

Treatment of Eating Disorders in Children, Adolescents, and Young Adults

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Author Disclosure
Dr Fisher did not
disclose any financial
relationships relevant
to this article.

Objectives After completing this article, readers should be able to:

1. Describe the demographics and pathogenesis of eating disorders.
2. Delineate the criteria for the diagnosis of anorexia and bulimia nervosa.
3. Detect the presence of an eating disorder and evaluate its severity.
4. Outline the medical complications of eating disorders.
5. Organize a treatment or referral plan for patients who have eating disorders.

Introduction

A 16-year-old girl who initially was underweight has been dieting and lost 20 pounds in the last 3 months. A 19-year-old girl has been sent home from college because she was found vomiting every night in her dormitory room. A 14-year-old boy has been exercising 3 hours a day and eliminated all fat from his diet to “increase my muscle mass and decrease my fat.” An 11-year-old girl has grown 2 inches but gained no weight since her last check-up 1 year ago. A 15-year-old girl is found to have empty boxes of laxatives hidden under her bed but denies they are hers.

In January 2003, the American Academy of Pediatrics (AAP) published a policy statement entitled “Identifying and Treating Eating Disorders.” Written by the Committee on Adolescence, it outlined the roles of the pediatrician in the identification, evaluation, and management of eating disorders in children, adolescents, and young adults. The statement provided recommendations for treatment in outpatient, inpatient, and day programs and suggested roles for the pediatrician in the areas of prevention and advocacy. Also included were some specifics relevant to particular recommendations, but not a detailed overview of the topic. This article provides that overview and, together with the policy statement, offers a state-of-the-art review of the eating disorders anorexia nervosa and bulimia nervosa. Included in this review are discussions of diagnosis and demographics; pathogenesis and presentation; evaluation and complications; medical, nutritional, and psychological management; and prognosis and prevention. It is expected that pediatricians will use the information in this review to hone their skills in identifying, evaluating, and managing the types of patients presented in the opening paragraph, thus improving the prognosis for children, adolescents, and young adults who have eating disorders.

Demographics and Diagnosis

Behaviors simulating those seen in current eating disorders go back to the bingeing and purging seen in ancient Rome and the fasting and exercise reported among ascetics in the Middle Ages. The term “anorexia nervosa” was used first in England in the 1880s to describe those who willfully decreased their eating and lost excessive weight; the term “anorexia hysteria” was used in France. Isolated cases were reported through the first half of the twentieth century, with a significant increase in cases beginning in the 1960s. This increase was noted principally among adolescents and young adults and has been considered an outgrowth of changing cultural norms in the ways that women’s shapes and sizes are viewed. Increases in economic and social choices available to women at that same time also may have played a role. The term “bulimia” was introduced in 1979 to describe the bingeing and purging behaviors that were becoming more prominent in individuals who had eating disorders, some of whom were of normal weight or overweight. Those behaviors previously were considered simply to be a part of anorexia nervosa. More

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recently, a new diagnosis, binge eating disorder, has been put forth to describe individuals, most of whom are very overweight, who binge but do not purge. This diagnosis is not yet officially defined as a separate eating disorder. Although binge eating disorder may have its antecedents for some individuals during adolescence, it is rarely seen during the teenage years. Binge eating disorder, therefore, will not be included in this review.

Official diagnostic criteria for the definitions of anorexia and bulimia nervosa have been established by the psychiatric community and are published in the *Diagnostic and Statistical Manual for the Mental Disorders* (DSM-IV) (Table 1). For anorexia nervosa, key diagnostic criteria are weight loss to more than 15% below ideal body weight (IBW), disturbed body image with a fear of becoming fat or gaining weight, and amenorrhea in postmenarchal females of at least three cycles. For bulimia nervosa, key diagnostic criteria are recurrent episodes of binge eating (as defined in the table) occurring at least twice weekly for at least 3 months; recurrent, inappropriate compensatory behaviors to prevent weight gain (ie, self-induced vomiting or use of laxatives, diuretics, fasting, or hyperexercising); and self-evaluation unduly influenced by body shape or weight. The DSM-IV defines two subtypes of anorexia nervosa (restricting and binge eating/purging) and two subtypes of bulimia nervosa (purging and nonpurging).

From a clinical perspective, two clarifications of these criteria are required. First, no specific calculation of IBW is provided. Although the pediatrician may use various growth tables and charts, a simple mnemonic (females: 100 pounds for 60 inches in height and 5 pounds for each additional inch; males: 106 pounds for 60 inches and 6 pounds for each additional inch) generally works well for estimating IBW in adolescents and young adults. For children or adolescents who are not yet fully grown, it is necessary to look at the individual's growth chart to establish where the weight and height would have been had there been no malnutrition. In the younger age group, a diagnosis of anorexia nervosa can be established without any weight loss if the normal progression of weight and height has been delayed sufficiently. In addition, delayed menarche and primary amenorrhea may be signs of an eating disorder in this age group.

Second, studies have shown that more than 50% of children and adolescents who present with eating disorders to adolescent medicine settings do not meet the full diagnostic criteria for either anorexia or bulimia nervosa, but that such patients require the same treatment approaches and have the same psychological disturbances as those who do meet full criteria. The term Eating

Table 1. Diagnosis of Anorexia Nervosa and Bulimia Nervosa

Anorexia Nervosa

1. Intense fear of becoming fat or gaining weight, even though underweight.
2. Refusal to maintain body weight at or above a minimally normal weight for age and height (ie, weight loss leading to maintenance of body weight <85% of that expected, or failure to make expected weight gain during period of growth, leading to body weight <85% of that expected).
3. Disturbed body image, undue influence of shape or weight on self-evaluation, or denial of the seriousness of the current low body weight.
4. Amenorrhea or absence of at least three consecutive menstrual cycles (those whose periods are inducible only after estrogen therapy are considered to be amenorrheic).

Types:

Restricting: no regular bingeing or purging (self-induced vomiting or use of laxatives and diuretics).
Binge eating/purging: regular bingeing and purging by a patient who also meets the above criteria for anorexia nervosa.

Bulimia Nervosa

1. Recurrent episodes of binge eating, characterized by:
 - a) Eating substantially larger amounts of food in a discrete period of time (ie, in 2 h) than would be eaten by most people in similar circumstances during that same time period.
 - b) A sense of lack of control over eating during the binge.
2. Recurrent inappropriate compensatory behavior to prevent weight gain (ie, self-induced vomiting, use of laxatives, diuretics, fasting, or hyperexercising).
3. Binges or inappropriate compensatory behaviors occurring, on average, at least twice weekly for at least 3 mo.
4. Self-evaluation unduly influenced by body shape or weight.
5. The disturbance does not occur exclusively during episodes of anorexia nervosa.

Types:

Purging: regularly engages in self-induced vomiting or use of laxatives or diuretics.
Nonpurging: uses other inappropriate compensatory behaviors (ie, fasting or hyperexercising) without regular use of vomiting or medications to purge.

From American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed, DSM-IV. Washington, DC: American Psychiatric Association; 1994.

Disorder Not Otherwise Specified has been used by the DSM-IV to categorize these patients. Included in this category are: 1) Those who have not yet missed three menstrual cycles or are not quite 15% below IBW. It is important to note that patients who initially are very overweight may be more physiologically compromised without being 15% below IBW than patients who initially are at normal weight and are 15% below IBW. 2) Those who vomit or use laxatives regularly but who do not binge. This finding is much more common in adolescents than in young adults. 3) Children 8 to 12 years of age whose eating disorder behaviors are not driven by a specific fear of gaining weight. Eating disorders in this age group sometimes may be marked by a fear of choking, misinterpretations of nutritional advice, or selective eating and sometimes are referred to as “food avoidance emotional disorders.”

Using official DSM-IV criteria, it is estimated that approximately 0.5% of adolescent and young adult women have a diagnosis of anorexia nervosa and 1% to 3% have a diagnosis of bulimia nervosa. In general, anorexia nervosa more commonly begins in the adolescent age group, and bulimia nervosa more commonly begins in young adults. College-age women are believed to have much more eating disorders behaviors in both categories than are estimated by using the official criteria. Most cases occur in females, with the literature estimating a 10 to 20:1 ratio. A recent increase in cases among males appears to be due to an increased focus on excessive exercise and body building, but it is important to realize that some males may be pushed to engage in unhealthy behaviors because of sports participation without developing the thinking patterns that mark those who develop an eating disorder. In the United States, eating disorders are seen much more commonly in Caucasian and Asian than in African-American or Latino youth, with different cultural attitudes toward body weight and shape suggested to account for this difference. Internationally, eating disorders have been considered more common in developed than in developing countries, but globalization is believed to be closing that gap. The fascinating story of the Island of Fiji, which had no people who had eating disorders for 2 centuries until the appearance of American television programs in the mid-1990s, most exemplifies that change.

Pathogenesis, Presentation, and Prevention

Who develops an eating disorder and why are not easy questions to answer. It is believed that the pathogenesis of eating disorders is multifactorial, with cultural, individual and family, and genetic/ biochemical factors each

playing roles. Cultural factors in historic, ethnic, and international contexts have been alluded to previously. In the contemporary setting, the role of the media in exacerbating the desire to be thin, causing ever-younger girls (and boys) to go on diets, is much discussed. From a public health perspective, fighting the growing epidemic of obesity without increasing the numbers of cases of eating disorders is a consideration. Individual psychological factors that classically have been considered to play a role in the pathogenesis of anorexia nervosa are the lack of control and self-confidence found in otherwise successful, although somewhat restricted, young women. However, these findings have been less universal as the epidemic has grown to include other, nonclassic personality features. Patients who have bulimia nervosa tend to be more impulsive, especially compared with their more compulsive peers who have anorexia nervosa, and studies have shown associations with ongoing substance abuse and past sexual abuse in some patients who have this disorder. Multiple traits, such as overinvolvement and enmeshment, have been shown over the years in the families of those who have eating disorders, but their role in the pathogenesis of the disorder is not clear.

Cultural, psychological, and family factors may not be sufficient to cause the onset of an eating disorder without the presence of a genetic/biochemical vulnerability. Studies have demonstrated that several psychiatric conditions (including depression, obsessive-compulsive disorder, and addictions), each of which has features that overlap with the eating disorders, are more common in individuals and families who have eating disorders. Although environmental factors may play a role in these associations, it is likely that genetic vulnerabilities, mediated through alterations in biochemical reactions, also may play a role. Multiple hormones are being studied (including, most recently, ghrelin, leptin, and melanocortin), and some genetic loci (including several serotonin receptor genes) are being considered as possible sites of alterations.

The Figure presents one approach to the issues of pathogenesis, presentation, and prevention of eating disorders. Studies have shown that more than 80% of adolescent females, especially in suburban settings, express a desire to lose weight, even though most of these girls are of normal weight or underweight. Among those girls, many start a diet, some complete a diet, and a smaller number diet excessively, either by losing too much weight or by using unhealthy methods. Within this group, some develop an early eating disorder, and if allowed to progress, a relatively small number progress to a fully diagnosed eating disorder. Most of these girls,



Figure. One approach to the progressive pathogenesis of eating disorders.

who fit into the bottom half of the figure, are unlikely to present clinically. They generally are responding to the cultural norms of the times. Prevention of eating disorders for this general population requires a public health approach, and efforts are underway to change the cultural milieu regarding appropriate body size and shape for young women. These efforts are taking place in the schools, including changes in health education classes and the introduction of specific curricula, and in the media, where eating disorder behaviors and appearances are being presented less positively. Controversies exist as to whether these approaches, especially the use of school curricula, are having the desired effect. Clearly, much more study is required.

Those adolescents on the top half of the Figure have distinguished themselves from the general population, responding to more than just cultural cues and presumably being affected by the individual, family, and genetic factors discussed previously. It is these adolescents who present clinically. From both a treatment and prevention point of view, it is crucial to detect the problem as early in the process as possible to prevent progression. If detected early, the individual who has taken a diet too far usually can be prevented from developing an early eating disorder, and the individual who has an early disorder can be prevented from developing the fully diagnosed syndrome. For parents and school personnel, this means acting quickly and decisively on the suspicion of eating disorder behaviors, whether that be excessive weight loss, preoccupation with food or weight, excessive exercise, or behaviors such as vomiting or use of diet pills, laxatives,

or diuretics. For the pediatrician, this means recognizing that these behaviors require attention even if the individual denies their presence or minimizes their significance, as most patients who have eating disorders do. The pediatrician often is in a position to intervene at an early stage in the process. Acting quickly can result in easier treatment and a better prognosis.

Evaluation

Most patients who have eating disorders and are seen in pediatric settings present with some variation of the themes in the five cases listed at the opening of this article. Evaluation of such patients, regardless of the specific presentation, requires attention to the nutritional, medical, and psychological aspects of the patient's status. A complete history and physical examination, along with selected laboratory tests, are performed to specify the diagnosis, determine the level of severity, and plan the treatment.

The nutrition history focuses on issues of weight, diet, and eating disorder behaviors. Current, previous, and desired weights are determined by using a combination of examination, growth charts, and history from the patient and family. Current diet and exercise, with changes over time, are obtained on history from the patient, along with any use of diet pills, laxatives, diuretics, or ipecac (used by some patients to induce vomiting). Because eating disorder behaviors and even diagnoses may change over time, questions regarding these activities during the past days, weeks, months, and even years may need to be asked to achieve a full understanding of the depth and course of the disorder. Also, information obtained on the history should be confirmed, to the degree possible, by parents (or other relatives and friends) because patients who have eating disorders are not always completely truthful about their activities.

Medical symptoms are explored and a complete review of systems is obtained to determine the presence of symptoms associated with malnutrition (such as constipation and feeling cold or faint), vomiting (such as chest pain or hematemesis), or other medical causes of weight loss (such as headaches, polyuria and polydipsia, or persistent diarrhea). The differential diagnosis of weight loss or vomiting includes a long list of other medical and psychiatric conditions (Table 2). It is crucial to evaluate for these other possibilities whenever there are suggestive symptoms or the eating disorder diagnosis is not completely clear. An original set of criteria for the eating disorders in the 1970s specified that an individual did not have anorexia nervosa if any of the conditions in Table 2 were present. However, some individuals can have an

Table 2. Differential Diagnosis of Eating Disorders

Medical

- Inflammatory bowel/celiac disease
- Addison disease
- Hypo/hyperthyroidism
- Hypopituitarism
- Diabetes mellitus/insipidus
- Brain tumor
- Occult malignancy

Psychiatric

- Affective disorder
- Obsessive compulsive disorder
- Schizophrenia
- Substance abuse
- Paranoid disorder
- Conduct disorder

eating disorder in addition to any of the other diagnoses. Thus, the information in Table 2 serves as a list of both differential diagnoses and possible comorbidities. Patients who have eating disorders and several of the diagnoses listed in Table 2, such as thyroid disorders or inflammatory bowel disease, sometimes manipulate use of their medications to facilitate weight loss, and patients who have some diagnoses, such as diabetes mellitus, have a higher prevalence of eating disorders than the general population.

The psychosocial history obtained from the child, adolescent, or young adult who is suspected of having an eating disorder is aimed at determining both what the individual is thinking and how the individual is functioning. Questions should be asked about body image and why the individual is losing weight or engaging in bulimic behaviors. Ultimately, the diagnosis of an eating disorder must include the finding that a desire to lose weight or fear of weight gain is driving the individual's actions. Signs and symptoms indicative of the psychiatric diagnoses listed in Table 2 should be elicited, either as evidence of an alternate diagnosis or as indicators of comorbidity. Depression is very common among patients who have eating disorders. Obsessions or compulsions may be seen as well. Each of these symptoms can be both a possible cause of the eating disorder or a result of the malnutrition. Suicidal thoughts and "cutting" behaviors, if present, must be taken very seriously. The former requires immediate attention; the latter, which has been seen much more commonly during the past 5 to 10 years, indicates significant distress. For patients who have bor-

derline personality disorder, eating disorder behaviors may be one of several areas of dysfunction. Participation in adolescent health risk behaviors, including substance use and sexual activity, may be more frequent and more problematic for individuals who have eating disorders, especially those who have bulimia nervosa, than in age-matched peers. Functioning within the family, with friends, and at school may be impaired for some individuals who have an eating disorder. Psychosocial distress can be both a cause of an eating disorder and exacerbated by the condition. However, many patients who have an eating disorder may be functioning well in any or all of these spheres despite ongoing dieting or bulimic behaviors.

A limited laboratory evaluation should be performed for all patients who present with an eating disorder to detect possible complications or alternate diagnoses. A complete blood count, metabolic panel, urinalysis, and thyroid function tests (thyroxine [T4] and thyroid-stimulating hormone [TSH]) generally are performed, along with measurement of other hormonal values (luteinizing hormone [LH]/follicle-stimulating hormone [FSH], estradiol, prolactin, and human chorionic gonadotropin, as appropriate in those who have amenorrhea) to detect abnormalities in metabolic, hematologic, hepatic, renal, and endocrine function. Electrocardiography (ECG) is recommended for those who have cardiac symptoms, abnormal electrolyte concentrations, or significant bulimia. Radiographic studies (upper or lower gastrointestinal series, computed tomography [CT] or magnetic resonance imaging [MRI] of the brain) are reserved for those cases in which the diagnosis of anorexia or bulimia nervosa is in doubt and other possibilities (eg, esophageal dysfunction, inflammatory bowel disease, or a brain tumor) need to be considered. Vitamin studies and other indicators of malnutrition generally are not ordered because results usually are normal, and abnormalities are treated readily by improved nutrition. Bone density studies, using DEXA (dual-energy x-ray absorptiometry) technology, often are performed in those who have amenorrhea of greater than 6 to 12 months, although specific use of the findings, other than to provide information and possibly motivation, has yet to be determined.

Medical Complications

The medical complications associated with eating disorders may be considered in three categories: those caused by the malnutrition of anorexia nervosa, those caused by bulimic behaviors, and those caused by refeeding (referred to as "the refeeding syndrome" in its most extreme

form). Some complications may appear as symptoms experienced by the patient, some may be found on physical examination, and others may be detected on laboratory, ECG, or radiographic studies. Findings overlap in anorexia and bulimia nervosa. Some complications are very common; others are encountered rarely. Most of the findings are apparent either on presentation or can appear during the course of the illness or treatment. Knowledge of the abnormalities in all of the organ systems affected by each of the eating disorders is crucial to the medical evaluation.

Metabolic Abnormalities

Most patients who have an eating disorder have normal results on metabolic panels. However, significant electrolyte disturbances, requiring immediate attention, can be found in patients who have anorexia nervosa or bulimia nervosa and during refeeding. Patients who have anorexia nervosa may drink too little fluid (to make their weight as low as possible) or too much fluid (to fool the treatment team when they are weighed), thereby causing hyper- or hyponatremia. In rare cases, hyponatremia may be sufficiently severe to cause seizures. Both the vomiting and the laxative or diuretic abuse associated with bulimia nervosa can result in a hypochloremic, hypokalemic, metabolic alkalosis, which can be most severe in individuals who participate in both behaviors and can, in rare cases, result in sudden death. Determination of electrolyte levels, therefore, is crucial in the initial evaluation and at appropriate intervals in all patients who have an eating disorder, especially those who have bulimia nervosa. Rapid refeeding of those who are severely malnourished can result in hypophosphatemia, which can lead to cardiac, neurologic, and hematologic complications. Hypophosphatemia is caused by extracellular-to-intracellular shifts of phosphorus in a state of total phosphate depletion. Refeeding also can cause the development of edema, as can too-rapid replenishment of fluids or abrupt cessation of laxative or diuretic use. Long-term dehydration or laxative or diuretic use can result in the development of renal stones.

Cardiac Abnormalities

Bradycardia and hypotension, accompanied by orthostatic changes, are common findings in anorexia nervosa, serving as criteria for hospitalization if sufficiently severe (Table 3). A prolonged QT interval is rarer, but has life-threatening implications, and a pericardial effusion can be seen in hospitalized patients who are severely malnourished. Various ECG abnormalities may be found in those who have bulimia nervosa, with two fatal cardiac

Table 3. Criteria for Hospital Admission for Eating Disorders

Anorexia Nervosa

- <75% ideal body weight or ongoing weight loss despite intensive management
- Refusal to eat
- Body fat <10%
- Heart rate <50 beats/min daytime, <45 beats/min nighttime
- Systolic pressure <90 mm Hg
- Orthostatic changes in pulse (>20 beats/min) or blood pressure (>10 mm Hg)
- Temperature <96°F (35.6°C)
- Arrhythmia

Bulimia Nervosa

- Syncope
- Serum potassium concentration <3.2 mEq/L (3.2 mmol/L)
- Serum chloride concentration <88 mEq/L (88 mmol/L)
- Esophageal tears
- Cardiac arrhythmias, including prolonged QTc
- Hypothermia
- Suicide risk
- Intractable vomiting
- Hematemesis
- Failure to respond to outpatient treatment

From American Academy of Pediatrics. Committee on Adolescence. Identifying and treating eating disorders. *Pediatrics*. 2003;111:204–211.

complications being of most concern: sudden cardiac death due to hypokalemia and the development of an irreversible cardiomyopathy that can occur suddenly from ipecac use. Cardiac failure also can occur as part of the refeeding syndrome.

Pulmonary complications, in contrast, are uncommon in the eating disorders, with the exception of the rare case of aspiration pneumonia or pneumothorax caused by forceful vomiting by patients who have bulimia nervosa.

Gastrointestinal Abnormalities

Most patients who have eating disorders have gastrointestinal signs and symptoms at some point during the illness, with most of those problems being more bothersome than dangerous. Patients who have anorexia nervosa often complain of abdominal pains and constipation during either the starvation or refeeding phase. Studies have shown delayed gastric emptying and prolonged peristalsis to be associated with malnutrition. Vomiting frequently results in esophageal irritation and chest pain.

However, the individual who denies that the vomiting is purposeful should prompt consideration of other diagnoses, and the individual who reports emesis should cause consideration of the infrequent Mallory Weiss tears or the rare esophageal rupture. Erosion of tooth enamel may be seen on dental examination in patients who vomit regularly. Some patients may develop calluses on their knuckles (known as Russell sign) from biting down on their fingers when they vomit. Other findings can include gallstones, seen occasionally in those who have lost large amounts of weight, and liver enzyme abnormalities, seen most commonly in refeeding. Decreases in enzyme function may result in elevated levels of carotene, which can cause the skin to appear to be bright orange and occurs especially in those who eat many vegetables and salads. Cholesterol levels also can be elevated, which is surprising in those who have malnutrition, but albumin levels almost always are normal in patients who have an eating disorder. In fact, a low albumin level should prompt a search for other diagnoses, such as inflammatory bowel disease.

Neurologic Abnormalities

As noted previously, seizures can occur in those who have anorexia nervosa and create a state of hyponatremia by overloading fluids. Also, a peripheral neuropathy, which responds rapidly to refeeding, can be seen in those who lose large amounts of weight relatively rapidly. CT and MRI studies show atrophy of brain tissue in those who are significantly malnourished. The implications of these findings on short- and long-term neurocognitive functioning are being studied.

Endocrine Abnormalities

In response to insufficient availability of energy, thyroid function is decreased centrally in patients who have anorexia nervosa, resulting in a lowered temperature, pulse, metabolic rate, and ECG voltage. T₄ and TSH values generally are in the low-normal range, with T₃ often being below normal because of a “euthyroid sick syndrome” that decreases conversion of reverse T₃ to T₃. Other hormonal abnormalities include slight increases in cortisol production, with loss of diurnal variation; increased growth hormone, but decreased somatomedin; and decreased vasopressin activity, at times resulting in polyuria. Most importantly, LH/FSH and estrogen levels are decreased, resulting in amenorrhea, a hallmark of the illness. Amenorrhea can play a major role in the development of osteopenia and, ultimately, osteoporosis in many patients who have anorexia nervosa and some patients who have bulimia nervosa. Studies have demon-

strated that adolescence is the time of life during which the greatest gains in bone density are achieved, that patients who have amenorrhea due to an eating disorder have a loss of bone density, and that all patients who have prolonged amenorrhea (>2 to 2.5 y) develop either osteopenia (defined as bone density >1.0 SD below normal) or osteoporosis (>2.5 SD below normal), regardless of how far above the mean their bone density was genetically determined to be before the onset of the eating disorder.

Hematologic/Immunologic Abnormalities

Mild anemia is common in those who have anorexia nervosa due to deficiencies in folate or iron, but severe anemia is rare, especially because amenorrhea tends to protect against the development of significant iron deficiency. The erythrocyte sedimentation rate generally is low in anorexia nervosa, white blood cell counts generally are low with malnutrition, and platelet counts occasionally may be decreased with severe malnutrition. Multiple immunologic markers, most notably the interleukins, are altered in anorexia nervosa, but no specific clinical implications have been determined. In fact, anecdotal evidence suggests that patients who have anorexia nervosa have fewer upper respiratory tract infections than others, perhaps because the immune system is placed in a state of alert by the malnutrition.

Treatment

The AAP position paper produced in 2003 outlines the types of treatment required for patients who have eating disorders based on level of severity. For those who have the mildest cases that respond easily to treatment, management can be provided locally by the pediatrician along with a nutritionist or a mental health professional (psychiatrist, psychologist, or social worker, as needed and available). More severe or intractable cases require outpatient management by an eating disorders treatment team. Some patients may benefit from more intensive care plans (referred to as intensive outpatient, day treatment, or partial hospitalization programs) that are provided several days or evenings per week. Others require inpatient treatment on a medical or psychiatric unit. Details of which patients require each of the available levels of care, along with insurance and advocacy issues, are provided in the position paper.

Medical Therapy

Most of the medical complications of the eating disorders that are due to malnutrition or bulimic behaviors resolve with improved nutrition and cessation of the

bulimic behaviors. Thus, most complications require monitoring, but no specific intervention. However, certain complications, especially those that potentially could be fatal or have long-term effects, require specific attention. Three such complications are electrolyte disturbances and cardiac abnormalities, refeeding syndrome, and amenorrhea and osteopenia.

The importance of monitoring electrolytes, especially in those who have bulimia, cannot be overemphasized because sudden death from hypokalemia is an important medical cause of fatality. A person who has very mild hypokalemia at times can be treated as an outpatient, but most of those who have hypokalemia require hospitalization, and very low potassium levels require careful replenishment in an intensive care unit. Significant bradycardia also is a cause for hospitalization, as are orthostatic changes in pulse and blood pressure. Studies have shown that approximately 10 days of inpatient nutritional replenishment are required to reverse the cardiovascular instability.

Rapid refeeding of patients who are severely malnourished (generally those who are hospitalized and more than 30% to 35% below IBW) can cause hypophosphatemia, which can result in such major complications as cardiac failure, stupor and coma, and hemolytic anemia. This can occur with intravenous, nasogastric, or oral refeeding. Initial replenishment, therefore, must occur slowly, generally starting at 1,000 to 1,600 kcal/d and increasing by 200 to 400 kcal/d. Phosphorous levels should be monitored carefully (daily at first, less frequently after a few days), and use of phosphorous supplementation, either prophylactically or at the first sign of a decreasing phosphorous level, should be considered. The refeeding syndrome also can result in marked edema due to fluid and electrolyte shifts. Therefore, rapid replenishment of fluids also must be avoided.

Because the development of osteopenia and osteoporosis is the one complication of the eating disorders that is known to have irreversible long-term implications, many studies have been undertaken to determine whether there are treatment approaches that can ameliorate the effects of amenorrhea on bone density. To date, these studies have shown that only a return to normal weight, generally within 10% of IBW, along with normal eating and exercise patterns, can bring about a return of menses and a cessation of the bone loss. Periods can return immediately when some patients achieve a normal weight; others experience a delay of several months before menses returns. Other treatments, including the use of calcium or estrogen supplementation, have not been found to be effective in the prevention of bone loss.

Despite this, some practitioners continue to prescribe hormonal replenishment, generally in the form of oral contraceptives, to amenorrheic patients who have anorexia nervosa. Most specialists, however, do not prescribe hormonal replacement to patients who have an eating disorder, considering it a deterrent to consideration of the return of normal periods as a marker of good health and a motivation to return to normal weight. Studies are underway to examine the possible effects of other medications on bone density, including the bisphosphonates, insulin-like growth factor-1, estrogen, testosterone, and DHEA, but the effectiveness, safety, and practicality of using these medications are yet to be determined.

Nutritional Therapy

Nutritional rehabilitation is a crucial aspect of treating anorexia nervosa, and nutritional stabilization is an important component of the treatment of bulimia nervosa. Generally, management of medical issues is of immediate concern in the treatment of eating disorders, management of nutritional issues is critical for the short- and intermediate-term course of the eating disorders, and management of psychological issues ultimately is responsible for the long-term outcome of the illness. Three aspects of nutritional management that require attention by the pediatrician are outpatient, inpatient, and behavioral aspects.

For those patients who do not require hospitalization, outpatient nutritional counseling is used to establish weight gain for those who are underweight or weight maintenance for those who are at or have reached a normal weight. For those who need to gain 10 to 20 lb or more, a reasonable rate of expected gain is an average of 1 to 1.25 lb/wk (ie, 4 to 5 lb/mo). Some patients may gain weight more quickly, which is preferable unless it is being accomplished too rapidly or by binge eating. Others may gain more slowly and in uneven fits and spurts. This also can be acceptable, especially in those who do not have as much weight to gain, as long as sufficient progress is being made.

Various methods have been used to achieve weight gain, including calorie counts, exchange systems, preprinted menus, and "common sense" diets, based both on the style of the treatment team and the needs of the patient. Daily diets in the 1,000 to 2,000 kcal range generally are used initially for weight gain, while metabolism is slow and the patient becomes acclimated to eating greater quantities. Diets in the range of 2,000 to 3,000 kcal/d usually are required to continue weight gain beyond the first few weeks. A 3,000 to 4,000 kcal/d

diet may be needed, especially in those who are higher-level athletes. Because individuals typically gain (or lose) 1 to 2 lb/wk if their intake is 3,500 kcal above (or below) maintenance for the week, adding about 500 kcal/day generally is necessary when weight gain is not progressing. Keeping a daily diary and making changes every 1 to 2 weeks based on accomplishment of weight goals, along with monitoring and restriction of exercise as needed, are aspects of the week-by-week nutritional management. Ultimately, when the goal weight is reached, a diet aimed at achieving maintenance is initiated. The goal weight is based both on the patient's previous weights and calculations of IBW for age, sex, and height; a weight within 5% to 10% of IBW often is used because that is a weight at which most patients can achieve the return of regular and normal periods.

Although several of the criteria listed in Table 3 for hospitalization are medical or psychological, the degree of weight loss correlates with medical and psychiatric status and determines the need for hospitalization. Patients who are 20% to 25% below IBW occasionally require hospitalization, those who are 25% to 30% below IBW usually require hospitalization, and those who are more than 30% below IBW almost always require hospitalization. Patients who have bulimia nervosa are hospitalized less commonly, usually if there are electrolyte abnormalities or a pattern that is very out of control. Adolescents who have an eating disorder can be hospitalized on either a medical or psychiatric unit, with several adolescent medicine units that specialize in the treatment of eating disorders available throughout the country. No two units use the same protocols to achieve weight gain for inpatients who have anorexia nervosa. Most units employ oral refeeding for most of their patients, generally including a combination of meals and snacks that begins at 1,000 to 1,600 kcal/d and increases over time to approximately 3,000 kcal/d. Some units use nasogastric tube feeding, liquid diets, or intravenous hyperalimentation more quickly than others. Ultimately, the exact details are less important than the presence of a protocol that is logical, consistent, and includes the possibility of the refeeding syndrome. For pediatricians who must treat a patient who has an eating disorder on a general pediatric or medical unit that does not specialize in the treatment of eating disorders, use of supervised meals and snacks, as outlined previously, can be tried. If consistent weight gain, generally 2 to 4 lb/wk, is not achieved, transfer to a specialized unit is advised.

One area of nutritional management that cannot be overlooked involves the behavioral aspects of care. Because patients who have anorexia nervosa generally do

not want to gain weight, despite whatever statements they may make outwardly, nutritional advice alone usually is not sufficient to bring about weight gain. Ultimately, patients who have an eating disorder must be made to understand that they have no choice about gaining weight. Often, the pediatrician is forced to set the parameters. For patients who are close to a weight for which hospitalization is required, goal weights can be established by which hospitalization can be avoided (sometimes referred to as "weights and dates"). Goal weights always should be higher than current weight and never lower because most patients tend to go to the lowest weight they are allowed. In essence, patients are told that they no longer have a choice *whether* to gain weight but still do have a choice *where* to gain weight (at home or in the hospital). Once they are admitted to the hospital, they no longer have a choice *where* to gain weight but only *how* to gain weight (oral feeding or other methods). For patients whose weight loss is less severe, other behavioral interventions (the use of positive or negative reinforcements) may be required. Restriction of physical activity can serve this purpose, but other restrictions (important enough to matter to the patient but not so important to have a negative impact on life) may need to be used. These behavioral motivations are not considered to be treatment of the eating disorder per se but rather serve as an important means for other aspects of treatment to move forward.

Psychological Therapy

Although the counseling and behavioral management provided by pediatric practitioners can be considered an important component of the psychological treatment offered to patients who have eating disorders, most patients also require the more intensive approaches provided by mental health practitioners (including social workers, psychologists, or psychiatrists). Individual therapy is the mainstay of mental health care, aiming at understanding both why the individual has developed an eating disorder and how to handle its ramifications. Individual therapy may not be as effective when a patient is severely malnourished or for young adolescents, and standard interpersonal therapy may not be as effective in some situations as newer approaches, such as cognitive-behavioral therapy. Family therapy can be particularly important for adolescents. Group therapy sometimes is used as an adjunct, especially in college settings, although there are concerns about the "contagion effect" it can engender. Ultimately, the ability of a patient and family to benefit from therapy reflects the degree of

underlying difficulties and bears directly on the course and outcome of the illness.

Psychotropic medications are used increasingly to treat eating disorders, although with some controversy during the past few years. Studies have shown that antidepressant medications in the selective serotonin reuptake inhibitor (SSRI) class, such as fluoxetine, affect the frequency of binge eating and purging by patients who have bulimia nervosa. This probably is a direct effect, although it may be mediated through a decrease in the level of depression. SSRIs have not been shown to affect weight gain of patients who have anorexia nervosa. They are used frequently, however, to treat the depression and anxiety that often accompany the eating disorders. Some studies have shown that SSRIs may decrease the relapse rate in anorexia nervosa once weight goals have been achieved. Questions have been raised about whether SSRIs precipitate suicidal behaviors in children and adolescents who are depressed, prompting the need for extra caution with their use in the treatment of eating disorders in these age groups. Of late, the use of atypical antipsychotics has shown some benefits for patients who have recalcitrant anorexia nervosa, and some antiepileptic drugs are being used to decrease binge-eating episodes by patients who have bulimia nervosa.

Course and Outcome

The short-, intermediate-, and long-term outcomes for patients who have eating disorders are variable, and no indicator provides a specific prognosis for any individual case. In the short-term, it should be possible to reverse weight loss in almost every patient who has anorexia nervosa, even those who are exceedingly difficult to manage, as long as the appropriate outpatient and inpatient programs are available, the family is supportive of treatment needs, and the family's insurance company does its part. Whether initial weight gain is accompanied by necessary changes in "mood, food, and attitude" depends on underlying factors within the individual patient. For patients who have bulimia nervosa, both short- and intermediate-term outcomes depend on individual factors. Appropriate treatment gives bulimic patients an improved chance of controlling their behaviors, but the more coercive approaches used to accomplish weight gain in anorexia nervosa cannot be used as effectively to decrease harmful behaviors for those who have bulimia. Studies have not demonstrated the superiority of any specific approach in the treatment of anorexia nervosa, and medications and several different types of therapy have been associated with similar results in the treatment of bulimia nervosa. Several factors related to illness

length and severity long have been considered prognostic factors in anorexia nervosa; more recently, weight on discharge from the hospital has been evaluated as a predictor of relapse in patients who have anorexia nervosa.

The long-term outcome of anorexia nervosa has been evaluated in more than 100 studies during the past 4 decades. These studies have shown that approximately 50% of patients do well over time, approximately 30% do reasonably well but continue to have symptoms, and approximately 20% do poorly. A mortality rate of 5% to 10%, due to either suicide or medical complications, has been reported in the longer-term studies, representing among the highest mortality rates of all psychiatric disorders. These outcome data demonstrate how significant the eating disorders are for long-term health and well-being. Some indications in the literature, however, suggest that the prognosis in adolescents, especially those who are treated successfully as outpatients, is better. Furthermore, it appears that early and aggressive treatment in adolescence has a strongly positive affect on prognosis. Thus, it is incumbent on pediatric practitioners to detect, treat, and refer patients who have an eating disorder as quickly as possible to promote the best possible outcome in this often difficult and long-lasting disease.

Suggested Reading

- American Academy of Pediatrics. Committee on Adolescence. Identifying and treating eating disorders. *Pediatrics*. 2003;111:204–211
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994
- American Psychiatric Association. Practice guidelines for the treatment of patients with eating disorders (revision). *Am J Psychiatry*. 2000;157(suppl):1–39
- Attia E, Schroeder L. Pharmacologic treatment of anorexia nervosa: where do we go from here? *Int J Eat Disord*. 2005;37(suppl):60–63
- Becker AE, Grinspoon SK, Klibanski A, Herzog DB. Eating disorders. *N Engl J Med*. 1999;340:1092–1098
- Becker AE, Hamburg P. Culture, the media, and eating disorders. *Harvard Rev Psychiatry*. 1996;4:163–167
- Carlat DJ, Camargo CA Jr, Herzog DB. Eating disorders in males: a report on 135 patients. *Am J Psychiatry*. 1997;154:1127–1132
- Castro J, Lazaro L, Pons F, Halperin I, Toro J. Predictors of bone mineral density reduction in adolescents with anorexia nervosa. *J Am Acad Child Adolesc Psychiatry*. 2000;39:1365–1370
- Eisler I, Dare C, Russell GFM, Szmulker G, LeGrange D, Dodge E. Family and individual therapy in anorexia nervosa: a 5-year follow-up. *Arch Gen Psychiatry*. 1997;54:1025–1030

- Fisher M. Medical complications of anorexia and bulimia nervosa. *Adolescent Medicine: State of the Art Reviews*. 1992;3:487–502
- Fisher M. The course and outcome of eating disorders in adults and in adolescents: a review. *Adolescent Medicine: State of the Art Reviews*. 2003;14:149–158
- Fisher M, Golden NH, Katzman DK, et al. Eating disorders in adolescents: a background paper. *J Adolesc Health*. 1995;16:420–437
- Fisher M, Schneider M, Pegler C, Napolitano B. Eating attitudes, health risk behaviors, self-esteem, and anxiety among adolescent females in a suburban high school. *J Adolesc Health*. 1991;12:377–384
- Fisher M, Simpser E, Schneider M. Hypophosphatemia secondary to oral refeeding in anorexia nervosa. *Int J Eat Disord*. 2000;28:181–187
- Golden NH, Lanzkowsky L, Schebendach J, Palestro CJ, Jacobson MS, Shenker IR. The effect of estrogen-progesterone treatment on bone mineral density in anorexia nervosa. *J Pediatr Adolesc Gynecol*. 2002;15:135–143
- Grinspoon S, Thomas E, Pitts S, et al. Prevalence and predictive factors for regional osteopenia in women with anorexia nervosa. *Ann Intern Med*. 2000;133:790–794
- Hoek HW, Van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J Eat Disord*. 2003;34:383–396
- Howard WT, Evans KK, Quintero-Howard CV, Bowers WA, Andersen AE. Predictors of success or failure of transition to day hospital treatment for inpatients with anorexia nervosa. *Am J Psychiatry*. 1999;156:1697–1702
- Hsu LKG. Epidemiology of the eating disorders. *Psychiatr Clin North Am*. 1996;19:681–700
- Jones JM, Lawson ML, Daneman D, Olmstead MP, Rodin G. Eating disorders in adolescent females with and without type 1 diabetes: cross sectional study. *BMJ*. 2000;20:1563–1566
- Katzman DK. Medical complications in adolescents with anorexia nervosa: a review of the literature. *Int J Eat Disord*. 2005;37(suppl):52–59
- Kaye WH, Kaplan AS, Zucker ML. Treating eating disorder patients in a managed care environment: contemporary American issues and a Canadian response. *Psychiatr Clin North Am*. 1996;19:793–810
- Klibanski A, Biller BM, Schoenfeld DA, Herzog DB, Saxe VC. The effects of estrogen administration on trabecular bone loss in young women with anorexia nervosa. *J Clin Endocrinol Metab*. 1995;80:898–904
- Klump KL, Gobrogge KL. A review and primer of molecular genetic studies of anorexia nervosa. *Int J Eat Disord*. 2005;37(suppl):43–48.
- Kreipe RE, Yussman SM. The role of the primary care practitioner in the treatment of eating disorders. *Adolescent Medicine: State of the Art Reviews*. 2003;14:133–147
- Lock J, leGrange D. Family-based treatment of eating disorders. *Int J Eat Disord*. 2005;37(suppl):64–67.
- Lucas AR, Beard CM, O’Fallon WM, Kurland LT. 50-year trends in the incidence of anorexia nervosa in Rochester, Minn: a population-based study. *Am J Psychiatry*. 1991;148:917–922
- Palla B, Litt IF. Medical complications of eating disorders in adolescents. *Pediatrics*. 1988;81:613–623
- Robinson E, Bachrach L, Katzman DK. Use of hormone replacement therapy to reduce the risk of osteopenia in adolescent girls with anorexia nervosa. *J Adolesc Health*. 2000;26:343–348
- Rock CL, Curran-Celentano J. Nutritional management of eating disorders. *Psychiatr Clin North Am*. 1996;19:701–713
- Schebendach J, Nussbaum MP. Nutrition management in adolescents with eating disorders. *Adolescent Medicine: State of the Art Reviews*. 1992;3:541–558
- Solomon SM, Kirby DF. The refeeding syndrome: a review. *J Parenter Enteral Nutr*. 1990;14:90–97
- Strauss RS. Self-reported weight status and dieting in a cross-sectional sample of young adolescents. *Arch Pediatr Adolesc Med*. 1999;153:741–747
- Treat TA, Gaskill JA, McCabe EB, Ghinassi FA, Luczak AD, Marcus MD. Short-term outcome of psychiatric inpatients with anorexia nervosa in the current care environment. *Int J Eat Disord*. 2005;38:123–133
- Yager J, Andersen AE. Anorexia nervosa. *N Engl J Med*. 2005;353:1481–1488

PIR Quiz

Quiz also available online at www.pedsinreview.org

1. You are evaluating a previously healthy 15-year-old girl for secondary amenorrhea. She denies a history of nausea, vomiting, diarrhea, and headaches. She is in 10th grade, does well in school, and swims daily at the local health club. A 24-hour dietary recall appears adequate, although the patient states that she is considering eliminating red meat and fat from her diet. Her body mass index is 17. A urine pregnancy test is negative. Of the following, the *most* likely reason for this patient's secondary amenorrhea is:
 - A. Anorexia nervosa.
 - B. Bulimia nervosa.
 - C. Crohn disease.
 - D. Depression.
 - E. Hypothyroidism.
2. Rapid refeeding of those who are severely malnourished can result in:
 - A. Hypocalcemia.
 - B. Hypochloremia.
 - C. Hypokalemia.
 - D. Hyponatremia.
 - E. Hypophosphatemia.
3. You are evaluating a 17-year-old girl who has anorexia nervosa for possible hospital admission. She denies a recent history of vomiting, syncope, and hematemesis. Of the following physical findings, the *most* appropriate indication for hospitalization includes:
 - A. Hyperthermia.
 - B. Lower extremity edema.
 - C. Orthostatic changes.
 - D. Resting tachycardia.
 - E. Tachypnea.
4. To promote the best possible outcome for an adolescent who has an eating disorder, pediatric practitioners should:
 - A. Begin antidepressant therapy early.
 - B. Detect, treat, and refer patients aggressively for treatment.
 - C. Recognize the role of estrogen replacement therapy.
 - D. Refer to a dietitian for nutritional advice.
 - E. Screen the patient for medical complications.