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Should Medicare Remove Total Knee Arthroplasty From Its Inpatient Only List? A Total Knee Arthroplasty Is Not a Partial Knee Arthroplasty

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ABSTRACT

Background: The Centers for Medicare and Medicaid Services have solicited comments to consider removing total knee arthroplasty (TKA) from the Inpatient Only list, as it has done for unicompartmental knee arthroplasty (UKA). The purpose of this study is to determine whether Medicare-aged patients undergoing TKA had comparable outcomes to those undergoing UKA.
Methods: We queried the American College of Surgeons-National Surgical Quality Improvement Program database for all patients aged 65 years or older who underwent elective TKA or UKA from 2014 and 2015. Demographic variables, comorbidities, length of stay (LOS), 30-day complication, and readmission rates were compared between UKA and TKA patients. A multivariate regression analysis was then performed to identify independent risk factors for complications and hospital LOS greater than 1 day.
Results: Of the 50,487 patients in the study, there were 49,136 (97%) TKA patients and 1351 UKA patients (3%). Medicare-aged TKA patients had a longer mean LOS (2.97 vs 1.57 days, $P < .001$), had a higher complication rate (9% vs 3%, $P < .001$), and were more likely to be discharged to a rehabilitation facility (31% vs 9%, $P < .001$) than Medicare-aged UKA patients. When controlling for other variables, TKA patients were more likely to experience a complication (odds ratio, 2.562; $P < .001$) and require LOS >1 day (odds ratio, 14.679; $P < .001$) than UKA patients.
Conclusion: TKA procedure in the Medicare population is an independent risk factor for increased complications and LOS compared to UKA. Policymakers should use caution extrapolating UKA data to TKA patients and recognize the inherent disparities between the 2 procedures.

The Centers for Medicare and Medicaid Services (CMS) established the Inpatient Only (IPO) list in 2000 to identify surgical procedures that should be performed exclusively in an inpatient hospital setting [1]. Requirements to assign a procedure to the IPO list included the invasive nature of the surgery, the need for greater than 24 hours of postoperative care, and the underlying physical condition of the patient [1]. Facilities are paid for procedures on the IPO list through the Inpatient Prospective Payment System, a

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separate payment structure that excludes reimbursement for an outpatient in both hospitals and ambulatory surgical facilities. While total knee arthroplasty (TKA) has been on the IPO list since its inception in 2000, advances in blood conservation, pain management, and early mobilization have resulted in substantial reductions in hospital length of stay (LOS) after TKA [2,3] and have now made outpatient TKA a reality for younger patients [4–6]. Additionally, with a shift toward more TKAs being performed in ambulatory surgical centers, some surgeons have advocated for a policy change to give select, healthy Medicare beneficiaries the option to undergo TKA as an outpatient.

For the 2017 Proposed Rule, CMS has solicited public comments to consider removing TKA from the IPO list. Specifically, CMS has asked "is the procedure described by Current Procedural Terminology (CPT) code 27447 (total knee arthroplasty) sufficiently related to or similar to the procedure described by CPT code 27446 (unicompartmental knee arthroplasty) (UKA) [7]," a procedure that CMS has already removed from the IPO list. Concerns exist that should TKA be reclassified as outpatient like UKA, CMS may reduce payment to facilities, including ultimately refusing to pay for an inpatient stay. A recent study found no difference in short-term complications between TKA and UKA patients [8], but whether these results can be extrapolated to an older cohort of Medicare patients with a more severe comorbidity profile remains unknown. Increased age has already been identified in several national studies as an independent risk factor for complications and readmissions following TKA [9–11]. Further concern is warranted due to older patients potentially having occult comorbidities that fail to show up on existing preoperative screening for medical risk assessment and subsequently put a greater proportion of Medicare-aged patients at risk for postoperative complications after TKA, compared to UKA.

This study was designed to address the CMS question of whether TKA is a similar procedure with similar outcomes to UKA using a queriable national database. Specifically, the purpose of this study is to determine whether Medicare-aged patients undergoing TKA had a longer LOS, more complications, and a higher readmission rate than Medicare-aged UKA patients. Secondary study questions included whether there is any difference between the types of complications between TKA and UKA patients. Finally, when controlling for demographic variables and medical comorbidities, by identifying independent risk factors for LOS of greater than 1 day and 30-day complications, could we identify the ideal Medicare-aged candidate for a short-stay or outpatient TKA?

Methods

We retrospectively queried the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database for all patients aged 65 years or older who underwent elective primary TKA and UKA from January 1, 2014, to December 31, 2015. Patients in the database were identified based on the primary procedure CPT code 27446 (medial or lateral UKA) and 27447 (TKA). Patients younger than 65 years and emergent procedures were excluded from analysis. This study was exempt from institutional review board as all data were de-identified. No external funding was received for this study.

The NSQIP database is a validated, national database including cases from over 650 hospitals [12,13]. Demographic variables, medical comorbidities, as well as 30-day complication, readmission, and mortality were noted from the database. We used standard definitions for comorbidities including defining 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 more than 1.5 mg/L. Complications, reoperations, and readmissions within 30 days of surgery were documented. We defined complications within 30 days of surgery according to NSQIP as any patient having a recorded surgical site infection, pneumonia, respiratory complication requiring intubation, pulmonary embolism, deep venous thrombosis, unplanned intubation, mechanical ventilation greater than 48 hours, renal insufficiency or failure, urinary tract infection, stroke, cardiac arrest, bleeding requiring transfusion, myocardial infarction, sepsis, or septic shock. Postoperative infection was defined as any patient who was recorded as having a superficial surgical site infection, deep surgical site infection, or wound dehiscence. Complete NSQIP methodology has been reported previously in the literature [14].

Of the 50,487 consecutive Medicare-aged patients included in the study, there were 49,136 (97%) TKA patients and 1351 UKA patients (3%). The mean age of all patients was 72.7 years (standard deviation [SD], 5.8 years) and the mean body mass index (BMI) was 31.7 kg/m^2 (SD, 6.5 kg/m^2). The mean LOS was 2.94 days (SD, 3.33 days). There were 4321 patients (9%) who experienced a complication within 30 days. The most common complication was bleeding requiring a blood transfusion in 2381 patients (5%), followed by urinary tract infection in 494 patients (1%), surgical site infection in 459 patients (1%), and deep vein thrombosis in 458 patients (1%). There were 4121 patients (8%) who were discharged from the hospital on postoperative day 1 or sooner.

Statistical Analysis

We first conducted an a priori power analysis to determine the appropriate sample size. We sought to power our study to answer whether Medicare-aged patients undergoing TKA had a higher 30-day complication rate than those patients undergoing UKA. Based on a prior published NSQIP complication rate among TKA patients at 5%, with a 10:1 TKA-to-UKA patient ratio, in order to detect a 2% difference in complication rate, with a type I error rate of 0.05, we would need a total sample size of 14,611 patients to achieve a power of 0.80 [8].

Data analysis was first performed comparing patients who underwent TKA with those undergoing UKA. Categorical variables were analyzed using a chi-square test. When observed or expected values were less than 5, we performed a Fisher exact test. Continuous variables such as age and BMI were analyzed using an unpaired, 2-tailed, Student *t*-test. Statistical significance was set at $P < .05$. To identify the optimal Medicare-aged candidate to undergo outpatient or short-stay TKA, we then performed a multivariate logistic regression analysis to identify independent risk factors for a LOS greater than 1 day and 30-day complications. Statistical analysis was performed using Microsoft Excel (Bellevue, WA) and IBM SPSS version 24.0 (Armonk, NY).

Results

The TKA group was more likely to be female (62% vs 49%, $P < .001$), had a higher mean BMI (31.7 vs 30.5 kg/m^2, $P < .001$), and had a higher American Society of Anesthesiologists classification ($P = .002$) than the UKA group. Complete demographic and outcomes between the groups are shown in Table 1. Medicare-aged TKA patients had a longer mean LOS (2.97 vs 1.57 days, $P < .001$), had a higher complication rate (9% vs 3%, $P < .001$), and were more likely to be discharged to a rehabilitation facility (31% vs 9%, $P < .001$) than Medicare-aged UKA patients. There was no difference between the groups with respect to 30-day mortality (<0.1% vs 0%, $P = .416$), reoperation (1% vs 1%, $P = .614$), or readmission (4% vs 3%, $P = .436$). Medicare-aged TKA patients were also more likely to require a hospital stay of greater than 1 day (54% vs 7%, $P < .001$).