

The Role of Neighborhood Social Deprivation in Patients Undergoing Hemiarthroplasty: Complications, Readmissions, and Costs of Care

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INTRODUCTION:

Socioeconomic status (SES) has been demonstrated to be an important prognostic factor among patients undergoing surgery including trauma and lower extremity arthroplasty. Measures of socioeconomic disadvantage may enable improved targeting of measures to prevent and recognize potential increased healthcare utilization in these disadvantaged patients. The Area Deprivation Index (ADI) is a validated and weighted index comprised of 17 census-based markers of material deprivation and poverty. The purpose of this study was to utilize a large nationwide administrative claims database to determine whether patients with high ADI (greater disadvantage) undergoing hemiarthroplasty is associated with differences in: 1) 90-day medical complications; 2) 90-day emergency department (ED) utilization; 3) 90-day readmission rates; and 4) costs of care.

METHODS: A retrospective query of all hemiarthroplasty patients was performed using a large private insurance database from January 1st, 2010 to October 31st, 2020. Cohorts of interest were queried using Current Procedural Terminology (CPT) codes and International Classification of Disease, Ninth/Tenth Revision (ICD-9), ICD-10 codes. ADI is reported on a scale of 0-100 with higher numbers associated with greater disadvantage. Percentile was documented for each zip code for all states. The study group consisted of patients undergoing hemiarthroplasty in zip codes associated with high ADI (95%+) as established by previously published studies. The comparison cohort consisted of hemiarthroplasty patients who underwent surgery in zip codes not defined by the study group (ADI 0-94%). Patients with high ADI were 1:1 propensity score matched to controls by age, gender, and Elixhauser Comorbidity Index (ECI). This yielded 75,650 patients in total, evenly matched between the two cohorts. Primary endpoints of the study were to compare 90-day medical complications, 90-day ED utilization, 90-day readmission rates, and costs of care. Multivariable logistic regression models were used to calculate the odds-ratios (OR) and 95% confidence intervals (95%CI) of ADI on medical complications, ED utilization, and readmission rates. Costs were compared between groups using Welch's T tests. A p-value less than 0.05 was considered to be statistically significant.

RESULTS:

High ADI patients incurred significantly higher rates and odds of developing any medical complications (46.74 vs. 44.97%; OR: 1.05, 95%CI: 1.02 – 1.09, p=0.002), including surgical site infections (1.19 vs 1.00%; OR: 1.20, 95%CI: 1.04 - 1.37, p=0.011), cerebrovascular accidents (1.64% vs. 1.41%; OR: 1.16, 95%CI: 1.03 - 1.31, p=0.012), respiratory failures (2.27% vs. 2.02%; OR: 1.13, 95%CI: 1.02- 1.24, p=0.017), and urinary tract infections (15.76% vs. 14.88%; OR: 1.07, 95%CI: 1.03- 1.12, p=0.0007). Despite no significant difference in 90-day ED utilization in the more deprived cohort (2.92 vs 2.86%: OR: 1.02, 95%CI: 0.94 – 1.12, p=0.579), high ADI patients had significantly lower rates and odds of readmissions within 90 days (10.57 vs. 11.06%; OR: 0.95, 95%CI: 0.91 – 0.99, p=0.027). Ninety-day mortality was similar between cohorts (0.03 vs. 0.06%, p=0.132). Overall day of surgery (\$7,570 vs \$5,974) and 90-day expenditures (\$12,700 vs \$10,462) were greater in patients from a high ADI (p<0.0001).

DISCUSSION AND CONCLUSION:

Socioeconomically disadvantaged patients have increased rates and odds of all 90 day medical complications including cerebrovascular accidents and respiratory failures. Despite an increased overall complication rate, ED utilization was similar in socioeconomically disadvantaged patients within 90 days of surgery. Readmission rates were lower in high ADI patients. Measures of neighborhood disadvantage, including the ADI, could potentially be used to inform healthcare policy and improve post-discharge care.

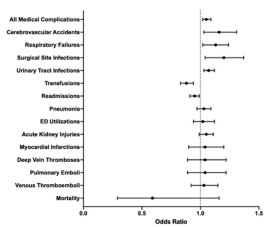


Figure 1. Forest plot of postoperative outcomes of high ADI patients versus controls. High ADI patients were those above the 95th percentile. The reference cohort was anyone from an ADI of 0-94%. High ADI patients had greater odds of all 90-day medical complications, cerebrovascular accidents, respiratory failures, surgical site infections, and urinary tract infections. Patients from high ADI had lower odds of transfusions and readmissions.

Demographics	High ADI (95%)		Controls		p-value*
	n	%	n	%	
Age (Years)					0.99
15-19	4	N/A	4	N/A	
20-24	4	N/A	4	N/A	
25-29	45	0.12	45	0.12	
30-34	61	0.16	61	0.16	
35-39	95	0.26	95	0.26	
40-44	125	0.33	125	0.33	
45-49	155	0.42	155	0.42	
50-54	184	0.50	184	0.50	
55-59	212	0.57	212	0.57	
60-64	239	0.65	239	0.65	
65-69	265	0.72	265	0.72	
70-74	287	0.78	287	0.78	
75-79	305	0.83	305	0.83	
80+	371	1.00	371	1.00	
Sex					0.99
Female	2594	67.66	2594	67.66	
Male	12231	32.34	12231	32.34	
Comorbidity Index					0.99
ECI	1813	4.79	1813	4.79	
0	2397	6.34	2397	6.34	
1	3537	9.35	3537	9.35	
2	4251	11.34	4251	11.34	
3	4313	11.40	4313	11.40	
4	4151	11.04	4151	11.04	
5	3532	9.34	3532	9.34	
6	2660	7.11	2660	7.11	
7	2028	5.35	2028	5.35	
8	1677	4.43	1677	4.43	
9	2081	5.50	2081	5.50	
10	1326	3.51	1326	3.51	
11	894	2.45	894	2.45	
12	716	1.88	716	1.88	
13	491	1.30	491	1.30	
14	1813	4.79	1813	4.79	
15	815	2.15	815	2.15	

Table 1. Demographics of Hemiarthroplasty Patients from High Area Deprivation Index Regions Compared to Case-Matched Controls. ECI = Elixhauser Comorbidity Index. * = <0.1 Patients, N/A = Not Applicable, ** = Assessed by Pearson's χ^2

Medical Complications	High ADI (%)	Control (%)	OR	95% CI	p-value
Urinary Tract Infections	15.76	14.88	1.07	1.03-1.12	0.0007
Acute Kidney Injuries	8.07	7.73	1.05	0.99-1.11	0.079
Phlebotomy	7.88	7.62	1.03	0.97-1.09	0.266
Myocardial Infarctions	1.00	0.86	1.04	0.90-1.20	0.584
Transfusions	5.53	6.01	0.88	0.83-0.94	<0.0001
Surgical Site Infections	1.19	1.00	1.20	1.04-1.37	0.011
Venous Thromboemboli	1.08	1.44	0.75	0.62-0.91	0.014
Pulmonary Emboli	0.88	0.85	1.04	0.89-1.22	0.543
Deep Vein Thromboses	0.99	0.85	1.06	0.89-1.25	0.590
Cerebrovascular Accidents	1.64	1.41	1.16	1.03-1.31	0.012
Respiratory Failures	2.27	2.02	1.13	1.02-1.24	0.017
Total Complications	46.74	44.97	1.05	1.02-1.09	0.002

Table 2. Comparison of Incidence and Odds of 90-day Medical Complications of Patients from High Area Deprivation Index Regions Compared to Controls. OR = Odds Ratio, 95% CI = 95% Confidence Interval

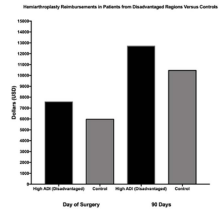


Figure 2. Comparison of day of surgery and 90-day reimbursements in patients from high ADI region versus controls. Patients from high ADI had significantly higher costs both on the day of surgery and within 90-day episode of care (p<0.0001).