Analysis of perioperative morbidity and mortality in shoulder arthroplasty patients with preexisting alcohol use disorders

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Background: Shoulder arthroplasty is becoming increasingly popular in the United States. Given the high prevalence of alcohol abuse and its implications in postoperative morbidity and the increasing incidence of shoulder arthroplasty, it is prudent to explore the effect of alcohol use disorders (AUDs) in this patient population. In this study, we considered numerous outcome variables, including perioperative complications, in-hospital death, prolonged hospital stay, and nonroutine discharge.

Methods: Using the Nationwide Inpatient Sample, we performed a retrospective cohort study to identify a population of 422,371 adults (≥18 years old) undergoing total shoulder arthroplasty or hemiarthroplasty between January 1, 2002, and December 31, 2011. We then further subdivided this cohort into those who were classified as having AUDs and those who did not. Comparisons of early postoperative outcome measures were performed by bivariate and multivariable analyses with logistic regression modeling.

Results: Compared with those without AUDs, patients undergoing shoulder arthroplasty with a preexisting AUD have a greater likelihood to experience death, pneumonia, deep venous thrombosis, acute renal failure, transfusion, prolonged length of stay, and nonroutine discharge irrespective of age, gender, race, and other medical comorbidities. Patients with a preexisting AUD are 2.7 times more likely to experience perioperative complications after shoulder arthroplasty.

Conclusion: Patients undergoing shoulder arthroplasty with a preexisting AUD have a greater likelihood of perioperative complications and health care resource utilization after shoulder arthroplasty. Presurgical alcohol screening may prove effective in identifying at-risk patients, and providing interventions before surgery may effectively limit the complication profile.

Level of evidence: Level III, Retrospective Cohort Design, Treatment Study.

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The term *alcohol use disorder* (AUD) has come to describe alcohol use or abuse. Alcohol use is extremely common; up to 115 million American adults imbibe alcohol.[33] Between 2008 and 2010, 5.4% of adults were classified as heavier drinkers (women who drink, on average, more than 7 drinks per week; men who drink, on average, more than 14 drinks per week).[32] Among all

hospitalized patients, it is estimated that 21% to 42% have AUD.[12,22,34] This cohort is increasingly susceptible to sepsis and pneumonia and has a higher rate of mortality.[2,9,10,20] Further, it has also been shown that heavy drinkers have more postoperative complications after colon, prostate, and ankle surgery[39,42,43]; specifically, this population experiences an increased risk of infection,[29] dysrhythmias and cardiac failure,[40,42] and prolonged bleeding time.[28]

Given the high prevalence of alcohol abuse and its implications in early postoperative morbidity and mortality,[14,36,38] it is prudent to explore the effect of AUD in surgical candidates. Shoulder arthroplasty is becoming increasingly popular.[6,19,21] However, the literature has yet to examine the risk encountered by patients with AUD. The aim of this study was to provide an analysis of the impact of preexisting alcohol abuse on perioperative outcomes in a large cohort of individuals admitted to hospitals in the United States for shoulder arthroplasty between 2002 and 2011. Specifically, we sought to evaluate the association between alcohol abuse and perioperative complications, in-hospital death, prolonged hospital stay, and nonroutine disposition in patients undergoing shoulder arthroplasty. The null hypothesis states that among patients undergoing shoulder arthroplasty, and accounting for confounding factors, there will be no differences in inpatient outcomes between patients with and without a concurrent diagnosis of AUD.

Materials and methods

The current study was exempt from approval by our Institutional Review Board as all data were commercially available and deidentified before use.

Using the Nationwide Inpatient Sample (NIS), we performed a retrospective cohort study for the years 2002 through 2011. The NIS is a survey of hospitals conducted annually and sponsored by the Agency for Healthcare Research and Quality. In 2011, the data set included information from 7 to 8 million hospital stays at 1045 hospitals, accounting for a 20% random sample from all hospital discharges from selected hospitals in 46 participating states.[24] This database is currently the largest all-payer inpatient care database in the United States. This database has been published annually since 1988, with an emphasis on demographic, clinical, and resource use data.[15]

The NIS can be used to assess a multitude of queries because it records up to 25 medical diagnoses and 15 procedures that can be identified through the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes. The database also maintains specifics on patient and hospital characteristics and inpatient outcomes including discharge disposition, length of stay, and total hospitalization charges.[16,27] However, a distinguishing characteristic of this database is that it includes only in-hospital data; therefore, no preoperative data are available (excluding preoperative diagnoses). Numerous studies have recently been published employing databases such as the NIS to analyze pertinent medical questions.[3,24,25]

In this study, the NIS was employed to identify a population of 422,371 adults ($\geq$18 years old) undergoing total shoulder

arthroplasty or hemiarthroplasty between January 1, 2002, and December 31, 2011. We then further subdivided this cohort into those who were classified as having AUD and those who did not. AUDs were identified by the following ICD-9-CM codes: 303 (acute alcohol intoxication), 303.9 (unspecified alcohol dependence), 305 (alcohol abuse), and 291 (alcohol-induced mental disorders). To identify a population of shoulder arthroplasty patients, discharges with a procedure code (ICD-9-CM) for total shoulder arthroplasty (81.80, 81.88) and hemiarthroplasty (81.81) were included in the sample. Unfortunately, patients undergoing shoulder arthroplasty with AUDs who were not identified and classified as such represented the non-AUD cohort.

In this study, we considered the following outcome variables: perioperative complications (e.g., acute myocardial infection, pulmonary embolism, acute renal failure, gastrointestinal complication), in-hospital death, prolonged hospital stay, and nonroutine discharge. A prolonged hospital stay was defined as an average length of stay greater than the 75th percentile.[13,17,25] Discharge disposition status was dichotomized to routine (home) and nonroutine (short-term hospital, skilled nursing facility, intermediate care, another type of facility, home health care, against medical advice, and death). Other variables including age, ethnicity, sex, and median household income were used in this study.

The primary outcome of the study was to compare perioperative complications in shoulder arthroplasty patients with and without AUDs. Secondary outcomes focused on identifying variations in length of stay and hospital discharge.

Normal distribution of the data was assumed because of the large sample size. Bivariate analysis was used to determine the relationship between AUD and shoulder arthroplasty with respect to the aforementioned criteria. We specifically used Pearson χ^2 test for categorical data and independent samples t test for continuous data. Multivariable binary logistic regression analyses assisted identification of independent risk factors for complications, mortality, prolonged hospital stay, nonroutine discharge, and higher hospital charges. These models were adjusted for age, gender, race, and comorbidities to report an odds ratio (OR) with respect to 95% confidence interval (CI). Statistical significance was set at $P < .05$. SPSS version 22.0 (SPSS, Chicago, IL, USA) was used for all statistical analyses and data modeling.

Results

Between January 1, 2002, and December 31, 2011, an estimated total of 422,371 patients underwent shoulder arthroplasty, 5658 (1.3%) with AUD and 416,713 (99%) without AUD (Table I). Of these patients, 59% underwent total shoulder arthroplasty and 41% underwent hemiarthroplasty. Patients with AUD tended to be younger (62 ± 11 years vs 69 ± 11 years; $P < .001$), males (63% vs 39%; $P < .001$), and of African American descent (4.7% vs 3.1%; $P < .001$). Regarding insurance status, household income, and region of the country, patients with AUD tended to have either Medicaid insurance (8.8% vs 2.5%; $P < .001$) or private insurance (34% vs 26%; $P < .001$), a lower median household income (23% vs 21% in $1-$38,999 range, $P < .001$; 28% vs 27% in $39,000-$47,999