The Journal of Arthroplasty 30 (2015) 2086–2091

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Patient Selection in Short Stay Total Hip Arthroplasty for Medicare Patients

Scott T. Lovald, PhD [a], Kevin L. Ong, PhD [b], Edmund C. Lau, MS [a], Girish P. Joshi, MD [c], Steven M. Kurtz, PhD [b], Arthur L. Malkani, MD [d]

[a] Exponent, Inc., Menlo Park, California
[b] Exponent, Inc., Philadelphia, Pennsylvania
[c] Dept of Anesthesiology and Pain Management, University of Texas Southwestern Medical School, Dallas, Texas
[d] University of Louisville, Dept. of Orthopaedic Surgery, KentuckyOne Health, Louisville, Kentucky

ARTICLE INFO

Article history:
Received 14 February 2015
Accepted 21 May 2015

Keywords:
total hip arthroplasty
short-stay
readmission
length of stay
complications

ABSTRACT

There is a trend towards shortening inpatient hospital stays following total hip arthroplasty (THA) in an effort to reduce healthcare costs and potentially decrease complications. The purpose of this study was to identify patients who are at risk for readmission, complications, and mortality after short stay THA. The Medicare sample (1997–2011) was used to identify THA patients with 1–2-day (Group A, n = 2949) or 3-day (Group B, n = 8707) stays. Complication risks were similar between groups, though there was a reduced risk for hospitalization for Group A (adjusted hazard ratio = 0.90, $P = 0.029$). These findings suggest that age and comorbidities, particularly diabetes and cardiovascular conditions, have the greatest effect on readmission and event risk after short stay THA.

There is a trend towards reducing the length of hospital stay after total hip arthroplasty (THA) to improve patient experience, reduce hospital costs, and potentially decrease morbidity and complications [1,2]. Historically, hospitalization after THA was on the order of weeks [3]. More recently, it has been proposed that programs to shorten the length of stay after THA procedures can be done safely and decrease the need for hospital resources [2]. Beyond cost reduction, it has been proposed that accelerated postoperative rehabilitation may improve a patient's short term functional outcome and perception of well-being [4].

Rehabilitation after THA may be limited by pain, impaired mobility, and postoperative complications [3]. Reduction in hospital stay after total joint arthroplasty has been associated with specialized clinical pathways, patient education, advances in surgical approach, and the use of local/regional analgesia, which controls pain during early physical therapy while allowing adequate lower limb motor function for safe ambulation [3]. To date, most studies of short stay THA patients involve highly selective patient populations. Currently, there is little information in the published literature discussing patient selection prior to a short stay THA procedure. There is therefore a research interest in preoperative identification of patients who are better candidates for short-stay THA procedures [5].

The purpose of the current study was to stratify patient factors associated with increased risk for hospital readmission, revision, complications, and mortality after short stay THA, using a large, nationally representative sample of elderly patients. We hypothesized that patient's age and presence of comorbidities, particularly cardiovascular and diabetic conditions would be associated with a higher risk for hospital readmission and postoperative complications. We also hypothesized that there would be no increased risk in hospital readmissions for patients discharged within 2 days of their hospital stay compared with patients charged within 3 days.

Methodology

The Medicare 5% Limited Data Set (LDS) was used to identify patients who underwent THA between 1997 and 2011. Patients were identified by the CPT-4 code 27130 (Total Hip Arthroplasty) in the physicians' claim records. All included patients were followed for up to 1 year after the THA, until end-of-study, termination of enrollment, or death. Bilateral THA, hemiarthroplasty, and revision THA patients were excluded. Patients in the THA group were further stratified to those who had 1–2 days (Group A) and 3 days (Group B) inpatient stays. Only discharges indicated as "routine" or "routine with home health service" were included, excluding those discharged to a rehabilitation facility, skilled nursing facility, or other institutions. Other exclusions included patients who received benefits for a reason other than

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.2015.05.040.

Reprint requests: Scott Lovald, PhD, Exponent, Inc., 149 Commonwealth Drive, Menlo Park, CA 94025.

http://dx.doi.org/10.1016/j.arth.2015.05.040
0883-5403/

age (i.e., end-stage renal disease or disability) or Medicare beneficiaries who received their care through the Medicare Advantage (Part C) program, and patients who died in the hospital. There were 2949 Group A and 8707 Group B patients who met the inclusion criteria. Patients' enrollment status, age, and date of death, were derived using the matching 1997–2011 Medicare beneficiary denominator files. The Medicare claims data released to researchers include only the final and adjudicated claims records, with corrections to any erroneous or missing information which may be present in the initial submission.

Outcomes examined include mortality, hospital readmission for any cause, revision, postoperative complications, and accidental falls (Table 1). The frequency of these outcomes was examined within 30 days, 90 days, and 1 year after surgery. Revisions were identified using CPT-4 procedure codes 27134, 27137, and 27138, while other postoperative events were identified using the appropriate ICD-9-CM diagnosis and procedure codes.

Multivariate Cox regressions were used to evaluate risk factors for the postoperative outcomes. Patients who did not experience the event or died within the post-THA follow-up periods were censored. If multiple events of the same type occurred (e.g., accidental falls), the first occurrence of the event was modeled in the regression. Covariates included in the Cox regressions were age, gender, census region of residence, race, patient's overall health status (Charlson comorbidity index), socioeconomic status (using the Medicare buy-in status as surrogate), hospital LOS, year of surgery, and existing disease diagnoses for diabetes, heart failure, ischemic heart disease/atherosclerosis, or cardiopulmonary disease, which were identified from diagnoses listed on other claims records for up to a year prior to the index surgery. The Charlson index quantifies the presence of comorbid conditions into a composite score, and has been determined to be a valid method for estimating the risk of death from comorbid disease [6]. A separate model was generated for each outcome, allowing for different risk profiles. All data processing and statistical analyses were conducted using the SAS (9.4) software package (Cary, NC).

Results

The sample was predominantly younger (65–75 years), Caucasian, and having low (0–2) Charlson scores (Figs. 1 and 2). There were small but significant differences between groups according to gender ($P < 0.001$), age ($P < 0.001$) and region ($P < 0.001$). Patients in Group A were more likely to be male, between the ages of 65 and 69 years, and from the West, when compared to patients in Group B. There were no significant differences between Groups A and B according to race ($P = 0.200$), Charlson score ($P = 0.156$), pre-existing ischemic heart disease ($P = 0.732$), diabetes ($P = 0.147$), pulmonary heart disease ($P = 0.595$), or heart failure ($P = 0.907$). There was an increase in the number of patients in Group A after approximately 2005 (Fig. 3). Between 2000 and 2009, there is a faster increase in the number of patients in Group B compared to Group A patients, after which the number of Group B patients begins to level off.

Complications were comparable between Group A and Group B (Table 2), and for all time periods evaluated there were no significant differences in risk between these groups (Tables 3–5), except that Group A had a reduced hospital readmission risk at 1 year (adjusted hazard ratio (HR) = 0.90, $P = 0.029$). Hospital readmission risk was significantly higher for older patients (75+ years vs. 65–69 years: 30 days adjusted HR = 1.38–1.43, $P < 0.001$; 90 days adjusted HR = 1.23–1.35, $P < 0.001$; 365 days adjusted HR = 1.21–1.29, $P < 0.001$), patients with a higher Charlson score (3+ vs. 0: 90 days adjusted HR = 1.27–1.42, $P < 0.003$; 365 days adjusted HR = 1.40–1.51, $P < 0.001$), patients with diabetes (30 days adjusted HR = 1.23, $P = 0.021$; 90 days adjusted HR = 1.17, $P = 0.014$), patients with a history of ischemic heart disease (365 days adjusted HR = 1.10, $P = 0.039$), and patients with a history of congestive heart failure (365 days adjusted HR = 1.28, $P < 0.001$). Patients having their surgery more recently over the study period (30 days adjusted HR = 0.91, $P < 0.001$; 90 days adjusted HR = 0.90, $P < 0.001$; 365 days adjusted HR = 0.93, $P < 0.001$) and patients treated in the Western region (vs. South: 30 days adjusted HR = 0.76, $P = 0.010$; 90 days adjusted HR = 0.82, $P = 0.017$; 365 days adjusted HR = 0.85, $P = 0.008$) had a reduced risk for hospital readmission.

Patients with poorer health status (i.e., a higher Charlson score) were also associated with an increased risk for revision (Charlson score of 5+ vs. 0: 30 days adjusted HR = 3.40, $P = 0.028$; 90 days adjusted HR = 3.31, $P < 0.001$), DVT (Charlson score of 3–4 vs. 0: 365 days adjusted HR = 1.69, $P < 0.001$), mortality (Charlson score of 3+ vs. 0: 1 year adjusted HR = 2.50–7.30, $P \leq 0.015$), and accidental falls (5+ score vs. 0: 30 days adjusted HR = 3.76, $P = 0.010$; 365 days adjusted HR = 2.59, $P = 0.001$). Older age was associated with a higher risk for accidental falls (80+ years vs. 65–69 years: 90 days adjusted HR = 2.85, $P < 0.001$; 70+ years vs. 65–69 years: 365 days adjusted HR = 1.46–3.17, $P \leq 0.017$), though was not significantly associated with an increased risk for death, revision, infection, DVT, dislocation, or mechanical complications for up to a year after the surgery. Interestingly, patients 70–74 years old had the highest risk for postoperative infection (90 days adjusted HR = 1.77, $P = 0.003$; 365 days adjusted HR = 1.45, $P = 0.021$).

At 90 days, patients with ischemic heart disease (adjusted HR = 2.78, $P = 0.049$), diabetes (adjusted HR = 2.51, $P = 0.039$), and pulmonary heart disease (adjusted HR = 6.29, $P = 0.007$) all had significantly increased risk for mortality (Table 4). At 365 days, this risk was only significant for patients with pulmonary heart disease (adjusted HR = 3.46, $P = 0.002$). Patients with heart failure had a 1-year increased risk for dislocation (adjusted HR = 1.88, $P = 0.034$). Patients with diabetes had a higher risk for infection at 90 days (adjusted HR = 1.56, $P = 0.038$), though interestingly, patients with ischemic heart disease had a reduced risk for infection at all follow-up points (30 days adjusted HR = 0.33, $P = 0.004$; 90 days adjusted HR = 0.46, $P = 0.003$;

Table 1
ICD-9 and CPT4 Codes Used to Identify Complications, Revision, and Mortality.

	ICD9 Diagnosis Code	ICD9 Procedure Code	CPT4 Code
Accidental Falls (outcome at 2 weeks, if possible)	E880.X, E881.X, E882.X, E883.X, E884.X, E885.X, E886.X, E887X, E888X		
Infection	996.66, 996.67, 998.59		
Osteolysis	996.45		
Implant fracture	996.43		
Dislocation	996.42, 718.35, 835.0x	79.75, 79.85	
Unspecified or other mechanical complication; Other Complications due to internal joint prosthesis, implant, or graft	996.40, 996.47, 996.46, 996.49, 996.77, 996.78		
Periprosthetic fracture	996.44		
Deep Vein Thrombosis	453.4, 451.1, 451.19, 451.2, 451.81, 451.9, 453.1, 453.2, 453.8, 453.9		
Implant loosening	996.41		
Revision		80.05, 81.53, 00.70–00.73	27134, 27137, 27138
Readmission	any hospital admission		
Mortality	extracted from denominator file		