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Original article

Which postoperative complications matter most after bariatric surgery? Prioritizing quality improvement efforts to improve national outcomes

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Abstract

Background: National quality programs have been implemented to decrease the burden of adverse events on key outcomes in bariatric surgery. However, it is not well understood which complications have the most impact on patient health.

Objective: To quantify the impact of specific bariatric surgery complications on key clinical outcomes.

Setting: The Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program database.

Methods: Data from patients who underwent primary bariatric procedures were retrieved from the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program 2015 participant use file. The impact of 8 specific complications (bleeding, venous thromboembolism [VTE], leak, wound infection, pneumonia, urinary tract infection, myocardial infarction, and stroke) on 5 main 30-day outcomes (end-organ dysfunction, reoperation, intensive care unit admission, readmission, and mortality) was estimated using risk-adjusted population attributable fractions. The population attributable fraction is a calculated measure taking into account the prevalence and severity of each complication. The population attributable fractions represents the percentage reduction in a given outcome that would occur if that complication were eliminated.

Results: In total, 135,413 patients undergoing sleeve gastrectomy (67%), Roux-en-Y gastric bypass (29%), adjustable gastric banding (3%), and duodenal switch (1%) were included. The most common complications were bleeding (.7%), wound infection (.5%), urinary tract infection (.3%), VTE (.3%), and leak (.2%). Bleeding and leak were the largest contributors to 3 of 5 examined outcomes. VTE had the greatest effect on readmission and mortality.

Conclusion: This study quantifies the impact of specific complications on key surgical outcomes after bariatric surgery. Bleeding and leak were the complications with the largest overall effect on end-organ dysfunction, reoperation, and intensive care unit admission after bariatric surgery. Furthermore, our findings suggest that an initiative targeting reduction of post–bariatric surgery VTE has the greatest potential to reduce mortality and readmission rates. (Surg Obes Relat Dis 2018;▮:00–00.)

Keywords: Bariatric surgery; Quality; Complications; Accreditation; Thromboembolism; VTE; Leak; Bleeding; Morbidity; Mortality

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Quality initiative (QI) programs have been designed and implemented by the American Society for Metabolic and Bariatric Surgery, the American College of Surgeons (ACS), and other surgical organizations to mitigate surgical complications and to decrease the clinical and financial burden of postoperative adverse events on key clinical outcomes in bariatric and metabolic surgery. Comparable programs are rapidly becoming the backbone of many specialties and aim to enhance the quality of patient care delivery and allow for evidence-based regulatory and accreditation processes [1,2]. Furthermore, programs like the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) provide an enormous volume of data that serves as the foundation of innumerable contemporary studies that continue to shape our specialty into the safe, effective, and cutting-edge field it has become [3–7].

Within the field of bariatric and metabolic surgery, the MBSAQIP has been instrumental in identifying several patient, disease, operative, and postoperative variables that contribute to the occurrence of several early and late outcomes, including both desired effects and intervention-related complications. However, it is not well understood which postoperative complications have the most significant effect on outcomes after bariatric surgery, an important factor when considering resource-dependent QI efforts in today's healthcare climate, which demands increased quality of care delivery at less cost. Recently, innovative analyses have been reported in other surgical specialties to address these very questions employing a novel statistical method, population attributable fractions (PAFs), to gain a sense of the weighted effects of certain complications on various important clinical outcomes like readmission, reoperation, end-organ dysfunction, and mortality [8,9].

The aim of this study was to quantify the nationwide impact of specific bariatric surgery complications on key clinical outcomes using PAFs, among other statistical methods, for what we believe to be the first time in bariatric and metabolic surgery. A better understanding of these results will help direct future national quality improvement efforts.

Methods

Data source and study population

Data from patients aged ≥18 years with body mass index (BMI) >30 kg/m^2 who underwent elective primary bariatric surgical procedures were retrieved from the MBSAQIP 2015 participant use file (PUF).

With more than 150,000 metabolic and bariatric cases captured from >700 academic and community centers across the United States and Canada each year, the MBSAQIP is the largest, bariatric-specific, clinical data set in North America. The 2015 MBSAQIP-PUF is a clinical data set that contains approximately 200 standardized and audited variables, including preoperative patient characteristics, laboratory values, procedure details, as well as, details of complications, reoperations, and readmissions within 30 days. Data are collected prospectively and entered into the database by trained abstractors at each site. The MBSAQIP uses multiple mechanisms to ensure that the data collected are of the highest reliability and consistency [3].

Variables

Available demographic characteristics and perioperative variables that were included for this study, included age, sex, race, BMI, Current Procedural Terminology codes (surgical procedure), American Society of Anesthesiologists class, operative time, and several related co-morbid conditions. For the purpose of this analysis, the impact of 8 specific complications (bleeding, venous thromboembolism [VTE], leak, incisional surgical site infection [SSI], pneumonia, urinary tract infection, myocardial infarction, and stroke) on 5 main 30-day outcomes (end-organ dysfunction, reoperation, intensive care unit [ICU] admission, readmission, and mortality) was estimated using risk-adjusted PAFs.

In this study, we considered organ/space SSI after bariatric surgery as gastrointestinal leak. End-organ dysfunction, a composite outcome variable, was defined as occurrence of postoperative septic shock, coma, or postoperative renal insufficiency or mechanical ventilation for >48 hours [8,9].

Statistical methods

Data were described using mean ± standard deviation and medians (ranges) for continuous variables and counts and percentages for categorical variables. Before analysis, any missing values were singly imputed by their conditional medians or modes using the transcan function from the Hmisc packages in R software (version 3.3.1, 2016-06-21; R Software for Statistical Computing, Vienna, Austria).

Relative risk for each complication–outcome pair, which was the ratio of the probability of the 5 study outcomes occurring in patients with a particular postoperative complication (n = 8) to the probability of the same outcome occurring in patients without that complication, was calculated. A multivariable Poisson regression model with log link and robust estimation was used to assess the relative risk in each complication–outcome pair and for each outcome considering all the complications and all the potential predictors. Covariates (potential predictors) used for risk adjustment in these models were sex, age, race, BMI, type 2 diabetes, smoking, functional status before surgery, use of mobility device, oxygen dependence before surgery, obstructive sleep apnea, gastroesophageal reflux disease, history of myocardial infarction, previous percutaneous coronary intervention, previous cardiac surgery,