Adolescent Clients and Weight-Loss Surgery*

Note: In 2002, Cincinnati Children's Hospital Medical Center became the first pediatric institution to offer gastric bypass surgery to older adolescents with severe obesity. This multidisciplinary program was designed both to meet the surgical, medical, and nutritional needs of this population, and to address the psychosocial, cognitive, and developmental issues that can affect the success of weight-loss surgery (WLS) in this population.[1] Recommendations in this chapter for treating adolescent candidates for WLS are based on practices at this institution and the limited evidence available. As research in this field advances, recommendations may change.

Over the last 30 years, the prevalence of obesity, defined as body mass index (BMI) greater than the 95th percentile for age and sex, has more than doubled for children (ages 6 to 11 years) and tripled for adolescents (ages 12 to 19).[2] Even more concerning is the increase in the *severity* of overweight for children and adolescents.[3] This increase has been associated with an increase in obesity-related medical complications, such as type 2 diabetes, obstructive sleep apnea, hypertension, hyperlipidemia, and degenerative joint disease,[4] which in the past were health issues largely encountered during adulthood. Therefore, there is an urgent need to seek more aggressive, but safe and effective interventions for youth with severe obesity (BMI $\geq$ 40).

Initial Assessment

Selection Criteria for Weight-Loss Surgery

An expert panel of surgeons and pediatricians specializing in the treatment of childhood and adolescent obesity developed conservative selection criteria to limit the use of WLS to severely obese adolescents with serious comorbid conditions and to reduce the risk of adverse medical and psychosocial outcomes (Box 1).[5] These factors should be taken into consideration as part of an extensive comprehensive assessment by a multidisciplinary team comprised of the surgeon, physicians, a psychologist, a registered dietitian (RD), a social worker, a clinical nurse practitioner, and an exercise physiologist.

Role of the Registered Dietitian

During the initial assessment, the RD performs the following tasks:

- Collects baseline anthropometric measurements
- Assesses which weight management strategies were attempted in the past, how long they were used, and, when applicable, why they were discontinued
- Reviews findings with the other members of the multidisciplinary team to determine whether adequate attempts at weight management have been made, and whether there are any concerns that the client may not comply with the post-WLS dietary regimen

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Preoperative Education

After the decision is made for the adolescent to proceed with gastric bypass surgery, preoperative education sessions should be offered by individual members of the clinical team, including the RD. A preoperative nutrition education session that is tailored to the needs of adolescents is essential for the following reasons:

- The nutrition education session provides an overview of the progression of the diet stages for the initial 3 months after surgery.
- The session allows the adolescent to learn about the high-protein foods that are acceptable during the first couple of weeks after surgery.
- The session is also an opportunity for the adolescent to taste-test a variety of high-protein drinks (both commercially available products and those prepared with milk, sugar-free instant breakfast, and protein powder) and choose products and flavors they prefer.
- Nutrition education increases the likelihood that the adolescent will comply with the dietary regimen during the initial 3 months after WLS.

Roux-en-Y Gastric Bypass Procedure

The Roux-en-Y gastric bypass procedure (RYGBP) is the WLS used in adolescents. Advantages of the RYGBP include the following:

- Advancements in the safety and long-term efficacy have been made in the use of this surgical procedure in morbidly obese adults (mean 61% loss of excess body weight; operative mortality = 0.5%).[6]
- RYGBP may lead to the resolution of or improvement in many obesity-related comorbidities.[7]
- Long-term outcomes data in adolescents are comparable to those reported in adults.[8,9]

Box 1. Criteria for Adolescents Being Considered for Gastric Bypass Surgery

- Have failed ≥ 6 months of organized attempts at weight management as determined by their primary care provider
- Have attained or nearly attained physiologic maturity
- Very severely obese (BMI ≥ 40) with serious obesity-related comorbidities or have a BMI ≥ 50 with less severe comorbidities
- Demonstrate commitment to comprehensive medical and psychological evaluations both before and after surgery
- Agree to avoid pregnancy for at least 1 year postoperatively
- Be capable of and willing to adhere to nutritional guidelines postoperatively
- Provide informed assent to surgical treatment
- Demonstrate decisional capacity
- Have a supportive family environment

Source: Reprinted from Inge TH, Krebs NF, Garcia VF, Skelton JA, Guice KS, Strauss RS, Albanese CT, Brandt ML, Hammer LD, Harmon CM, Kane TD, Klish WJ, Rudolph CD, Helmrath MA, Donovan E, Daniels SR.

Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics*. 2004;14:217–223. Reproduced by permission of the American Academy of Pediatrics.

Concerns Regarding Weight-Loss Surgery in Adolescents

To achieve positive long-term outcomes from WLS, adolescents must adhere to a strict regimen that includes the following:[8,9]

- A highly-structured dietary protocol
- Taking daily vitamin and mineral supplements for the rest of their lives
- Sustaining a healthful portion-controlled eating plan and a physically active lifestyle

Adolescents who continually snack on high-fat foods are at risk of regaining most or all of weight lost following WLS. Long-term follow-up care provided by a multi disciplinary team with clinical expertise in working with adolescents is essential and promotes the use of developmentally appropriate behavioral interventions that optimize adherence to the postoperative regimen.[1]

Nutrition Principles

Much of what is known about the dietary modifications recommended for adolescents after WLS has been gleaned from the practices of larger, well-established adult surgical programs. Generally, adolescents can follow the same recommendations as adults and benefit from clearly stated guidelines and timeframes for the type, amount, consistency, and texture of food eaten.

Principles for the First Weeks After Surgery

For at least the first 12 weeks after surgery, the adolescent should avoid foods and beverages that contain sugar and those high in fat—these can cause "dumping" symptoms, such as cramps, sweating, heart racing, vomiting, and/or diarrhea. During this period, the client should also avoid carbonated beverages, drinks with caffeine, and alcohol.

Principles for Postsurgery

Protein Intake

After WLS, following a high-protein diet helps maintain lean body mass, promote healing, and minimize hair loss. The client should eat 15 to 20 g of protein from high-quality protein foods at each meal.

When the client begins eating starches, fruits, and vegetables after WLS, the portions of these foods should

be limited to very small amounts (Table 1). This will help ensure that protein intake remains adequate. Clients should be encouraged to record the type, amount, and timing for food intake so their protein intake can be assessed.

Other Principles

The client's eating regimen must be strictly controlled after WLS. The healthcare team should emphasize that the dietary modifications are permanent. Principles to observe include the following:

- Limit the volume of food consumed at each sitting (after 4 weeks have passed since surgery, clients may have up to 1 cup of food per meal).
- Complete each meal in 15 to 20 minutes.
- Stop eating at the first sign of fullness.
- Sip fluids continually between meals. However, do not drink liquids in the 30 minutes before or after a meal.
- Try new foods one at a time, every 2 to 3 days as tolerated. The amount tried should be limited as needed, in order to not exceed the total volume recommended for each stage.

Table 1. Recommended Diet Stages for Adolescents After Weight-Loss Surgery

STAGE	DESCRIPTION	DURATION/TIMING
1	**Water and ice chips** • Fluid goal: 1 oz water per hour	• Duration: 1–2 days • Used during hospital stay
2	**Sugar-free clear liquids** • Acceptable fluids: water, broth, sugar-free fruit-flavored drinks, sugar-free ice pops, sugar-free gelatin • Fluid goal: 4–6 oz water/hr; Total: 48–64 oz/d	• Duration: 3–7 days
3	**High-protein liquids/foods with a smooth consistency** • New foods introduced: high-protein drinks (made with nonfat milk or low-fat soy or lactose-free milk), sugar-free pudding, light yogurt (plain or vanilla), low-fat cottage cheese, low-fat ricotta cheese • Protein goal: 50–60 g/d • Fluid goal: 90 oz/d • Calories: 500–600 kcal/d	• Duration: 1–2 weeks • Generally starts after discharge from hospital
4	**Mechanical soft/semi-solid high-protein foods** • New foods introduced: scrambled eggs; minced or ground chicken, turkey, fish, or tofu; tuna; low-fat cheese (not melted) • Food consistency: pureed or chopped into pieces no larger than a pea • Protein goal: ≥ 60 g/d; ≥ 15 g/meal • Volume for solid foods: 1/2 cup/meal • Meal pattern: 3–4 meals/d • Try new foods one at a time (1/4 cup) every 2–3 days	• Duration: 2–3 weeks • Starts ~10–14 days after surgery
5	**Soft foods—other protein foods, fruit, vegetables, and grains** • New foods introduced: ◦ Protein foods: shaved deli meats, low-fat melted cheese, lean pork, Canadian bacon, cooked beans ◦ Fruit: soft or canned in own juice; no skin ◦ Vegetables: soft-cooked or canned ◦ Grains: toast, low-sugar cereal, crackers, oatmeal, rice, pasta, mashed potatoes (choose mainly whole grains) • Consistency: Take small bites and chew food well • Protein goal: F 60 g/d • Volume for solid foods: 1/2–1 cup/meal • Fluid goal: 90 oz/d (emphasis on water) • Meal pattern: 3–4 meals/d	• Duration: 4 weeks • Starts ~4 wk after surgery
6	**Increased texture** • New foods introduced: bread (not toasted); raw fruits and vegetables, including lettuce; nuts, seeds, and popcorn • Protein goal: ≥ 60 g/d • Fluid goal: 64–90 oz/d (emphasis on water) • Volume for solid foods: up to 1 cup/meal • Meal pattern: 3–4 meals/d	• Duration: 4 weeks • Starts ~8 weeks after surgery
7	**All textures and acidities and other high-calorie foods** • Portion-controlled eating plan • New foods introduced: lean red meat, lean pork 100% fruit juice, citrus fruit, olives, avocado, peanut butter, sweets (in moderation), sugar-free carbonated drinks, caffeinated drinks (in moderation) • Protein: ≥ 60 g/d • Volume for solid foods: 1–1 1/2 cups/meal • Meal pattern: 3–4 meals/d	• Duration: lifelong • Starts ~12 weeks after surgery

Protocol is adapted with permission from Cincinnati Children's Hospital Medical Center.

Dietary Progression

Adolescents who have had WLS may take longer to progress from one diet stage to the next. As a result, it is helpful to extend the timeframes of the diet stages, compared with those used with adults who have had WLS, and break them into substages that have specific guidelines. After WLS, adolescents typically receive inpatient treatment for 3 to 5 days. A barium study may be conducted on the first day after WLS to confirm that a leak or pouch obstruction did not occur. If there are no contraindications to feeding, oral fluids (diet stage I) are started.

Table 2. Sample Meal Pattern for Stage 3 After Weight-Loss Surgery

MEAL TIME	AMOUNT/FOOD TYPE	ENERGY, kcal	PROTEIN, g
8:00 AM	6 oz protein drink	150	15
Noon	1/2 cup protein-supplemented sugar-free instant pudding	127	12
5:00 PM	6 oz protein drink	150	15
9:00 PM	6 oz protein-supplemented low-fat yogurt (vanilla-flavored or plain)	106	12
	Total	**533 kcal**	**54 g**

Adapted with permission from Kirk S, Inge TH, Daniels SR. Gastric bypass surgery for severely obese adolescents: nutritional considerations. *Pediatric Nutrition: A Building Block for Life* (publication of the Pediatric Nutrition Practice Group). 2005;28(4):1–12.

Table 3. Sample Meal Pattern for Stage 5 After Weight-Loss Surgery

MEAL TIME	AMOUNT/FOOD TYPE	ENERGY, kcal	PROTEIN, g
8:00 AM	2 scrambled eggs (made with 2 Tbsp nonfat milk)	161	
	1/4 slice whole wheat toast (plain)	20	0
Noon	Tuna salad (3 oz water-packed tuna, drained, with 2 Tbsp fat-free mayonnaise)	117	21
	2 whole wheat saltine crackers	26	0
5:00 PM	3 oz minced chicken (with added broth to moisten)	105	21
	2 Tbsp green beans, canned, chopped	6	0
	1/4 cup mashed potato	40	1
9:00 PM	1/2 cup cottage cheese, low-fat, small curd	70	14
	2 Tbsp peaches, canned drained and chopped	15	0
	Total	**588 kcal**	**72 g**

Adapted with permission from Kirk S, Inge TH, Daniels SR. Gastric bypass surgery for severely obese adolescents: nutritional considerations. *Pediatric Nutrition: A Building Block for Life* (publication of the Pediatric Nutrition Practice Group). 2005;28(4):1–12.

The stages listed in Table 1 are a variation of those recommended for adults and are in use at Cincinnati Children's Hospital Medical Center. Sample meal plans for a high-protein diet at two different stages are shown in Tables 2 and 3 with the corresponding recipes in Table 4 and 5.[10]

Vitamin and Mineral Supplementation

After WLS, lifelong daily vitamin and mineral supplementation is recommended. Supplements should include the following:

- A sugar-free multivitamin and mineral supplement (for menstruating females, use a prenatal supplement with iron)

Table 4. Recipes for Meal Plans for Stage 3 After Weight-Loss Surgery

FOOD	RECIPE
Protein drink	1 packet sugar-free instant breakfast powder 2/3 cup nonfat milk 4 tsp protein powder supplement[a]
Pudding	1/2 cup sugar-free instant pudding 1 Tbsp protein powder supplement[a]
Yogurt	6 oz vanilla-flavored or plain low-fat yogurt 1 Tbsp protein powder supplement[a]

[a]Protein supplement: calcium caseinate or whey protein isolate providing 4 g protein per Tbsp.

Adapted with permission from Kirk S, Inge TH, Daniels SR. Gastric bypass surgery for severely obese adolescents: nutritional considerations. *Pediatric Nutrition: A Building Block for Life* (publication of the Pediatric Nutrition Practice Group). 2005;28(4):1–12.

Table 5. Recipes for Meal Plans for Stage 5 After Weight-Loss Surgery

FOOD	RECIPE
Scrambled eggs	2 eggs 1/4 cup skim milk 1 1/2 Tbsp protein powder supplement[a]
Tuna salad	3 oz can tuna packed in water 2 Tbsp + 2 tsp fat-free mayonnaise 1 Tbsp protein powder supplement[a]
Minced chicken in broth	1/2 cup minced chicken (skinless, boneless, boiled, white meat only) 3 Tbsp chicken broth
Mashed potatoes	1/4 cup mashed boiled potato with nonfat milk (no added fat) 2 tsp protein powder supplement[a]
Cottage cheese	1/2 cup cottage cheese (small curd) 1 Tbsp protein powder supplement[a]

[a]Protein supplement: calcium caseinate or whey protein isolate providing 4 g protein per Tbsp.

Adapted with permission from Kirk S, Inge TH, Daniels SR. Gastric bypass surgery for severely obese adolescents: nutritional considerations. *Pediatric Nutrition: A Building Block for Life* (publication of the Pediatric Nutrition Practice Group). 2005;28(4):1–12.

- Vitamin B-12: 500 mcg sublingual or 1,000 mcg by injection every 4 to 6 weeks
- Calcium: 1,500 mg/d is recommended; choose a calcium citrate form for optimal absorption
- Vitamin B-1 (thiamin): 50 mg/d for the first 6 months after surgery

Cases of beriberi resulting from vitamin B-1 deficiency have been reported in adolescents who experience post-WLS vomiting. This may suggest that, compared with adults who have had WLS, adolescent WLS clients are at greater risk of beriberi due to thiamin malabsorption. However, it also could be that the adolescents in the case reports did not comply with supplementation recommendations. Strict adherence to dietary and nutrition supplement regimens can prevent such deficiencies.[11,12]

Monitoring and Evaluation

After WLS, follow-up with a healthcare team can help the adolescent integrate the restricted dietary plan and continual need to sip fluids throughout the day into his or her daily life. In addition, long-term follow-up helps the team monitor and evaluate whether the following goals are being met:

- Nutrition is sufficient to preserve lean body mass while optimizing loss of body fat.
- The exercise routine includes both aerobic and weight resistance activities.

Inpatient

The role of the RD during the client's hospital stay is outlined in Box 2.

Outpatient

Postsurgical follow-up involves a clinical team of a surgeon, a nurse, an RD, and an exercise specialist. A behavioral psychologist should also meet with clients postoperatively on an as-needed basis. See Box 3 for the role of the RD.

Follow-up Schedule

In the first year after surgery, follow-up visits are scheduled at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year. A 9-month follow-up visit may also be scheduled, depending on the individual client's adjustment to the diet and exercise regimen. In the second year after surgery, two follow-up visits are scheduled (at 18 and 24 months). Annual visits are recommended after year 2.

Box 2. Role of the Registered Dietitian in an Inpatient Setting

- Ensure that the adolescent and family members understand the progression of the diet used during and immediately after the hospital stay.
- Ensure that self-monitoring of fluid intake has begun.
- Provide ample opportunity for questions and answers.
- Confirm that the family has necessary products and equipment to advance dietary stages after discharge.
- Remind clients to expand daily tracking to include vitamin/mineral supplements, food and drink consumed, and physical activity after discharge.

Box 3. Role of the Registered Dietitian at Follow-up Visits

- Reviews compliance with the following:
  - Assigned diet stage
  - Volume of food and drink consumed
  - Timing of meals
  - Amount of protein and energy intake
  - Daily vitamin and mineral supplements
- Identifies food cravings and any adverse reactions associated with intake of food or drink
- Assesses readiness to advance to the next dietary stage
- Uses behavioral tools, such as goal-setting, contracts, and self-monitoring, to reinforce the anatomic and physiologic effects of the surgery, so that the desired behaviors become more of a habit and not simply a reaction to the altered anatomy

The Roux-en-Y gastric bypass procedure is the WLS used in adolescents.

Data Collected at Follow-Up Visits

In addition to follow-up from their WLS team, clients also meet with their primary care physician at their 6-month, 1-year and 2-year follow-up visits. Laboratory tests and an echocardiogram are obtained at these appointments.

Weight and height measurements are obtained at each visit. Body composition should also be periodically assessed by dual energy x-ray absorptiometry (DEXA). DEXA data are generally obtained at the 6-month, 1-year, and 2-year follow-up visits. ■

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