The Journal of Arthroplasty xxx (2017) 1–6

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Proceedings of AAHKS

Discharge to Inpatient Facilities After Total Hip Arthroplasty Is Associated With Increased Postdischarge Morbidity

Michael C. Fu, MD, MHS *, Andre M. Samuel, MD, Peter K. Sculco, MD, Catherine H. MacLean, MD, PhD, Douglas E. Padgett, MD, Alexander S. McLawhorn, MD, MBA

Division of Adult Reconstruction and Joint Replacement Service, Hospital for Special Surgery, New York, New York

ARTICLE INFO

Article history:
Received 12 January 2017
Received in revised form
20 February 2017
Accepted 17 March 2017
Available online xxx

Keywords:
total hip arthroplasty
discharge destination
rehabilitation
complications
hip arthroplasty
readmission

ABSTRACT

Background: Discharge disposition accounts for significant variability in costs after elective total hip arthroplasty (THA). Therefore, institutions must evaluate the short-term clinical outcomes associated with postdischarge care options. The present study intends to characterize the associations between short-term morbidity after primary THA and discharge destination.

Methods: Primary elective unilateral THA cases performed for osteoarthritis were identified in the American College of Surgeons National Surgical Quality Improvement Program registry from 2011 to 2014. Propensity scores were used to adjust for selection bias in discharge destination, based on demographics, obesity class, preoperative functional status, modified Charlson comorbidity index, American Society of Anesthesiologists (ASA) class, and the presence of predischarge complications. Propensity-adjusted multivariate logistic regressions were used to examine associations between discharge destination and postdischarge complications, controlling for selection bias based on observable patient characteristics.

Results: Among 54,837 THA cases included in the study, 40,576 (74%) were discharged home, and 14,261 (26%) were discharged to inpatient facilities. In multivariate propensity-adjusted analyses, patients discharged to continued inpatient care after THA were more likely to have septic complications (odds ratio, 2.34; 95% confidence interval, 1.58-3.45), urinary complications (1.51; 1.21-1.90), readmission (1.44; 1.29-1.59), wound complications (1.31; 1.09-1.57), and respiratory complications (1.93; 1.21-3.07).

Conclusion: Discharge to continued inpatient care following THA is associated with increased odds of postdischarge morbidity and unplanned readmission, after propensity score adjustment for predischarge characteristics. Additional research is needed on the impact of devoting resources toward facilitating discharge to home after THA.

Total hip arthroplasty (THA) remains one of the most commonly performed elective surgical procedures worldwide, with estimates between 277,000 and 562,000 THA cases to be performed annually in the United States by 2030 [1]. Similarly, over 88,000 cases were performed in the UK alone in 2014 [2], while in France, over 105,000 THA procedures were performed in 2000 [3]. With such high volumes of THA performed worldwide, postoperative management algorithms must be designed to both optimize patient outcomes and minimize costs to an already taxed global health care payment system.

One phase of postoperative care with significant practice variability is the postdischarge rehabilitation period [4,5]. This postacute inpatient care can account for up to 36% of the total bundled costs of a THA procedure [6], while there remains no clear evidence that it is routinely necessary for functional recovery. Data from the Global Orthopaedic Registry indicates that after THA surgery in the United States, 53% patients are discharged to an inpatient rehabilitation facility, compared with 81% in Japan, and

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to http://dx.doi.org/10.1016/j.arth.2017.03.044.

Each author certifies that his or her institution-approved or waived approval for the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research.

* Reprint requests: Michael C. Fu, MD, MHS, Division of Adult Reconstruction and Joint Replacement Service, Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021.

http://dx.doi.org/10.1016/j.arth.2017.03.044
0883-5403/

only 3%-6% in the UK [7,8]. A report from Canada states the rate of inpatient rehabilitation after THA varies from 0% to 86% depending on the hospital where the patient is discharged from [9].

Since utilization of postacute inpatient rehabilitation services varies quite a bit globally for a procedure with relatively reproducible outcomes, this is an area for potential cost savings for countries and institutions stressed by rising health care costs. It has previously been shown that the cost of home discharge with outpatient rehabilitation is 15,000 US dollars less than discharging the same patient to an inpatient rehabilitation facility [4,5]. In addition, it has been estimated that 5 or more extra days may be added to a patient's acute perioperative hospitalization without exceeding the cost of an inpatient rehabilitation facility admission [10,11].

With the higher costs of inpatient rehabilitation well established, it is also important to understand its clinical ramifications. Inpatient rehabilitation may certainly be indicated in certain patients to improve long-term functional outcomes. However, its use has become exceedingly common after THA procedures in certain institutional and regional settings. Therefore, better understanding of the impact of inpatient rehabilitation on short-term patient morbidity and complications, which are normally uncommon after THA, is warranted. Investigation of complications during the immediate postoperative period after THA is often difficult due to inadequate statistical power to measure differences in the rates of rare negative events. As a randomized trial of inpatient vs home or outpatient rehabilitation is also logistically and clinically difficult, even greater statistical power is also needed to adequately control for confounding patient factors that may influence the discharge disposition of patients. The present study addresses these challenges by using the large patient sample within the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database [12,13]. Propensity score calculation and adjustment is used to determine the association of discharge to inpatient rehabilitation with postdischarge morbidity, independent of predischarge patient factors. We hypothesize that after adjusting for predischarge patient factors, discharge to continue inpatient facility is independently associated with increased postdischarge short-term morbidity.

Materials and Methods

Data Source

A retrospective cohort study was conducted of patients in the American College of Surgeons NSQIP registry from 2011 to 2014. The NSQIP data set is a registry of surgical patients from over 700 US hospitals, including data from operative reports, medical charts, and direct patient questionnaires. Program participants range from large academic medical centers to smaller community hospitals, although not including government Department of Veterans Affairs hospitals [14]. Patients are followed up for 30 days postoperatively to include data on readmissions, adverse events, and any subsequent surgical procedures. Data elements are prospectively collected via chart-abstraction or phone interview by specifically trained NSQIP surgical clinical reviewers and is regularly tested to confirm high inter-rater reliability [14,15].

Study Population

Patients undergoing THA were identified in the database using the Current Procedural Terminology code 27130 and the *International Classification of Diseases, Ninth Revision,* codes 715.15, 715.35, and 715.95 for hip osteoarthritis. Patients undergoing emergent THA, simultaneous bilateral THA, those with recent infections, and those with missing data on age, gender, height, and weight were excluded.

Variables, Outcome Measures

Patient age, gender, height, weight, American Society of Anesthesiologists (ASA) class, anesthesia type, preoperative functional status, and medical comorbidities were obtained from continuous and discrete data elements in the NSQIP 2011-2014 participant user files. Discharge disposition is coded in the NSQIP as "Home" or a number of other values including "Rehab," "Separate Acute Care," "Skilled Care, Not Home," and "Unskilled Facility Not Home," which were grouped as "Inpatient facilities" for the purposes of the present study. Outcome measures assessed were postdischarge complications. As NSQIP follows patients for 30 days postoperatively, all reported complications were assessed including cardiac complications (cardiac arrest or myocardial infarction), inpatient readmissions, respiratory complications (pneumonia, intubation, or ventilator requirement), septic complications (sepsis or septic shock), urinary tract infection, venous thromboembolic complications (deep vein thrombosis or pulmonary embolism), wound complications (deep surgical site infections, organ space surgical site infections, superficial surgical site infections, or wound dehiscence), and death. All complications are defined by strict clinical criteria according to the NSQIP Participant Use Data File User Guide [14]. A composite outcome measure of "any complications" was also assessed including occurrence of any of the aforementioned complications.

Statistical Analysis

First, bivariate analyses were performed to compare outcomes between the home discharge and inpatient discharge populations. Chi-square tests were used to compare categorical data. Owing to multiple hypothesis testing in the present study, a Bonferroni false discovery rate correction was used to avoid type 1 error and to determine the level of statistical significance for each hypothesis test [16].

Next, to account for possible confounding patient factors and the potential selection bias in comparing patients discharged to continued inpatient care and patients discharged to home, a multivariate analysis was conducted using propensity score adjustment. Propensity score adjustment is useful for minimizing confounding effects in studies when randomization may otherwise be clinically or logistically unfeasible. Instead, large sample sizes are used to compute the conditional probability of a patient being assigned to the treatment vs the control group based on pretreatment factors. In the present study, propensity for discharge to an inpatient facility was calculated based on age, gender, preoperative functional status, ASA class, body mass index, anesthesia type (general vs neuraxial), and presence of any NSQIP-defined predischarge complication. A modified Charlson comorbidity index (CCI) was calculated based on predischarge medical comorbidities (Appendix 1) and is an established method for accounting for overall comorbidity burden in outcomes research using the NSQIP [17–19]. In each multivariate analysis, the regression adjusted for baseline patient demographic characteristics, comorbidities, and propensity scores as covariates.

All statistical analyses were conducted using SPSS 22 statistical software (IBM Corporation, Armonk, NY). All statistical tests were 2 tailed. Again, a Bonferroni false discovery rate correction was used to avoid type 1 error and determine the level of statistical significance for each hypothesis test individually.

Results

A total of 55,457 THA patients were initially identified from the 2011-2014 NSQIP using the previously defined query criteria. After