



## Complete Summary

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### GUIDELINE TITLE

Bariatric surgery for severely overweight adolescents: concerns and recommendations.

### BIBLIOGRAPHIC SOURCE(S)

Inge TH, Krebs NF, Garcia VF, Skelton JA, Guice KS, Strauss RS, Albanese CT, Brandt ML, Hammer LD, Harmon CM, Kane TD, Klish WJ, Oldham KT, Rudolph CD, Helmraath MA, Donovan E, Daniels SR. Bariatric surgery for severely overweight adolescents: concerns and recommendations. Pediatrics 2004 Jul;114(1):217-23. [46 references] [PubMed](#)

### GUIDELINE STATUS

This is the current release of the guideline.

## COMPLETE SUMMARY CONTENT

SCOPE  
METHODOLOGY - including Rating Scheme and Cost Analysis  
RECOMMENDATIONS  
EVIDENCE SUPPORTING THE RECOMMENDATIONS  
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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES  
IDENTIFYING INFORMATION AND AVAILABILITY  
DISCLAIMER

## SCOPE

### DISEASE/CONDITION(S)

Severe obesity and obesity-related conditions

### GUIDELINE CATEGORY

Evaluation  
Management  
Treatment

### CLINICAL SPECIALTY

Pediatrics  
Surgery

## **INTENDED USERS**

Physicians

## **GUIDELINE OBJECTIVE(S)**

To present recommendations regarding the evaluation of adolescent patients' candidacy for bariatric surgery, type of surgical treatment, and long-term follow-up monitoring

## **TARGET POPULATION**

Severely obese adolescents, defined as:

- Body mass index [BMI]  $\geq 40$
- Have attained a majority of skeletal maturity or adult stature (generally  $\geq 13$  years of age for girls and  $\geq 15$  years of age for boys)

## **INTERVENTIONS AND PRACTICES CONSIDERED**

### **Patient Evaluation**

1. Body mass index (BMI [weight in kilograms divided by height in meters, squared])
2. Investigation into possible endogenous causes of obesity
3. Identification of any obesity-related health complications
4. Referral of candidates for bariatric surgery to appropriate treatment centers, with access to experienced medical teams
5. Development of specific treatment recommendations for individual patients, including the appropriateness and timing of possible surgical intervention
6. Comprehensive psychologic evaluations involving both patient and parent interviews
7. Assessment of decisional capacity (competency) of the patient
8. Assessment of the influence of the family environment on postoperative regimen adherence
9. Laboratory tests, including fasting glucose and hemoglobin A1C measurements, liver function tests, lipid profile tests, complete blood counts, thyroid function tests, pregnancy tests for female patients, and screening for micronutrient deficiencies as indicated
10. Radiological assessment of bone age assessment in younger patients
11. Polysomnography for patients with symptoms of obstructive sleep apnea

### **Patient Selection**

Criteria for patient selection for bariatric surgery

### **Surgical Treatment**

1. Optimal timing of surgery
2. Obtaining informed permission
3. Preoperative education
4. Laboratory and radiological investigations
5. Choice of surgical procedure (Roux-en-Y gastric bypass or adjustable gastric banding [AGB])
6. Addressing postoperative concerns (e.g., nutritional complications, avoidance of nonsteroidal anti-inflammatory medications, use of contraception to avoid pregnancy during first 1-2 postoperative years)

### **Long-Term Follow-up Monitoring**

1. Follow up visits to the surgeon and subspecialists in nutrition and obesity management during the first post-operative year.
2. Reinforcement of compliance with required eating behaviors
3. Administration of medications and nutritional supplements
4. Patient adherence to physical activity regimen
5. Identification of early hematological or metabolic complications by monitoring of blood counts, blood chemistry profile, body composition
6. Lifelong monitoring to ensure optimal postoperative weight loss, eventual weight maintenance, and overall health
7. Consistent treatment at a center of excellence with ongoing clinical data collection and targeted research

### **MAJOR OUTCOMES CONSIDERED**

- Morbidity and mortality following surgical intervention
- Weight loss following bariatric surgery
- Nutritional complications associated with a low calorie, low carbohydrate intake following bariatric surgery

## **METHODOLOGY**

### **METHODS USED TO COLLECT/SELECT EVIDENCE**

Searches of Electronic Databases

### **DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE**

The authors performed searches of Medline during the development of the guideline.

### **NUMBER OF SOURCE DOCUMENTS**

15

### **METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE**

Expert Consensus

## **RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE**

Not applicable

## **METHODS USED TO ANALYZE THE EVIDENCE**

Review

## **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

Not stated

## **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus (Consensus Development Conference)

## **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

The original guideline document was developed at a meeting of surgeons and pediatricians specializing in the treatment of overweight and obese children. The guideline represents the consensus reached by participants at that meeting on the basis of published evidence, their current knowledge, and current clinical practice in pediatric obesity management.

## **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

Not applicable

## **COST ANALYSIS**

A formal cost analysis was not performed and published cost analyses were not reviewed.

## **METHOD OF GUIDELINE VALIDATION**

Peer Review

## **DESCRIPTION OF METHOD OF GUIDELINE VALIDATION**

Not stated

# **RECOMMENDATIONS**

## **MAJOR RECOMMENDATIONS**

### **Patient Evaluation**

Body mass index (BMI [weight in kilograms divided by height in meters, squared]) is a useful screening tool for assessing and tracking the degree of obesity among adolescents. Medical evaluations should include investigation into possible endogenous causes of obesity that may be amenable to treatment and identification of any obesity-related health complications. Likely candidates for bariatric surgery should be referred to centers with multidisciplinary weight management teams experienced in meeting the distinct physical and psychologic needs of adolescents. These teams should include specialists with expertise in adolescent obesity evaluation and management, psychology, nutrition, physical activity instruction, and bariatric surgery. Surgeons participating in multidisciplinary adolescent bariatric teams should undergo subspecialty training in bariatric medical and surgical care, as detailed by the American College of Surgeons and the American Society for Bariatric Surgery. The importance of proper training and experience in bariatric surgery to ensure safe and effective application of this intervention in the adolescent population cannot be understated.

Additional expertise in adolescent medicine, endocrinology, pulmonology, gastroenterology, cardiology, orthopedics, and ethics should be readily available. The team approach should include a review process (patient review board) similar to that used in multidisciplinary oncology and transplant programs. This review should result in specific treatment recommendations for individual patients, including the appropriateness and timing of possible surgical intervention.

In addition to undergoing medical assessments, potential candidates should undergo comprehensive psychologic evaluations involving both patient and parent interviews, to facilitate assessment of the family unit, determination of the coping skills of the adolescent, and assessment of the severity of psychosocial comorbidities. These evaluations may inform the team of family strengths or family dysfunction that could have significant effects on the overall success of bariatric surgery, because of the influence of the family environment on postoperative regimen adherence.

The most important ethical issues when considering an adolescent for a bariatric procedure are whether the patient's health is being compromised by severe obesity, whether the patient has failed more conservative options to meet that health need, and whether the patient has decisional capacity. Decisional capacity is not determined strictly by chronologic age, but many would agree that children <13 years of age usually do not have the capacity to make decisions regarding such a complicated serious intervention. At  $\geq 13$  years of age, adolescent patients, if developmentally normal, may be able to make informed decisions. The responsibility then falls on health care professionals to make the argument for or against that capacity for any given patient. When there are questions about decisional capacity, specialists in pediatric psychiatry or psychology can assist in determining decisional capacity or competency (the legal term). Patients with decisional capacity should be allowed to participate in self-determining decisions. However, the younger the patient, the more compelling and serious the comorbidity of obesity should be to prompt surgical intervention (refer to Table 1 in the original guideline for a list of obesity-related conditions that may be improved with bariatric surgery).

In the presence of certain circumstances or medical conditions, bariatric surgery is not a realistic treatment option. These conditions include a medically correctable cause of obesity; a substance abuse problem within the preceding year; a medical, psychiatric, or cognitive condition that would significantly impair the patient's ability to adhere to postoperative dietary or medication regimens; current lactation, pregnancy, or planned pregnancy within 2 years after surgery; and inability or unwillingness of either the patient or the parents to fully comprehend the surgical procedure and its medical consequences, including the need for lifelong medical surveillance.

## **Patient Selection**

### **Criteria for Bariatric Surgery**

Adolescents being considered for bariatric surgery should:

- Have failed  $\geq 6$  months of available, organized attempts at weight management, as determined with the assistance of their primary care provider
- Have attained or nearly attained physiologic maturity
- Be very severely obese (BMI  $\geq 40$  kg/m<sup>2</sup>) with serious obesity-related comorbidities or have a BMI of  $\geq 50$  kg/m<sup>2</sup> with less severe comorbidities
- Demonstrate commitment to comprehensive medical and psychologic 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

## **Surgical Treatment**

### **Optimal Timing**

The timing of surgical treatment of clinically severe obesity among adolescents is controversial and often depends on the severity of obesity-related comorbidities for individual patients. Neuroendocrine, skeletal, and psychosocial maturation are accelerated during adolescence, and it is not yet known how these processes are affected by restrictive or malabsorptive surgical procedures. The rapid somatic growth observed in early adolescence requires adequate nutrition; therefore, bariatric procedures performed before the growth spurt could potentially compromise linear growth. Physical examinations should include evaluations of sexual maturation, because the linear growth spurt generally occurs before Tanner stage IV for both boys and girls. The majority of skeletal maturity is attained for girls by  $\geq 13$  years and for boys by  $\geq 15$  years of age.

These ages may well represent conservative estimates of skeletal maturation, because overweight children experience an early onset of puberty and are likely to achieve skeletal maturity (adult stature) earlier in adolescence, compared with age-matched, nonoverweight children. When there is uncertainty regarding whether adult stature has been attained, bone age can be objectively assessed with radiographs of the hand and wrist. If an individual has attained  $\geq 95\%$  of

adult stature, according to the results of this examination, then there is little concern that a bariatric procedure may significantly impair completion of linear growth. It is unknown, however, whether and to what extent bariatric surgery may affect bone mineral density adversely and increase the risk of brittle bone fractures later in life. Finally, although many severely obese adolescents may be deemed physiologically mature, psychologic readiness for a bariatric surgical intervention is less readily assured.

### **Informed Permission**

Assent for surgery must be obtained from the adolescent patient, whereas informed permission must be obtained from the responsible parents or guardians before surgery. Both patients and parents must be made aware of the fact that bariatric surgery is a procedure with considerable risks, including the risk of death. Although bariatric procedures can result in substantial weight loss, the long-term metabolic, nutritional, and psychologic effects among adolescents are unknown. Similarly, patients and parents must understand that the durability of surgically induced weight loss among adolescents remains to be clearly defined.

### **Preoperative Education**

An important element of long-term health and weight loss success is the development of an integrated multidisciplinary education program. Such a program must be aimed at teaching both parents and patients about the anatomic and physiologic features of the proposed surgery and the lifelong need for strict adherence to nutritional guidelines and daily physical activity and offering behavioral strategies to meet these needs. Attendance at adolescent bariatric support group meetings before and after surgery can also be quite helpful.

### **Laboratory and Radiologic Investigations**

Several studies should be considered when candidacy for bariatric surgery is contemplated. These studies may identify conditions that may affect perioperative decision-making or may identify obesity related comorbid conditions that may justify surgical intervention. These studies include fasting glucose and hemoglobin A1C measurements, liver function tests, lipid profile tests, complete blood counts, thyroid function tests, pregnancy tests for female patients, and screening for micronutrient deficiencies. For patients with symptoms of obstructive sleep apnea, polysomnography is suggested. Finally, bone age assessment should be considered for younger patients, to document the degree of skeletal maturity.

### **Choice of Surgical Procedure**

There is currently a paucity of data comparing the efficacy and safety of various bariatric procedures among adolescents. However, both Roux-en-Y gastric bypass and adjustable gastric banding (AGB) have been effective in treating the medical consequences of severe obesity in adolescence.

Gastric bypass currently seems to be the most appropriate surgical option for most adolescents who are candidates for bariatric surgery; however, appropriately

designed trials are needed to determine which surgical procedure is optimal for adolescents.

### **Postoperative Concerns**

There are numerous postoperative concerns after bariatric surgery in adolescence. To avoid nutritional complications, patients must adhere to guidelines regarding diet and vitamin/mineral supplementation. Gastric bypass essentially results in surgically enforced, very low-calorie, low-carbohydrate dietary intake, thus requiring attention to adequate ( $\geq 0.5$  g/kg) daily protein intake. Micronutrients, including calcium, vitamin B<sub>12</sub>, folate, multivitamins, thiamine, and iron (for menstruating female subjects), must be supplemented after gastric bypass. A bariatric dietitian who is familiar with the progressive addition of food items with more complex compositions and consistencies can help with meal planning and nutritional "troubleshooting" as recovery proceeds. Finally, nonsteroidal anti-inflammatory medications should be avoided, to reduce the risk of intestinal ulceration and bleeding.

Although pregnancies can be safely supported after bariatric surgery, reliable contraception should be used for at least the first year after the operation, because of the increased risk to the fetus posed by the rapid weight loss. Iron deficiency anemia attributable to menstrual bleeding can also be minimized with oral contraception. After the period of rapid weight loss, pregnancies should be carefully planned and monitored.

### **Long-Term Follow Up Monitoring**

Meticulous, lifelong, medical supervision of adolescent patients who undergo bariatric procedures is essential. During the first postoperative year, regular visits to the surgeon and other subspecialists with expertise in nutrition and obesity management (e.g., psychologist, dietitian, and exercise physiologist) should be provided to identify potential complications and to reinforce compliance with required eating behaviors, administration of medications and nutritional supplements, and physical activity regimens. Early hematologic or metabolic complications can be detected with periodic assessments of blood counts, blood chemistry profile, and body composition. Psychosocial adjustments during the postoperative period of rapid weight loss may present new unanticipated challenges for adolescent patients. The multidisciplinary team approach should minimize the adverse effects of these challenges as a healthier weight is achieved.

It is strongly recommended that all patients who undergo bariatric surgery be monitored throughout their lives, to ensure optimal postoperative weight loss, eventual weight maintenance, and overall health. This is particularly important for adolescents, given the fact that the long-term effects of bariatric surgery in younger, reproductively active populations have not been well characterized. Ideally, adolescents who undergo bariatric surgery should be treated consistently, at regional centers of excellence, with ongoing clinical data collection and targeted research. The ability to make useful recommendations about the appropriate timing of bariatric surgery and optimal surgical and postoperative management depends on the collection of rigorous, high quality outcome data.

### **CLINICAL ALGORITHM(S)**

None provided

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence was not specifically stated for each recommendation.

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

- Appropriate evaluation of adolescent patients' candidacy for bariatric surgery
- Appropriate timing of bariatric surgery and optimal surgical and postoperative management

### POTENTIAL HARMS

- Bariatric procedures performed before the growth spurt could potentially compromise linear growth
- Potential complications of gastric bypass include intestinal leakage, thromboembolic disease, small bowel obstruction, incisional hernia, symptomatic cholelithiasis, protein calorie malnutrition, and micronutrient deficiencies, especially of iron, calcium, and vitamin B<sub>12</sub>.
- Early complications following gastric bypass may include pulmonary embolism, wound infections, stomal stenoses (requiring endoscopic dilation), dehydration, and marginal ulcers requiring medical treatment.
- Late complications following gastric bypass may include small-bowel obstruction, incisional hernias, and late weight regain in up to 15% of cases. Suboptimal vitamin intake and micronutrient deficiencies have also occurred.
- Possibility of significant surgical complications and lesser degrees of weight loss with adjustable gastric banding (AGB), compared with gastric bypass
- Possible AGB device-related complications include port malposition or malfunction, tubing leaks, band slippage leading to gastric prolapse, foreign body infection, and band erosion into the stomach or esophagus.
- As AGB devices have a finite lifetime, adolescent patients may need to undergo replacement of the device during their lifetimes

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

## **IOM DOMAIN**

Effectiveness  
Patient-centeredness

## **IDENTIFYING INFORMATION AND AVAILABILITY**

### **BIBLIOGRAPHIC SOURCE(S)**

Inge TH, Krebs NF, Garcia VF, Skelton JA, Guice KS, Strauss RS, Albanese CT, Brandt ML, Hammer LD, Harmon CM, Kane TD, Klish WJ, Oldham KT, Rudolph CD, Helmrath MA, Donovan E, Daniels SR. Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics* 2004 Jul;114(1):217-23. [46 references] [PubMed](#)

### **ADAPTATION**

Not applicable: The guideline was not adapted from another source.

### **DATE RELEASED**

2004 Jul

### **GUIDELINE DEVELOPER(S)**

Pediatric Bariatric Study Group - Independent Expert Panel

### **GUIDELINE DEVELOPER COMMENT**

The guideline was produced by experts in pediatric obesity management, pediatric gastroenterology/nutrition, pediatric cardiology, pediatric surgery, and pediatric health care policy, with input of experts in pediatric ethics and pediatric psychology; input from obesity experts at the National Institutes of Health and the Centers for Disease Control and Prevention was also obtained for the guideline.

### **SOURCE(S) OF FUNDING**

Pediatric Bariatric Study Group

### **GUIDELINE COMMITTEE**

Not stated

### **COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE**

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## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

Not stated

## **GUIDELINE STATUS**

This is the current release of the guideline.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available from the [Pediatrics Journal Web site](#).

Print copies: Available from the Comprehensive Weight Management Center, Department of Pediatric Surgery, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave, MLC 2023, Cincinnati, OH 45229.

## **AVAILABILITY OF COMPANION DOCUMENTS**

None available

## **PATIENT RESOURCES**

None available

## **NGC STATUS**

This NGC summary was completed by ECRI on September 30, 2004. The information was verified by the guideline developer on November 10, 2004.

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