

# Emergency Department Care of the Post-Metabolic and Bariatric Surgery Patient

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**Abstract:** Metabolic and bariatric surgical procedures have increased in the pediatric-age population over the past decade. Three operations, laparoscopic adjustable gastric banding, vertical sleeve gastrectomy, and Roux-en-Y gastric bypass, are the most commonly performed procedures for weight reduction. This article will examine the specifics of each procedure along with the complications associated with any metabolic or bariatric surgery. Complications unique to each operation will be reviewed as well as recommendations for the management of these patients.

**Key Words:** bariatric surgery, metabolic surgery, complications, ED management

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## TARGET AUDIENCE

This article is directed at any clinicians who will encounter a metabolic or bariatric surgery patient in an acute care setting. This audience would include physicians, physician assistants, nurse practitioners, nurses, technicians, and prehospital providers.

## LEARNING OBJECTIVES

After completion of this article, the reader should be better able to:

1. Predict the complications that may occur in patients after metabolic or bariatric surgery.
2. Describe the 3 major metabolic or bariatric surgeries performed in pediatric-aged patients.
3. Explain the proper management of a metabolic or bariatric surgery patient with evidence of a bowel obstruction.

Metabolic and bariatric surgery procedures are among the most common operations performed in the United States and worldwide. This increase in the number of weight reduction operations parallels the increase in the body mass index (BMI) of residents in the United States and other industrialized countries. A conservative estimate places the number of obese individuals in United States at approximately 39.8% of the adult population. Worldwide in 2008, approximately 10% of men and 20% of women were considered to be obese. In 2016, the prevalence of obesity in those 2 to 19 years of age was 18.5% with over 1600 weight reduction surgical procedures performed in patients aged 10 to 19 years in 2009.<sup>1–4</sup>

Obesity is defined as a BMI of greater than 30 kg/m<sup>2</sup>. Severe obesity may be defined as a BMI of greater than 40 kg/m<sup>2</sup>.

The American Society for Metabolic and Bariatric Surgery (ASMBS) Pediatric Committee and the Centers for Disease Control and Prevention classify obesity based on age- and sex-matched growth charts and define class II obesity as 120% of the 95th percentile and class III obesity as 140% of the 95th percentile. Indications for bariatric surgery are generally based on a combination of a patient's BMI or obesity classification and the presence of obesity-related comorbidities. The ASMBS committee on pediatrics considers those adolescents with class II obesity and 1 or more comorbidities as candidates for metabolic or bariatric surgery (MBS). They also believe that those with class III obesity can be considered for MBS. The associated comorbidities include both physiologic and mental conditions and do not exclude adolescents with mental illness or eating disorders.<sup>1–3</sup> Table 1 lists the common comorbidities found in children with class II whose obesity warrants consideration for an MBS procedure.

Not all class II or III obese adolescents are eligible for bariatric surgery to address their weight problems. Contraindications to any MBS include a medically correctable cause of obesity, ongoing substance abuse issues, psychiatric conditions that prevent adherence to postoperative dietary regimens, and planned pregnancy in the next year or next 2 years.<sup>2</sup>

Regardless of the indication for a weight reduction surgery, patients undergoing such procedures have an emergency department (ED) utilization rate of between 11% and 30% in the year after their operations.<sup>3,4</sup> This review will focus on both the surgical and nonsurgical complications associated with bariatric surgery and the ED management of these patients.

Currently, there are 3 procedures commonly performed for MBS: laparoscopic adjustable gastric banding, laparoscopic vertical sleeve gastrectomy (VSG), and laparoscopic or open Roux-en-Y gastric bypass (RYGB). Each procedure produces weight loss through either restriction of caloric intake, malabsorption of ingested food, or both.<sup>4,5</sup> Figure 1 contains the different surgical approaches to metabolic and bariatric surgery.

In the laparoscopic gastric banding procedure, an adjustable gastric band is placed in the proximal portion of the stomach just distal to the esophageal gastric junction. The band itself is inflatable and connected to a reservoir port, which is placed subcutaneously in the abdominal wall to allow for the inflation or deflation of the band as needed. Weight reduction is accomplished through the creation of a small pouch in the proximal stomach, which restricts the amount of food ingested and, as a result, the amount of calories consumed. The stretching of the stomach wall forming the proximal pouch produces a sensation of fullness and early satiety. This is the simplest of the bariatric procedures to perform; however, its long-term success rate is relatively limited. Up to 20% of patients undergoing lap band surgery will require a second procedure for removal or revision of the band with some series showing up to 50% of patients requiring a repeat surgical intervention.<sup>3</sup>

Laparoscopic VSG is the most commonly performed MBS in the world. Vertical sleeve gastrectomy is also the most recommended procedure for adolescent MBS. In this procedure, a series of staples is placed parallel to the greater curvature of the stomach with resection of 70 to 80% of the stomach. This is also a restrictive

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**TABLE 1.** Comorbid Indications for MBS in Class II Obese Adolescents

BMI >35 kg/m <sup>2</sup> or 120% 95th percentile
Obstructive sleep apnea
Type 2 diabetes mellitus
Idiopathic intracranial hypertension
Gastro-esophageal reflux
Cardiovascular disease including hypertension
Nonalcoholic fatty liver disease and steatohepatitis
Weight-related orthopedic disease such as slipped femoral epiphysis

procedure, which anatomically limits food ingestion leading to early satiety. Vertical sleeve gastrectomies also produce hormonal changes in patients, most notably through a reduction in the “hunger hormone” ghrelin, which is one of the endocrine proteins that stimulate a patient's appetite. The success rate and safety profile for this procedure are exceptional with mortality rates below 0.2%. Vertical sleeve gastrectomy also has the advantage of limiting postoperative malabsorption syndromes.<sup>2-4</sup>

The RYGB is a complex surgical procedure requiring multiple anastomoses. When completed, the procedure leaves a smaller gastric pouch that empties directly into the jejunum leading to both early satiety through a restrictive component and malabsorption through a bypass of the duodenum. Compared with other procedures, RYGB surgery allows for the most effective weight loss but also has the highest complication rate. Roux-en Y gastric bypass is the surgical procedure with the most extensive long-term follow-up of any of the weight loss surgeries and has proven effective in both initial and extended weight loss.<sup>2</sup>

Currently, the ASMBS Pediatric Committee recommends either VSG or RYGB for adolescent MBS.<sup>1,2</sup>

As would be anticipated, all weight reduction procedures have associated surgical and nonsurgical complications, and it is these adverse events that can lead these patients to present to the ED.

**Metabolic and Bariatric Surgical Complications**

Wound complications including infections, dehiscence, and necrotizing fasciitis are all possibilities in patients undergoing open procedures. Because of the large amount of subcutaneous space present in these patients, serious skin and soft tissue infections can be missed if the infection occurs deep within the adipose tissue.

**Adjustable Gastric Band**

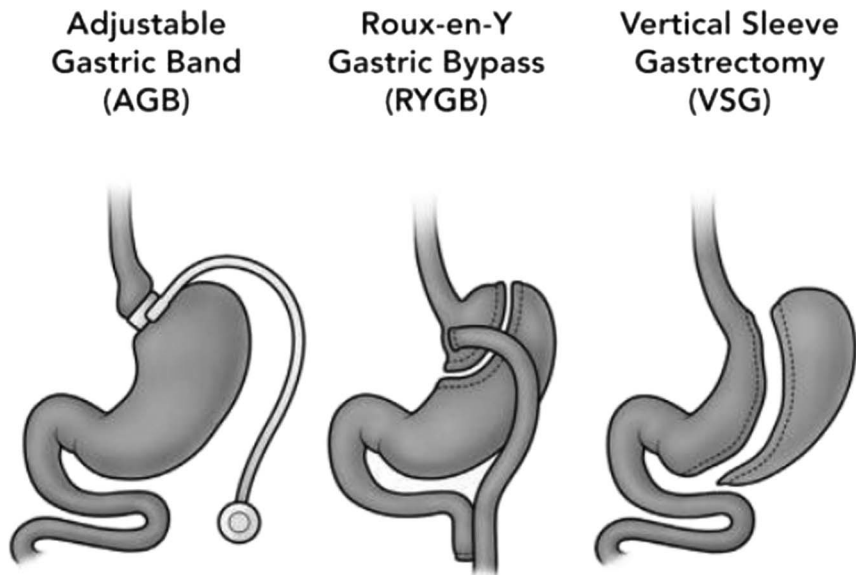
Laparoscopic gastric band surgery is unique in that it does not require an actual incision into the gastrointestinal tract. However, esophageal or gastric perforation can occur during the placement of a gastric band itself. Overinflation of the gastric band leading to tissue ischemia can produce necrosis and perforation of either the stomach or the esophagus.<sup>3,5,6</sup>

This surgery is also unique in that it is the only procedure requiring hardware to be left in the patient. As with any internalized foreign bodies, dislodgment or infection is possible complications. The gastric band itself can slip or prolapse, leading to complete gastric obstruction. The connections between the gastric band tubing and reservoir port may become loosened or disconnect entirely leading to failure of the stomach restriction. These same components may also become infected. The most common location of infections in these cases is the subcutaneous port because it is the site of percutaneous needle insertions to add or remove fluid from the gastric band.<sup>5</sup>

**Laparoscopic Sleeve Gastrectomy**

Both the VSG and the RYGB require excision and anastomotic repairs of the gastrointestinal track. As a result, both procedures have the potential for leakage and stricture formation.

In a VSG, the leakage will be along the staple line used to divide the stomach and may occur in 3 to 7% of patients. The highly acidic gastric contents found in this area can produce rapid and severe peritonitis. Abdominal pain nausea vomiting and not infrequently left shoulder pain are all presenting symptoms of this complication. Fevers are frequently found with VSG leakages and may be the first signs of a problem along with epigastric pain and tachycardia.<sup>3-7</sup>



**FIGURE 1.** Three most common metabolic and bariatric surgeries performed on pediatric patients.

Strictures are also a well recognized complication that may occur in the distal portion of the stomach remnant. The strictures may result from ischemia, tissue edema, or even twisting of the stomach. As expected, these patients will present with signs of obstruction including nausea vomiting and esophageal reflux.<sup>5,6</sup>

The other major complication for vertical sleeve gastrectomies is hemorrhage. Erosions along the staple line may lead to intraperitoneal bleeding with presentations similar to those of postoperative leakage. Intraperitoneal bleeding can be severe in these patients if it involves the gastric perforating arteries between the stomach and spleen. Bleeding into the stomach itself may result from gastritis or ulcer formation. Gastrointestinal hemorrhaging may be completely asymptomatic until patients develop symptoms from anemia and orhypovolemia. If the bleeding is acute, hematemesis may occur along with melena.

Unlike with laparoscopic gastric band procedures, which limit the back flow of stomach contents into the esophagus, reflux is a common complaint in patients undergoing vertical sleeve gastrectomies.<sup>6</sup>

### Roux-en Y Gastric Bypass

Because of the complex nature of the RYGB procedure, this surgery has the greatest number of potential complications.

Leakage from an anastomotic site is one of the early complications associated with this operation. The incidence of postoperative leakage ranges from 1% to 6% and can occur at any suture or staple line. The most common site for this to occur is at the gastrojejunostomy anastomosis. Distention of the isolated portion of the stomach can also lead to leakage at the staple line in this location. Fever, abdominal pain nausea, and vomiting are frequent symptoms associated with this complication. As with the vertical gastric sleeve procedure, tachycardia and fever may be the initial presenting complaint in these patients.<sup>5,6</sup>

In addition to leakage, strictures may occur at any of the anastomotic sites. These strictures can produce obstruction and or distention, which can then lead to rupture of suture or staple lines. As with any gastrointestinal obstruction, patients with postoperative strictures will present with nausea and vomiting. Both the gastrojejunal and jejunojejunal sites are potential locations for post operative strictures, although any sutured or staples site can be a source of this problem.

Postoperative hemorrhage is another complication and can be found in up to 11% of metabolic or bariatric surgeries. Bleeding may be intraperitoneal if it occurs at a suture line or secondary to a lacerated or clipped blood vessel. More commonly, bleeding in these patients is a result of ulcer formation or gastritis in either the gastric pouch for the bypassed portion of the stomach.<sup>5,6</sup>

Intestinal herniation with obstruction is unique to this operation and is one of the most serious complications associated with weight-loss surgery. As a result of the Roux-en Y procedure, a number of potential spaces are created between the small and large intestines. Herniation of bowel into these spaces can occur in 1% to 3% of patients with a mortality rate of 50% if unrecognized. Symptoms including abdominal pain and vomiting may be intermittent early in the course of these herniations, making their diagnosis difficult. However, if strangulation occurs, these patients will appear acutely toxic with intractable pain and signs of hemodynamic compromise. Intestinal herniation is generally a late complication occurring 6 months to 2 years after the actual surgery.<sup>3,5,6</sup>

Intussusception is another source of obstruction in these patients, although it is much less common than other postoperative complications.

Gastric ulcers including marginal ulcers may occur in RYGB patients. Located most commonly at the gastrojejunal junction, these ulcers may produce pain or gastrointestinal bleeding.

Dumping syndromes are unique to the RYGB procedures and may occur as either early or late complications. Early dumping syndromes generally occur approximately 20 to 30 minutes after ingestion of a meal. Symptoms are felt to result from hyperosmolar solutions entering the jejunum. The entire small bowel responds with hypermobility and distention, leading to bloating and diarrhea. Symptoms with early dumping may be severe and produce hypertension flushing and tachycardia. With time, most patients learn to adjust their eating to avoid early dumping symptoms.<sup>5,6</sup>

The late dumping syndrome tends to occur approximately 3 hours after a meal and is thought to result from over secretion of insulin and resulting hypoglycemia. A rapid rise in blood sugar after a meal leads to the hypersecretion of insulin and the secondary hypoglycemia. Dizziness lightheadedness, weakness, diaphoresis, and tremors can be found in these patients, and all may be attributed to a drop in serum blood glucose levels.<sup>3,5,6</sup>

Many patients undergoing RYGB will have incidental cholecystectomies at the time of their procedures. Patients in whom their gallbladder's are retained have an increased incidence of cholelithiasis and cholecystitis.<sup>5,6</sup>

### Nonsurgical Complications

All obese patients undergoing any surgical procedures have an increased risk of nonprocedural postoperative problems. Thromboembolic events including deep venous thrombosis and pulmonary embolism are more common in this population occurring in up to 2% of patients at 30 postoperative days.<sup>5,6,8</sup>

Atelectasis is another common complication and may be present in a wide range of patients extending from 0.6% to 37% of patients. As expected, those patients will also have an increased incidence of pneumonia. Inability or unwillingness to comply with postoperative pulmonary exercises is a risk factor for both of these complications.<sup>6,9</sup>

Although not common initially, various nutritional deficiencies can develop in these patients over time. Thiamine deficiency may be the most serious of these problems. This problem should be suspected in any patient presenting with acute neurologic problems including dizziness lightheadedness ataxia, or confusion. Wernicke encephalopathy has been documented in patients after RYGB procedures. Caution should be used in the administration of any glucose solutions to these patients unless accompanied by concomitant thiamine supplementation. In patients with intact gastrointestinal tracts, thiamine may be administered orally; however, in MBS patients, a parenteral form of thiamine is required.<sup>5</sup>

Other malabsorption-associated problems include deficiencies in vitamin D, vitamin B12, calcium folate, and iron. All 3 procedures can produce these deficiencies even though only the RYGB has an intended malabsorption mechanism of action. Osteopenia, osteoporosis, and anemia may occur if these deficiencies are unrecognized over an extended period of time.<sup>5,6</sup>

### ED Management

The initial approach to a postoperative MBS patient should be no different than the initial approach to any other ED patient with attention to airway breathing and circulation taking priority. Airway compromise must be addressed immediately with special precautions taken if endotracheal intubation is required. Particular maneuvers, including ramping of the chest will be required to successfully intubate this patient population.

Vital signs take on increase significant in MBS patients as tachycardia and or tachypnea can be signs of severe intra-abdominal pathology. In addition, the patient's underlying BMI may also predispose them to acute pulmonary complications



including respiratory failure and pulmonary emboli. Tachycardia not only may represent infection but also may indicate hypovolemia either from dehydration or postoperative bleeding.

Metabolic and bariatric surgery patients presenting with specific abdominal complaints including, pain, nausea, or vomiting should be suspected of having an acute surgical complication until proven otherwise. Aggressive diagnostic and, if needed, resuscitative procedures should be initiated as soon as possible in these individuals with calls for early surgical consultation. Patients status post-RYGB procedures with abdominal pain out of proportion to their physical findings on abdominal examination should be treated as surgical emergencies because they may have developed internal hernias with strangulation. Vague abdominal complaints may still be associated with severe complications that have recently developed but not progressed to localized pain or abnormal vital signs.

Vomiting is very common in MBS patients as is diarrhea in those with dumping syndromes, and both can lead to severe volume loss. Clinicians should not be reassured by a normal blood pressure in this population because these patients still have strong cardiovascular reserves, which can mask underlying intravascular problems. Hypotension indicates that a patient has exceeded their ability to compromise their underlying pathological condition and will require aggressive resuscitation. A thorough search for sepsis, blood loss, or severe dehydration is indicated in any MBS patient presenting with tachycardia and hypotension.<sup>3,5,6</sup>

Aggressive fluid resuscitation in hypotensive MBS patient should be initiated immediately. If blood loss is considered a serious possibility, then blood product transfusions may be begun even without the results of blood studies. Some sources recommend use of a massive transfusion approach to these individual with use of packed red blood cells, fresh frozen plasma, and platelet transfusions in a 1:1:1 ratio.<sup>3</sup>

A quick assessment of the lungs and heart should be attempted as soon as the airway is determined to be stable. The large BMI in these patients may make auscultation difficult and will likely need to be supplemented with some form of diagnostic study.

The remainder of the physical examination should be no different than in any other ED patient, although particular attention should be directed toward the more common pathologies in this population. Careful palpation of the abdomen with particular attention to any surgical incisions or laparoscopic port insertion sites is the norm. Even without erythema, deep adipose infections may be present.

Examination of the lower extremities should also be carefully performed, looking for signs or symptoms of deep venous thrombosis. Rectal examination and evaluation of stool for melena or occult blood should be rapidly completed in any patient with tachycardia or hypotension.

Generalized complaints of malaise, weakness, excessive tiredness, and the like may simply represent normal postoperative symptoms exacerbated by the retention of anesthetics in adipose tissue. However, these same symptoms can be found in patients with bleeding and malabsorption-related metabolic abnormalities and need to be investigated for such.

Clinicians adept in a point-of-care ultrasonography may use this device to augment the physical examination. A dilated right ventricle may indicate a pulmonary embolism, whereas a collapsed inferior vena cava can indicate intravascular pathology. Atelectasis or pneumonia may be visualized in patients with a less extreme body habitus. Ultrasound of the abdomen may be performed looking for free blood indicative of postoperative bleeding. Compression ultrasonography at the lower extremities may help in identifying venous thromboembolic conditions in the legs.

All pediatric bariatric patients have associated obesity comorbidities, which led to their need for a surgical procedure.

These issues will take months or years to resolve and will likely still be present in the immediate postoperative period. The treating clinician must be aware of these conditions and include them in the differential assessment of the patients ED presentation.

Endocrine metabolic problems and, in particular, diabetes can be the primary cause of an ED visit in the postoperative weight-loss surgery patient. The stress resulting from the surgery itself or the recovery phase can lead to severe hyperglycemia and ketoacidosis in these patients. Patients with underlying diabetes should undergo point-of-care glucose testing on arrival to the ED. Other endocrine problems including thyroid and adrenal abnormalities may also appear in the postoperative period.

Those with idiopathic intracranial hypertension may still have headaches in the short-term postoperative period. Depression is very common in these patients both before and after surgery. An understanding bedside manner is essential when questioning patients about their ED presentation.<sup>1,2</sup>

Regardless of the surgery performed, any postoperative MBS patient, particularly those with abnormal vital signs including fever or tachycardia, should undergo aggressive diagnostic testing. Baseline studies including a complete blood count, a basic metabolic panel, a urinalysis, serum lipase, serum lactate, and a hepatic function panel are indicated in these patients. Abnormalities in these tests should not be attributed to chronic conditions unless confirmed with access to prior patient records. In particular, patients with low hemoglobin levels should be investigated for either intra-abdominal or intraluminal bleeding or nutritional deficiencies related to either vitamin B12 or iron.<sup>3,5,6</sup>

Clinicians caring for bariatric surgery patients should also have a low threshold for obtaining diagnostic radiographic studies. Although every effort should be made to limit radiation exposure in any patient and, in particular, adolescents, the use of diagnostic computerized tomography studies should be seriously considered if there is any concern for a surgical complication.<sup>3,5,6</sup>

Diagnostic radiology studies may be considered part of the stabilization process in these patients. Intra-abdominal catastrophes in particular internal hernia's with strangulation can result in severe morbidity and even mortality if diagnoses are delayed. In facilities with access to computer tomography, emergent abdominal studies with oral and intravenous contrast should be performed. The amount of oral contrast should be limited to the amount of fluid normally ingested at a single seating by the patient. In facilities without access to immediate tomographic studies, arrangements should be made for expeditious transfer of these patients.

Plain radiographs, although no substitute for computed tomography imaging, may identify underline pathology while awaiting transfer for more sophisticated testing. Chest x-rays can demonstrate atelectasis, free intraperitoneal air, or pneumonia. An upper gastrointestinal series with oral contrast may diagnose a slipped gastric band or gastric or esophageal perforation. The appropriate location of a gastric band is to the left of the spinal column at an angle of approximately 15 degrees. Plain films of the abdomen may also demonstrate gastric band displacement or acute intestinal obstruction. Again, caution should be exercised because these studies may be normal even in the face of internal hernias.<sup>3,5,6</sup>

Other diagnostic studies that may be required include upper endoscopy to look for ulcers strictures and even anastomotic leakage. A formal ultrasound beyond a point-of-care examination will be useful in evaluation of gallbladder disease and/or hydronephrosis secondary to renal calculi. It should be noted that radiologist familiar with reading postoperative bariatric surgery studies are needed to identify some of the more subtle findings in these individuals.

Emergency department treatment of these patients is directed at initial stabilization and mobilization of the multiple consultants generally needed to care for these cases. At a minimum, the surgeon and or metabolic physician involved in the care of the patient should be notified of their arrival in ED. For many of these conditions, surgical intervention may be the only treatment that can address a problem.

## Disposition

Unless an ED visit was precipitated by a minor problem not associated with the patient's underlying obesity or recent surgery, the disposition of these patients should involve input from their surgeon and other members of their care team. The treating emergency physician should have a very high threshold for discharging these patients to home without an extensive evaluation of both their surgical and nonsurgical status. If a decision is made to discharge the patient, then close follow-up should be arranged.

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