The Journal of Arthroplasty xxx (2017) 1–6

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Alternative Payment Models Should Risk-Adjust for Conversion Total Hip Arthroplasty: A Propensity Score-Matched Study

Alexander S. McLawhorn, MD, MBA [a, *], William W. Schairer, MD [a], Ran Schwarzkopf, MD, MSc [b], David A. Halsey, MD [c], Richard Iorio, MD [b], Douglas E. Padgett, MD [a]

[a] Department of Orthopaedic Surgery, Adult Reconstruction & Joint Replacement Division, Hospital for Special Surgery, New York, New York
[b] Department of Orthopaedic Surgery, NYU Langone Medical Center, Hospital for Joint Diseases, New York, New York
[c] Department of Orthopaedic Surgery, University of Vermont Medical College, South Burlington, Vermont

ARTICLE INFO

Article history:
Received 15 December 2016
Received in revised form
19 November 2017
Accepted 29 November 2017
Available online xxx

Keywords:
total hip arthroplasty
conversion hip arthroplasty
postoperative complications
Medicare
health insurance reimbursement
health policy

ABSTRACT

Background: For Medicare beneficiaries, hospital reimbursement for nonrevision hip arthroplasty is anchored to either diagnosis-related group code 469 or 470. Under alternative payment models, reimbursement for care episodes is not further risk-adjusted. This study's purpose was to compare outcomes of primary total hip arthroplasty (THA) vs conversion THA to explore the rationale for risk adjustment for conversion procedures.

Methods: All primary and conversion THAs from 2007 to 2014, excluding acute hip fractures and cancer patients, were identified in the National Surgical Quality Improvement Program database. Conversion and primary THA patients were matched 1:1 using propensity scores, based on preoperative covariates. Multivariable logistic regressions evaluated associations between conversion THA and 30-day outcomes.

Results: A total of 2018 conversions were matched to 2018 primaries. There were no differences in preoperative covariates. Conversions had longer operative times (148 vs 95 minutes, $P < .001$), more transfusions (37% vs 17%, $P < .001$), and longer length of stay (4.4 vs 3.1 days, $P < .001$). Conversion THA had increased odds of complications (odds ratio [OR] 1.75; 95% confidence interval [CI] 1.37-2.24), deep infection (OR 4.21; 95% CI 1.72-10.28), discharge to inpatient care (OR 1.52; 95% CI 1.34-1.72), and death (OR 2.39; 95% CI 1.04-5.47). Readmission odds were similar.

Conclusion: Compared with primary THA, conversion THA is associated with more complications, longer length of stay, and increased discharge to continued inpatient care, implying greater resource utilization for conversion patients. As reimbursement models shift toward bundled payment paradigms, conversion THA appears to be a procedure for which risk adjustment is appropriate.

The goal of most alternative payment models is to link reimbursement to patient outcomes. For alternative payment models that use bundled payments, health insurers pay one "target price" for all health care services rendered to a patient within a specified period, an "episode of care." An episode of care is triggered or "anchored" on an initial care event, such as an acute hospitalization for elective surgery. The ensuing episode typically lasts between 30 and 90 days, and the target price must cover the entire spectrum of services related to the triggering event and supplied to the patient over the prespecified period. The target price is paid to episode initiators, which are the entities bearing the financial risk for the episode. Initiators are thus incentivized to coordinate all stakeholders in the care supply chain to minimize overall costs. Therefore, bundled payments theoretically achieve improved patient

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.

Work was performed at the Hospital for Special Surgery, New York, NY.

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 https://doi.org/10.1016/j.arth.2017.11.064.

* Reprint requests: Alexander S. McLawhorn, MD, MBA, Division of Adult Reconstruction & Joint Replacement, Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021.

https://doi.org/10.1016/j.arth.2017.11.064
0883-5403/

outcomes through cost control, inducing better coordination between care providers and facilities to achieve economic efficiencies.

In April 2016, the Centers for Medicare and Medicaid Services (CMS) implemented its mandatory Comprehensive Care for Joint Replacement (CJR) bundled payment model in 67 geographic areas across the United States. CJR impacts all Medicare beneficiaries in these areas receiving total hip arthroplasty (THA) and total knee arthroplasty. Approximately, 800 hospitals are eligible episode initiators. Episodes are triggered by Medicare Severity Diagnosis-Related Group (MS-DRG) codes 469 (major joint replacement or reattachment of lower extremity with major complications or comorbidities) and 470 (major joint replacement or reattachment of lower extremity without major complications or comorbidities) [1]. The MS-DRG system uses International Classification of Diseases procedure codes or Current Procedural Terminology (CPT) procedure codes to identify hospitalizations reimbursed under MS-DRG 469 and 470. Numerous International Classification of Diseases and CPT codes beyond those for primary THA and total knee arthroplasty map to MS-DRG 469 and 470, including those for conversion hip arthroplasty after prior hip surgery. With the exception of specific exclusions [2], such as hemophilia clotting factors, there are few services excluded from CJR, after an MS-DRG 469 or 470 episode is triggered. However, other than target price adjustments made for the 2 MS-DRG codes and the presence or absence of an acute fracture [1,3], CJR provides no other risk adjustment for patient or procedural complexities. Thus, the model potentially disincentivizing episode initiators from assuming the financial risk associated with caring for patients with unusual resource demands or elevated risk for complications. As a foreseeable consequence, these patients access to needed surgery may become restricted.

Conversion THA is a prototypical example of a procedure at risk for restricted access under CJR. CPT 27132 has existed to differentiate conversion of previous hip surgery to THA from primary THA. The code acknowledges that previous hip surgery frequently results in procedural difficulty because of scarring, deformity, and/or retained hardware, and potentially higher complication rates. Further to this point, the relative value units assigned to this CPT code are higher than for primary hip arthroplasty codes, indicating that physician and facility resources required for conversion THA are higher than for primary hip arthroplasties [4]. For example, conversion THA has been associated with increased operative times [5] and has been linked to increased risk for intensive care unit admission [6] compared with primary THA. Yet, the CJR reimbursement model does not currently accommodate for these differences.

Conversion THA is not infrequently required after hip arthrodesis [7,8], hip osteotomies and other preservation procedures [9–11], failed open reduction and internal fixation of acetabular and proximal femur fractures [12–17], and failed hip hemiarthroplasty [18,19]. Although conversion arthroplasty has long been recognized as a high-value procedure from the patient perspective, improving pain, function, and quality-of-life [20], these procedures are known to be more complex than primary THA [10,15], often requiring more costly, revision-style implants [16,21]. Furthermore, although there are few high-quality matched comparative studies [8–10,21], the frequency of reported complications appears to be higher for conversion THA compared with primary THA. Also, Chin et al [21] demonstrated that hospital resource utilization was higher at one hospital for conversion vs primary THA, but differences in postacute care (PAC) between these groups of patients have not been explored and can be a significant driver of bundled care costs [22].

Under a bundled payment reimbursement model, it would seem evermore important to implement systems to differentiate patients and procedures according to their expected outcomes and financial risk so as to prevent cherry picking, lemon dropping, and potential access to care issues. In addition, under these models, resource consumption and outcomes in both the acute and postacute settings must be considered. Therefore, the purpose of this study was to compare the perioperative and 30-day postoperative clinical outcomes in matched cohorts of primary THA and conversion THA patients to explore the rationale for risk adjustment for conversion procedures.

Materials and Methods

This retrospective study accessed the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database, which contains clinical data from surgical patients receiving care at hundreds of participating hospitals. Trained clinical reviewers apply rigorous data definitions for over 135 variables to extract data via chart review. Demographic features and medical comorbidities are recorded. Perioperative variables include primary diagnosis, procedure(s), operative time, and laboratory values. Patients are followed up for 30 days after surgery to capture complications, readmissions, and reoperations. These data are periodically audited, with published audits demonstrating an average inter-rater disagreement of less than 2% [23].

After institutional review board exemption, all primary THA (CPT procedure code 27130) and conversion THA (CPT procedure code 27132) performed between 2007 and 2014 were identified in the NSQIP. Patients were excluded if they had primary diagnosis of hip fracture, because it has been shown that these patients have significantly poorer outcomes after primary THA [3], and CJR provides risk adjustment for fracture diagnoses [1]. Patients with primary diagnoses of cancer were also excluded from this analysis, as these diagnoses also qualify for exclusion under CJR [2].

The primary outcome was the overall frequency of 30-day postoperative complications after THA, as defined by the NSQIP. Complications were further categorized and analyzed as either surgical or medical in nature. Hospital length of stay (LOS), time delay to the operative room (OR), operative time, preoperative and postoperative transfusion requirements, discharge destination, and unplanned hospital readmission within 30 days were additional outcomes of interest.

Statistical Analysis

Preoperative demographics were compared between the primary THA and conversion THA groups for both the unmatched cohorts and one-to-one propensity score-matched cohorts. In general, a propensity score is defined as the conditional probability of receiving an intervention given a set of specified covariates. Statistical methods using propensity scores attempt to reduce confounding in observational studies by balancing measured covariates between study groups, mimicking randomization in prospective trials. Thus, propensity score techniques are useful methods to estimate differences in treatment effects when random allocation to treatments is not possible. These methods require large sample sizes, but when successfully used they provide increased confidence in concluding that observed differences in outcomes between groups are actually attributable to treatment differences [24].

The propensity score for an individual patient in our study was the conditional probability of receiving a conversion THA, given his or her baseline demographic features, including age, sex, American Society of Anesthesiologists score, medical comorbidities, and World Health Organization obesity class. Preoperative laboratory values were not used for matching, because some variables