Decreasing Readmissions in Bariatric Surgery

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Chapter Objectives

1. Assess causes for readmissions.
2. Determine opportunities for improvement.

Introduction

Over the last decade, bariatric surgery has been an American surgical success story. Mortality rates have plummeted to the point that bariatric surgery mortality is now equivalent to laparoscopic cholecystectomy [1]. A key component to this quality improvement has been the accreditation process, which is now a unified program for the American Society of Metabolic and Bariatric Surgery and the American College of Surgeons called MBSAQIP (Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program) [2]. The accreditation process has been proven to save lives, lower complications, increase access, and decrease costs [3].

The MBSAQIP accreditation program provides an ideal platform for quality improvement by maintaining a clinically derived, data registry with the ability to benchmark results and track outcomes longitudinally. As the MBSAQIP program moves forward with over 800 hospitals in place, the program will seek to find further opportunities for quality improvement. The 30-day readmission rate is an ideal outcome upon which to focus future quality improvement efforts.

Rationale

The current MBSAQIP standards require each hospital to perform at least one annual quality improvement project. In prioritizing quality improvement efforts, it is critical to find opportunities for improvement that are preventable and actionable. With mortality rates and specific complications such as anastomotic leaks becoming increasingly rare, other quality metrics must be investigated. Thirty-day readmission rates are an important quality metric. Readmission rates are a *meta*-outcome, which touch upon patient/physician satisfaction, cost, coordination of care, and complications. Currently, MBSAQIP 30-day readmission rates are at 6% with variation allowing for enhancement efforts. In addition, the Centers for Medicare and Medicaid Services, along with other payors, have made readmission rate reduction a priority.

Mechanisms for Decreasing Readmission Rates

The first aspect of quality improvement is definition and measurement. There should be a distinction between 23 h readmissions and readmissions greater than 24 h given the difference in acuity and intervention between both types of readmissions. In addition, the readmission capture rate should include readmissions to not only the index hospital but to other hospitals as well. MBSAQIP is able to accomplish both of these tasks as well as provide an opportunity to benchmark individual hospital results to national rates. Another advantage to MBSAQIP is the prospect of creating custom fields in the registry to capture specific processes that may influence readmission rates.

While at Stanford, we determined that our 30-day readmission rates were higher than national average at 8%. At the inaugural Obesity Week 2013, we presented our quality improvement program for readmission reduction [4]. First, there was recognition that processes that were assumed to be occurring consistently were not occurring consistently. Second, causes were determined for readmissions as listed here.

- Dehydration
- Nausea

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- Medication side effects
- Patient expectations

Next, the following components of care coordination were implemented:

- Improved pre-op patient education/discharge planning
- Medication reconciliation at pre-op visit
- Post-op prescriptions given at pre-op visit
- Intra-op nausea management including iv fluids, decadron, and propofol
- Clinical road map/standardized order set/early ambulation
- Discharge checklist
- Provided direct phone numbers to patients
- Clinic RN calls each patient the day after discharge
- Same day appointments made available for any concerns
- Using clinical decision unit for 23 h stays particularly for dehydration
- Two-week post-op appointment with nutritional counseling
- Readmission root cause analysis for readmission

After implementation of the readmission bundle, 30-day readmission rates dropped from 8% to 2.5% over 18 months.

Team Approach

One of the most important lessons learned from the previous Stanford experience was that utilization of the entire clinical team could provide an opportunity for improvement. For example, when the registered dietician was part of the 30-day postoperative visit, dietary readmission rates declined to zero [5].

It has been recommended that postoperative care after bariatric surgery be managed by an interdisciplinary team of providers, including both physicians and nutritionists [8]. Because dietary regulation and supplementation are important aspects of postoperative care, it has been suggested that nutritionists educate patients about their eating habits within 4–6 weeks after surgery [6–8]. However, most of the suggested guidelines for postoperative care are merely supported by anecdotal evidence or expert opinion. The recommendations for a team-based approach, especially the inclusion of a nutritionist, are not substantiated by experimental clinical data, but are instead derived from a very limited body of literature [9].

Previously, it has been shown that among obese Hispanic patients who underwent bariatric surgery, participation in a comprehensive postoperative care group with frequent follow-up visits managed by a nutritionist at 6 months after surgery led to greater weight loss and BMI reduction, as compared to patients in a limited postoperative care group with no physical follow-up visits at 6 months after surgery [10]. In another study, patients who underwent laparoscopic adjustable gastric banding (LAGB) procedure and were followed up by a nutritionist showed lower rates of complications but also lower percent excess weight loss at 3 and 6 months postoperatively, as compared with patients who were followed up by a surgeon/nurse team [11]. A more recent study showed that patients who were required to follow up with a nutritionist bi-weekly for 4 months after bariatric surgery had lower, but not statistically significant, percent weight loss at 6 months, as compared with patients who were not required to see a nutritionist during that interval. The former group of patients also reported healthier eating habits postoperatively [12]. Taken together, the literature about optimizing postoperative care after bariatric surgery and about the importance of including a nutritionist in the follow-up team remains inconsistent and limited [8].

In this study, a retrospective analysis of a natural experiment to evaluate the value of a combined physician and nutritionist follow-up policy after bariatric surgery by comparing outcomes between patients who were followed up by either a physician alone or by a physician and a nutritionist at 2–6 weeks postoperatively [5].

A total of 570 patients were in the study, with 302 patients in the physician follow-up group, and 268 patients in the nutritionist follow-up group. The number of patients undergoing laparoscopic Roux-en-Y gastric bypass (LRYGB) was similar in both groups (73.2% vs. 66.0%), while the number of patients undergoing laparoscopic adjustable gastric banding (LAGB) and laparoscopic sleeve gastrectomy (LSG) was different (LAGB, 13.6% vs. 9.0%; LSG, 13.3% vs. 25.0%). The mean age of patients was similar in both groups (46.4 vs. 45.9 years), and males and females were equally distributed (19% vs. 25%, males and 81% vs. 75%, females). While the majority of patients in both follow-up groups were Caucasian (54.8% vs. 54.5%), Hispanics were the second most common (30.1% vs. 27.1%), and African Americans were more represented in the nutritionist follow-up group (5.0% vs. 12.4%). The most common types of insurance plans were private, Medicare, and Medi-Cal—each type was equally represented in both follow-up groups (79.7% vs. 81.1%, private; 15.2% vs. 13.6%, Medicare; and 3.3% vs. 3.0%, Medi-Cal, i.e., Medicaid). Both groups also had a similar percentage of patients with pre-existing diabetes (39.0% vs. 38.9%). In comparing preoperative anthropometric and laboratory values, both groups had nonsignificant differences in weight (127.8 vs. 127.6), body mass index (BMI) (46.0 vs. 45.5), percent weight loss during the screening process (0.15 vs. 0.05), serum thiamine (115.5 vs. 104.4), total cholesterol (175.3 vs. 104.4), low-density lipoprotein (LDL) cholesterol (106.6 vs. 105.3), high-density lipoprotein (HDL) cholesterol (46.7 vs. 45.7), and triglycerides (130.8 vs. 142.4).

The physician follow-up group had 264 patients at 3 months, 234 at 6 months, and 211 at 12 months. The nutritionist follow-up group had 211 patients at 3 months, 155 at 6 months, and 79 at 12 months. Overall, there were no significant differences in percent excess weight loss (EWL) between groups at all time-points. Comparing percent EWL between groups by stratifying for type of procedure (LRYGB, LAGB, or LSG) also resulted in no significant differences at all time-points (data not shown). The nutritionist follow-up group had significantly fewer readmissions related to dietary problems or insufficiencies (9 vs. 0, $p = 0.004$). The number of total complications was similar between groups (18 vs. 12). However, after grouping the complications into two types, "major" (leaks, gastrointestinal bleeding, deep venous thrombosis, bowel obstruction, myocardial infarction, intra-abdominal abscess, or pulmonary complications), and "minor" (nutrition/dehydration/vitamin deficiencies, arrhythmia, wound infection, or ulcers/strictures), a lower number of "minor" complications was found in the nutritionist follow-up group (16 vs. 6, $p = 0.080$). The number of dietary-related complications was also lower in the nutritionist group, albeit not statistically significant (6 vs. 3, $p = 0.511$).

At 3 months, serum thiamine showed a significantly less negative change in the nutritionist follow-up group (−30.4 vs. −4.0, $p = 0.002$), as did HDL cholesterol (−3.42 vs. −1.67, $p = 0.053$). Decrease in triglycerides was significantly higher in the nutritionist follow-up group (−17.5 vs. −31.5, $p = 0.029$), while decrease in total cholesterol was not significantly different (−5.83 vs. −12.44), as was LDL cholesterol (−1.39 vs. −5.29). At 6 months, changes in all aforementioned biochemical laboratory values were more favorable in the nutritionist follow-up group, but no differences reached statistical significance. At 12 months, the only significant difference was in serum thiamine, which was increased from baseline in the nutritionist follow-up group and decreased in the physician follow-up group (−18.5 vs. 7.50, $p = 0.039$). All other 12-month changes, while more favorable in the nutritionist group, did not reach statistical significance.

Multivariate logistic regression models were constructed to predict favorable changes in biochemical laboratory values at 3, 6, and 12 months. The binary independent variables included in the model were nutritionist follow-up, white race, age >50, private insurance, preoperative BMI >50, and male sex. The effect of nutritionist follow-up in predicting favorable 3, 6, and 12 month changes in each biochemical laboratory value after controlling for demographic predictor variables. Nutritionist follow-up significantly predicted a 3-month increase in thiamine (OR = 2.49, $p < 0.000$), decrease in total cholesterol (OR = 1.58, $p = 0.030$), increase in HDL cholesterol (OR = 1.73, $p = 0.010$), and decrease in triglycerides (OR = 1.55, $p = 0.033$). Prediction of decrease in LDL cholesterol at 3 months was not significant (OR = 1.15, $p = 0.504$). At 6 and 12 months, nutritionist follow-up did not significantly predict favorable change in any biochemical laboratory value.

This study suggests that follow-up with a physician and nutritionist within 2–6 weeks after bariatric surgery helps improve patient outcomes. While the study did not find a difference in percent EWL between follow-up groups at 3, 6, or 12 months, other favorable outcomes for patients were found for those followed up by a nutritionist and physician, including lower incidence of adverse events after surgery, as well as more favorable changes in biochemical laboratory values. Because most of these differences were seen at 3 months and did not persist at later time-points, it could be attributed that these changes were due to the intervention itself (nutritionist follow-up), which occurred within 2–6 weeks after surgery. Moreover, this suggests the need for additional nutritionist follow-up at later time-points. These conclusions are especially reinforced by the multivariate logistic regression models, which showed that while at 3 months nutritionist follow-up can predict favorable changes in biochemical laboratory values, at 6 and 12 months, it fails to do so.

This study suggests that a combined follow-up visit with a physician and nutritionist within 2–6 weeks after bariatric surgery helps improve patient outcomes. Such an interdisciplinary follow-up system helps reduce readmissions and complications while also ensuring more favorable changes in biochemical laboratory values after surgery.

Characterizing Readmissions Following Bariatric Surgery

While bariatric surgery has increased in safety, readmissions due to complications from surgery can, and do, occur. A large single, site study and a national database study sought to determine causes for readmissions [13, 14]. A large, prospective study involving over 50,000 patients who had primary bariatric surgery at a bariatric surgery center of excellence found that the 30-day readmission rate for laparoscopic Roux-en-Y gastric bypass (LRYGB) was 5.8% and 1.2% for laparoscopic adjustable gastric banding (LAGB) [15]. The greatest predictors for readmission after surgery were found to be prolonged length of hospital stay, increased number of preoperative obesity-related comorbidities, having government-subsidized insurance, having BMI >50 kg/m^2, and having procedure performed at low volume hospital [15–18].

Depending on which bariatric procedure is preformed, reasons for readmission can vary. The most common chief complaint at readmission is nausea, vomiting, and diarrhea [15, 18]. For LRYGB, readmissions were primarily procedure-related complications such as GI bleed, stricture, and obstruction [15, 16]. For LAGB, pneumonia and device-related infection were common reasons for readmission [15]. However few studies have directly compared readmission characteristics across the three most common bariatric procedures beyond 30 days: laparoscopic Roux-en-Y gastric bypass (LRYGB), laparoscopic sleeve gastrostomy (LSG), and laparoscopic adjustable gastric banding (LAGB). This study sought to compare causes of readmissions, time to readmission, and characteristics of readmitted patients across these three different bariatric procedures [13].

From a total of 1775 consecutive patients who were included in the study, 113 (6.37%) patients experienced a readmission. The incidence of readmissions was significantly different across surgery types (LRYGB, 7.17%; LAGB, 3.05%; LSG, 4.25%, $p = 0.04$). There were no differences in age, gender, race (white vs. nonwhite), and insurance status (private vs. public) between those readmitted and those without readmissions. Anthropometric measures including weight, waist circumference, and BMI were also not significantly different. Patients with and without readmission had no significant difference in the number of preoperative comorbidities and had nonsignificant differences in preoperative fasting glucose, HbA1c, fasting insulin, total cholesterol, LDL, HDL, lipoprotein A, homocysteine, and high sensitivity C-reactive protein (hs-CRP).

Patients with readmission had a significantly longer operative time (174 vs. 160 min, $p = 0.03$). However, after stratifying by type of procedure, patients with readmission did not have a significantly longer operative time (LRYGB, 184 vs. 175 min, $p = 0.15$; LAGB, 120 vs. 116 min, $p = 0.89$; LSG, 126 vs. 122 min, $p = 0.77$). All procedures taken together, patients with readmissions had a significantly higher initial hospital length of stay (4.45 vs. 2.62 days, $p < 0.001$). Stratifying by type of surgery, patients with readmissions who underwent LRYGB (4.83 vs. 2.91 days, $p < 0.001$) and LSG (LSG: 2.64 vs. 2.23 days, $p = 0.06$) had a higher initial hospital length of stay. However, patients who underwent LAGB with readmission did not (LAGB 1.00 vs. 0.90 days, $p = 0.77$).

Mean time to readmission was 52.1 days for all patients, 58.0 days for LRYGB, 26.8 days for LAGB, and 9.22 days for LSG ($p = 0.16$). From all readmissions, 64.6% occurred within 30 days, 22.1% from 30 to 90 days, 1.77% from 90 to 180 days, and 11.5% from 180 to 365 days. Time to readmission varied significantly across surgery type. 90.0% of LSG and 80.0% of LABG patients who had a readmission had it in the first 30 days compared to only 60.8% of LRYGB ($p = 0.02$).

In categorizing cause of readmissions, 4.42% were an anastomotic leak, 7.08% bleeding, 29.2% dietary-related causes, 34.5% GI-related, 4.42% pulmonary, 7.96% SSI/wound/abscess, 8.85% VTE, and 3.54% others. Distribution of cause of readmission varied significantly across surgery types ($p = 0.04$) with most patients undergoing LRYGB and LAGB having GI-related causes (LRYGB, 36.1%; LAGB, 60.0%) and LSG with mostly surgical site infection/wound/abscess (36.4%).

In a multivariable logistic regression controlling for type of procedure, age >50, male sex, white race, private insurance, preoperative BMI >50, number of preoperative comorbidities, operative time, and LOS, incidence of readmission was independently associated with increased hospital LOS (OR = 1.07, 95% CI: 1.02–1.13, $p = 0.01$).

Most readmissions after bariatric surgery in this study occur within the first 30-days postoperative; however, a measurable number do occur well beyond the first 30-days post-op. This is particularly true for patients undergoing LRYGB. LRYGB patients should be followed closely within the first 90-days postoperative to manage potential procedure-related complications that would require readmission. Lastly, because the most common causes of readmissions in this study are related to gastrointestinal issues from the surgery itself and dietary related issues, efforts to reduce readmissions should focus on the preventable and intervenable aspects of these complications.

This next study used a large registry to determine causes for readmissions [14]. Readmissions are increasingly scrutinized as an accountable quality metric. Laparoscopic Roux-en-Y gastric bypass (LRYGB), laparoscopic adjustable gastric banding (LAGB), and laparoscopic sleeve gastrectomy (LSG) were identified using CPT codes in the 2012 National Surgical Quality Improvement Project (NSQIP) Public Use File.

In this study, there were a total of 18,296 bariatric patients, among which 10,080 (55.1%) were LRYGB, 1829 (10.0%) were LAGB, and 6387 (34.9%) were LSG. Among all patients, 955 (5.22%) were readmitted. There was no significant difference in age between patients with and without readmissions (44.4 vs. 44.8, $p = 0.28$) or distribution of female sex (81.1% vs. 79.0%, $p = 0.13$); however, readmitted patients were less likely to be white (65.3% vs. 71.4%, $p < 0.001$). Patients with readmissions had a higher BMI (46.8 vs. 45.9, $p = 0.001$) and had a greater proportion of those with BMI > 50 (30.2% vs. 24.6%, $p < 0.001$). Readmitted patients were more likely to have preoperative diabetes (31.1% vs. 27.7%, $p = 0.02$), COPD (2.63% vs. 1.72%, $p = 0.04$), and HTN (54.5% vs. 50.8%, $p = 0.03$). Of the patients with readmissions, the most common reasons for readmissions were GI-related (45.0%), dietary (33.5%), and bleed (6.57%).

Readmitted patients had a higher operative time (132 min vs. 115, $p < 0.001$) and higher LOS (2.76 days vs. 2.23, $p < 0.001$) with a greater proportion of patients with LOS >4 days (9.57% vs. 3.36%, $p < 0.001$). Patients with readmissions were more likely to have experienced a complication (40.4% vs. 3.9%, $p < 0.001$). Specifically, patients with readmissions were more likely to have a complication of SSI (15.5% vs. 1.15%, $p < 0.001$), pneumonia (2.94% vs. 0.19%, $p < 0.001$), reintubation (1.58% vs. 0.21%, $p < 0.001$), pulmonary embolus (PE) (2.52% vs. 0.06%, $p < 0.001$), urinary tract infection, UTI (3.15% vs. 0.65%, $p < 0.001$), MI (0.4% vs. 0.1%, $p < 0.001$), bleed (3.05% vs. 1.27%, $p < 0.001$), deep venous thrombosis (DVT) (3.58% vs. 0.13%, $p < 0.001$), and return to operating room (22.6% vs. 0.92%, $p < 0.001$). Incidence of mortality was not significantly different between patients with and without readmissions (0.2% vs. 0.1%, $p = 0.41$). Thirty-day mortality may occur at any point in the 30-day period following the index procedure.

In a multivariable logistic regression analysis controlling for procedure type, age, sex, race, BMI >50, diabetes, hypertension (HTN), length of stay (LOS) >4, operative time, resident involvement, and complication, incidence of readmission was independently associated with white race (OR = 1.53, 95% CI: 1.07–2.19, $p = 0.02$), complication (OR = 11.3, 95% CI: 7.91–16.0, $p < 0.001$), and resident involvement (OR = 0.53, 95% CI: 0.29–0.96, $p = 0.04$).

Discussion

Readmissions have become an increasingly emphasized quality metric by payors specifically the Centers for Medicare and Medicaid Services (CMS) which will not reimburse hospitals for certain readmissions [19]. While CMS has not addressed bariatric surgery readmissions to date, other payors have made readmissions a priority [20]. Data regarding bariatric surgery readmissions are critical to help better understand and drive quality improvement in this area.

This study demonstrates that all-cause 30-day readmission following bariatric surgery is prevalent with an overall rate of 5.22%. Preoperatively, presence of diabetes, hypertension, COPD, and/or BMI >50 were all significantly higher in patients who were readmitted. During the hospital stay, longer OR time, return to OR, complications, and length of stay were also significantly associated with readmissions. The specific complications of SSI, pneumonia, reintubation, PE, DVT, UTI, myocardial infraction (MI), and bleed increased the likelihood of readmissions. The most common reasons for readmissions were GI-related (45.0%), dietary (33.5%), and bleed (6.57%). In the multivariate, logistic regression model, the incidence of readmission was increased with white race status and any complication, while resident involvement rendered a protective effect.

These data do represent an opportunity for prioritization in quality improvement in bariatric surgery. These data indicate that there may be potential modifiable, preoperative risk factors such as diabetes, hypertension, COPD, and BMI >50 amenable to tighter glucose or blood pressure control, pulmonary rehabilitation, and preoperative weight loss, respectively [21–23]. Furthermore, identification of the patient at high risk for readmission may allow the surgeon and hospital opportunity to employ additional resources or processes to decrease readmission for that individual. Additionally, many of the complications associated with readmission are considered, to some degree, preventable including SSI, PE, DVT, and UTI. Strategies in reducing readmissions should include addressing these specific, preventable complications.

In examining the causes of readmission, the majority of readmissions were likely related to GI and dietary issues. These readmissions are likely due to either dietary indiscretions or dehydration, which are both amenable to education and low-acuity intervention [5]. Of note, in this study, the involvement of residents lowered risk of readmission pointing toward the important role of care coordination.

The next study demonstrates greater specificity of readmissions for bariatric surgery [24]. The Metabolic and Bariatric Surgery Accreditation and Quality Improvement Project (MBSAQIP) data registry collects clinical readmission information, including the primary reason for readmission, a data element that is not available in most other multi-institutional data sources. The data registry for MSBAQIP prospectively specifies information collected about surgical readmissions, allowing a more precise assessment of causes for surgical readmission than has been previously reported. The objectives of this study were (1) to report the incidence and timing of readmissions after bariatric surgery, (2) to describe primary reasons for readmissions, and (3) to assess the factors contributing to early and late postoperative readmissions in this patient population.

From 698 MBSAQIP facilities, 130,007 bariatric patients in 2014 were identified meeting inclusion criteria, of which 7378 underwent a LAGB (5.7%), 80,646 underwent a LSG (62.0%), and 41,983 underwent a LRYGB (32.3%). The average operative time was 89.7 min (mins) (median 80 mins, IQR 54 mins), with LRYGB having the longest operative time (mean 117.6 mins, median 109, IQR 62), while LAGB had the shortest average operative time (mean 54.1 mins, median 49, IQR 29). The median index length of hospital stay for all bariatric procedures was 2 days, ranging from 0 days for LAGB to 2 days for LSG and LRYGB.

Across all procedures, 5663 (4.4%) patients were readmitted within 30 days for all causes with a total of 6284 readmissions. 4375 (3.4%) patients had a 30-day readmission for a reason likely related to a bariatric procedure with 4914 total related readmissions. LABG patients had the lowest related readmission rate of 1.4%, followed by LSG patients (2.8%), with LRYGB patients having the highest readmission rate at 4.9%. Of note, there was a statistically significant difference in the all-cause ($p < 0.001$) and related readmission ($p < 0.001$) rate among the three subgroups. Of those patients who had an inpatient complication, 24.6% suffered a related readmission, whereas those without a complication were readmitted 2.8% of the time ($p < 0.001$). There were 453 patients (10.4% of readmissions) who had more than one related readmission within 30 days.

The variation in the number of days from initial operation and from discharge to related readmission was estimated across procedures. The median time to related readmission from initial operation was 12 days, and the median time to readmission from discharge was 9 days. The LAGB patients had the shortest length of initial hospital stay and also had the shortest time to readmission from day of operation (6.5 days). The LSG and LRYGB groups had similar median time to readmission (LSG, 12 days; LRYGB, 11 days).

The length of readmission was then calculated. The median time of first readmission was 2 days across all readmissions. LABG and LRYGB patients had the shortest readmission stay of 2 days with LSG patients having the longest readmission LOS at 3 days. Overall, 24.7% of readmissions were short (LOS ≤1 day), and 72.0% were considered long (>1 day) with 3.4% of readmissions having an unknown LOS.

Of the 4375 patients who had at least one related readmission, there were 4914 total readmissions. The most common cause of a related readmission was nausea, vomiting, fluid, electrolyte, and nutritional depletion (35.4%), followed by abdominal pain ($n = 652$, 13.5%), anastomotic leak ($m = 308$, 6.4%), and bleeding ($n = 278$, 5.8%). Other common causes of readmission were intestinal obstruction ($n = 196$, 4.1%) and strictures/stromal obstructions ($n = 163$, 3.4%). Abdominal pain, not otherwise specified, was defined as YES if the patient is readmitted for acute or chronic, localized, or diffuse pain in the abdominal cavity.

When examining short and long LOS-related readmissions separately, there were significant differences in reasons for related readmissions between the two groups. Nausea, vomiting, fluid, electrolyte, and nutritional depletion remained the top reason for both groups; 43.5% of short vs. 33.1% of long readmissions were for this reason ($p < 0.001$). Abdominal pain was similar; it was the second most common cause in both groups with a variation in percentage of readmissions (short, 20.4%; long, 11.4%). For patients who had longer related readmission LOS (>24 h), 8.1% were due to anastomotic leaks compared to only 0.9% of patient with a short readmission LOS.

The factors associated with related readmissions among all bariatric surgeries were occurrence of a postoperative inpatient complication (odds ratio (OR), 9.61; 95% confidence interval [CI], 8.70–10.63); a history of a pulmonary embolism (PE) (OR 1.80; 95% CI 1.43–2.25); and a history of renal insufficiency (OR 1.76; 95% CI 1.28–2.41). A weak association exists between operative time and readmissions, however, clinically insignificant (OR 1.01 95% CI 1.00–1.02). When compared with LAGB, LSG and LRYGB had significantly higher rates of readmission (LSG, OR 1.89, 95% CI 1.52–2.33; LRYGB, OR 3.06, 95% CI 2.46–3.81).

For patients who underwent a LRYGB, inpatient complication and history of PE remained strong predictors of readmissions, whereas BMI class, ASA class, and index length of stay had no associations with readmissions. The days at risk remained a significant predictor of readmissions in this cohort, and operative time remained statistically significant however clinically insignificant. Inpatient complications remained a very strong association in patients who underwent a LSG, as well as higher ASA class. Finally, there were very few, weak associations between readmission and patients undergoing LAGB that include longer length of stay and previous surgery (OR 3.2; 95% CI 1.31–8.00). The operation time became statistically nonsignificant in this cohort of patients (OR 1.00 95% CI 0.99–1.01).

Understanding underlying reasons for readmission as well as the associated factors should assist hospitals in targeting their efforts in quality improvement initiatives to reduce readmissions. Short-term outpatient follow-up and intervention, the main focus of the nationwide DROP project [25], and close monitoring and review of surgical complications within programs may be very beneficial and possibly reduce the likelihood of a related readmission in bariatric surgery patients.

Next Steps

The first quality improvement project for MBSAQIP was a reduction in 30-day readmissions. The name of the quality improvement project was termed *DROP* (Decreasing Readmission through Opportunities Provided). Utilizing proven processes, the national goal for MBSAQIP was to reduce readmissions within 30 days. MBSAQIP worked to establish a readmission prevention checklist including standardized preoperative educational modules in surgery, nursing, nutrition, psychology, and pharmacology.

There were 128 DROP participating hospitals which were highly representative of MBSAQIP including equal geographic distribution between Northeast, Midwest, South, and West. Hospital demographics included 85% nonprofit, 50% large hospitals (>375 beds), 30% teaching, and 20% rural. The project was initially piloted in five centers prior to implementing the DROP through the time period April 2015 through March 2016. Along with the readmission bundle, the following interventions include 14 Webinars and 2 In Person Meetings at Obesity Week 2015 and Obesity Weekend 2016; MBSAQIP Quality Improvement Committee member was designated as a mentor to each center for monthly phone calls, site-specific reports for benchmarking, and custom data fields to assess adherence to the readmission bundle elements. From a baseline 4.02% 30-day readmission rate, the DROP participating hospitals had lowered the readmission rate by 27.11% by the fourth quarter of the project.

In conclusion, bariatric surgery has made significant patient safety gains in morbidity and mortality. In the next frontier of value-based medicine, bariatric surgery has made noteworthy gains in understanding and preventing readmissions through care coordination, patient education, and adherence to proven processes.

Question Section

1. Are bariatric surgery readmissions preventable?
   A. True
   B. False
2. What are common causes for bariatric surgery readmissions?
   A. Recurrent cancer
   B. Dehydration
   C. Myocardial infarction
   D. Inability to tolerate per oral
   E. B, D
3. The following are programs to decrease readmissions:
   A. DROP
   B. ACA
   C. CMS
   D. AHRQ
4. Which of the following can decrease readmissions?
   A. Phone call after discharge
   B. Preoperative education
   C. Clinical roadmap
   D. Dietary consult
   E. All of the above

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