

Non-White Patient Race is Associated with Higher Perioperative Costs Despite Comparable Outcomes following Elective Anterior Cervical Discectomy and Fusion: An Urban Institutional Matched Cohort Analysis

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INTRODUCTION: Racial disparities in anterior cervical discectomy and fusion (ACDF) outcomes have been well-established in the literature, including higher readmission rates, longer length of stay, and greater complication rates. While increased costs for non-white patients after spinal surgery have been linked to these factors, the specific impact of race on perioperative ACDF costs and surgical outcomes remains unquantified. Therefore, this study aims to describe the differences in costs and surgical outcomes between white and non-white patients undergoing elective ACDF.

METHODS: A total of 1,864 elective ACDF cases performed between 2008-2019 were retrospectively identified from an institutional database. Patients aged <18, those undergoing posterior-approach surgeries, and cases associated with cervical trauma, fracture, infection, or tumor were excluded. Patients were matched according to age and American Society of Anesthesiologists (ASA) status, resulting in white (n=934) and non-white (n=934) cohorts. Race was self-identified by the patients. To explore reasons for differences in costs between cohorts, all services contributing to the total direct cost were separately analyzed. Total cost includes direct costs incurred during the index hospital admission, stemming from surgical costs, nursing, pharmacy, rehabilitation, laboratory and diagnostic tests, imaging, respiratory therapy, and intensive care unit (ICU) stay. Differences in demographic characteristics, perioperative variables, surgical outcomes, and costs between the cohorts were evaluated using univariate analysis and multivariate regression.

RESULTS:

The non-white cohort consisted of 218 (23.3%) African American, 176 (18.8%) Asian, and 540 (57.8%) Hispanic/Latino patients. Compared to the white cohort, non-white patients had a lower percentage of non-government private insurance (43.7% vs. 67.1%, $p<.001$), received less propofol (200.43mL vs. 218.79mL, $p<.001$), had higher rates of hypertension (42.6% vs. 32.9%, $p<.001$) and diabetes (19.7% vs. 10.7%, $p<.001$), but lower rates of cardiac and vascular-related diseases (3.6% vs. 6.0%, $p<.001$). Obesity status, length of surgery, length of hospital stay (LOS), discharge status, required ICU admission, and 30- and 90-day readmission rates did not significantly differ between cohorts (all $p>.05$). Complication rates were higher in the non-white cohort, but the difference was not statistically significant (5.5% vs. 4.0%, $p=.16$).

When adjusted for age, ASA status, levels fused, and insurance status, costs were significantly higher for the non-white cohort (Coeff: \$822.30, 97.5% Confidence Interval: \$402.26 – \$1242.34, $p<.001$). Specifically, non-white patients had significantly greater surgery costs, which includes surgeon and staff fees, implants, and anesthesia supply costs (\$10,411.41 vs. \$9,183.48, $p<.001$; Table 1). Non-white patients also had higher physical therapy and rehabilitation services costs received during the hospital stay (\$138.43 vs. \$123.74, $p<.001$). Logistic regression analysis, adjusted for age, ASA status, and levels fused, did not reveal significant differences in 30- and 90-day readmission rates, discharge location, hospital stay, or postoperative complications ($p>.05$).

DISCUSSION AND CONCLUSION: Non-white patients incur higher surgical costs associated with elective ACDF procedures, despite similar postoperative outcomes and controlling for insurance type and baseline demographics. Our findings suggest that the bulk of cost disparities stem from the perioperative period, highlighting a potential target for cost and resource optimization. Despite no differences in ASA status between cohorts, managing specific comorbidities such as hypertension and diabetes prior to surgery may help reduce surgical costs, particularly in non-white patients. In light of rising healthcare costs, our findings from an urban institutional perspective offer a unique and detailed insight into racial disparities in ACDF surgery. Identifying and optimizing areas of discrepancy, with the aim of alleviating the burden of hefty surgical expenses, may enhance the patient-care experience, particularly for underrepresented racial cohorts.

Table 1. Outcomes and Cost Aggregate Analysis for White and Non-White Matched Cohorts

	White (n=934)	Non-White (n=934)	P-value
Intraoperative Variables			
Length of Surgery, minutes (SD)	156.19 (2.08)	153.99 (1.99)	.44
Segments Operated (SD)	2.82 (0.02)	2.85 (0.02)	.33
Propofol, mL (SD)	218.79 (5.50)	200.43 (2.95)	<.001
Estimated Blood Loss, mL (SD)	57.96 (2.95)	56.31 (2.82)	.69
Prolonged Intubation, n (%)	6 (0.6)	13 (1.4)	.17
Postoperative Variables			
Length of Stay, days (SD)	1.62 (0.10)	1.49 (0.03)	.23
Nonhome Discharge, n (%)	19 (2.0)	30 (3.2)	.15
Days in ICU (SD)	0.07 (0.03)	0.03 (0.01)	.26
Required ICU Stay, n (%)	26 (2.8)	18 (1.9)	.29
30-Day Readmission, n (%)	19 (2.0)	12 (1.3)	.28
90-Day Readmission, n (%)	42 (4.5)	36 (3.9)	.56
Complications, n (%)	37 (4.0)	51 (5.5)	.16
Cost Aggregate Analysis (\$, SD)			
Total Cost	\$10,764.16 (193.10)	\$11,815.89 (149.98)	<.001
Blood Bank Cost	\$60.92 (3.37)	\$45.11 (1.73)	<.001
Diagnostic Cost	\$100.86 (8.11)	\$84.13 (6.72)	.11
ICU Cost	\$87.59 (41.92)	\$42.64 (12.03)	.30
Imaging Cost	\$36.78 (3.22)	\$42.60 (2.64)	.16
Laboratory Cost	\$53.14 (4.05)	\$38.50 (1.64)	<.001
Nursing Cost	\$892.51 (48.72)	\$839.00 (22.33)	.32
Pharmacy Cost	\$201.33 (37.20)	\$163.87 (5.70)	.32
Rehabilitation Cost	\$123.74 (3.15)	\$138.43 (3.46)	<.001
Respiratory Therapy Cost	\$23.69 (13.07)	\$7.79 (2.32)	.23
Surgery Cost	\$9,183.48 (109.66)	\$10,411.41 (141.16)	<.001

SD, Standard Deviation; ICU, Intensive Care Unit. Univariate analysis compared baseline characteristics between white versus non-white cohorts, after elective anterior cervical discectomy and fusion procedures. All cost information represents those incurred during index hospital admission.