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Original Article

Day of Surgery Affects Length of Stay and Charges in Primary Total Hip and Knee Arthroplasty

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ABSTRACT

Background: Length of hospital stay (LOS) is a large driver of cost after primary total joint arthroplasty (TJA). Strategies to decrease LOS may help reduce the economic burden of TJA. This study's aim was to investigate the effect of day of the week of surgery on mean LOS and total charges following primary total knee arthroplasty (TKA) and total hip arthroplasty (THA).

Methods: An administrative clinical database at a large US health care system was reviewed for all primary THA and TKA admissions performed between 2010 and 2012 (n = 15,237). Of these, 14,800 cases met our inclusion criteria and were analyzed. Furthermore, the cohort was divided into early (Monday/Tuesday) and late week (Thursday/Friday) surgeries, excluding Wednesday surgeries (n = 2835). Univariate and multiple regression analyses examined the effect of each variable on LOS.

Results: Mean LOS for THA and TKA on Monday was 3.54 and 3.35 days and increased to 4.12 and 3.66 days on Friday ($P < .0001$), respectively. Late vs early week admissions had 0.358 (95% confidence interval: 0.29-0.425, $P < .001$) additional hospital days. Increased age (0.003 days per unit increase in age, $P = .02$) and severity of illness score (0.781 days per level increase, $P < .001$) were associated with increased LOS. Late week surgery had a greater effect on LOS for TKA than for THA. TKAs were associated with higher charges for late week surgery vs early week surgery ($P < .001$).

Conclusion: Late week TJA cases, older age, and increasing severity of illness score were associated with increased LOS. Furthermore, late week TKA was associated with increased total charges.

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Primary total joint arthroplasty (TJA), including total hip arthroplasty (THA) and total knee arthroplasty (TKA), is a widely employed surgical procedure for the treatment of end-stage arthritis [1-3]. These procedures are proven cost-effective interventions but remain active targets for cost control given the volume performed annually [4,5]. Length of hospital stay (LOS) is a large driver of medical cost after primary THA and TKA [6]. Over the past decade, the LOS following TJA has decreased through the use of clinical pathways [7] that emphasize blood management [8], multimodal analgesia [9], and early ambulation [10]. Reductions in LOS can help reduce the economic burden of primary THA and TKA [11,12].

In addition to cost savings, LOS is related to the quality of care [13], with studies demonstrating improved patient satisfaction with "fast-tracked" discharge regimens, which further demonstrates the importance of determining factors that increase LOS [14-16]. While numerous authors have established patient and surgical factors that influence LOS such as age, gender, medical comorbidities, anesthesia type, and intraoperative blood transfusions [17-21], there is limited literature on whether the LOS is associated with the weekday that surgery is performed [22-24]. In addition, most studies investigating LOS following primary THA and TKA are limited by small numbers, mixed hospital systems with potentially varying discharge and rehabilitation policies, and failure to control for well-established confounding factors.

The purpose of this study was to investigate the effect of day of the week of surgery on mean LOS and medical charges following primary THA and TKA within a single, large, health care system in the United States.

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Materials and Methods

The University Health Systems Consortium is a validated administrative database [25]. Patient- and hospital-specific factors are collected in this shared database and then assessed by participating institutions for clinical and operational improvement initiatives. The University Health Systems Consortium database was queried for all primary THA and primary TKA done in our health care system between January 1, 2010 and December 31, 2012 using the International Classification of Disease, 9th edition procedural codes 81.54 and 81.51, respectively. There were a total of 15,237 patients who underwent TJA during the study period. Demographics, severity of illness score, day of surgery, and total charge data were collected. Exclusion criteria included non-orthopedic surgery service (n = 103), simultaneous bilateral procedures (n = 62), nonelective diagnoses (n = 237), Saturday/Sunday operations (n = 24), and age less than 18 years (n = 11). A total of 14,800 cases were included in the analysis (Fig. 1). The cohort was divided into early week (Monday and Tuesday) and late week (Thursday and Friday); Wednesday cases were excluded (n = 2835) to clearly delineate between early and late week surgeries. The primary outcome was LOS and the secondary outcome was total charges, stratified by early week and late week surgery status.

Statistical Analysis

Statistical analyses were performed with Stata version SE 10, (College Station, TX). Univariate analysis was performed using Pearson chi-square test or Fisher's exact test for categorical variables and independent Student *t* test or analysis of variance for continuous variables. Multivariate logistic regression was used to determine independent risk factors for increased LOS and charges while adjusting for age, gender, race, and severity of illness score. Risk factors with a *P* value less than .2 in the univariate analysis were used in multivariate models. Odds ratios and 95% confidence intervals (CIs) were reported. A *P* value less than .05 was used to determine statistical significance.

Results

Demographic data and severity of illness score are described in Table 1. The mean age was 65.4 years (±11.2). There were 5441 THAs

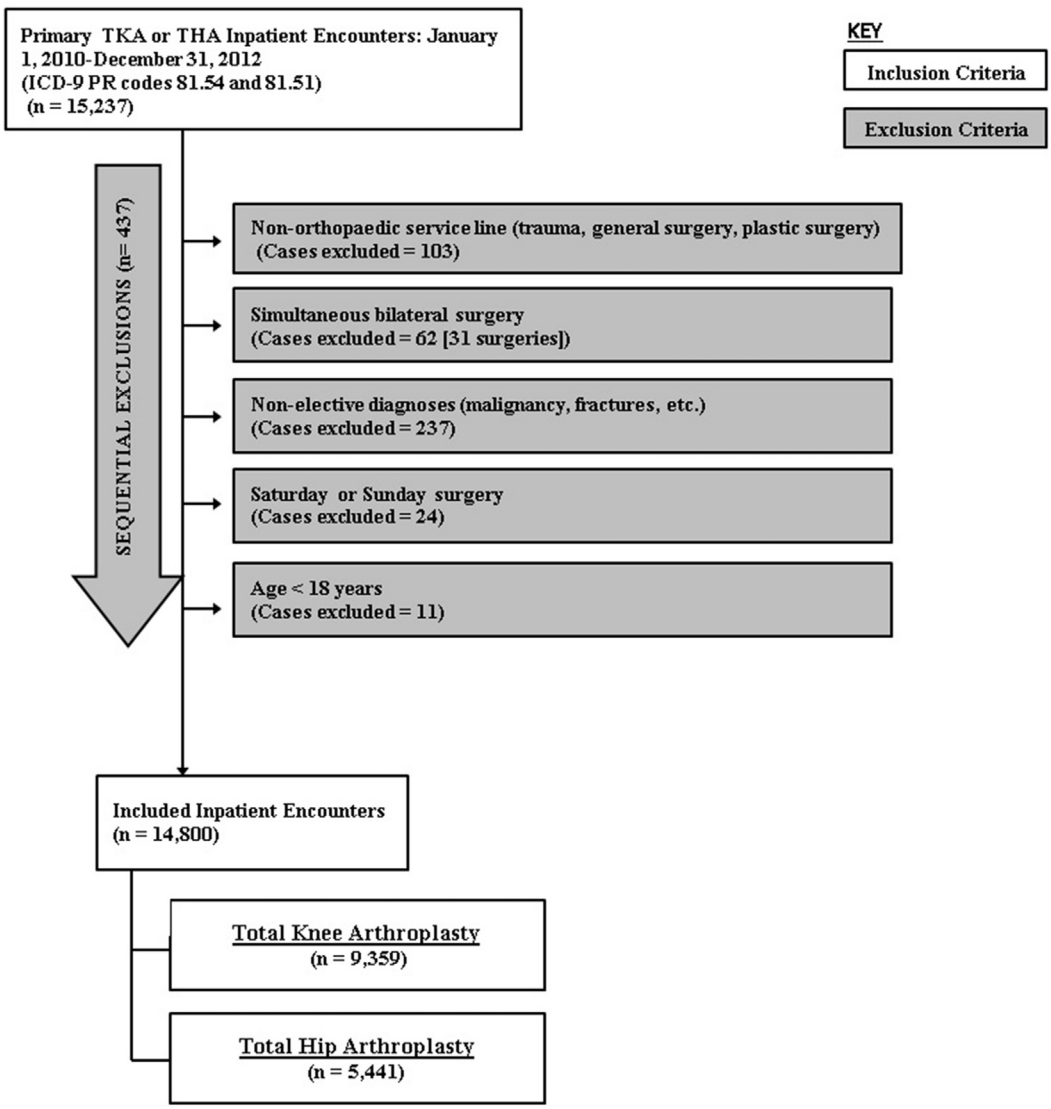

Fig. 1. Flow diagram showing the methodology for identifying the cohort. THA, total hip arthroplasty; TKA, total knee arthroplasty, ICD-9 PR code, International Classification of Disease, 9th edition, procedure code.