
Risk Factors for 30-Day Readmissions and Modifying Postoperative Care after Gastric Bypass Surgery



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- BACKGROUND:** Although hospital 30-day readmissions policies currently focus on medical conditions, readmission penalties will be expanding to encompass surgical procedures, logically beginning with common and standardized procedures, such as gastric bypass. Therefore, understanding predictors of readmission is essential in lowering readmission rate for these procedures.
- STUDY DESIGN:** This is a retrospective case-control study of patients undergoing laparoscopic gastric bypass at Tufts Medical Center from 2007 to 2012. Variables analyzed included demographics, comorbidities, intraoperative events, postoperative complications, discharge disposition, and readmission diagnoses. Univariate analysis was used to identify factors associated with readmission, which were then subjected to multivariable logistic regression analysis.
- RESULTS:** We reviewed 358 patients undergoing laparoscopic gastric bypass, 119 readmits, and 239 controls. By univariate analysis, public insurance, body mass index >60 kg/m², duration of procedure, high American Society of Anesthesiologists (ASA) class, and discharge with visiting nurse services (VNA) were significantly associated with 30-day readmissions. In the regression model, duration of procedure, high ASA class, and discharge with visiting nurse services (VNA) remained significantly associated with readmission when controlling for other factors (odds ratio [OR] 1.523, 95% CI 1.314 to 1.766; OR 2.447, 95% CI 1.305 to 4.487; and OR 0.053 with 95% CI 0.011 to 0.266, respectively). The majority of readmissions occurred within the first week after discharge. Gastrointestinal-related issues were the most common diagnoses on readmission, and included anastomotic leaks, postoperative ileus, and bowel obstruction. The next 2 most common reasons for readmission were wound infection and fluid depletion.
- CONCLUSIONS:** Using readmission risk, we can stratify patients into tiered clinical pathways. Because most readmissions occur within the first postdischarge week and are most commonly associated with dehydration, pain, or wound issues, focusing our postoperative protocols and patient education should further lower the incidence of readmission. (*J Am Coll Surg* 2014;219: 489–495. © 2014 by the American College of Surgeons)
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The Centers for Medicare and Medicaid Services (CMS) began publicly reporting 30-day readmission rates for individual hospitals in 2009, making readmissions

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a nationally recognized quality metric. In 2013, the Centers for Medicare and Medicaid Services began to initiate penalties for 30-day readmissions associated with heart failure, myocardial infarction, and pneumonia dating back to discharges beginning October 1, 2012.¹ The expected national savings of \$2.5 billion from avoidable readmissions and expected profits of \$300 million from collected penalties has led the Centers for Medicare and Medicaid Services to pronounce that the 30-day readmission policy will continue to expand to include additional diseases and procedures.¹ While current readmission policy focuses on medical hospitalizations, expansion to surgical hospitalizations is anticipated.

Abbreviations and Acronyms

ASA = American Society of Anesthesiologists

BMI = body mass index

OR = odds ratio

VNA = visiting nurse services

Previous studies suggest readmission rates anywhere from 5% to 20% for surgical patients, depending on the surgical procedure.²⁻⁸ Among general surgery patients, readmission diagnoses often include gastrointestinal complications, surgical site infections, and dehydration.²⁻⁸ Studies have looked at a variety of risk factors for readmissions, including social factors, comorbidities, intraoperative factors, postoperative complications, pain scores, factors relating to follow-up, and length of stay.²⁻¹⁰ Conclusions from previous studies of readmissions have been inconsistent. One study found postoperative complications and comorbidities, factors associated with the patient, to be significant risk factors.² Yet another found that hospital factors and the volume of the procedure seen are determinants of readmission.⁹ The variability in these studies speaks to the difficulty of creating risk prediction models for readmission.^{11,12}

As the prevalence of morbid obesity continues to increase nationally, gastric bypass surgery has become a high volume procedure in many large medical centers. Preventing readmissions in such high volume procedures is a priority. Previous studies looking more specifically at readmissions among gastric bypass patients have observed readmission rates hovering around 15%, with predictors of readmission including pain score and length of stay.^{2,13-15} Studies have also found the most common causes for readmission to be dehydration, abdominal pain, and wound complications, although as with other studies, their conclusions are inconsistent.^{2,13-16}

Because patient selection, preoperative preparation, surgical technique, and postoperative clinical pathways are all well defined and modifiable, the analysis of bariatric readmissions could lead to practice changes that minimize readmissions and improve patient outcomes.¹⁷⁻²⁰ In this study, we used case-control methods comparing readmitted and nonreadmitted patients, with the goal of identifying modifiable predictors of readmission risk.

METHODS

This is a retrospective case-control study of patients who underwent laparoscopic gastric bypass surgery at Tufts Medical Center during the years 2007 to 2012. The data collected include all of the readmissions to Tufts Medical Center within 30 days of discharge and a random

sample of control patients. A sample size of 360 patients (120 readmitted patients and 240 controls, 1:2 matching) provided 85% power to detect an odds ratio of 2.0 for comparing the difference in a readmission risk factor between cases and controls, assuming the proportion of individuals with the risk factor in the control group was 30%. This used a 2-sided test with $\alpha = 0.05$. Therefore, we performed 2:1 matching because adding additional controls provided only a marginal increase in statistical power. A large number of variables were analyzed, including descriptive demographics, comorbidities, intraoperative events, postoperative complications, discharge disposition, and readmission diagnoses.

Once approved by the Institutional Review Board, data were collected via chart review using ICD-9 codes to identify controls and readmissions within 30 days of discharge. Demographic variables included age, sex, insurance, and marital status. Comorbidities included hypertension, diabetes, coronary artery disease (CAD), COPD, obstructive sleep apnea or asthma, history of alcohol or drug abuse, and depression. Body mass index (BMI) was also recorded. Intraoperative variables included estimated blood loss, American Society of Anesthesiologists (ASA) class, and duration of procedure from the start to end of anesthesia. Postoperative complications and length of hospital stay were recorded. Discharge status was grouped as home vs home with visiting nurse services (VNA). No patients were discharged to a rehabilitation facility.

The data collected on the readmission patients included interval from discharge to readmission, length of readmission stay, and readmission diagnosis. Readmission diagnosis was grouped in the following categories: gastrointestinal, genitourinary, wound, hydration or nutrition, pain, cardiopulmonary, deep vein thrombosis or pulmonary embolism, and other.

Univariate analysis was used to identify factors associated with readmission, using chi-square or Fisher's exact test and independent-sample *t*-test. The factors identified through univariate analysis were used in a multivariable logistic regression model along with sex, age, and insurance status. A *p* value < 0.05 was considered significant. All statistical analysis was completed in SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0.).

RESULTS

Our retrospective case-control analysis included a sample of 358 patients who underwent laparoscopic gastric bypass surgery between the fiscal years 2007 to 2012. We analyzed the total number of readmissions

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