

# Racial Disparity in Total Hospital Length of Stay for Adults Undergoing Elective ACDF

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## Introduction

Racial disparities are an important component of healthcare cost inequalities. It is important to become more familiar with racial differences in patients undergoing spine surgery.

## Methods

Patients were identified by CPT (Current Procedural Terminology) code in the American College of Surgeon's National Surgical Quality Improvement Program (ACS-NSQIP) database. A univariate analysis was performed to compare demographics, comorbidities, operative and postoperative complications across Hispanics, Blacks and Whites. Multivariate step-wise logistic regression was performed on each complication that demonstrated significant association to race in the univariate comparison. Race and any perioperative variables with P<0.2 were included in the multivariate analyses. White race was set as the reference for the race category. Level of significance was set at p=0.05.

## Conclusions

Black race when using White race as reference is an independent predictor of prolonged LOS in patients undergoing ACDF. Further research may be warranted in this area.

## Results

Hispanics were more likely to be ≥ 65 years of age than Whites or Blacks (23.08% vs. 16.41% vs. 12.01%)(p=0.002). Smoking status was least amongst Hispanic patients (23.56% vs. 33.7 Blacks vs. 33.55% Whites)(p=0.002). With regards to comorbidities, Hispanics were observed to have a greater rate of neuromuscular injury (p<0.0001) and previous stroke (p=0.0001) than White or Black patients undergoing ACDF. Length of stay (LOS) > 5 days was more often to be experienced by Black or Hispanic patients than White patients, respectively (11.235 vs. 7.69% vs. 4.96%)(p<0.0001). Postoperative blood transfusion was observed at a greater rate in Hispanics (1.44%) than in Blacks (1.04%) or Whites (0.35%) (p=0.027). Multivariate for LOS > 5 days shows that Black race [Adjusted Odds Ratio (OR)=2.36, p=0.002] but not Hispanic race is an independent predictor of prolonged LOS.

## Learning Objectives

By the conclusion of this session, participants should be able to understand the impact of race on length of stay in patients undergoing ACDF.

**Table 1**

Demographics and Clinical Characteristics of Adults undergoing Posterior Lumbar Fusion Stratified by Race									
Feature	N	White		Blacks		Hispanic		P value	
		Rate	%	Rate	%	Rate	%		
Female	50,51%	3420	50.32%	300	52.23%	97	46.63%	0.451	
Male	49,49%	3402	49.68%	183	47.78%	131	53.37%		
Age									
<65	83.68%	2359	83.59%	337	87.99%	160	76.92%	0.002	
≥65	16.32%	463	16.41%	46	12.01%	48	23.08%		
ASA									
ASA 1/2	62.38%	3779	63.04%	208	54.31%	142	68.27%	0.0008	
ASA 3/4	37.62%	3243	36.96%	173	45.69%	66	31.73%		
Inpatient vs. Outpatient									
Inpatient	79.90%	2240	79.38%	311	81.20%	176	84.62%	0.152	
Outpatient	20.10%	582	20.62%	72	18.80%	32	15.38%		
BMI Class									
Non-Obese (18.5-29.9)	54.23%	3554	55.07%	182	47.52%	135	55.29%	0.023	
Obese I (30-34.9)	26.11%	1733	25.32%	107	27.96%	58	27.88%		
Obese II (35-39.9)	11.57%	737	11.59%	48	12.53%	20	9.62%		
Obese III (≥40)	7.88%	508	7.37%	46	12.01%	15	7.21%		
Diseases									
No Diabetes	84.73%	2429	86.07%	308	79.50%	157	75.48%	<0.0001	
Diabetes	15.27%	971	13.93%	78	20.50%	50	24.52%		
Insulin Dependent	4.69%	323	4.38%	22	5.74%	15	7.21%		
Insulin Independent	7.58%	502	6.55%	46	11.76%	35	16.31%		
Smoke									
Smoker	33.55%	222	33.70%	144	37.60%	49	23.56%	0.002	
Non-smoker	66.45%	448	66.30%	94	24.40%	66	32.44%		
Alcohol									
Alcohol	3.02%	85	3.01%	35	3.92%	3	1.44%	0.244	
Drugs									
At Rest	0.44%	33	0.46%	1	0.26%	1	0.48%	0.887	
Moderate Exertion	6.74%	485	6.91%	22	5.74%	13	6.25%		
No Drugs	93.28%	6464	93.03%	380	98.00%	184	93.27%		
Functional Status Prior to Surgery									
Independent	97.19%	3754	97.50%	386	95.56%	197	94.71%	0.005	
Partially Dependent	2.46%	177	2.02%	17	4.44%	10	4.81%		
Totally Dependent	0.35%	25	0.39%	0	0.00%	1	0.48%		

## Demographics

**Table 2**

Comorbidities and Operative Characteristics of Adults undergoing Posterior Lumbar Fusion Stratified by Race									
Comorbidity	N	White		Blacks		Hispanic		P value	
		Rate	%	Rate	%	Rate	%		
Pulmonary Comorbidity	5.40%	39	3.51%	11	2.87%	6	2.88%	0.743	
Cardiac Comorbidity	45.71%	3226	43.44%	241	62.92%	93	44.71%	<0.0001	
Peripheral Vascular Disease	0.91%	23	0.24%	7	1.83%	1	0.48%	0.117	
Diabetes	0.39%	3	0.11%	0	0.00%	1	0.48%	<0.0001	
Impaired Sensorium	0.15%	4	0.14%	0	0.00%	1	0.48%	0.721	
Neuromuscular Injury	4.69%	332	3.97%	26	6.79%	22	10.58%	<0.0001	
Stroke	2.20%	56	1.59%	2	0.52%	18	8.65%	0.001	
Steroid Use	2.99%	82	2.91%	12	3.13%	8	3.85%	0.733	
Recent Weight Loss	0.32%	10	0.35%	1	0.26%	0	0.00%	0.668	
Bleeding Disorder	1.05%	13	1.17%	0	0.00%	0	0.00%	0.243	
Preoperative Blood Transfusion	0.00%	0	0.00%	0	0.00%	0	0.00%	NA	
Operative Variables									
Operative Time > 4 hours	93.29%	2542	93.62%	349	81.12%	193	92.70%	0.178	
Multilevel	18.06%	450	15.95%	69	18.02%	29	13.94%	0.406	

## Comorbidities and Operative Factors

**Table 3**

Postoperative Complications and Outcomes for Adults undergoing Posterior Lumbar Fusion Stratified by Race									
N	Total	White		Blacks		Hispanic		P value	
		Rate	%	Rate	%	Rate	%		
Postoperative Complication Rate	3.34%	90	3.19%	16	4.18%	8	3.85%	0.550	
Any Complication	0.26%	7	0.25%	2	0.52%	0	0.00%	0.461	
Death	1.49%	37	1.31%	8	2.09%	6	2.88%	0.117	
Pulmonary Complication	0.76%	21	0.74%	3	0.78%	2	0.96%	0.940	
Wound Complication	0.06%	2	0.07%	0	0.00%	0	0.00%	0.811	
Renal Complication	0.23%	6	0.21%	2	0.52%	0	0.00%	0.386	
CNS Complication	0.18%	5	0.18%	1	0.26%	0	0.00%	0.769	
VTE	0.50%	13	0.46%	4	1.04%	0	0.00%	0.180	
Cardiac Complication	0.15%	4	0.15%	2	0.52%	1	0.48%	0.841	
UTI	0.56%	14	0.50%	4	1.04%	1	0.48%	0.396	
Peripheral Nerve Injury	0.12%	3	0.11%	1	0.26%	0	0.00%	0.622	
Intra/postoperative Blood Transfusion	0.50%	10	0.35%	4	1.04%	3	1.44%	0.007	
Graft Failure	0.03%	1	0.04%	0	0.00%	0	0.00%	0.901	
Other Outcomes									
LOS > 5 Days	5.83%	140	4.96%	43	11.23%	16	7.69%	<0.0001	
Return to OR	1.90%	54	1.81%	9	2.31%	2	0.96%	0.467	
Unplanned Reoperations (2011-2012)	1.28%	16	1.28%	2	1.32%	1	0.93%	0.237	
Unplanned Readmissions (2011-2012)	5.13%	101	4.97%	10	6.10%	7	8.64%	0.999	

## Postoperative Complications and Outcomes

**Table 4**

Multivariate Logistic Regression to Assess Race as an Independent Risk Factor for Intra/Postoperative Blood Transfusions				
Risk Factor	Adjusted Odds Ratio	95% Confidence Limits	P Value	
Black vs. White	2.477	0.701 - 8.747	0.3301	
Hispanic vs. White	2.643	0.559 - 12.507	0.5068	
Multilevel Fusion vs. Single	5.494	1.931 - 15.637	0.0014	
Age > 65	4.726	1.614 - 13.843	0.0046	
Functional Health Status: Partially Dependent vs Independent	5.677	1.465 - 21.999	0.0046	
Functional Health Status: Totally Dependent vs Independent	<0.001	<0.001 - >999.999	0.8877	
Cardiac Comorbidity	11.775	1.499 - 92.52	0.019	
Recent Weight Loss	8.39	0.742 - 94.894	0.0857	
Operative Time > 4 Hours	12.43	4.336 - 35.632	<0.0001	
Multivariate Logistic Regression to Assess Race as an Independent Risk Factor for Prolonged LOS (>5 Days)				
Risk Factor	Adjusted Odds Ratio	95% Confidence Limits	P Value	
Black vs. White	2.357	1.582 - 3.511	0.0017	
Hispanic vs. White	1.249	0.682 - 2.287	0.5073	
Outpatient vs. Inpatient	0.074	0.002 - 0.247	<0.0001	
Age > 65	1.771	1.153 - 2.693	0.0012	
Obese II vs. Non-obese	0.454	0.293 - 0.704	0.0005	
Obese III vs. Non-obese	1.214	0.756 - 1.949	0.0081	
Obese II vs. Non-obese	0.861	0.469 - 1.484	0.056	
ASA > 3	1.909	1.365 - 2.671	0.0002	
Functional Health Status: Partially Dependent vs Independent	3.268	1.853 - 5.762	0.4902	
Functional Health Status: Totally Dependent vs Independent	5.748	1.383 - 23.885	0.1136	
Pulmonary Comorbidity	2.822	1.602 - 4.971	0.0005	
Neuromuscular Injury	3.891	2.457 - 6.16	<0.0001	
Bleeding Disorder	3.346	1.294 - 8.649	0.0127	
Operative Time > 4 hours	4.444	2.988 - 6.615	<0.0001	

## Multivariate analysis for Outcomes