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Original Article

Complications Following Outpatient Total Joint Arthroplasty: An Analysis of a National Database

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ABSTRACT

Background: As outpatient total hip (THA) and knee arthroplasties (TKA) increase in popularity, concerns exist about the safety of discharging patients home the same day. The purpose of this study is to determine the complications associated with outpatient total joint arthroplasty (TJA) and to identify high-risk patients who should be excluded from these protocols.
Methods: We queried the American College of Surgeons-National Surgical Quality Improvement Program database for all patients who underwent primary TKA or THA from 2011 to 2014. Demographic variables, medical comorbidities, and 30-day complication, readmission, and reoperation rates were compared between outpatient and traditional inpatient procedures. A multivariate logistic regression analysis was then performed to identify independent risk factors of poor short-term outcomes.
Results: Of the total 169,406 patients who underwent TJA, 1220 were outpatient (0.7%). The outpatient and inpatient groups had an overall complication rate of 8% and 16%, respectively. Patients aged more than 70 years, those with malnutrition, cardiac history, smoking history, or diabetes mellitus are at higher risk for readmission and complications after THA and TKA (all $P < .05$). Surprisingly, outpatient TJA alone did not increase the risk of readmission (OR 0.652, 95% CI 0.243-1.746, $P = .395$) or reoperation (OR 1.168, 95% CI 0.374-3.651, $P = .789$), and was a negative independent risk factor for complications (OR 0.459, 95% CI 0.371-0.567, $P < .001$).
Conclusion: With the resources available in a hospital setting, outpatient TJA may be a safe option, but only in select, healthier patients. Care should be taken to extrapolate these results to an outpatient facility, where complications may be more difficult to manage.

As hospitals and healthcare providers face pressure to reduce length of stay after total joint arthroplasty (TJA) procedures [1,2], concerns exist about an increase in readmission and complication rates. Although once considered a major surgery necessitating weeks of inpatient hospitalization and rehabilitation [3,4], inpatient stay after TJA has declined to less than 4 days, with many centers offering fast-track or outpatient total hip (THA) and knee (TKA) arthroplasties [5,6]. As length of stay has decreased, large Medicare studies have noted a concurrent increase in readmissions and short-term complications after TJA [7].

Although supporters of outpatient arthroplasty argue that their protocols decrease costs, hidden costs from managing complications and readmissions have recently come under question [8]. Outpatient TJA protocols are also time intensive, requiring increased resources and staff to manage patients and phone calls in the perioperative period. Recent studies have speculated that patients undergoing outpatient TJA also have more medical complications [9-11], thereby potentially increasing episode-of-care costs. The literature is not clear on the short-term outcomes after outpatient arthroplasty, as many studies supporting outpatient TJA have small number of subjects, lack control groups, and may not capture differences in reoperation and readmission rates at the national level. Furthermore, risk factors excluding patients from outpatient TJA protocols have yet to be addressed in large series in

Study conducted at Rush University Medical Center, Chicago, IL.

Disclosure: The American College of Surgeons National Surgical Quality Improvement Program and the hospitals participating in the ACS NSQIP are the source of the data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors.

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the literature. We hypothesize that outpatient TJA will be associated with poorer short-term outcomes than inpatient procedures.

The purpose of this study was to determine what are the complications of patients undergoing outpatient THA or TKA. We also sought to answer if there was any difference in short-term complications or readmissions between outpatient and traditional inpatient TJA. Finally, when controlling for confounding variables, we asked what are the independent risk factors for 30-day readmissions, complications, and reoperations to determine who should be excluded from outpatient TJA protocols.

Methods

We retrospectively queried the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database for all patients who underwent primary, elective TKA or THA from January 1, 2011 to December 31, 2014. Patients in the database were identified based on the primary procedure consisting of Current Procedural Terminology codes 27447 and 27130. Revisions and arthroplasty procedures coded for fractures were excluded from the study. This study was exempt from institutional review board's approval as all data were deidentified. No external funding was received for this study.

The NSQIP database is a validated, national database including cases from over 650 hospitals [12]. Demographic variables, medical comorbidities, outpatient, or inpatient status were documented from the database. We defined malnutrition as any patient with a preoperative albumin less than 3.5 g/dL and preoperative kidney disease as any patient with a preoperative creatinine greater than 1.5 mg/L. Cardiac disease was defined as someone who underwent a prior percutaneous coronary intervention. Complications, reoperations, and readmissions within 30 days of surgery were noted. Complete NSQIP methodology has been reported previously in the literature [13]. We defined complications within 30 days of surgery as any patient having a recorded surgical site infection, pneumonia, respiratory complication requiring reintubation, pulmonary embolism, deep venous thrombosis, renal insufficiency or failure, urinary tract infection, stroke, cardiac arrest, bleeding requiring transfusion, sepsis, or septic shock. Specific definitions are found in the NSQIP participant use data file [14].

Of the total 169,406 patients included in the study, there were 1220 who underwent an outpatient TJA (0.7%). Outpatient and inpatient TJA were defined using “the hospital's definition of inpatient and outpatient status [14].” The mean age of all patients was 65.9 years (range 18-89 years). There were 102,567 TKA procedures (61%), and 68,226 patients (40%) were men. There were 26,367 (16%) complications within 30 days of surgery, the most common being bleeding requiring transfusion in 12%, wound complications or infection in 1%, urinary tract infection in 1%, and venous thromboembolic events in 1%. There were 904 readmissions within 30 days (0.5%) and 359 patients (0.3%) required a return to the operating room. Descriptive statistics of the study population are tabulated in Table 1.

Statistical Analysis

An *a priori* power analysis was first conducted to determine the appropriate sample size. We sought to power out study to answer whether outpatient TJA had a higher 30-day complication rate than a traditional inpatient stay. Based on a prior NSQIP study citing a complication rate of 7% after primary THA and TKA [9], in order to detect a 1% difference in complication rate, we would need to include a total of 22,182 patients assuming a type I error rate of 0.05 to achieve a power of 0.80.

Table 1
Descriptive Statistics and Demographic Data on the Entire Patient Population.

Demographic Data, N = 169,406	Number
Mean age, y	65.9
Mean BMI, kg/m^2	31.7
Number TKA, %	102,567 (61)
Male gender, %	68,226 (40)
Ethnicity, %	
White	134,208 (79)
African American	11,565 (7)
Asian	3249 (1.9)
Diabetes mellitus, %	25,913 (15)
Smoking history, %	3723 (2)
Malnourished, %	3857 (2)
Kidney disease, %	4618 (3)
Cardiac disease, %	944 (0.6)
History of stroke, %	166 (0.1)
ASA classification, %	
1	5136 (3)
2	88,833 (52)
3	72,256 (43)
4	3003 (1.8)
Outpatient surgery, %	1220 (0.7)
Mean operative time, min	94.5
Any complication, %	26,367 (16)
Return to operating room, %	359 (0.2)
Readmission within 30 d, %	904 (0.5)
Mortality, %	117 (0.1)

ASA, American Society of Anesthesiologists; BMI, body mass index; TKA, total knee arthroplasty.

Data analysis was first performed comparing patients undergoing outpatient TJA with those who had a traditional inpatient stay. Categorical variables were analyzed using a chi-square test. Continuous variables such as age and body mass index were analyzed using an unpaired, 2-tailed, Student *t* test. Statistical significance was set at $P < .05$. Multivariate logistic regression analysis was then performed to identify independent risk factors for 30-day complications, readmissions, and reoperation. Statistical analysis

Table 2
Comparison of Patients Undergoing Outpatient TJA vs Those Undergoing TJA as an Inpatient in the NSQIP Database.

Demographic Data	Outpatient TJA, N = 1220	Inpatient TJA, N = 168,186	*P* Value
Mean age, y	63.1	65.9	<.001
Mean BMI, kg/m^2	32.1	31.7	.024
Number TKA, %	758 (62)	101,809 (60)	.255
Male gender, %	539 (44)	67,687 (40)	.012
Ethnicity, %			
White	878 (72)	133,330 (79)	<.001
African American	190 (16)	11,375 (7)	
Asian	8 (1)	3241 (2)	
Diabetes mellitus, %	208 (17)	25,705 (15)	.088
Smoking history, %	17 (1)	3706 (2)	.054
Malnourished, %	18 (1)	3839 (2)	.060
Kidney disease, %	40 (3)	4578 (3)	.234
Cardiac disease, %	14 (1)	930 (0.5)	.005
History of stroke, %	7 (1)	159 (0.1)	<.001
ASA classification, %			
1	39 (3)	5097 (3)	.534
2	661 (54)	88,172 (52)	
3	504 (41)	71,752 (43)	
4	16 (1)	2987 (2)	
Mean operative time, min	91.8	94.6	.016
Any complication, %	94 (8)	26,273 (16)	<.001
Return to operating room, %	3 (0.2)	356 (0.2)	.796
Readmission within 30 d, %	4 (0.3)	900 (0.5)	.322
Mortality, %	0 (0)	117 (0.1)	.357

ASA, American Society of Anesthesiologists; BMI, body mass index; NSQIP, National Surgical Quality Improvement Program; TJA, total joint arthroplasty; TKA, total knee arthroplasty.