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Original article

Predicting potentially preventable hospital readmissions following bariatric surgery

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Abstract

Background: Using hospital readmissions as a quality of care measure predicates that some readmissions were preventable. Objectives: This study identifies predictors of potentially preventable readmissions (PPR) within 30 days of bariatric surgery discharge. Setting: New York State acute care hospitals.

Methods: Adult inpatient surgical discharges, during 2012, with a principal diagnosis of overweight or obesity and a principal procedure for bariatric surgery were identified. Logistic regression was used to evaluate surgical approach, sex, age, race/ethnicity, payor, body mass index, complications and co-morbidities recorded during the surgical admission.

Results: There were 10,448 surgeries studied for readmission of which 552 were followed by a PPR, for a statewide rate of 5.3 per 100 surgeries. Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) was the most common surgical approach (46.0%), then Sleeve Gastrectomy (SG) (41.3%), Laparoscopic Adjustable Gastric Band (LAGB) (8.1%), and Open Roux-en-Y Gastric Bypass (RYGB) (4.6%). RYGB had the highest PPR rate (8.8), followed by LRYGB (6.1), SG (4.3) and LAGB (3.3). Compared to LAGB, the odds of a PPR in patients with RYGB, LRYGB, and SG increased by 2.4 fold, 1.8 fold and 1.2 fold respectively. Black, non-Hispanic patients were at a greater risk of PPR (odds-ratio 2.0, $P < .0001$) compared to White, non-Hispanic patients while the risk of a PPR increased by 2-fold in patients with a surgical complication.

Conclusions: Taking all patient risk factors into account, the most significant predictors of a PPR were surgical approach, race and the presence of a surgical complication. (Surg Obes Relat Dis 2015;11:866–873.)

Keywords: Bariatric surgery; Gastric bypass; Laparoscopy; Sleeve resection; Co-morbidity; Risk factors; Logistic regression; Readmission; Preventable; PPR

While there are benefits of bariatric surgery, there are potential consequences as well. These include postoperative complications before discharge [1–8] and hospital readmissions [9–22]. As the total volume of bariatric surgery continues to increase, and the link between quality of inpatient care, inpatient costs and readmissions receives continued attention [19,23], it becomes increasingly important to better understand outcomes associated with this intervention.

Previous studies have used any type of hospital readmission within a specified time frame [24]. However, all readmissions are not related to inadequate care and using them in the calculation of readmission rates may be misleading. The usefulness of readmissions as a measure of quality of care is predicated on the notion that the readmissions might have been prevented. It is essential that credible and consistent clinical criteria be used to define that subset of readmissions that were potentially preventable [25].

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The purpose of this study is to identify predictors of a potentially preventable readmission after bariatric surgery. This study is the first to evaluate readmissions after bariatric surgery using the Potentially Preventable Readmission (PPR) Classification System Software developed by 3 M Health Information Systems [26]. This algorithm uses precisely defined clinical criteria to identify those readmissions that are clinically related to previous hospitalizations and thus may have been preventable.

In previous research, Saunders et al. [10,27] distinguished among the various bariatric surgical approaches and compared readmission rates between approaches. Lindsey et al. [8] found that complication rates varied dramatically according to the bariatric surgical approach. In this paper, we will explore potentially preventable readmission rates by surgical approach and develop a multivariate logistic model to calculate the odds of a potentially preventable readmission based on surgical approach and patient risk factors, including patient demographic characteristics, postoperative complications and co-morbidities.

Methods

Hospital inpatient discharge data from the New York State Statewide Planning and Research Cooperative System (SPARCS) were used in this study. SPARCS collects patient level detail regarding patient demographic characteristics, diagnoses, procedures, discharge status, and charges for every inpatient discharge from New York State hospitals.

The study population was limited to adult (age 18 or older) inpatient discharges between January 1, 2012 and December 31, 2012 from all hospitals in New York State with an International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) principal diagnosis code for overweight or obesity (278.00, 278.01, or 278.02) *and* an ICD-9-CM principal procedure code for bariatric surgery. Bariatric surgery was defined as Open Roux-en-Y Gastric Bypass (RYGB) (44.31, 44.39, 44.69), Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) (44.38), Laparoscopic Adjustable Gastric Band (LAGB) (44.68, 44.95), and Sleeve Gastrectomy (SG) (43.82, 43.89). SPARCS data for all of 2012 were analyzed for bariatric surgery, with inpatient readmissions extending through January 31, 2013, to allow 30 days for readmission. The age and diagnostic restrictions ensured the bariatric surgery was for weight loss.

The dependent variable was whether or not the bariatric surgical inpatient admission was followed by a potentially preventable inpatient admission within 30 days of discharge using the PPR software (Version 30.0 [3M, Salt Lake City, UT]) [25,26]. We used the 30 day timeframe because readmissions during that time are more likely to be related to the initial hospitalization and the transition of care to the outpatient setting. In addition, this timeframe is used in other publicly reported measures from the National Quality Forum (NQF) and the Centers for Medicare and Medicaid Services (CMS). There were no restrictions that the readmission had to occur at the same hospital as the bariatric surgery.

The PPR software first identifies globally excluded inpatient admissions and removes them from analysis. These include; most types of major metastatic malignancies, trauma, burns, many types of obstetric admissions and newborns, as well as patients whose treatment abruptly ended (the patient left against medical advice or the patient was transferred to another hospital).

If suitable for analysis, the admission is classified as an initial admission, readmission, or only admission. The PPR software determines if an admission is clinically related to a prior admission and occurred in the readmission time interval. Clinically related means the underlying reason for admission is plausibly related to the care rendered during or immediately following the prior hospital admission and may have resulted from the process of care and treatment during the prior admission or from a lack of postadmission follow up. An initial admission is an inpatient admission followed by at least one clinically related inpatient admission within the readmission timeframe. A readmission is a clinically related inpatient admission that followed the initial inpatient admission within the readmission timeframe. An initial admission and all the readmissions associated with that initial admission form a PPR chain. If the admission was suitable to be followed by a readmission (not excluded) but was not, it is classified an only admission.

The patient characteristics evaluated included gender, age, race/ethnicity, payor, and body mass index (BMI). Age was calculated at the time of admission and categorized into 4 groups: 18–29 years of age, 30–39 years of age, 40–49 years of age, and 50 years and older. Race/ethnicity was categorized into the following 4 groups: white, non-Hispanic; black, non-Hispanic; Hispanic; and Other. The Other group included Asian, Native Hawaiian/Pacific Islander, Native American, and those for whom race was recorded as other or unknown.

Payor was identified by the source of payment listed on the surgical admission. Payors were split into 4 major groups: Medicaid, Medicare, Commercial (workers compensation, insurance company, self-pay, Blue Cross) and Other (Other federal program, CHAMPUS, other nonfederal program). BMI was identified by the diagnosis code recorded on the surgical admission and was grouped into 5 groups: BMI of 19.0–39.9 kg/m^2, 40.0–44.9 kg/m^2, 45.0–49.9 kg/m^2, 50.0 kg/m^2 and over, and other (where BMI was either missing or miscoded as a pediatric code). In addition, we included whether or not the patient experienced a postoperative complication during the bariatric surgery admission [8].

Patient co-morbidities were defined using the approach developed by Elixhauser et al. [8,28]. We excluded a