SCIENTIFIC ARTICLE

Complications Within 30 Days of Hand Surgery: An Analysis of 10,646 Patients

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Purpose The American College of Surgeons Surgical Quality Improvement Program database collects detailed and validated data on demographics, comorbidities, and 30-day postoperative outcomes of patients undergoing operations in most subspecialties. This dataset has been previously used to quantify complications and identify risk factors in other surgical subspecialties. We sought to determine the incidence of postoperative complications following hand surgery and to identify factors associated with increased risk of complications in order to focus preventive strategies.

Methods National Surgical Quality Improvement Program data from 2006 to 2011 were queried using 302 hand-specific Current Procedural Technology codes. Descriptive statistics were calculated for the population, and potential risk factors and patient characteristics were analyzed for their association with complications in the 30-day postoperative period using both univariate and multivariate analyses.

Results There were 208 hand-specific Current Procedural Technology codes represented in the data, and of these, 84 were associated with at least 1 complication. The overall incidence of complications within 30 days of hand surgery was 2.5% (95% confidence interval, 2.2%–2.8%). In univariate analysis, older age, diabetes, chronic obstructive pulmonary disease, congestive heart failure, atherosclerosis, steroids, bleeding disorder, increasing American Society of Anesthesiologists class, increasing wound class, emergency procedure, longer operative time, and preoperative transfusion were associated with significantly higher risk of complications, and local anesthesia and outpatient surgery were associated with lower risk. In the multivariate model, male sex, increasing American Society of Anesthesiologists class, wound class 4, and preoperative transfusion were associated with significantly higher risk, and outpatient surgery was associated with significantly lower risk. The most common complication was surgical-site infection (1.2%).

Conclusions The incidence of complications was low, with overall health status being more important than specific comorbidities in predicting complication risk. This information may be valuable in counseling patients before surgery and in identifying patients at higher risk for complications following hand surgery. *(J Hand Surg Am. 2015;■(■):■–■. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic III.

Key words Complications, hand surgery, morbidity, NSQIP, risk factors.

Additional material is available online.

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The demand for accurate surgical outcomes data has increased in recent years.[1–3] Although hand surgery is generally regarded as having low systemic risk,[4] data on early morbidity and risk factors are scarce. Most outcomes studies in the hand surgery literature have focused on upper extremity-specific outcomes, such as recovery of function or bony union. Furthermore, most of these studies did not have the statistical power to analyze risk factors for systemic complications, which are rare after hand surgery. Understanding the rates and risk factors for early postoperative complications is an important step toward evidence-based decision making and accurate preoperative counseling, but accomplishing these goals requires the analysis of a large sample of patients.[1–3,5]

The American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) maintains a robust, validated, prospective database of patients undergoing surgical procedures at over 570 institutions. Large patient numbers provide adequate statistical power to investigate even rare exposures and outcomes. This database has been used extensively in other surgical fields to study 30-day complication profiles and risk factors.[6–11] Recently published studies have used NSQIP data to investigate the 30-day risk profile of operative repair of distal radius fractures,[1–3,12,13] but the NSQIP database has not been used to define the risk profile for hand surgery overall.

A thorough analysis of the NSQIP data for hand surgery could enhance evidence-based preoperative counseling and the implementation of risk-reduction strategies. Furthermore, the resulting information might provide insights that would allow hand surgeons to focus efforts where they might have the greatest impact. In this study, we analyzed NSQIP data from 2006 to 2011 to define the overall 30-day complication profile in hand surgery and to identify patient and perioperative factors associated with an increased risk of complications.

MATERIALS AND METHODS

Study design, population, and setting

We conducted a retrospective cohort study based on the NSQIP database in adults undergoing hand surgery from 2006 through 2011. The NSQIP database contains preoperative, intraoperative, and postoperative data on adult patients undergoing surgical procedures across all surgical fields collected at over 570 participating centers. The NSQIP data-collection methods have been well-validated[4,14] and are described in detail elsewhere.[1–3,5,15] This study contains patients aged 16 years and older, because NSQIP increased inclusion age from 16 to 18 years in 2011. Trained surgical clinical reviewers record 240 preoperative and intraoperative variables for each patient enrolled and any complications occurring in the first 30 days after surgery.[6–11,16] Complete follow-up is ensured through chart review, patient telephone calls, and scheduled clinic visits. A 2010 audit of NSQIP found its variable coding to have high inter-rater reliability, with a disagreement incidence that had fallen from 3.2% to 1.6% over time.[14]

National Surgical Quality Improvement Program participant use data files were obtained for the years 2006 through 2011. Three-hundred two hand-specific Current Procedural Terminology (CPT) codes were identified.[17] Current Procedural Terminologies related to the elbow, upper arm, or shoulder were not included. Nonspecific CPTs (eg, skin graft) that could refer to procedures on the hand or other anatomical locations were also excluded. The participant use data files were combined into one large data set and queried by the 302 hand-specific CPTs in order to capture as many hand surgery patients as possible.

Exposures and outcomes

Based on previous studies of surgical complications,[4,18,19] we identified patient- and perioperative factors that we hypothesized might be associated with a higher risk of complications after hand surgery. These were our exposures of interest and included patient characteristics (age, race, ethnicity, body mass index), comorbidities (smoking history, alcohol use, diabetes, chronic obstructive pulmonary disease [COPD], congestive heart failure [CHF], clinical atherosclerosis, bleeding disorder, and steroid use within 30 days prior to surgery), and perioperative clinical factors (whether surgery was emergent, whether the patient was transfused before surgery, whether surgery was performed in an inpatient vs an outpatient setting, surgical wound classification, and length of the operation). Preoperative transfusion was defined in the NSQIP database as more than 3 units during the 72 hours preceding surgery. We defined clinical atherosclerosis as history of coronary artery disease, peripheral vascular disease, stroke, or transient ischemic attack. Bleeding disorder was defined as anything that increases bleeding risk, including therapeutic anticoagulation not stopped for the procedure but not including aspirin use. We also examined American Society of Anesthesiologists (ASA) class as a marker of overall patient health as an exposure of interest. We favored ASA class over other