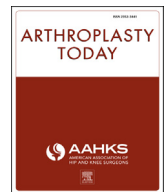




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Original research

Post-acute care disparities in total joint arthroplasty

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ABSTRACT

Background: Understanding the socioeconomic factors that influence hospitalization and post-discharge metrics after joint replacement is important for identifying key areas of improvement in the delivery of orthopaedic care.

Methods: An institutional administrative data set of 2869 patients from an academic arthroplasty referral center was analyzed to quantify the relationship between socioeconomic factors and post-acute rehabilitation care received, length of stay, and cost of care. The study used International Classification of Disease, ninth edition coding in order to identify cohorts of patients who received joint arthroplasty of the knee and hip between January 2007 and May 2015.

Results: The study found that females (odds ratio [OR], 2.07; 95% confidence interval [CI], 1.74–2.46), minorities (OR, 2.11; 95% CI, 1.78–2.51), and non-private insurance holders (OR, 1.56; 95% CI, 1.26–1.94) were more likely to be assigned to institutional care after discharge. The study also found that minorities (OR, 1.45; 95% CI, 1.24–1.70) and non-private insurance holders (OR, 1.43; 95% CI, 1.16–1.77) are more likely to exhibit longer length of stay. Mean charges were higher for males when compared to females (\$80,010 vs \$74,855; $P < .001$), as well as total costs (\$19,910 vs \$18,613; $P = .001$).

Conclusions: Socioeconomic factors such as gender, race, and insurance status should be further explored with respect to healthcare policies seeking to influence quality of care and health outcomes.

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Introduction

Primary and revision knee and hip arthroplasty are experiencing increases in procedural volume across the United States [1–3]. To counter the increase in joint arthroplasty procedures, governmental mandates have focused on cost-saving initiatives, including alternate payment models [4] and the recent implementation of the Comprehensive Care for Joint Replacement model. The Patient Protection and Affordable Care Act has placed an increased focus on quality-driven metrics within US health care, while also attempting to decrease the disparities in healthcare costs and outcomes [5].

The disparities in patient length of stay (LOS), readmission rates, and a variety of other quality metrics have been increasingly

studied within the literature [6–11]. In addition, cost analyses of procedures stratified by socioeconomic factors have also been gaining attention [12,13]. In particular, minority patients or any patients with low socioeconomic status have been found to exhibit lower health outcomes [14,15]. However, few studies in the literature focus on the types of post-acute rehabilitation care (PARC) that joint replacement patients receive based on socioeconomic factors, race, or ethnicity [16]. Furthermore, few studies tie together metrics such as LOS and PARC received with financial metrics. Given this context, the present study aimed at determining (1) whether socioeconomic, gender, or race factors impacted PARC; (2) the influence of socioeconomic, gender, and race factors on LOS; and (3) whether socioeconomic, gender, or race factors influenced costs after total joint arthroplasty.

Material and methods

A consecutive series of patients who underwent a hip or knee arthroplasty procedure from 2007 to 2015 were obtained. Study was approved by the institutional review board. Total (99% of cohort) and partial (1%) joint replacement procedures were

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included. The data set was obtained through a query from our institutional data requisition department. Patients within the study were identified using International Classification of Disease, ninth edition codes 81.51-81.55; all patients exhibiting these codes were included in the study. The study cohort included 2869 patients (termed total cohort). A consecutive subset of patients had complete standardized financial data and were subgrouped into a cost cohort (N = 2612). The 2 study cohorts differ in population number due to missing financial data from 257 patients in the total cohort.

The data sets were then analyzed to determine frequencies, means, and standard deviations for key outcome variables. Univariate and stepwise forward logistic regression analyses were used in order to determine the relationship between our chosen independent variables (gender, race, and insurance) and our dependent variables (institutional care and prolonged LOS). Institutional care was defined as a discharge to a skilled nursing facility (SNF), institutional rehab (IR), or other non-home location. Private insurance was defined as any commercial insurance carrier, whereas managed care plans include Preferred Provider Organizations, Health Maintenance Organizations, and Point-of-Service plans. LOS was generated through hospital admissions data, as is calculated as the difference between time of admission and time of discharge. LOS is calculated in hours but presented in days within the study. The most prevalent zip codes were ranked, and odds ratios were analyzed to see whether they were predictive for an above-average LOS, as zip codes were used as a surrogate for patient residence and median income. Prolonged LOS was defined as longer than the median LOS. Odds ratios, along with the associated 95% confidence intervals and *P* values, were calculated. A *P* value of <.05 was considered to be statistically significant. In addition, 2-tailed Fisher exact tests were used to determine the statistical significance of a variety of differences between mean LOS, as well as cost and charge data between subgroups. In the study, all non-white patients were classified as minorities.

Results

A total of 2869 patients underwent total and partial hip or knee procedures within the single institutional database. The demographic data associated with the 2 study cohorts, total cohort and cost cohort, are listed in Table 1. The average clinical values, along with their standard deviations, are listed in Table 2. The 2 cohorts exhibited equivocal populations based on demographic and clinical information. The study population was comprised of predominantly 50- to 80-year-old females, split relatively evenly between white and black race. The body mass index values were evenly distributed. SNFs, home health (HH), and IR were the most prominent PARCs, and the mean LOS was 3.6 days. Also, 16.7% of patients had private insurance. The vast majority of patients had illness severity levels and risk mortality levels of 1.

As seen in Table 3, females were discharged more frequently to SNFs than males (56.3% vs 43.0%; *P* < .01), whereas males were discharged more frequently to HH than females (39.4% vs 23.3%; *P* < .01). Additionally, black and Asian patients were discharged more frequently to SNFs, when compared to white patients (60.0%, 59.2% vs 43.0%; *P* < .001). White patients were discharged more frequently to HH than either black or Asian patients (36.4% vs 21.9%, 20.4%; *P* < .01) within our patient population.

The relationship between socioeconomic factors and key outcomes is presented in Table 4. Females were more likely to be assigned to institutional care (odds ratio [OR], 2.07; 95% confidence interval [CI], 1.74-2.46; *P* < .001), as were minorities (OR, 2.11; 95% CI, 1.78-2.51; *P* < .001) and non-private insurance holders (OR, 1.56; 95% CI, 1.26-1.94; *P* < .001). Univariate regression analysis also

Table 1
Demographic and clinical data by cohort.

Variables	Total cohort, N = 2869 (%)	Cost cohort, N = 2612 (%)
Age (y)		
≤50	441 (15.4)	373 (14.3)
50-60	880 (30.7)	790 (30.2)
60-70	945 (32.9)	876 (33.5)
70-80	471 (16.4)	449 (17.2)
≥80	132 (4.6)	124 (4.7)
Gender		
Male	1037 (36.1)	952 (36.4)
Female	1832 (63.9)	1660 (63.6)
Race/ethnicity		
White	1349 (47.0)	1244 (47.6)
Black	1391 (48.5)	1245 (47.7)
Asian	49 (1.7)	46 (1.8)
Other	80 (2.9)	77 (2.9)
Body mass index (kg/m ²)		
<25	342 (11.9)	309 (11.8)
25-29.9	714 (24.9)	657 (25.2)
30-34.9	712 (24.8)	651 (24.9)
35-39.9	481 (16.8)	435 (16.7)
≥40	620 (21.6)	560 (21.4)
Discharge location		
SNF	1477 (51.5)	1330 (50.9)
HH	835 (29.1)	780 (29.9)
IR	516 (18.0)	464 (17.8)
RD	37 (1.3)	34 (1.3)
OT	4 (0.1)	4 (0.2)
Length of stay		
<3	426 (14.8)	397 (15.2)
3.0-3.99	1969 (68.6)	1800 (69.0)
4.0-4.99	250 (8.7)	214 (8.2)
≥5	224 (7.8)	201 (7.7)
Insurance classification		
Private	—	435 (16.7)
Medicaid	—	507 (19.4)
Medicare	—	650 (24.9)
Managed care	—	525 (20.1)
Managed Medicare	—	438 (16.8)
Other	—	57 (2.2)
Illness severity level		
1	2317 (80.8)	2123 (81.3)
2	485 (16.9)	430 (16.5)
3	57 (2.0)	51 (2.0)
4	10 (0.3)	8 (0.3)
Risk mortality level		
1	2597 (90.5)	2368 (90.7)
2	238 (8.3)	215 (8.2)
3	18 (0.6)	15 (0.6)
4	16 (0.6)	14 (0.5)

RD, routine discharge; OT, other.

showed similar correlations for LOS (Table 5): prolonged LOS indicated patients who stayed longer than the median LOS (3.3 days). Minorities were more likely to exhibit longer LOSs (OR, 1.45; 95% CI, 1.24-1.70; *P* < .001), as were non-private insurance holders (OR, 1.43; 95% CI, 1.16-1.77; *P* < .001). However, females did not exhibit a longer LOS (OR, 1.11; 95% CI, 0.94-1.3; *P* = .11). Also, patient zip code was not determined to be a significant predictor of LOS.

Table 6 indicates that there is no significant difference between the mean LOS between males and females. However, black patients

Table 2
Average clinical values and standard deviations (SD).

Variable	Total cohort	Cost cohort
Mean age ± SD	61.0 ± 11.7	61.4 ± 11.7
Mean body mass index ± SD	33.3 ± 8.1	33.2 ± 8.0
Mean length of stay ± SD	3.6 ± 1.5	3.6 ± 1.5
Illness severity level ± SD	1.2 ± 0.5	1.1 ± 0.5
Risk of mortality level ± SD	1.1 ± 0.4	1.1 ± 0.5

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