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Preoperative risk factors for discharge to a postacute care facility after shoulder arthroplasty

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Background: Shoulder arthroplasty procedures are becoming increasingly prevalent in the United States due to expanding indications and an aging population. Most patients are discharged home, but a subset of patients is discharged to a postacute care (PAC) facility. The purpose of this study was to identify the risk factors for discharge to a PAC facility after shoulder arthroplasty.

Methods: The Nationwide Inpatient Sample discharge records from 2011 to 2012 were analyzed for patients who underwent a total shoulder arthroplasty (TSA) or reverse total shoulder arthroplasty (RTSA). Patient and hospital characteristics were identified. Univariate and multivariate analysis were used to determine the statistically significant risk factors for discharge to a PAC facility while controlling for covariates.

Results: In 2011 and 2012, 103,798 patients underwent shoulder arthroplasty procedures: 58,937 TSAs and 44,893 RTSAs were identified. RTSA patients were 1.3 times as likely to be discharged to a PAC facility as TSA patients ($P = .001$). Medicare patients were 2 times as likely to be discharged to a PAC facility than those with private insurance ($P < .001$). In addition, women and patients presenting with a fracture, older age, or an increasing number of medical comorbidities were more likely to be discharged to a PAC facility ($P < .001$).

Conclusion: The risk factors identified in our study can be used to stratify patients at high risk for postoperative discharge to PAC, allowing for greater improvement in overall care and the facilitation of postoperative discharge planning.

Level of evidence: Level III, Retrospective Cohort Study using Large Database, Treatment Study.

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Keywords: Shoulder arthroplasty; discharge; nationwide; database; rehabilitation

Shoulder arthroplasty has become increasingly prevalent, with a 3-fold increase in procedure incidence from 1993 to 2007 and an annual growth rate of 10.6%.[3] With an aging population, expanding indications, and established long-term complication rates, this trend will likely continue. Although most shoulder arthroplasty patients are discharged home, a subset of these patients is discharged to a postacute care (PAC) facility, including skilled nursing facilities (SNFs) and inpatient rehabilitation facilities (IRFs).

PAC facilities are used for patients who require additional medical support or rehabilitation. In the absence of SNFs and IRFs, these patients would face unnecessarily

This study was exempt from Investigational Review Board review at our institution because it used a publicly disseminated database.

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prolonged hospital stays, using limited hospital space and resources. Although a single PAC day costs less than an equivalent day in an inpatient hospital, the financial burden from PAC facilities is still significant.[18] In 2007, more than $150 billion was spent on these facilities alone in the United States (U.S.).[6]

Currently, for any given shoulder arthroplasty performed in the U.S., the discharge disposition is determined case-by-case by the operating surgeon, with no uniform guidelines regarding postdischarge management. This leaves surgeons open to criticism by payers, who are rightfully attempting to mitigate the use of this costly resource. Determining a patient population at an increased risk for discharge to a PAC facility may help clear this ambiguity and serve as justification for the use of this resource.

A number of studies have identified the risk factors for hip and knee replacements that led to discharge to PAC facilities.[1,2,4,8,11,14] Some studies have proposed quantitative scoring algorithm to assess the risk factors for discharge to a PAC facility.[1,12] However, a similar investigation for shoulder arthroplasty has not previously been reported. The purpose of this study was to describe the preoperative characteristics of individuals undergoing shoulder arthroplasty procedures and to identify risk factors for discharge to a PAC facility. Results from this study may be used during preoperative counseling and postoperative discharge planning.

Materials and methods

A retrospective review of the Nationwide Inpatient Sample (NIS) discharge records was conducted for the years 2011 and 2012. The search was limited to these 2 years because 2011 is the first year a unique billing code was created for reverse total shoulder arthroplasty (RTSA) and 2012 is the final year of data currently available through this database. The NIS is the largest inpatient database in the U.S., representing a sample of discharges from all hospitals participating in the Healthcare Cost and Utilization Project (HCUP).[17] This database was searched using International Classification of Diseases, 9th edition (ICD-9) procedure coding for individuals who had a primary procedure of RTSA (81.88) or total shoulder arthroplasty (TSA; 81.80). Primary and revision shoulder arthroplasties were both included in our study. The analysis excluded patients who died during their hospital stay and patients with inflammatory arthropathies, congenital deformities, and malignancies. A full list of the billing codes used for exclusion can be found in Appendix I.

Individuals were grouped by their discharge disposition. Those with a routine discharge home were compared with patients discharged to SNFs and IRFs. Variables assessed included age, sex, race (Caucasian, Black, Hispanic, Asian, Native American), number of chronic medical conditions, days from admission to the primary procedure, total length of stay, primary procedure (TSA, RTSA), primary payer (private insurance, Medicare, Medicaid, self-pay), median household income of the patient's ZIP code of residence ($\leq$\$39,003, \$39,000-\$48,000, \$48,000-\$63,000, $\geq$\$63,000), discharge month, hospital region (Northeast, Midwest, South, West), hospital location and teaching status (urban teaching and nonteaching, rural teaching and nonteaching), hospital bed size (small, medium, large), and hospital ownership (government, private not-for-profit, private for-profit). In addition to total number of chronic conditions, patients with hypertension, congestive heart failure (CHF), diabetes mellitus, peripheral vascular disease, and chronic kidney disease were identified. These specific comorbidities were examined because studies in the hip and knee arthroplasty literature have identified them as risk factors for PAC discharge.[1,14]

All of the aforementioned categoric variables were defined by the HCUP before distribution of the NIS database. The HCUP provides unweighted data, which is the raw number of records provided in the database. Because the data are only a sample of discharges from each community hospital, results from the unweighted data are not generalizable nationwide. To solve this problem, the NIS contains a variable that weights each record by its relative contribution to providing a nationwide estimate. This method of using a weighting variable to produce nationwide estimates has been used in a number of studies using the NIS.[5,10,13,16] Discharge-level weights were used when individual records were compared, and hospital-level weights were used when hospitals characteristics were compared.

Statistically significant differences between those undergoing routine discharge and those going to a PAC facility were determined initially with univariate analysis. The Student t test was used for continuous variables, and χ^2 analysis was used for categoric variables. Any statistically significant variables in the univariate analysis were added to the regression model. To control for the effects of confounding variables, multinomial logistic regression was used to determine the odds ratios (ORs) for each of the variables, with routine discharge used as a reference. Statistical significance was set at $P < .05$.

Results

Patient characteristics

In 2011 and 2012, 103,798 patients underwent shoulder arthroplasty procedures: 58,937 had TSA, and 44,893 had a RTSA. The top 3 indications for both procedures were osteoarthritis, rotator cuff arthropathy, and humeral fractures, accounting for 60.3%, 25.1%, and 11.7% of shoulder arthroplasties, respectively. In addition, 1.76% (1827 patients) were revision arthroplasties.

Of all shoulder arthroplasties, 63.5% (65,958 patients) had a routine discharge, and 14.4% (14,908 patients) were discharged to a PAC facility. The remaining 22% (22,932 patients) were discharged with other dispositions (ie, inpatient hospital, home health care, against medical advice). Patients discharged to PAC facilities were older, with a mean age of 76.8 $\pm$ 8.2 years compared with 67.6 $\pm$ 9.6 years for those routinely discharged ($P < .001$). PAC patients had more comorbidities than those routinely discharged (Table I).

Risk factors

After controlling for confounding factors identified on univariate analysis, older age progressively increased the

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