



Brief communication

Medicare coverage is an independent predictor of prolonged hospitalization after primary total joint arthroplasty

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ABSTRACT

The purpose of this study was to investigate the association between insurance type and length of stay (LOS) in primary total joint arthroplasty. A retrospective review of 848 patients was performed. Patients were divided into 3 groups based on their insurance type: Medicare, Medicaid, or commercial coverage. Medicare patients had a significantly higher rate of LOS > 2 days than the Medicaid and commercial groups ($P < .0001$). The effect of Medicare coverage on LOS remained significant even after controlling for baseline differences among the study groups. There were no differences in the rates of 90-day emergency room visits and readmissions between the 3 groups ($P > .05$). Arthroplasty surgeons not experienced with outpatient surgery should not be pressured to default to outpatient admission in Medicare patients.

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Introduction

The Centers for Medicare and Medicaid Services (CMS) is the largest payer for total joint arthroplasty (TJA) in the United States [1]. Between 1991 and 2010, the hospital length of stay (LOS) among Medicare beneficiaries decreased from 7.9 to 3.5 for total knee arthroplasty (TKA) and from 9.1 to 3.1 days for total hip arthroplasty (THA) [2]. Declining trends in LOS and feasibility of fast-track surgery in octogenarians [3,4] have prompted CMS to remove primary TKA from its inpatient-only (IPO) list for Medicare beneficiaries. Discussions are also underway to follow the same suit for primary THA. While no criteria were provided by CMS on how to decide on the type of admission (inpatient vs outpatient), the Two-Midnight rule is frequently used as a benchmark [5]. This rule states that inpatient admission is appropriate if the hospitalization is expected to require at least 2 midnights.

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While the removal of TKA from the IPO list increased interest in outpatient TJA, the concurrent shift toward value-based medicine is another impetus as LOS is critical to controlling the cost of care [6]. Despite concerns in the arthroplasty community regarding CMS' position [7], there are currently limited data on the association between insurance type and LOS. Most studies to date have stratified patients into Medicaid vs non-Medicaid groups [8–10]. Only 2 studies dissected the effect of payer type on LOS into the 3 major insurance groups (Medicaid, Medicare, and commercial), but only in THA [5,11]. Collectively, these studies found higher rates of in-hospital morbidity, prolonged LOS, and resource utilization among Medicaid and Medicare patients [5,8–11]. We are not aware of similar reports comparing the 3 major insurance groups in TKA.

The purpose of this study was to investigate the association between insurance type and LOS after primary TJA. The specific questions were as follows: (1) What are the contemporary trends in LOS among the 3 major payer types (Medicaid, Medicare, and commercial)? (2) What baseline characteristics exist between patients of different payer types? (3) Is payer type associated with increased risk of LOS > 2 days? (4) Is there an association between payer type and 90-day global events? Is there a differential effect of payer type based on the procedure performed (THA vs TKA)? We hypothesized that Medicare coverage was associated with higher baseline comorbidity and higher LOS.

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Material and methods

Institutional review board approval was obtained. Our prospectively collected institutional joint database was queried for all patients who underwent primary THA and TKA between 2012 and 2017. Patients who had simultaneous bilateral, nonelective, or tumor-related surgeries were excluded. In addition, patients were excluded if they underwent a second arthroplasty procedure within 90 days from the first procedure. This is because readmission within the global 90-day postoperative period was one of the secondary outcomes of the study. All procedures were performed by fellowship-trained arthroplasty surgeons. Our institution does not participate in bundled payment programs.

Demographic data collected were age, sex, body mass index, American Society of Anesthesiologists physical classification, surgical indication (primary vs nonprimary osteoarthritis (OA)), education (primary/secondary school vs college/university), smoking status (never/former vs active), race (white, black, Hispanic, or other), and marital status (married/living with significant other vs single/divorced/widowed/separated). As an assessment of OA burden, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) data were collected. In addition, the Short Form-12 Physical Component Summary (SF-12 PCS) was collected as an indication of general physical well-being.

In our institution, there are no variations in perioperative care based on insurance type. The same pathways apply to all patients irrespective of their insurance type. In general, patients are offered to attend a joints class for preoperative education. Spinal anesthesia is the preferred anesthetic unless there are contraindications. Patients are expected to be mobilized on the day of surgery. Target discharge is on the second postoperative day or

earlier depending on meeting the following criteria: adequate pain control, safe ambulation, voiding, and absence of complications.

Medicare, Medicaid, and commercial insurance patients were included in this analysis. Two separate case-control analyses were performed for each arthroplasty procedure type: one compared Medicare patients to Medicaid patients (control group) and the other compared Medicare patients to commercial patients (control group). The primary outcome was hospital LOS. The secondary outcomes were rates of 90-day emergency room (ER) visits and readmissions. LOS was assessed as either >2 days or ≤2 days corresponding to inpatient and outpatient stay, respectively, as defined by the CMS [12]. Case-control power analyses demonstrated that, when assuming standard power and alpha measurements of 0.80 and 0.05, respectively, our sample sizes would be able to reliably detect minimum odds ratios (OR) ≥2.

Statistical analysis was performed using the Stata 15.0 software (StataCorp). Frequencies of occurrence for each of the variable groups were reported, and differences were analyzed using Pearson's chi-squared test. In the event of less than 5 occurrences for a given variable, Fisher's exact test was used. Welch's *t*-test and Wilcoxon's rank-sum test were used to discern differences across ordinal and interval variables, respectively. Multivariate logistical regression, which incorporated baseline variables demonstrating significant differences ($P < .05$), was used to model the association between payer type and LOS >2 days, in-hospital complications, and 90-day readmission and ER visits. Results are reported as adjusted ORs with corresponding 95% confidence intervals (CIs). A separate analysis was performed for THA and TKA. A *P* value of less than .05 was used to indicate statistical significance.

Table 1
Baseline characteristics of the study groups.

Variable	All insurance types (N = 848)	Group 1: medicare (N = 286)	Group 2: medicaid (N = 318)	Group 3: commercial (N = 244)	<i>P</i> value
		Case	Controls		
Age	60.49 ± 11.90	69.32 ± 10.70 ^{a2,3}	53.08 ± 8.77 ^{a1,3}	58.79 ± 9.50 ^{a1,2}	<.0001
Gender					
Male	431 (50.8%)	114 (39.9%) ^{a2,3}	176 (55.3%) ^{a1}	127 (52.0%) ^{a2}	<.0001
Female	417 (49.2%)	172 (60.1%) ^{a2,3}	142 (44.7%) ^{a1}	117 (48.0%) ^{a2}	
Body mass index	30.75 ± 5.54	30.32 ± 5.45	30.85 ± 5.66	31.12 ± 5.48	.2367
ASA classification	2.25 ± 0.50	2.32 ± 0.52	2.56 ± 0.49	2.18 ± 0.49	.085
Diagnosis					
Primary osteoarthritis	554 (70.3%)	215 (81.7%) ^{a2}	174 (57.6%) ^{a1,3}	165 (74.0%) ^{a1}	<.0001
Nonprimary osteoarthritis	234 (29.7%)	48 (18.3%) ^{a2}	128 (42.4%) ^{a1,3}	58 (26.0%) ^{a1}	
Education					
College/university	413 (51.0%)	145 (52.3%) ^{a2,3}	117 (39.7%) ^{a1,3}	151 (63.4%) ^{a1,2}	<.0001
Primary/secondary school	397 (49.0%)	132 (47.7%) ^{a2,3}	178 (60.3%) ^{a1,3}	87 (36.6%) ^{a1,2}	
Smoking status					
Never/former	702 (86.1%)	249 (89.2%) ^{a2}	234 (79.0%) ^{a1,3}	219 (91.2%) ^{a1}	<.0001
Active	113 (13.9%)	30 (10.8%) ^{a2}	62 (21.0%) ^{a1,3}	21 (8.8%) ^{a1}	
Ethnicity					
White	639 (75.9%)	238 (83.8%) ^{a2}	190 (60.3%) ^{a1,3}	211 (86.8%) ^{a1}	<.0001
Black	119 (14.1%)	31 (10.9%) ^{a2}	67 (21.3%) ^{a1,3}	21 (8.6%) ^{a1}	
Hispanic	58 (6.9%)	10 (3.5%) ^{a2}	42 (13.3%) ^{a1,3}	6 (2.5%) ^{a1}	
Other	26 (3.1%)	5 (1.8%) ^{a2}	16 (5.1%) ^{a1,3}	5 (2.1%) ^{a1}	
Marital status					
Married/living with significant Other	379 (46.7%)	130 (46.8%) ^{a2,3}	70 (24.0%) ^{a1,3}	179 (74.3%) ^{a1,2}	<.0001
Single/divorced/widowed/separated	432 (53.3%)	148 (53.2%) ^{a2,3}	222 (76.0%) ^{a1,3}	62 (25.7%) ^{a1,2}	
WOMAC	61.54 ± 20.73	57.95 ± 20.75 ^{a2}	69.03 ± 19.82 ^{a1,3}	56.42 ± 19.12 ^{a1}	<.0001
SF-12 PCS	27.28 ± 8.66	27.71 ± 8.52 ^{a2}	25.38 ± 7.93 ^{a1,3}	29.12 ± 9.26 ^{a1}	<.0001
Length of stay	2.45 ± 0.87	2.73 ± 1.16 ^{a2,3}	2.32 ± 0.68 ^{a1}	2.27 ± 0.55 ^{a1}	<.0001

ASA, American Society of Anesthesiologists physical classification system; SF-12 PCS, Short Form-12 Physical Component Summary; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

Overall *P* values for gender and ASA are reported from Pearson's chi-square test. Other *P* values are from an overall F-test of one-way analysis of variance (ANOVA).

The designator "a" and associated number(s) indicate which subgroup comparisons are significant ($P < .05$).

Bold indicates statistical significance.

Table 2
Postsurgical outcomes for total hip arthroplasty.

Outcome	Control group	Odds ratio	95% Confidence interval	P value
Hospital stay > 2 days	Medicaid	3.88	1.69-8.92	.001
	Commercial	4.42	1.78-10.98	.001
90-Day readmissions	Medicaid	0.06	0.00-1.90	.113
	Commercial		0.00-2.77	.170
90-Day emergency room visits	Medicaid	2.24	0.63-7.99	.214
	Commercial	1.53	0.34-6.84	.574

Odds ratios and their associated *P* values indicate the odds of experiencing each outcome for Medicare patients relative to the indicated control group. The odds ratios were determined from multivariate logistical regressions that accounted for the significant baseline characteristics among the different payer types. Bold indicates statistical significance.

Results

A total of 848 procedures were analyzed: 318 Medicaid, 286 Medicare, and 244 commercial. The mean LOS was 2.73 (range: 1-14) for Medicare patients, 2.32 (range: 1-8) for Medicaid patients, and 2.27 (range: 1-5) for commercial patients ($P < .0001$ compared to the Medicare group). There were no differences in body mass index between the groups. Medicaid beneficiaries were the youngest, whereas Medicare beneficiaries were the oldest ($P < .0001$). Medicaid patients were more likely to smoke tobacco ($P < .0001$), be non-white ($P < .0001$), and have worse baseline WOMAC ($P < .0001$) and SF-12 PCS scores ($P < .0001$). There were more females in the Medicare group ($P < .0001$). Educational attainment was highest among commercial insurance patients and lowest among Medicaid patients ($P < .0001$). While primary OA was the most common indication for TJA, there was higher prevalence of nonprimary OA among Medicaid patients ($P < .0001$). The aforementioned characteristics and associated *P* values are summarized in Table 1.

For THA, Medicare patients had a significantly higher rate of LOS >2 than patients with Medicaid (OR: 3.88, 95% CI: 1.69-8.92, $P < .0001$) and commercial insurance (OR: 4.42, 95% CI: 1.78-10.98, $P = .001$). The association between Medicare insurance and LOS >2 persisted even when considered alongside other significant baseline covariates in a logistic regression. There were no differences in the rates of 90-day ER visits or readmissions among the study groups. Table 2 summarizes the results of the multivariate analysis for THA.

For TKA, Medicare patients had a significantly higher rate of LOS >2 days than patients with Medicaid (OR: 3.81, CI: 1.72-8.44, $P = .001$) and commercial insurance (OR: 3.08, CI: 1.48-6.45, $P = .003$) even when modeled alongside other significant baseline variables. This was in part driven by a tendency toward higher in-hospital complications (OR: 1.65, CI: 0.80-3.38, $P = .055$). There were no differences in the rates of 90-day ER visits or readmissions among the study groups. Table 3 summarizes the results of the multivariate analysis for TKA.

Table 3
Postsurgical outcomes for total knee arthroplasty.

Outcome	Control group	Odds ratio	95% Confidence interval	P value
Hospital stay > 2 days	Medicaid	3.81	1.72-8.44	.001
	Commercial	3.08	1.48-6.45	.003
90-Day readmissions	Medicaid	0.97	0.19-4.84	.970
	Commercial	3.75	0.66-21.26	.135
90-Day emergency room visits	Medicaid	1.31	0.45-3.82	.626
	Commercial	1.67	0.51-5.44	.398

Odds ratios and their associated *P* values indicate the odds of experiencing each outcome for Medicare patients relative to the indicated control group. The odds ratios were determined from multivariate logistical regressions that accounted for the significant baseline characteristics among the different payer types. Bold indicates statistical significance.

Discussion

The removal of TKA from Medicare's IPO list and ongoing discussions to follow the same suit for THA have generated significant operational concerns for surgeons and hospitals, especially with no information provided by CMS on how to determine patient selection. In this study, we aimed to investigate whether any relationship existed between insurance type and hospital LOS after primary TJA. Secondary outcomes were 90-day postoperative global events. We found significant unfavorable baseline characteristics among Medicaid patients (higher prevalence of nonprimary OA, tobacco smoking, lower educational attainment, living alone, and worse WOMAC and SF-12 PCS scores). In spite of several confounders, Medicare remained a significant and independent predictor of increased LOS when compared with Medicaid and commercial insurance patients. There were no differences in the rates of 90-day ER visits or readmissions among the 3 payer types.

To our knowledge, this is the first study to explore the effect of the 3 major insurance types (Medicaid, Medicare, and commercial) on hospital LOS and 90-day global events in fast-track primary total hip and knee arthroplasty. Previous studies have stratified patients into Medicaid or non-Medicaid payer status or had relatively high mean LOS [8-10]. Browne et al [8] retrospectively reviewed 191,111 patients who underwent primary TJA between 2002 and 2011 using the Nationwide Inpatient Sample. The authors found higher LOS (mean: 3.3 days, range: 0-34 days) and in-hospital complications among Medicaid patients. Similarly, in 2 retrospective reviews of patients undergoing primary TJA stratified by Medicaid payer status using the Nationwide Readmissions Database, Shau et al [9,10] demonstrated significantly higher mean LOS in the Medicaid group (4.5 and 4.0 days for THA and TKA, respectively). Prior research by Gronbeck et al [12] examined the impact of numerous additional patient factors on LOS but did not specifically consider patient insurance type. Importantly, some of these factors that proved predictive of LOS, such as female gender and age, demonstrated significant baseline differences between insurance groups in our study and were adequately controlled for through the multivariate regressions.

Although we also observed a propensity for higher 90-day readmissions among Medicaid patients in our study, this propensity was lost when modeled alongside other significant baseline differences. Combining Medicare and commercial insurance patients into 1 group is not justified as several baseline differences exist between them (Table 1), which may lead to alternative conclusions.

This study should be interpreted in the context of some limitations. First, it is a retrospective review from a single, tertiary-care academic center. Second, while we had a sufficient sample size to assess the primary outcome (ie, LOS), the study was not powered for the secondary outcomes (ie, 90-day ER visits and readmissions). As such, we cannot definitely rule out an association between payer type and those secondary outcomes. Nonetheless, this is the first study to explore this topic. We incorporated a wide range of baseline characteristics in our multivariate analysis: both demographic and objective assessments of general health and OA burden.

Conclusions

In conclusion, concerns regarding the removal of TKA from the IPO list and ongoing discussions to follow the same suit for THA are justified. Medicare coverage is an independent predictor for the need of inpatient admission after primary TJA compared with Medicaid and commercial payer types. Risk stratification tools are needed to determine the subset of Medicare patients who are

suitable for outpatient surgery. Until such stratification systems are developed and validated, arthroplasty surgeons not experienced with outpatient surgery should not be pressured to default to outpatient admission in Medicare patients.

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