Unfortunately, many of the traditional methods for weight loss, such as dietary restriction, exercise, meal replacement, psychosocial and behavioral interventions, and medications, have limited effectiveness in long-term weight maintenance and regulation of chronic diseases such as type 2 diabetes. This has led to the development of surgical approaches to weight loss, generally referred to as bariatric surgery. Most bariatric surgery studies have shown excellent weight-loss rates for up to two years after surgery, with patients losing an average of 61% of their excess weight (losing 100% of excess weight would return patients to their ideal weight). There is also some evidence that most patients maintain some level of weight loss for up to ten years after surgery.6,7 In addition to aiding in weight loss, bariatric surgery decreases rates of serious obesity comorbidities such as type 2 diabetes, hypertension, and sleep apnea.8-11 There is now compelling evidence that bariatric surgery procedures are effective in resolving type 2 diabetes in 48% to 98% of patients.12,13 Although the number of bariatric surgeries performed annually has increased exponentially throughout the world since 199114 there is still very little research concerning best practices for managing patient health before and after surgery.

The purpose of this article is to provide primary care physicians and other clinicians with some background regarding bariatric surgical procedures and their risks and benefits. We also summarize the bariatric surgery process at Kaiser Permanente Southern California (KPSC), and then provide a detailed case study as an example of how KPSC screens patients referred for surgery, prepares them for the surgery, and cares for them once they have undergone surgery.
recommend bariatric surgery for patients who have clinically severe obesity (a body mass index [BMI] ≥40 kg/m²) with or without comorbid conditions or a BMI of 35 to 39.9 kg/m² with serious comorbid conditions. Comorbid conditions include life-threatening cardiopulmonary problems (severe sleep apnea and obesity-related cardiomyopathy), nonalcoholic steatohepatitis, gastroesophageal reflux disease, uncontrolled diabetes, and/or hypertension. Other possible surgery indications are related cardiomyopathy, nonalcoholic steatohepatitis, pulmonar problems (severe sleep apnea and obesity-

Surgical Procedures

Roux-en-Y Gastric Bypass

Because it produces superior long-term weight loss compared with other procedures that only restrict food intake, RYGBP is the most prevalent procedure in the US. In the 1980s, RYGBP was considered to be major surgery, with a number of peri- and postoperative risks. Most RYGBP surgeries are now performed laparoscopically and require minimal recovery time. Reported death rates directly related to the procedure vary from less than 1% at 30 days after surgery to 6% after five years. Rapid weight loss ensues after surgery in part because stomach restriction prevents patients from consuming the volume and types of foods and beverages that they did before surgery. 

The risk of mortality due to suicide in US patients who have undergone RYGBP is higher than the national rates of suicide for men and women of similar age who have not undergone the procedure. This could be in part because of the psychologic state of many severely obese patients who are referred for RYGBP surgery. Given that food cannot be fully absorbed in these patients, it would stand to reason that medications such as psychotropics may not be absorbed adequately and thus dosage would have to be adjusted and carefully monitored after surgery.

Laparoscopic Band

Laparoscopic banding surgery has recently received extensive media and commercial (www.lapband.com) coverage. Consequently, obese patients are asking their PCPs about the procedure and for referral to a bariatric surgery center. Although the procedure does not result in the same weight loss outcomes as RYGBP surgery, it is far superior to results produced by meal replacement, and recent evidence supports its use as a treatment for type 2 diabetes in the severely obese. Complications in the newest generation of laparoscopic bands are most often due to port infections, band disconnection or slippage, or port disconnections. Of these, the most serious complication is slippage, which can lead to gastric obstruction, esophageal dilation, erosion into the lumen of the stomach, and esophageal dysmotility.

Sleeve Gastrectomy

Sleeve gastrectomy, or gastric sleeve, is a procedure that results in weight loss by restricting food intake. Approximately 60% of the greater curvature of the stomach is removed in the procedure, resulting in a tube or “sleeve.” The typical patient for this procedure is one who has a BMI ≥40 kg/m² or for whom RYGBP is deemed to be too great a risk. Gastric sleeve is meant to serve as a bridge to a bypass procedure at a later date, once the patient has achieved sufficient weight loss. However, some patients do well with this procedure alone and never progress to a bypass procedure.

Bariatric Surgery at Kaiser Permanente Southern California

Approximately 2400 surgeries, primarily RYGBP, are performed per year on Kaiser Permanente (KP) patients nationwide. Half of these surgeries are done for patients in the KPSC Region. Currently, KPSC has two internal bariatric surgery centers. The South Bay Medical Center, recently accredited by the American College of Surgeons (ACS), has been performing surgeries since 1998 and handles approximately 30% of all KPSC bariatric surgeries. The West Los Angeles Medical Center recently began in 2009. Most KPSC patients are still referred to outside bariatric surgery centers in Los Angeles, Riverside, and San Diego counties with whom KPSC has contracted. Although there is a brief
period after surgery (up to six months) when patients
are monitored by the surgery centers, all patients return
to KPSC for treatment by their PCPs. KPSC also provides
care for patients who have had bariatric surgery in other
health care systems before joining KPSC (including those
who have had surgeries in other countries). In general,
patients who have bariatric surgery at KPSC are women
(76%), non-Hispanic white (46%), and 30 to 60 years of
age (72%). These data are similar to that reported for
other insured populations.14

Overview of the Role of
the Primary Care Physician
The PCP determines surgery eligibility (Table 1) and
refers an eligible patient to the Options surgery prepara-
tion program coordinator, whose office is in either
Health Education or Preventive Medicine at the patient’s
medical center. The Options program is explained in the
“Surgery Preparation” section of this article. The
PCP is kept up to date about patients’ progress through
the program by the Options coordinator or the bariat-
ric care manager at the medical center and is notified
when a patient undergoes physiologic and psychologic
evaluation for surgery.

Once the patient has finished the Options program,
the bariatric care manager arranges a surgery consulta-
tion and the PCP takes over the patient’s care (in col-
laboration with the bariatric care manager) after surgery,
although the patient may also be seen at the surgery
center for up to one year after surgery. The bariatric
care manager works closely with the surgery centers
and will continue to send periodic reports to the PCP
about any surgery complications, revision procedures,
and any other post-surgery issues. As with any program
or procedure for rapid weight loss, the PCP must moni-
tor the patient’s medications, blood pressure, comorbid
conditions, and psychologic state.

Referral Process
Table 1 summarizes the criteria for referral of a KPSC
patient for bariatric surgery. In general, patients must be
at least 18 years of age and have a BMI of ≥40 kg/m². In
addition, patients with a BMI ≥35 kg/m² with comorbid
conditions, such as type 2 diabetes and sleep apnea, can
be referred for surgery. Disease burden and potential for
surgical complications are just a few of the issues a sur-
geon must consider in proceeding with bariatric surgery.
Other issues include severe mental illness, poor social
support for behavioral changes required after surgery,
and failure to lose some weight (typically 2.5%–10%
of body weight) before surgery. These factors are not
necessarily contraindications to surgery. Some patients
who have not lost weight or have gained weight before
surgery may be good candidates for surgery. Surgeons,
the regional bariatric surgery steering committee, the
regional bariatric medical director, and the local cham-
pion for adult weight management oversee decisions
regarding patient referral and eligibility. If the PCP has
any questions about this process, s/he should contact
their adult weight management champion.

Surgery Preparation
In an effort to provide responsible medical treatment
and the best possible outcomes from surgery, KPSC has
institutionalized a program called Options, administered
either through the Department of Health Education or
through Preventive Medicine at most medical centers,
which prepares all patients for surgery. The Options cur-
riculum is designed to help patients lose weight; master
behavior-change techniques; educate them about surgery
and post-surgery care, including nutrition and vitamin
supplementation; inform them of possible complications
of the surgery; and help them set realistic goals for both
their weight loss and their behavior change after surgery.
Each patient has a personalized exercise program to use
outside of the classes. The Options program is provided
to each patient free of charge, however, patients can
enroll concurrently in a meal-replacement program of-

Table 1. Criteria for referral to a bariatric surgeon in Kaiser
Permanente Southern California

<table>
<thead>
<tr>
<th>Age criteria</th>
<th>BMI criteria</th>
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<tbody>
<tr>
<td>• At least 18 years of age</td>
<td>• BMI of ≥ 40 kg/m² with or without comorbidities</td>
</tr>
<tr>
<td>• BMI of ≥ 39.9 kg/m² with significant comorbidities outlined below that confer a high risk for obesity-associated morbidity or mortality</td>
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<table>
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<tr>
<th>Eligible comorbid conditions</th>
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<tr>
<td>• Established coronary heart disease, including a history of myocardial infarction, angina pectoris (stable or unstable), coronary artery surgery, or coronary artery procedures (eg, angioplasty)</td>
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<tr>
<td>• Type 2 diabetes, defined as a fasting plasma glucose ≥ 126 mg/dL or 2-h postprandial plasma glucose ≥ 200 mg/dL</td>
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<tr>
<td>• Moderate-to-severe sleep apnea (eg, Respiratory Disturbance Index [Apnea/Hypoxia Index] defined by apnea plus hyperpnea/&gt;19 hours of sleep) requiring use of a CPAP machine</td>
</tr>
<tr>
<td>• Other clinically significant conditions directly related to obesity and placing the patient at high risk for obesity-associated morbidity or mortality as recommended by an appropriate specialist to the regional bariatric champion and approved by the medical director at the respective medical center</td>
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</table>

*These criteria mirror the recommendations from the National Institutes of Health11 and the American Society for Metabolic and Bariatric Surgery.13, 16, 17

BMI = body mass index.
What Do I Do with My Morbidly Obese Patient? A Detailed Case Study of Bariatric Surgery in Kaiser Permanente Southern California

Surgery Eligibility
In addition to meeting the criteria necessary for referral to Options (Table 1), patients must attend all Options classes, with makeup sessions provided for those who miss classes. Patients have a clinical and psychologic assessment during Options before meeting with the bariatric surgeon. A set of laboratory tests must be done before week ten of the Options program (Table 2). These are usually ordered by the bariatric care manager. Tests are also done within 30 days of the surgery consultation. These tests differ somewhat by surgery center and thus will vary depending on where the patient will undergo surgery. Patients with serious psychiatric or physical illness are referred for treatment before they can advance to surgery, regardless of their performance in the Options program.

Postoperative Follow-Up Care
For those KPSC patients who have surgery at one of the contract surgery centers, their follow-up care is often handled by surgeons at these centers. However, the PCP should also see the patient during this time to monitor medications, comorbid conditions, and psychological state. The laboratory part of this care is handled at KPSC facilities. Suggested post-surgical laboratory tests are shown in Table 3. Surgery centers monitor complications and weight loss and provide this information to bariatric care managers for review. This information is then scanned and appended to patients’ charts. The timing of follow-up visits varies, but patients generally are scheduled for multiple laboratory tests and examinations in the first weeks after surgery, and then for laboratory tests and examinations at three- to six-month intervals thereafter. In addition, patients’ body weight should be checked annually for life.

Malnutrition
The recommended tests for nutrition monitoring are shown in Table 3 and are available as Smart Sets through KP’s HealthConnect system. These recommendations are based upon those of the ASMBS as well as the experiences of KPSC nutritionists in caring for bariatric patients. For the first two years after the surgery, the PCP should work closely with a staff nutritionist and refer patients who are having persistent dietary problems. In general we recommend that all bariatric patients take a daily serving of a balanced multivitamin that has minerals including zinc, folic acid, selenium, and copper.

Patients should also take a calcium citrate supplement for 1000 mg (Laparoscopic Band) or 1500 mg per day (Gastric Sleeve and RYGBP) in divided doses not to exceed 500 mg. For the first six months after surgery, all bariatric patients should take 50 mg of thiamine (Vitamin B1) daily. Only RYGBP patients need to continue thereafter. Finally, because there is evidence that some patients continue to have deficiencies in the B vitamins even after supplementation, 22 1000 μg B12 should be given to RYGBP and Gastric Sleeve patients three times a week sublingually or once per month intramuscular injections.

Table 2. Laboratory tests to be done before week ten of the Options program

<table>
<thead>
<tr>
<th>Test</th>
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<tr>
<td>25-hydroxy vitamin D</td>
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<tr>
<td>Calcium</td>
</tr>
<tr>
<td>Complete blood count without differential</td>
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<tr>
<td>Ferritin, iron, total iron binding capacity</td>
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<tr>
<td>Thyroid-stimulating hormone</td>
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<tr>
<td>Fasting blood glucose</td>
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<tr>
<td>Fasting lipid panel</td>
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<tr>
<td>Hemoglobin A1c</td>
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<tr>
<td>Urine quantitative microalbumin</td>
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<tr>
<td>Serum uric acid</td>
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<tr>
<td>Serum creatinine</td>
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<tr>
<td>Serum electrolytes</td>
</tr>
<tr>
<td>Liver function panel</td>
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<tr>
<td>Chronic panel for hepatitis</td>
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<tr>
<td>Serum total protein, serum albumin</td>
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</table>

Mental Health
In addition to nutritional monitoring after bariatric surgery, these patients also need close monitoring for depression, suicide, and substance abuse. Although not extensively studied, preliminary research has shown that these patients are at increased risk for suicide and drug overdose, 25 especially one year or more after surgery. If a change in mental health status is suspected, the PCP is encouraged to follow the KPSC clinical practice guidelines for major depressive disorder. Patients who were taking medications for mental health conditions before surgery should be monitored carefully because dosages will likely have to be adjusted.
Chronic Health Conditions

There is mounting evidence\textsuperscript{4,5,19} that bariatric surgery leads to normalized indicators of cardiovascular and metabolic function. In the case of type 2 diabetes, bariatric surgery may lead to full remission.\textsuperscript{13} The PCP should monitor comorbid conditions and their medications very closely after surgery. Patients will likely need lower doses of medication as they continue to lose weight and may even be able to discontinue medications. Table 2 contains recommended postsurgery laboratory tests; however, the PCP should order any additional tests relevant to the patient’s comorbid conditions throughout this period.

Pregnancy and Reproductive Health

A new review of recommendations regarding bariatric surgery and pregnancy was published in 2008.\textsuperscript{28} Women who are planning to become pregnant or who are already pregnant after surgery should be referred to an obstetrician and a registered dietitian who handle high-risk pregnancies. General practice at KPSC is to advise women to wait 18 months after having surgery to become pregnant to insure that they are not losing weight during pregnancy. Even for women of reproductive age who do not plan to be pregnant, bariatric surgery shows promise for resolving polycystic ovary syndrome.\textsuperscript{28} A woman’s fertility may increase with weight loss, and thus she should be advised to use birth control if she does not want to become pregnant. Women who have had RYGBP or BPD±DS and are using oral contraceptives should use additional forms of birth control.

Cosmetic Surgery

Depending on the amount of weight lost and the patient’s level of exercise after surgery, there is often some amount of excess skin that does not retain its elasticity after bariatric surgery. KP will cover a panniculectomy if the PCP or plastic surgeon details the skin conditions that result from this excess skin and if the pannus extends below the pubis. However, no other skin removal is covered, so patients should be made aware of this possible outcome of bariatric surgery.

Case Study

JR is a man, age 36 years, with a BMI of 45 kg/m\textsuperscript{2} who was referred to the Options bariatric surgery preparation program in June 2006 by his PCP after being unable to sustain weight loss and after developing comorbidities. JR had tried multiple commercial weight-loss programs but could not achieve and maintain a healthy body weight. He had never had a bariatric surgical procedure. He had numerous comorbidities related to his weight, including type 2 diabetes for more than 13 years, with diabetic nephropathy and polyneuropathy, hyperlipidemia, hypertension, erectile dysfunction, gastroesophageal reflux disease, gout, and depression. His diabetes had been steadily worsening despite his taking multiple oral hy-

| Table 3. Laboratory tests recommended for post-bariatric nutrition assessment for Kaiser Permanente Southern California bariatric surgery patients |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                | RYGBP and BPD/DS | Gastric Sleeve | Laparoscopic Band |
|                | 2–8 weeks | 2–5 months | 6–11 months | Annual | 2–8 weeks | 2–5 months | 6–11 months | Annual | 2–8 weeks | 2–5 months | 6–11 months | Annual |
| Creatinine     | X       | X       | X       | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |
| Electrolytes   | X       | X       | X       | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |
| CBC w/o diff   | X       | X       | X       | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |
| Albumin        | X       | X       | X       | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |
| Thiamin        | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |       |       |       |
| Calcium        | X       | X       | X       | X       | X       | X       | X       | X       | X       |       |       |       |       |       |       |
| Parathyroid hormone |       | X       | X       | X       | X       | X       |       |       |       |       |       |       |       |       |       |
| 25-hydroxy vitamin D | X       | X       | X       | X       | X       |       |       |       |       |       |       |       |       |       |       |
| Vitamin A      | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Iron panel     | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Vitamin B\textsubscript{12} | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Liver panel    | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Uric acid      | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Lipid panel    | X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Fasting glucose| X       | X       |       |       |       |       |       |       |       |       |       |       |       |       |       |

RYGBP = Roux-en-Y Gastric Bypass; BPD/DS = Bilopancreatic Diversion with Duodenal Switch; CBC w/o diff = Complete blood count without differential; ± = not required
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At his referral to the Options program in June 2006, he weighed 332 lb (150.6 kg). He started the Options program in August 2006 and finished in May 2007. Afterward, he weighed 302 lb (137 kg), corresponding to a loss of approximately 10% of his total body weight. He was then evaluated by the bariatric care management nurse practitioner under the supervision of the program’s medical director. Although he had lost the recommended amount of weight, his diabetes was still uncontrolled, with worsening fasting blood glucose levels and hemoglobin A\textsubscript{c} (HbA\textsubscript{c}) of 8.2%. The care manager advised JR that he would have to reduce his HbA\textsubscript{c} to <7% in order to have surgery. JR was able to change his diet and improve his use of insulin, so that six months later—in August 2007—his HbA\textsubscript{c} was improved to 6.4%. He was then reevaluated and referred for surgery, which was scheduled for November 2007.

At surgery, JR weighed 337 lb (153.2 kg; BMI of 45.7 kg/m\textsuperscript{2}), having gained 35 lb (15.9 kg) by the end of his participation in Options. Despite the weight gain, he underwent a laparoscopic RYGBP and had no complications. He responded well to the surgery, losing an average of 29 lb/mo (13.2 kg/mo). By his five-month postoperative appointment, JR had lost 102 lb (46.4 kg). In addition to having achieved excellent weight loss, he no longer needed any medications, including those he was taking for depression, diabetes, hypertension, and hyperlipidemia. His HbA\textsubscript{c} was 5.5%, and he had a normal blood pressure of 128/86 mm Hg. He has been monitored by the bariatric care management team and has been following the recommended diet and exercise regimen. The only complication that he has experienced has been occasional nausea and vomiting after eating large meals. As of October 2008, JR had lost 103 lb (46.8 kg), had a BMI of 31.7 kg/m\textsuperscript{2}, and was still free of chronic illness.

Conclusions and Recommendations

A PCP who decides to refer a patient for bariatric surgery must be aware of the proper criteria for surgical referral, preparation, and follow-up care. The Options bariatric surgery preparation program at KPSC was developed to provide patients with comprehensive information about the surgery so that they could make an informed choice about treatment options. The case study presented here illustrates the process of preparing for, undergoing, and recovering from regional bariatric surgery within KPSC. The KPSC Department of Research and Evaluation has formed a partnership with the regional bariatric surgery program to develop an interactive patient registry to track patients from their referral to the Options program, through their surgery, and throughout the years after surgery. This registry will be used to assist care managers and clinicians in treating these patients as well as providing KPSC leadership with information to make decisions regarding the expansion of the bariatric surgery program.

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Acknowledgment

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References

11. Mechanick JJ, Kushner RF, Sugerman HJ, et al. American Association of Clinical Endocrinologists, the Obesity Society, and American Society for Metabolic & Bariatric Surgery medical guidelines for clinical practice for the perioperative nutri-


The Body Too Thick

This is a very great deformity, especially in young women. There are different ways of curing it, the most certain is: 1) not to sleep too much; 2) to drink plenty of tea and coffee; 3) to abstain from chocolate, beer, and everything that is capable of producing too nourishing juices; 4) to eat and drink very moderately, and if you must drink wine, let it be white wine; 5) take a great deal of exercise on foot; 6) take every day, for several weeks, a little of the ashes of crayfish mixed with an egg or diluted broth. These ashes are very effective to hinder the body from growing fat.

— Orthopaedia, or the Art of Preventing and Correcting Deformities in Children, Nicolas Andry, 1658-1742, French founder of the orthopedics specialty