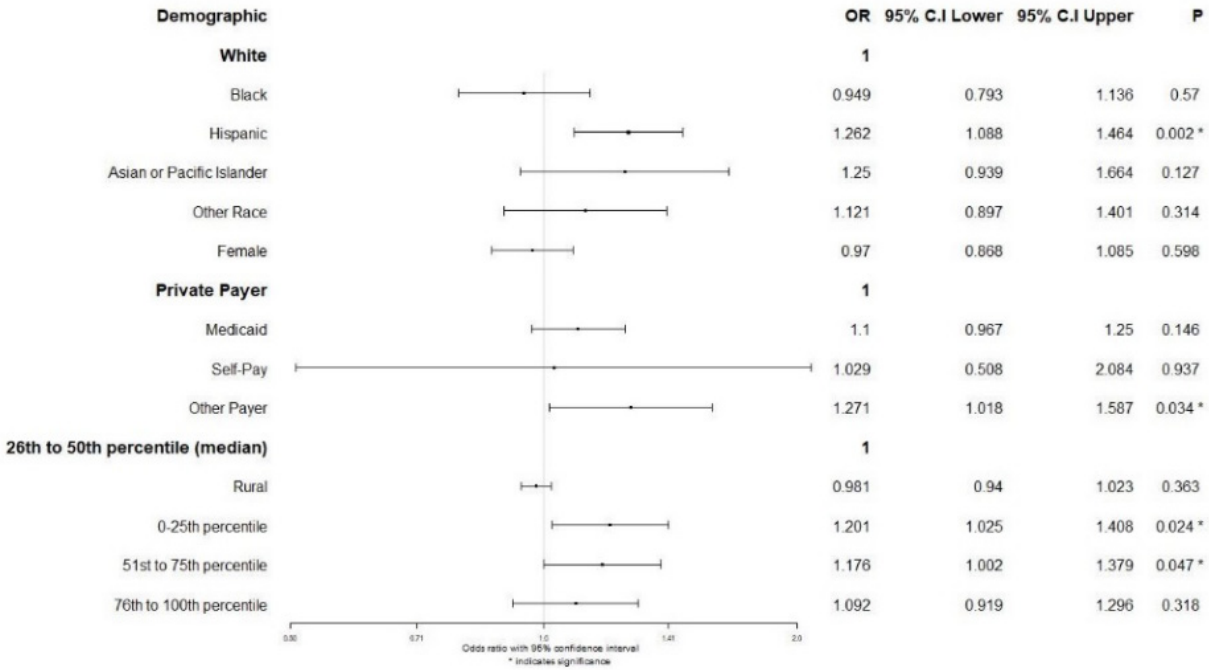

Figure 3. Length of stay regression analysis.

underrepresentation in the 76th-100th percentile, and a larger proportion utilizing Medicaid as payment for their surgery as compared to nonBlack patients, differences in hospital outcomes were not statistically significant. Hospital charges were even lower compared to nonBlack patients in our study. Unlike with Hispanic patients, our study's findings do not support our initial hypothesis regarding Black patient outcomes, at least not at face value.

Strengths and Limitations

Its retrospective element is inherent to the nature of our data, which brings with it a few key strengths and limitations. Our study design and specific demographic approach made it easy to see that disparities exist between ethnicity and race. In addition, this large sample size provides us with statistical power that is difficult to attain with other study designs. A random sampling of roughly 20% of the national cases is likely representative. However, as is the case with

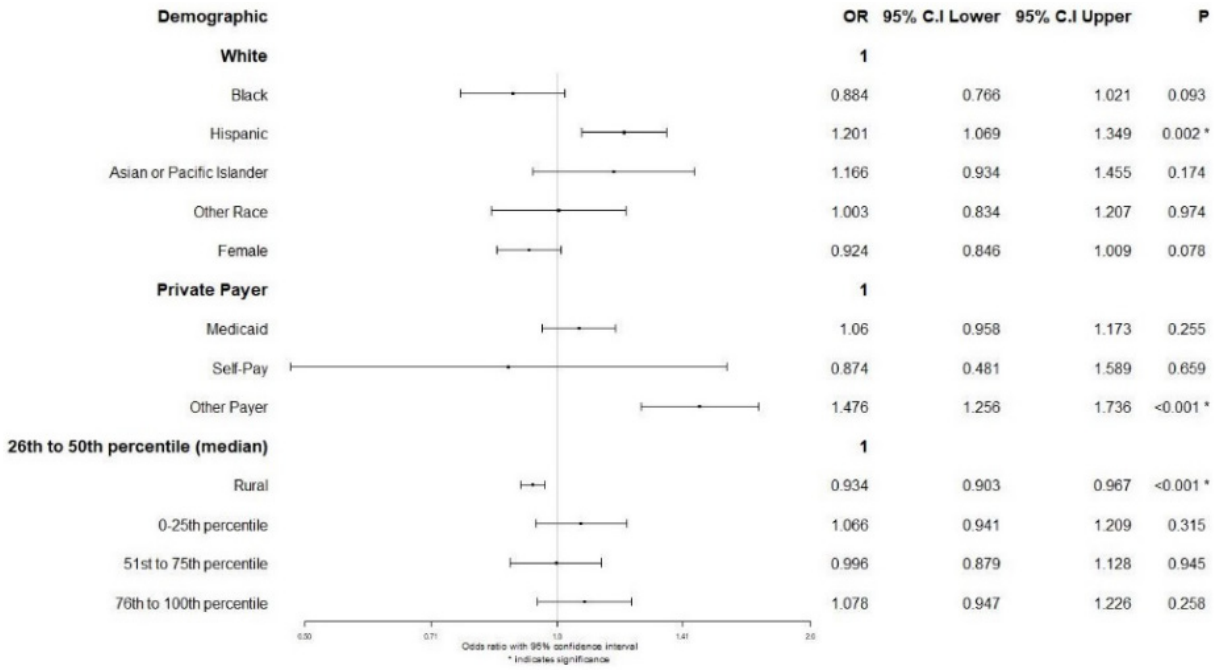

Figure 4. Total hospital charges regression analysis.

the shifting landscape of demographics, our study is limited to the data provided by health institutions participating in HCUP. Determining causality remains outside the bounds of this retrospective study. Limitations in our ability to manipulate these demographic variables preclude making statements about causality[25]. Regardless, using statistical tools like regression analysis allows us to understand better how factors influence one another. In this case, Hispanic ethnicity remained an independent risk, and based on these findings, we encourage the future pursuit of additional factors like medical comorbidities that may predispose to the results we see here. Furthermore, the pathology of neuromuscular scoliosis is diverse. The dataset cannot differentiate the various types of NMS, which is a major limitation of this paper.

Conclusion

In the era of value-based, individualized care, identifying those experiencing significant health disparities must be emphasized. For patients with neuromuscular scoliosis, a debilitating condition that often requires surgical intervention for treatment, we sought to determine if increasing costs and high complication rates threaten underserved populations disproportionately.

Using data from the HCUP database for the years 2016-2020, a retrospective, cross-sectional analysis revealed that compared to nonHispanic and nonBlack patients, Hispanic patients were more likely to face longer recovery times, overall length of stays, and increased total charges. We did not see the same in Black patients. However, both groups are composed of a larger proportion of Medicaid recipients and household income earners in the lowest quartile. The information elicited in this study is meant to guide quality improvement in the evolving management and landscape of increasingly costly spinal fusions for NMS. Implementing accelerated recovery protocols to reduce health disparities and improve postoperative outcomes may be an especially fruitful pursuit in certain populations. By better understanding the interplay between ethnicity, race, socioeconomic factors, and healthcare outcomes, we hope to better inform a patient-centered approach to the surgical treatment of NMS. By honing this understanding, we may one day reduce the health inequities that burden our underserved populations.

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