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ORIGINAL ARTICLE

Insurance status affects postoperative morbidity and complication rate after shoulder arthroplasty

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Background: Shoulder arthroplasty is an effective procedure for managing patients with shoulder pain secondary to end-stage arthritis. Insurance status has been shown to be a predictor of patient morbidity and mortality. The current study evaluated the effect of patient insurance status on perioperative outcomes after shoulder replacement surgery.

Methods: Data between 2004 and 2011 were obtained from the Nationwide Inpatient Sample. Analysis included patients undergoing shoulder arthroplasty (partial, total, and reverse) procedures determined by International Classification of Disease, 9th Revision procedure codes. The primary outcome was medical and surgical complications occurring during the same hospitalization, with secondary analyses of mortality and hospital charges. Additional analyses using the coarsened exact matching algorithm were performed to assess the influence of insurance type in predicting outcomes.

Results: A data inquiry identified 103,290 shoulder replacement patients (68,578 Medicare, 27,159 private insurance, 3544 Medicaid/uninsured, 4009 other). The overall complication rate was 17.2% (n = 17,810) and the mortality rate was 0.20% (n = 208). Medicare and Medicaid/uninsured patients had a significantly higher rate of medical, surgical, and overall complications compared with private insurance using the controlled match data. Multivariate regression analysis found that having private insurance was associated with fewer overall medical complications.

Conclusion: Private insurance payer status is associated with a lower risk of perioperative medical and surgical complications compared with an age- and sex-matched Medicare and Medicaid/uninsured payer status. Mortality was not statistically associated with payer status. Primary insurance payer status should be considered as an independent risk factor during preoperative risk stratification for shoulder arthroplasty procedures.

This study was deemed not human subjects research by the Boston University Medical Center Institutional Review Board.

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Level of evidence: Level IV; Case Series from Large Database; Prognosis Study
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Keywords: shoulder arthroplasty; reverse shoulder arthroplasty; medical complications; surgical complications; insurance status; shoulder arthritis

Shoulder arthroplasty is an effective procedure for managing patients with shoulder pain secondary to end-stage arthritis or degenerative joint disease. When nonoperative treatment is unsuccessful, shoulder arthroplasty can successfully reduce pain and restore function. Since the advent of this surgical procedure in 1893, medical advancements and improvements in implant design have led to the development of both the anatomic and reverse shoulder replacement procedures.¹² The number of shoulder arthroplasties performed annually consequently increased 2.5-fold between 2000 and 2008¹⁹ and continues to rise, due in large part to an aging demographic and surgeons' increasing familiarity with the techniques.

Recent legislative efforts such as the Patient Protection and Affordable Care Act of 2010 extends medical coverage to a previously uninsured population and emphasizes a better understanding of the preoperative factors associated with poor patient outcomes and increased costs. Patients with Medicare insurance are older than age 65 or receive the government-sponsored insurance because of permanent disability or dialysis. Medicaid insurance is a government-subsidized program that provides health care to low-income patients with poor socioeconomic status.

Insurance status has been shown to be an indicator of postoperative success in spine and general surgery because patients with no insurance or government-sponsored insurance (Medicare or Medicaid) are less compliant³¹ and are at greater risk for a postoperative complication.^{2,4,5,21} Understanding the effect of insurance status, limited access to health care, and relevant socioeconomic factors on patient compliance and postoperative results is important for optimizing patient outcomes and utilization of health care resources.

Although several studies have used insurance payer status to highlight differences in postoperative surgical outcomes, to our knowledge, this study is the first to evaluate the influence of insurance status and postoperative morbidity and mortality after shoulder replacement surgery. A large, national administrative database was used to study the effect of payer status on primary medical and surgical complications, and a secondary analysis assessed mortality and hospital charges. Based on previous literature, we hypothesized that uninsured or government-sponsored patients would have worse outcomes after total, partial, or reverse arthroplasty than those with private insurance and that primary insurance payer status would be an independent risk factor to consider during preoperative risk stratification and planning.^{7,10,14,16,21,27}

Materials and methods

The Healthcare Cost and Utilization Project Nationwide Inpatient Sample (NIS) between 2004 and 2011 was used to obtain the data. The NIS is the largest national database of all-payer inpatient discharge information, sampling approximately 20% of all nonfederal United States hospitals, and consists of 9 million hospital admissions annually. Each NIS entry includes International Classification of Diseases, 9th Revision, Clinical Modification diagnosis and procedure codes of activity during the patient's hospitalization at the time of discharge as well as patient demographics, hospital characteristics, and duration of stay. More information about the NIS can be found at: <http://www.hcup-us.ahrq.gov/nisoverview.jsp>.

Analysis included patients undergoing shoulder arthroplasty procedures (International Classification of Diseases, 9th Revision procedural coding: 81.80—total shoulder arthroplasty, 81.81—partial shoulder arthroplasty, and 81.88—reverse shoulder arthroplasty). Patient demographics and comorbidities were analyzed and stratified by insurance type (Medicare, Medicaid/uninsured, private insurance, or other). Comorbidities were scored based on the Charlson Comorbidity Index, a tool used to determine the likelihood of death for a patient during a 10-year period while taking into account possible medical conditions. Descriptive hospital data, including hospital size, location, teaching status, and region were collected.

The primary outcome was medical and surgical complications occurring during the same hospitalization, with secondary analyses of mortality, discharge destination, and hospital charges. Medical complications included an acute cardiac event, pulmonary edema, venous thromboembolic event, cerebrovascular event, acute kidney injury, pneumonia, sepsis, and urinary tract infection. Perioperative surgical complications included wound disruption, hematoma formation, implant failure, fractures, blood transfusions, or any reported adverse surgical events.

Adjusted odds ratios (ORs) were calculated to assess the risk of medical and surgical complications and mortality. The Wald parametric statistical test was similarly used to evaluate the strength of the association between complication risk and patient/hospital variables, including ethnicity, age and insurance type.

A secondary analysis was performed using the coarsened exact matching algorithm as described by Brown et al,⁷ where each Medicaid patient was matched to Medicare and private insurance patients while controlling for age and sex. Likelihood ratios were calculated to validate the adjusted ORs and Wald test results. The Pearson χ^2 test and multivariate regression were performed to assess the influence of insurance type on medical and surgical complications.

Multilevel logistic regression was also performed to determine the natural \log_{10} of the total charges as predicted by payor type and controlling for age and sex. The grouping variable hospital identification was also controlled for using generalized estimating equations and an independent correlation structure. All analysis was performed using R 3.0.3 (R Foundation, www.r-project.org) or STATA/MP 14.0 (StataCorp LP, College Station, TX, USA) statistical software.

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