

## REVIEWS

## What Every Hospitalist Should Know About the Post-Bariatric Surgery Patient

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Obesity is a growing worldwide epidemic, increasingly addressed through surgical options for weight loss. Benefits of these operations, such as weight loss and improvement or reversal of obesity-related comorbidities, are well established; however, postoperative complications do occur. This article will evaluate common causes for hospital admissions in the post-bariatric surgery population as they relate to the hospitalist who is often responsible for their care. Here we provide an overview of the most

common bariatric procedures currently performed, early postoperative complications, late medical complications (ie, abdominal complaints, weight fluctuations, nutritional deficiencies, and metabolic bone disease), and late surgical complications that often affect these patients and result in hospital admissions. Special attention will be paid to radiologic pearls that can assist in the initial evaluation and diagnosis of these patients. *Journal of Hospital Medicine* 2012;7:156–163. © 2011 Society of Hospital Medicine

Obesity is a growing epidemic in the United States and worldwide. Over one-third of Americans (33.8%) are considered obese (body mass index [BMI]  $\geq 30$ ).<sup>1</sup> Nonsurgical interventions have failed to achieve the long-lasting effects of weight loss surgery and the associated reduction in obesity-related comorbidities such as type 2 diabetes mellitus, hyperlipidemia, hypertension, obstructive sleep apnea, cancer, coronary artery disease, osteoarthritis, and gastroesophageal reflux disease (GERD).<sup>2–7</sup> The American Society for Metabolic and Bariatric Surgery estimates that 220,000 people underwent bariatric surgery in 2009 with over 1.5 million procedures performed since 1992.

Centers of excellence criteria include follow-up with the bariatric surgeon for 5 years; however, the patient may be admitted to a hospital without immediate availability of the bariatric surgeon. Since hospitalists are often “first responders” to the majority of newly hospitalized patients, this growing number of post-bariatric surgery patients necessitates hospitalists have a full understanding of their unique postoperative anatomical and physiological consequences. During the first hours of an acute inpatient presentation, post-

bariatric surgical patients can be divided into the following categories: surgical complications, surgical complications masquerading as acute medical conditions, and medical complications. Additionally, hospitalists should be aware of the nuances of radiographic imaging and appropriate endoscopic procedures in these patients. This article will discuss the common current bariatric surgical procedures; post-bariatric surgery radiographic imaging pearls; and a review of the signs, symptoms, and treatment of common medical and surgical complications.

### DESCRIPTIONS OF CONTEMPORARY PROCEDURES

Contemporary weight loss procedures can be divided into 2 categories based on how they produce weight loss: restrictive only or combination malabsorptive with restriction. Most are performed laparoscopically to reduce postoperative pain, speed recovery, and decrease wound complications.

#### Restrictive Procedures (Laparoscopic Adjustable Gastric Band and Sleeve Gastrectomy)

These procedures produce weight loss by reducing the size of the stomach or creating an obstruction in the proximal stomach, limiting the consumption of large quantities at one time. They produce early satiety, but patients may still consume a large volume of calorie-dense liquids compromising weight loss.

#### Laparoscopic Adjustable Gastric Band

Laparoscopic adjustable gastric band (LAGB; Figure 1A) is the primary form of restrictive procedures with 2 Food and Drug Administration-approved bands (Lap

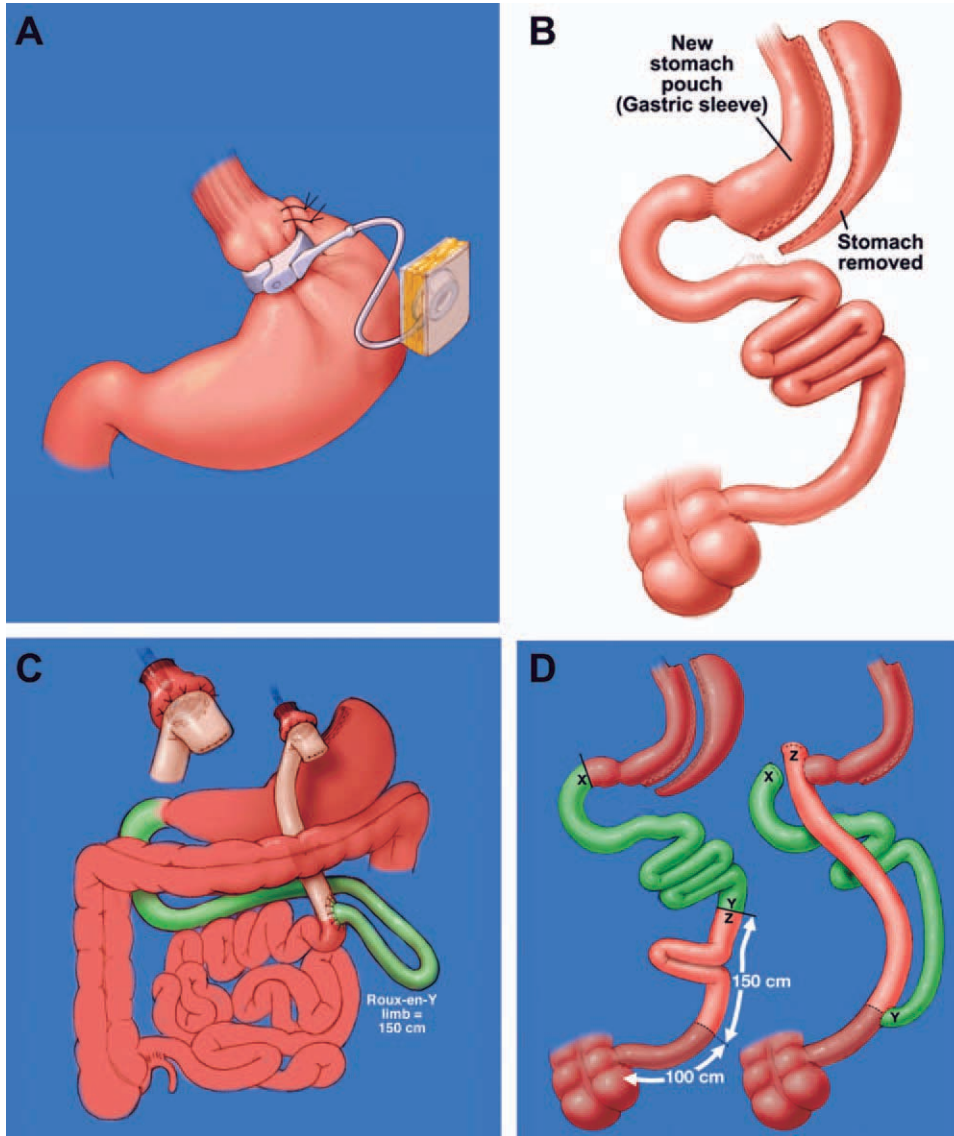
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**FIG. 1.** (A) Laparoscopic adjustable gastric band (LAGB); (B) sleeve gastrectomy; (C) Roux-en-Y gastric bypass (RYGB); (D) biliopancreatic diversion (BPD).

Band [Allergan, Inc; Irvine, CA] and REALIZE band [Ethicon Endo-Surgery, Inc; Cincinnati, OH]). A cuff is inflated around the proximal stomach creating a gastric pouch approximately 15-30 mL in size. A subcutaneous reservoir is attached to the cuff allowing adjustment to the degree of restriction.<sup>8</sup> LAGB has replaced the vertical banded gastroplasty (VBG). It is less invasive, adjustable, and reversible (0.1% operative mortality rate). Weight loss is maintained with this procedure but is generally less, with a higher failure rate compared to the more common gastric bypass procedure (Table 1).<sup>3,9</sup> Complications may include band dysfunction (ie, slippage, erosion, infections), esophageal dilatation, balloon failure, and port malposition, with rates approaching 3%-5% per year requiring removal or repair.<sup>10</sup> Patients may also experience GERD symptoms, especially if the condition was present preoperatively. Progressive GERD symptoms should be investigated with an upper gastrointestinal (GI) series to ensure there is no band slippage, esophageal dilation, or dysfunction.

**TABLE 1.** Comparison of Outcomes for Various Procedures

	LAGB	Roux-en-Y Gastric Bypass	Biliopancreatic Diversion With and Without Duodenal Switch
Excess weight loss	48%	62%	70%
Resolution of diabetes	48%	84%	98%

NOTE: References: Buchwald et al.<sup>3</sup>; Kendrick and Dakin.<sup>9</sup> Abbreviations: LAGB, laparoscopic adjustable gastric band.

**Sleeve Gastrectomy**

With the sleeve gastrectomy (Figure 1B) procedure, a small gastric tube is created by resecting the majority of the stomach. Early postoperative complications are comparable to those after Roux-en-Y gastric bypass (RYGB) operations. Leaks from the long gastric staple line are the most concerning. Recent report of a leak rate of 4.9% is much higher than contemporary reports

of leaks after laparoscopic RYGB operations.<sup>11</sup> Gastric tube stenosis is unique to the operation but comparable to gastrojejunal anastomotic stricture rates after RYGB. Weight loss is less than RYGB. Long-term results from larger cohorts are needed to determine if the high incidence of esophageal complaints (GERD 26%, vomiting 21%), and weight regain issues are consistently experienced.

### Combination Procedures (Roux-en-Y Gastric Bypass and Biliopancreatic Diversion With and Without Duodenal Switch)

These procedures produce weight loss by decreasing caloric intake and altering digestion and absorption.

#### **Roux-en-Y Gastric Bypass**

Roux-en-Y Gastric Bypass (RYGB) (Figure 1C) is the most common bariatric procedure performed in the United States. As the gold standard, it provides long-term successful weight loss and a defined risk profile.<sup>9</sup> This procedure involves the creation of a small (15-30 mL) gastric pouch by transecting the stomach and then draining the pouch via a Roux limb. The Roux (aka alimentary) limb is the segment of bowel between the small gastric pouch and the jejunojejunostomy. Variations on this procedure include different length Roux limbs (75-150 cm) and the use of a silastic ring at the gastrojejunal anastomosis. The latter is not commonly used because of the high incidence of band erosion. Weight loss seems to be independent of these variations. Postoperatively, food bypasses the biliopancreatic limb (ie, the stomach, duodenum, and part of the jejunum) resulting in selective malabsorption in the common channel (the segment distal to the jejunojejunostomy). Hormone secretions are altered, affecting satiety signaling and glucose metabolism.<sup>10,12</sup>

#### **Biliopancreatic Diversion With Duodenal Switch**

In biliopancreatic diversion (BPD) with duodenal switch (DS) (Figure 1D), a sleeve gastrectomy is performed. The ileum is transected about 250 cm proximal to the ileocecal valve and is then attached to the transected duodenum just distal to the pylorus, forming the path for the food. The excluded duodenum, jejunum, and proximal ileum drain the biliary and pancreatic secretions and are reconnected to the distal ileum about 50-100 cm proximal to the ileocecal valve. Food and digestive juices mix, allowing for absorption of nutrients over this short “common channel.” Greater malabsorption of calories, vitamins, and trace elements occurs, providing more reliable weight loss and significantly more nutritional problems.<sup>8,9</sup>

### RADIOGRAPHIC AND ENDOSCOPIC CONSIDERATIONS

When evaluating abdominal complaints with radiographic imaging, the postoperative anatomic varia-

tions can challenge routine interpretation. An experienced radiologist and involvement of a bariatric surgeon, who is familiar with the post-gastric bypass anatomical changes, are essential for accurate interpretation.

Computed tomography (CT) scans with oral contrast are the imaging modality of choice, particularly in the acute setting, to rule out small bowel obstruction. CT scans are helpful in delineating postoperative anatomy, detecting anastomotic leaks, obstructions and other intra-abdominal problems.<sup>13-15</sup> Routine upper GI series (UGI) after gastric bypass is controversial, with some performing it routinely and others only for cause. Regardless, when UGI is performed, likewise for CT, small volumes of water-soluble contrast should be used, followed by small volumes of dilute barium solution. A UGI may be complementary and more sensitive in the case of a small leak when done under fluoroscopy, but CT and UGI may not show the leak in as many as 30% of patients; CT scans may provide additional information to help guide the clinical decision making. A negative study should not preclude surgical exploration if a high suspicion for leak exists.<sup>16</sup> Internal hernias (loop of bowel passing through a mesenteric defect created by the original surgery), a common cause of bowel obstructions, are frequently missed, therefore a high level of suspicion is necessary.<sup>17-19</sup> Several studies have identified 8 radiographic CT findings in bowel obstructions caused by internal hernias including swirl sign, mushroom sign, hurricane eye, small bowel obstruction, clustered loops, small bowel behind superior mesenteric artery, right-side anastomosis, and engorged nodes.<sup>18,19</sup> The clinical picture should guide medical versus surgical management in those exceeding CT scanner weight limits (commonly 350 lb).

Imaging modalities such as UGI, endoscopy, or double balloon enteroscopy (DBE) should be used for patients with more chronic abdominal complaints. UGI may miss leaks and obstructions in the remnant stomach and bypassed intestine. If pathology, such as ulcers, retained sutures, and strictures are suspected in the bypassed stomach/intestine, DBE can be used to diagnose and therapeutically intervene, but may not be available at all centers and referral may be considered. Endoscopy allows for direct visualization of subtle or mucosal pathology in the small bowel, but is unable to visualize the excluded stomach and duodenum.<sup>20</sup>

### EARLY MEDICAL AND SURGICAL COMPLICATIONS

Early postoperative complications (within 30 days) occur in the minority of patients after weight loss operations. Clinical findings, even in life-threatening conditions, may be subtle. Readmissions most often occur for dehydration secondary to inadequate oral intake. Pneumonias, and wound and urinary tract

infections are not unique to the bariatric surgery patient, but there is a higher than average risk of pulmonary embolism and bleeding. Bleeding most frequently occurs into the GI tract from staple lines resulting in rapid catharsis or emesis, but can also be intraperitoneal and elusive. Most GI bleeding stops spontaneously, but some require transfusion and re-exploration in extreme cases.<sup>21</sup> Leaks may occur at any of the staple lines or anastomoses. The most common sites of leak are the g-j anastomosis, gastric pouch, and remnant stomach. Again, remnant stomach and j-j anastomosis leaks may escape detection by UGI and CT. Re-exploration of a sick patient in the early postoperative period may be required despite normal imaging studies. Early consultation with, or transfer to, a bariatric surgery center should always be considered for patients readmitted after bariatric surgery.

## LATE MEDICAL COMPLICATIONS

Gastrointestinal complaints, excessive weight loss, and vitamin/mineral deficiencies resulting in neurological problems and metabolic bone disease are post-bariatric medical complications that may prompt hospital admission. If not the primary reason for admission, special attention to these issues may prevent readmission, another focus of hospital care.

### Gastrointestinal Complaints

One of the most common causes of hospital admission any time postoperatively is abdominal pain. A differential diagnosis of abdominal pain, nausea, and/or vomiting in the post-bariatric surgery patient should include small bowel obstruction, hernias (internal or incisional), band complications, food intolerance, dietary noncompliance, ileus, mesenteric venous thrombosis, strictures (such as outlet obstruction or anastomotic stenosis), ulcers, esophagitis, cholelithiasis, dumping syndrome, and Roux stasis syndrome.<sup>20</sup>

A thorough history targeted at the relationship between symptoms and food intake, attention to the character and location of the pain, and a thorough physical exam (specifically the presence or absence of palpable tenderness, guarding, or rebound) is essential. The physical exam may be misleading in obese patients and, if radiographic studies cannot be performed secondary to patient size, surgical exploration may be needed soon after presentation. Therefore, even lacking an obvious surgical need, the bariatric surgeon should be notified of admission.

Improper food choice, and failure to slowly and adequately chew food, can result in emesis and digestive difficulty. Physical incompatibility with the small gastric pouch and gastric outlet obstructions can be caused by nondigestible foods (ie, breads, steak, raw vegetables). This highlights the importance of ordering the appropriate hospital diet.<sup>8</sup> Specific gastric bypass

hospital diets for all consistencies should reflect the mechanical limitations and carbohydrate/protein requirements of these patients.

Increased gallstone formation is observed in patients with rapid weight loss ( $\geq 1.5$  kg/wk), especially following RYGB and less often after LAGB procedures (40% vs 20% over 3 years). Routine use of ursodiol during rapid weight loss (6 months after RYGB) reduces this complication to  $< 5\%$ .<sup>8</sup>

Stenosis or ulceration at the anastomotic site for RYGB can cause abdominal pain and vomiting. The incidence of stomal stenosis has been reported at 5%-19% and typically occurs within the first 3 postoperative months.<sup>22</sup> This problem is often amenable to endoscopic dilatation, unless a ring was used to reinforce the anastomosis. Ulceration has been reported in 1%-16% of patients and is usually secondary to tobacco or non-steroidal anti-inflammatory drug (NSAID) use, *H. pylori*, fistula-induced acid exposure, reaction to foreign material, or ischemia from tension and poor tissue perfusion.<sup>23,24</sup> Endoscopy can diagnose the presence of ulcers, with biopsies to rule out *H. pylori* infection. Cessation of NSAIDs and tobacco are critical. Medical management including proton pump inhibitors and/or sucralfate is sufficient for up to 95% of patients. Surgical revision is reserved for persistent ulcers associated with obstruction, pain, and/or bleeding.<sup>25</sup>

Dumping syndrome is a complex of post-prandial symptoms occurring most commonly in the RYGB patients. As many as 44% of RYGB patients may experience this syndrome characterized by flushing, dizziness, abdominal distension, pain, nausea, vomiting, and/or diarrhea.<sup>26</sup> Symptoms may result from the ingestion of large amounts of sugars which empty from the altered gastric pouch at an unregulated rate. This large osmotic load causes fluid shifts and surges in peptide hormone levels, resulting in symptoms which may reinforce adherence to the prescribed postoperative diet. It occurs shortly after a meal and resolves over hours. Dietary modifications, such as increased protein and fiber intake with decreased consumption of simple sugars, will ameliorate symptoms in many patients, with most seeing resolution after the first year.<sup>8,27</sup> Some patients experience hyperglycemia secondary to ingestion of simple carbohydrates, with hypoglycemia approximately 2 hours later (late dumping). In our experience, limiting carbohydrate intake to 30 grams at any meal usually alleviates post-prandial hypoglycemia.

If the patient reports an absence of bowel movements and flatus, an ileus from chronic narcotic use or a mechanical small bowel obstruction secondary to internal hernias or adhesions (see "Late Surgical Complications") must be investigated. Severe or prolonged pain, lasting longer than a few hours, is cause for alarm and should prompt aggressive evaluation and possibly exploratory surgery.

**TABLE 2.** Expected Weight Loss for Roux-en-Y Gastric Bypass

Postoperative Time Period	Average Weight Loss (RYGB)	
	Daily	By Time Period
0-3 mo	0.22-0.45 kg/day	15-20 kg by 3 mo
3-9 mo	0.11-0.22 kg/day	25-35 kg by 6 mo
9-12 mo	0.11 kg/day	40-60 kg in first year

NOTE: Reference: McMahon et al.<sup>27</sup> Abbreviations: RYGB, Roux-en-Y Gastric Bypass.

### Excessive Weight Loss

In diagnosing postoperative excessive weight loss, it is important to understand average anticipated weight loss parameters. Compared to the values expected for RYGB, LAGB produces less weight loss and BPD with and without DS produces more (Table 2<sup>27</sup>). Patients experiencing more rapid or prolonged weight loss should be investigated for bacterial overgrowth syndrome, short bowel syndrome, or other anatomic abnormalities.

Known risk factors for bacterial overgrowth, which are prominent in this population, include decreased gastric acidity and slowed intestinal transit time (ie, narcotic use). Patients may be asymptomatic or experience weight loss, abdominal bloating and/or pain, nausea, vomiting, and diarrhea. The diagnosis can be made with a hydrogen breath test or by obtaining quantitative cultures of jejunal secretions during endoscopy. Questions remain on how the normalized values of these tests are affected by the postoperative environment, and on how this syndrome may present or be treated if it affects the excluded intestine. Bacterial overgrowth may be an incidental finding and not the cause of the gastrointestinal complaints. Although data is limited, treatment typically consists of a 7-10 day course of rifaximin 1200 mg/day (divided doses) and/or a trial of dietary modifications.<sup>20,28-31</sup> These may include avoiding lactose and eating a high fat, low carbohydrate, low fiber diet, so nutrients are readily absorbed and not left for bacterial consumption.<sup>32</sup>

Short bowel syndrome (<100-200 cm of intestinal tissue remaining and subsequent malabsorption) can occur after any extensive colonic resection or bypass of the intestine.<sup>33</sup> This condition rarely results after an initial bariatric procedure; however, subsequent procedures for small bowel obstructions or intestinal ischemia may result in short bowel syndrome. Typical presentations include diarrhea, weight loss, and symptoms of vitamin and mineral deficiencies. Short bowel can also predispose patients to the development of bacterial overgrowth, further complicating weight loss. Management consists of nutritional supplementation, occasionally parenteral nutrition, and rarely reoperation to increase the length of the common channel.<sup>34</sup> Avoidance of further bowel resection is crucial in preventing short bowel syndrome.<sup>33,34</sup> In

the setting of carbohydrate malabsorption with concomitant bacterial overgrowth syndrome, production of d-lactic acid causing a metabolic acidosis with encephalopathy has been reported.<sup>35</sup>

Once medical complications have been ruled out, it is prudent to evaluate for a psychological component such as anorexia nervosa. It is helpful to involve a qualified psychologist who is familiar with this population. Addictions to alcohol, gambling, and pain medications have been reported in the post-bariatric surgery population as a substitute for food addiction.

### Neurological Complications and Vitamin Deficiencies

Neurological complications develop months to years postoperatively, secondary to vitamin, mineral, and nutrient deficiencies that result from malabsorption or inadequate intake. An inpatient provider should be aware of the potential role these conditions may play in a hospitalized patient.

Peripheral neuropathy can develop secondary to several deficiencies, including vitamin B<sub>12</sub>, thiamine, vitamin E, and copper. Their sources, deficiencies, and replacement regimens are presented in Table 3.<sup>36-42</sup> Thiamine deficiency, manifesting as Wernicke's encephalopathy, is particularly important in the postoperative patient with excessive vomiting. For prevention, we recommend all patients readmitted with vomiting and dehydration receive a "banana bag" or "rally pack" (thiamine 100 mg, folic acid 1 mg, multivitamin with iron and magnesium 3 g in one liter of D5 normal saline) over 4-8 hours. Additional deficiencies after gastric bypass include folate, selenium, zinc, vitamin B<sub>6</sub>, and riboflavin. A multivitamin with minerals will meet the needs of most patients. Multiple fat-soluble vitamin deficiencies can occur with small bowel bacterial overgrowth or BPD.

### Anemia

Iron deficiency affects 6%-33% of patients after 1 year.<sup>43</sup> Iron is preferentially absorbed in the duodenum and proximal jejunum which are bypassed postoperatively. The absence of gastric acid prevents conversion of ferric (Fe<sup>2+</sup>) to the absorbable ferrous (Fe<sup>3+</sup>) iron, further decreasing absorption.<sup>44</sup> Ferritin reflects iron stores but is also an acute phase reactant and, therefore, may mask an underlying deficiency in an acutely ill hospitalized patient. A multivitamin with iron is recommended for all patients, but additional supplementation may be required for menstruating women.<sup>43</sup> Parenteral administration may be necessary if oral supplements are not tolerated or are inadequately absorbed.<sup>44</sup>

### Fractures and Osteomalacia

Calcium and vitamin D deficiencies are a significant problem in the bariatric surgery population, with

**TABLE 3.** Neurological Complications of Vitamin Deficiencies

	B <sub>12</sub>	B <sub>1</sub> (Thiamine)	Vitamin E	Copper
Dietary sources	Meat and dairy	Fortified grains, cereals, nuts, and pork	Vegetable oil, nuts, leafy vegetables <sup>39</sup>	Shellfish, organ meats (liver, kidney), chocolate, nuts, dried legumes/fruits <sup>41</sup>
Location of absorption	Terminal ileum after combining with intrinsic factor	Proximal small intestine	Upper small intestine <sup>41</sup>	Stomach and duodenum <sup>38</sup>
Mechanism of deficiency	Inadequate intake intrinsic factor deficiency <sup>37,39</sup>	Bypass of primary absorption site Inadequate intake Excessive emesis	Fat malabsorption <sup>39</sup> Inadequate intake	Defective intestinal mucosal transport <sup>40</sup> Decreased absorptive surface area <sup>40</sup> Inadequate intake Coadministered zinc which competes with copper for absorption <sup>38</sup>
Time to develop deficiency	Years	≥18 days <sup>37,39</sup>	6-12 mo <sup>39</sup>	3-12 mo <sup>42</sup>
Postoperative supplementation recommendation	Optimal prophylactic dose unknown Minimum 1-2 mg/day	1-1.5 mg/day <sup>37</sup>	Males: 10 mg/day Females: 8 mg/day	Multivitamin (900 µg/day)
Pathology of deficiency	Macrocytic anemia Paresthesias Ataxia Subacute combined degeneration of the spinal cord	Dry beriberi Wernicke's encephalopathy Korsakoff's syndrome	Myopathy/neuropathy Ataxia	Demyelinating neuropathy with ataxia Anemia
Labs to document deficiency	Serum B <sub>12</sub>	Erythrocyte transketolase activity Thiamine diphosphate effect <sup>37</sup>	Serum alphatocopherol <sup>37,39</sup> Check for deficiencies of other fat soluble vitamins (A, D, K)	Serum copper level <sup>40</sup>
Correcting deficiency	Intramuscular B <sub>12</sub> (1000 mcg) Sublingual supplementation <sup>36</sup>	50-100 mg/day (parenteral or oral) <sup>37</sup>	400 mg PO BID <sup>37</sup>	2-4 mg/day <sup>38</sup>

NOTE: References: Butler et al.<sup>36</sup>; Chaudhry et al.<sup>37</sup>; Goldenberg<sup>38</sup>; Koffman et al.<sup>39</sup>; Kumar et al.<sup>40</sup>; Mahan and Escott-Stump<sup>41</sup>; Xanthakos and Inge.<sup>42</sup> **Abbreviations:** BID, bis in die (twice a day); PO, per os (by mouth).

resultant osteoporosis or osteomalacia and associated fractures.<sup>38,43</sup> Calcium is preferentially absorbed in the duodenum and proximal jejunum. Vitamin D is absorbed in the ileum or produced in the skin in response to ultraviolet B (UVB) radiation.<sup>45</sup> Deficiency of vitamin D exacerbates calcium malabsorption, thereby causing secondary hyperparathyroidism, increased bone turnover, and osteomalacia. Dramatic weight loss can lead to bone loss, increasing the risk for osteoporosis and fractures.<sup>38</sup> Hypocalcemia or osteomalacia may cause generalized bone pain, muscular weakness, tetany, and chronic musculoskeletal pain.<sup>45</sup>

Fat-soluble vitamin deficiencies are more common in those undergoing malabsorptive versus restrictive procedures and, in the case of BPD, may be related to the length of the common channel.<sup>43</sup> It is important to ensure that calcium and vitamin D levels are sufficient prior to surgery, and prior to starting any osteoporotic treatment such as bisphosphonates.<sup>45</sup> We recommend at least 1200 mg of calcium citrate and 1000-2000 IU of Vitamin D daily. Up to 50,000 IU weekly or daily may be required to correct deficiency and maintain sufficiency in this population.<sup>46,47</sup> Vitamin D<sub>2</sub> (ergocalciferol) or D<sub>3</sub> (cholecalciferol) can be used for supplementation. Cholecalciferol is preferred if given through a feeding tube because it is less prone to clogging the tube.<sup>46</sup> With severe malabsorption, phototherapy may be necessary, as intravenous doses are often inadequate and intramuscular preparations require special compounding.<sup>46</sup> Calcium carbonate requires acid for proper absorption, therefore calcium citrate may be preferred due to achlorhydria from gastric exclusion.

## LATE SURGICAL COMPLICATIONS

Hospitalists are increasingly responsible for managing and comanaging surgical patients. The post-bariatric surgery patient may present with unique signs and symptoms of surgical conditions masquerading as medical conditions. Common conditions that present in uncommon ways include strictures (ie, outlet obstruction and stomal stenosis), hernias with strangulation (incisional and internal), and small bowel obstructions.

Small bowel obstruction (SBO) occurs in 0%-5% of RYGB patients (less with LAGB, similar with BPD), which is similar to other abdominal surgery rates, and may occur months to years after the original surgery. The differential diagnosis of an SBO includes internal hernias, adhesions, ventral hernia (incisional and umbilical), postoperative ileus, and jejunojejunal anastomotic stricture. Typical symptoms are often present, but may be less obvious than with a non-gastric bypass patient. Pain can range from acute to a chronic or intermittent pattern. Pain is the most common presenting symptom of obstruction. Pain relieved by emesis may indicate an obstruction in the Roux limb. Nausea, bloating, tachycardia, and hiccups with shoulder/back pain can occur when obstruction in the biliopancreatic limb causes gastric distension.<sup>48</sup>

Vomiting is seen in fewer than half of patients with SBOs due to the altered anatomy.<sup>49</sup> Any post-RYGB patient that vomits bile needs emergent surgical evaluation for a common channel obstruction. Radiographic imaging may be misleading as to the cause of the obstruction. SBO is crucial to consider since delayed diagnosis can result in bowel ischemia and death.<sup>18</sup> For the hospitalist who is caring for a post-

bariatric patient with a bowel obstruction, early surgical consultation is mandatory, preferably with a bariatric surgeon. Traditional medical management such as nasogastric (NG) tube placement will not decompress the excluded stomach, therefore patients rarely benefit from nasogastric decompression. If necessary, an NG tube should only be placed by experienced hands or fluoroscopic guidance, due to the altered anatomy.

## CONCLUSION

Weight loss surgery, developed to address the growing obesity problem, has been beneficial to hundreds of thousands of people by decreasing their excess weight and comorbidities. For some, the postoperative course is complicated by medical and surgical problems requiring hospitalization. It is critically important that, as this relatively new field of postoperative medicine evolves, the hospitalist stay informed on relevant presentations, complications, and treatment to better address this growing population. Early consultation with, and transfer to, a bariatric surgery center should be encouraged. The importance of arranging proper hospital follow-up, including community-based support groups, nutritional consults, psychological support, and close follow-up with the bariatric surgeon, bariatrician, and/or primary care physician, should not be underestimated.

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