Role of the Primary Care Physician Before and After Weight-Loss Surgery

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Introduction

Obesity spares no organ system and is associated with an increased risk of many diseases, including diabetes mellitus type 2 (DM2), obstructive sleep apnea (OSA), hypertension, dyslipidemia, coronary heart disease, cardiomyopathy, some types of cancer, nonalcoholic steatohepatitis (NASH), and osteoarthritis (OA). Weight-loss surgery (WLS) is currently the most effective intervention for the treatment of severe obesity in terms of magnitude as well as duration of weight loss. WLS produces averages losses of 45–70% of excess weight (actual – ideal weight),[1] in contrast to the approximate 10% loss from initial weight with nonsurgical approaches.[2,3] WLS results in improvements in many obesity-related comorbidities, including DM2, hypertension, OSA, dyslipidemia, cardiomyopathy, nonalcoholic NASH, symptoms related to OA or back pain, and psychological dysfunction and impaired quality of life, and recently has been shown to reduce mortality.[1, 4–21] The numbers of weight-loss procedures performed in the United States has increased dramatically in recent years (Fig. 1). As more patients undergo WLS, it will be important for primary care clinicians to understand the procedures performed and the management of patients before and after these procedures. This review focuses on the preoperative and postoperative issues of the WLS patient that are relevant to the primary care provider.

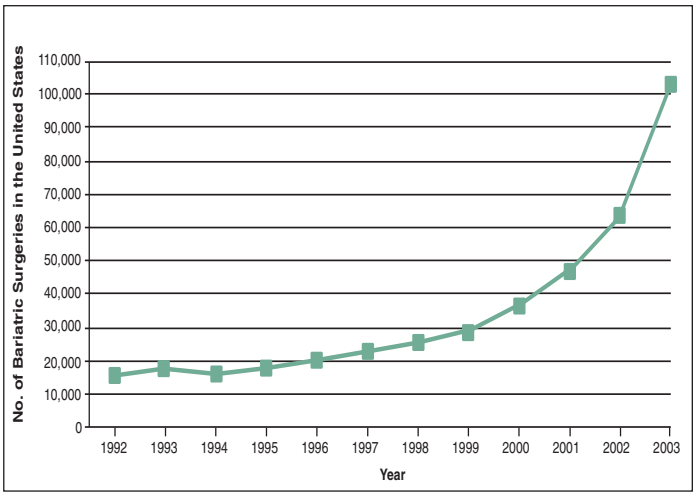

Fig. 1. Estimated number of bariatric operations performed in the United States.
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Who Should Be Referred for Surgery?

Patient selection criteria from the 1991 National Institutes of Health Consensus Development Conference on Gastrointestinal Surgery for Severe Obesity[22] provide the basis for WLS candidacy (*see sidebar, p. 151*). The fundamental criterion is body mass index (BMI) ≥40 kg/m^2 or BMI ≥35 kg/m^2 in the presence of significant comorbidities. There remain no specific

guidelines for the extent to which patients must try to control weight by nonsurgical means before consideration of WLS.

Surgery for Weight Loss

Surgical procedures for weight loss range from purely restrictive, to restrictive with a modest degree of malabsorption, to primarily malabsorptive. Figure 1 illustrates the procedures most often performed. The current, purely restrictive procedure of choice is the laparoscopic adjustable gastric band (LAGB). A fluid-filled band is placed around the stomach, and the degree of restriction can be adjusted by inflation of the band with saline through a subcutaneous port. Roux-en-Y gastric bypass (GBP) is currently the most popular procedure performed in the U.S. In this operation, a 15-mL gastric pouch is created, the jejunum is resected and the distal portion anastomosed to the pouch, and the proximal jejunal limb is then re-anastomosed to create a roux limb. The roux limb may be of variable length, with longer limbs associated with greater malabsorption. The more malabsorptive procedures, biliopancreatic diversion (BPD) with or without duodenal switch, create substantial degrees of malabsorption.

Risks associated with LAGB and GBP are listed in Table 1 and discussed in detail elsewhere.[23,24] Complications of WLS procedures vary, with rates of serious complications and mortality highest in BPD and revisional surgeries, intermediate with GBP, and lowest with LAGB. Other factors associated with increased complication rates are higher BMI, greater age, and male gender. Comorbid conditions such as DM2, OSA, and hypertension have been associated only inconsistently with complications or early mortality after surgery.[25–31] Approximately two thirds of early postoperative mortality after GBP is associated with anastomotic leaks and pulmonary emboli. In addition, limited surgeon experience and low hospital/procedure volume are strongly associated with complications and mortality.[32,33] Patients who have BMI ≥50 kg/m^2, who are older, and who have multiple comorbid conditions should undergo surgery by experienced surgeons in high-volume centers that can provide around-the-clock airway management and resuscitative care. Patients with certain unacceptable perioperative risks should not undergo this form of surgery (*see sidebar, p. 150*).

The degree to which severe obesity impairs quality of life as well as health cannot be underestimated. This impairment may impart a sense of desperation such that patients may not fully appreciate the potential risks of WLS. Careful discussions regarding the balance of benefits versus risks are required, which should be reflected in the informed consent process.[34]

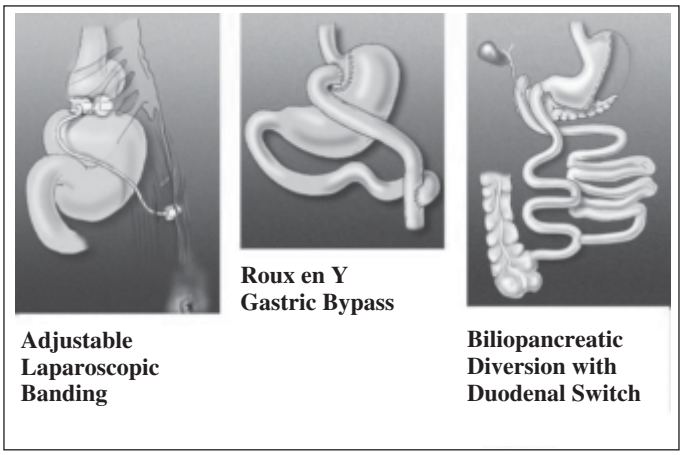

Fig. 2. Types of weight loss surgery.
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Table 1. Surgical Complications of Weight-Loss Surgery

Complications of Gastric Bypass Surgery
- Stomal obstruction (5–15% of patients)
- Postoperative bleeding (1–5% of patients)
- Small bowel obstruction (1–3% of patients)
- Gastrointestinal leak (1–3% of patients)
- Deep vein thrombosis (1–2% of patients)
- Splenectomy (1% of patients)
- Pulmonary embolus (0.5% of patients)
- Death within 30 days (0.5–1% of patients)
- Protein-calorie malnutrition (<1% of patients)

Complications of Gastric Banding
- Slippage of the band (2–3% of patients)
- Band erosion (1% of patients)
- Port infection (1% of patients)
- Injury to adjacent organs (0.5% of patients)
- Death within 30 days (< 0.5% of patients)

Source: Massachusetts Department of Public Health. www.mass.gov/dph/betsylehman/pdf/executive_report_20040804.pdf. Accessed April 12, 2005.

Preoperative Evaluation

Severely obese patients in general receive less preventive medical care than their lean counterparts, and WLS patients often present for preoperative evaluation with undiagnosed weight-related comorbidities. In two series, among patients with DM2, up to two thirds have not had their disease diagnosed before their preoperative evaluation, as well as 50% of those with hypertension or dyslipidemia.[35,36] OSA is also often undiagnosed at presentation for WLS. Therefore, preoperative evaluation by primary care physicians for conditions that may influence surgical outcomes or that are commonly associated with obesity is recommended. Listed here are several of the issues to be considered in patients considering WLS.

Obstructive Sleep Apnea

Sleep studies conducted in patients presenting for WLS that suggest prevalence is between 35% and 71%.[15,37–39] The adverse effects of OSA extend well beyond daytime fatigue, and OSA is associated with pulmonary HTN, transient cardiac ischemia, arrhythmias, traffic accidents, and mood disturbances.[40–42] OSA also increases the risk of anesthesia-related perioperative complications.[42,43]

Clinical predictors of OSA such as questionnaires or anthropometrics have yielded inconsistent predictive power in extremely obese persons; thus they cannot replace need for formal polysomnography in the diagnosis of this disorder.[44] Benefits associated with the treatment of OSA include reduced airway mucosal edema, improved responsiveness to hypercapnia and hypoxemia, reduced baseline hypoxemia, decreased ventilation perfusion mismatch andshunt, and possibly weight loss.[40–42] Overnight polysomnography should routinely be included as part of the preoperative assessment for patients who have witnessed episodes of sleep apnea, significant daytime somnolence, or other suggestive symptoms, especially in the presence of coexisting hypertension, lower extremity edema, and cardiac disease.

Thromboembolic Disease

Persons with WLS are at high risk for venous thromboembolism in comparison to leaner individuals.[45,46] Although the absolute incidence of deep vein thrombosis (DVT) and pulmonary emboli (PE) after WLS is low,[27,30]

> Patients often present for preoperative evaluation with undiagnosed weight-related comorbidities.

PE accounts for 25% to 67% of early postoperative mortality.[26,47,48] Risk factors for DVT/PE include history of a prior thromboembolic event or hypercoagulable state, use of oral contraceptives, central fat distribution, smoking, female gender, increased age, venous stasis or insufficiency, and OSA.[45,46,49] Unless contraindicated, WLS patients should receive perioperative venous thromboem-

Table 2. Recommendations for Micronutrient Supplementation After Gastric Bypass Surgery

Nutrient	Routine Supplementation?	Monitoring	Recommended	Supplementation Treatment of Deficiency
Multivitamin		Yes	N/A In GBP consider Prenatal MVI	MVI N/A
Iron	As in MVI *Consider* additional supplementation for menstruating women	Serum Fe, Fe saturation, Ferritin	As in MVI For menstruating women, consider Prenatal MVI or Elemental Fe 50–100 mg/d	PO: 120–200 elemental Fe daily in divided doses Consider vitamin C 250 mg with Fe dose Parenteral Fe if unable to replete orally
Calcium	Yes	Bone Mineral Density testing at baseline and periodically in post-menopausal women, or others with risk factors	1200–1500 mg per day in divided doses Use preparations with added vitamin D Calcium citrate (theoretically more soluble)	N/A
Vitamin D monthly maintenance	As in MVI and calcium	Vitamin 25-OH D	As in MVI and calcium supplements	Vitamin D 50, 000 units weekly limited duration, then monthly maintenance
Vitamin B_{12}	As in MVI	Serum B12 Methylmalonic acid for confirmation of deficiency	As in MVI	Repletion: IM if symptomatic, otherwise IM or PO 1000 µ daily Sublingual or intranasal available but not assessed in GBP
Folate	As in MVI Additional for pregnancy or anticipated pregnancy	RBC folate	400–1,000 mg/day	1000 mg/day

Generated from references 72, 76–78, 80, 81, 83–89. GBP, gastric bypass.

Contraindications for Bariatric Surgery

- Unstable or severe coronary artery disease
- Severe pulmonary disease
- Portal hypertension with gastric or intestinal varices
- Conditions that seriously compromise anesthesia
- Wound healing problems
- Inability to comprehend basic principles of WLS
- Unable to follow postoperative instructions

bolism prophylaxis by both mechanical methods and unfractionated or low–molecular weight heparin. Preoperative inferior vena cava filter placement should be considered for patients at very high risk for DVT or PE.[31,50]

Liver Disease

Nonalcoholic fatty liver disease (NAFLD) and the progression to NASH are associated with obesity and DM2.[51–54] Intraoperative liver biopsy samples from WLS patients show high rates of liver disease: 65–89% had steatosis, 10–56% had NASH, 1–51% had fibrosis, and up to 6% had cirrhosis.[51,55–59] Serum transaminase concentrations are unreliable predictors of NAFLD, but an aspartate aminotransferase–to–alanine aminotransferase ratio >1 as well as elevated ferritin concentrations, have been associated with more advanced inflammation or fibrosis.[54,60,61] Prospective WLS patients with unexplained elevations of serum transaminases should undergo preoperative evaluation and elevated transaminases should not be ascribed to NAFLD until other etiologies have been excluded. Intraoperative liver biopsy at the time of WLS should be considered for patients with hepatic dysfunction for diagnostic purposes or for establishing the extent of disease, especially in those with DM2, insulin resistance, or hyperferritinemia. In patients with cirrhosis, the decision about whether to proceed with WLS should be made by consideration of overall patient health, the physical and histological appearance of the liver, and whether evidence of portal hypertension or ascites is present.

Preoperative Weight Loss

In many WLS centers, patients are encouraged to lose weight before surgery. The rationale for this is twofold. Diet and lifestyle changes leading to weight loss are considered to be reflective of the lifelong changes necessary after WLS. In addition, modest weight loss may reduce surgical risk and improve outcome. Losses of just 5–10% of initial weight are known to improve obesity-related OSA, hypertension, lipid abnormalities, and glycemic control.[62–64] However, no published prospective studies have demonstrated that preoperative weight loss reduces perioperative complications. Busetto et al[65] reported significantly shorter operating room times and lengths of stay after preoperative weight loss by use of an intragastric balloon in patients with BMI >50. Reduction in visceral adipose tissue as well as liver volume or fat is observed with weight loss in the range achievable surgery.[66] Despite the absence of evidence that preoperative reduces complications or predicts long-term weight outcome, it seems prudent to encourage at least modest preoperative weight loss (*i.e.*, 5–10% of initial weight) in WLS patients, especially those with a BMI >50 kg/m^2 and those with obesity-related comorbidities. In selected patients such as those with higher BMI or uncontrolled comorbid conditions, greater degrees of weight loss may be requested.

Postoperative Care

Postoperative Vomiting

It should be stressed that *vomiting is never normal after WLS* and is not an intended effect of WLS. Postoperative vomiting is often caused by eating too much or too fast, especially in patients soon after WLS. The restriction imposed by gastric banding and gastric bypass dictates that small bites be taken, food chewed extensively, and small portions consumed. Although vomiting may most often be ascribed to behavioral issues, anatomic and other complications do occur. In GBP patients, vomiting may indicate stricture or ulceration at the gastrojejunostomy ("marginal ulceration") or bowel obstruction. For diagnosis of ulcer, upper gastrointestinal contrast studies are seldom useful, and endoscopy by a gastroenterologist familiar with GBP anatomy is recommended. Stricture and bowel obstruction are often first assessed by upper GI contrast studies, followed by endoscopy if indicated. Cholelithiasis should be suspected in patients with nausea, vomiting, or abdominal pain who have not undergone cholecystectomy. Internal hernia is more likely to present after substantial weight loss, is often is associated with vague symptoms, and is difficult to diagnosis by available radiological studies.[67] If other etiologies of vomiting, pain, or other symptoms are excluded, surgical exploration may be warranted to diagnose and repair internal hernia. In LAGB patients, vomiting may indicate that band tightness should be reduced or that a complication such as band slippage has occurred.

Weight loss surgery produces average losses of 45–70% of excess weight.

Postoperative vomiting may lead to dehydration and can result in uncommon but potentially serious problems, such as protein energy malnutrition and thiamine deficiency. Protein energy malnutrition is most likely to occur with malabsorptive procedures such as BPD and distal GBP[68,69] but may occur in any situation with prolonged poor intake. Symptomatic thiamine deficiency has occurred in patients without preoperative risk factors or concurrent alcohol abuse and has developed as early as 1 week to 2 months after WLS.[70–72] All WLS patients with protracted vomiting should be treated with supplemental thiamine in addition to usual micronutrient supplementation.

Management of Comorbid Conditions

In some WLS patients, postoperative weight loss is rapid. It is not uncommon for patients treated for DM2 to demonstrate dramatic reductions in need of medications as soon as 1–2 weeks after surgery, and such patients may require weekly or bimonthly monitoring. Patients taking antihypertensive mediations may also experience hypotension, although the rapidity of blood pressure reduction after WLS appears to be slower than that with DM2. Patients with OSA appear to demonstrate slower improvement despite improved daytime symptoms, however. It is recommended that patients continue use of continuous positive airway pressure for at least 3–6 months after WLS and then undergo follow-up polysomnography to re-assess OSA status.

Vomiting is never normal after weight loss surgery.

Micronutrient Supplementation

Micronutrient deficiency occurs because of a decrease in food intake, malabsorption, and complications such as vomiting. Risk of deficiency is least with purely restrictive procedures, intermediate with GBP (and varies with length of roux limb), and greatest with BPD. GBP patients are at risk for development of deficiencies of iron, vitamins B_{12}, vitamin D, and folic acid and may have be at increased risk for metabolic bone disease. Patients with BPD are at risk for the above nutrient deficiencies as well deficiencies of fat-soluble vitamins and are at greater risk for metabolic bone disease.

Selection Criteria for Bariatric Surgery

- BMI ≥40 kg/m^2
- BMI ≥35 kg/m^2 and significant comorbidities
- Well informed and motivated
- Failure to achieve weight control with nonsurgical approaches
- Acceptable operative risk

Table 2 lists recommendations for supplementation and treatment of micronutrient deficiencies after GBP. Iron deficiency has been observed in 20–49% of GBP patients and is most likely to occur in menstruating women.[73–75] Ferrous sulfate (640 mg/day) has been shown to prevent iron deficiency[74] but may not always be tolerated because of gastrointestinal side effects. Addition of small doses of vitamin C (*e.g.*, ≤250 mg) with iron supplements) may improve absorption.[76] Vitamin B_{12} deficiency has been found in about 35% (range 25–75%) patients after gastric bypass.[75,77–79] Supplementation with oral crystalline B_{12} (up to 1000 mcg) has been found to prevent deficiency in some but not all patients. Patients who have symptomatic vitamin B_{12} deficiency should always be treated with parenteral therapy. Folic acid deficiency is generally prevented by regular multivitamin use,[80] and deficiencies should evoke consideration of noncompliance with supplementation or alcohol abuse. BPD and to a lesser extent GBP have been associated with hypovitaminosis D, impaired calcium absorption, elevated markers of bone turnover, and osteopenia.[81–83]

All WLS patients should be screened preoperatively for micronutrient deficiencies, particularly of iron, vitamin B_{12}, and vitamin D, which are not uncommon in the general population. Assessment of micronutrient status should be repeated 6 months after surgery and at least annually thereafter. Postoperative micronutrient assessment should include assessment of iron, vitamin B_{12}, folate, and vitamin D status. Persistent vomiting may be associated with additional micronutrient deficiencies, especially of thiamine. All WLS patients should take a daily multivitamin and calcium supplement with added vitamin D. Other recommendations are found in Table 2.

Long-Term Follow-Up Required

To maintain weight loss after WLS, patients need to maintain lifelong vigilance to prevent return to patterns that contributed to weight gain, and need also to maintain appropriate diet and physical activity. Some patients experience a sense of invincibility during the rapid weight loss that occurs early after GBP and BPD. However, approximately 1–2 years after WLS, patients commonly experience increased desire to eat, increased cravings,

and tendencies to return to pre-WLS eating and lifestyle patterns. Furthermore, the rapid and dramatic weight loss with WLS necessitates far-reaching psychological and emotional adjustments. These adjustments are facilitated by individual and group counseling by mental health providers familiar with WLS. A multidisciplinary team of physicians, nutritionists, and psychologists is best equipped to address the medical, nutritional, and behavioral long-term care needs of WLS patients.

Disclaimer: *Any opinions, findings, conclusions or recommendations are those of the authors and do not necessarily reflect the views of the U.S. Department of Agriculture.* ■

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