



# Identification and Management of Eating Disorders in Children and Adolescents

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Eating disorders are serious, potentially life-threatening illnesses afflicting individuals through the life span, with a particular impact on both the physical and psychological development of children and adolescents. Because care for children and adolescents with eating disorders can be complex and resources for the treatment of eating disorders are often limited, pediatricians may be called on to not only provide medical supervision for their patients with diagnosed eating disorders but also coordinate care and advocate for appropriate services. This clinical report includes a review of common eating disorders diagnosed in children and adolescents, outlines the medical evaluation of patients suspected of having an eating disorder, presents an overview of treatment strategies, and highlights opportunities for advocacy.

## abstract

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## INTRODUCTION

### Definitions

Although the earliest medical account of an adolescent patient with an eating disorder was more than 300 years ago,<sup>1</sup> a thorough understanding of the pathophysiology and psychobiology of eating disorders remains elusive today. The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* includes the latest effort to describe and categorize eating disorders,<sup>2</sup> placing greater emphasis on behavioral rather than physical and cognitive criteria, thereby clarifying these conditions in those children who do not express body or weight distortion. *DSM-5* diagnostic criteria for several of the eating disorders commonly seen in children and adolescents are presented in Table 1.

Notable changes in *DSM-5* since the previous edition include the elimination of amenorrhea and specific weight percentiles in the diagnosis of anorexia nervosa (AN) and a reduction in the frequency of binge eating and compensatory behaviors required for the diagnosis of bulimia nervosa (BN). The diagnosis “eating disorder not otherwise specified” has been

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**TABLE 1** Diagnostic Features of Eating Disorders Commonly Seen in Children and Adolescents

DSM-5 Eating Disorder Diagnosis	Diagnostic Features
Anorexia nervosa (AN)	<p>A. Restricted caloric intake relative to energy requirements, leading to significantly low body weight for age, sex, projected growth, and physical health</p> <p>B. Intense fear of gaining weight or behaviors that consistently interfere with weight gain, despite being at a significantly low weight</p> <p>C. Altered perception of one's body weight or shape, excessive influence of body weight or shape on self-value, or persistent lack of acknowledgment of the seriousness of one's low body weight</p> <p>Subtypes: restricting type (weight loss is achieved primarily through dieting, fasting, and/or excessive exercise. In the previous 3 mo, there have been no repeated episodes of binge eating or purging); binge-eating/purging type (in the previous 3 mo, there have been repeated episodes of binge eating or purging; ie, self-induced vomiting or misuse of laxatives, diuretics, or enemas)</p>
Bulimia nervosa (BN)	<p>Repeated episodes of binge eating. Binge eating is characterized by both of the following: within a distinct period of time (eg, 2 h), eating an amount of food that is clearly larger than what most individuals would eat during a similar period of time under similar circumstances and a sense that one cannot limit or control their overeating during the episode</p> <p>Repeated use of inappropriate compensatory behaviors for the prevention of weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; or excessive exercise</p> <p>On average, the binge eating and compensatory behaviors both occur at least once a week for 3 mo</p> <p>Self-value is overly influenced by body shape and weight</p> <p>The binge eating and compensatory behaviors do not occur exclusively during episodes of AN</p>
Binge-eating disorder (BED)	<p>Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following: within a distinct period of time (eg, 2 h), eating an amount of food that is clearly larger than what most individuals would eat during a similar period of time under similar circumstances and sense that one cannot limit or control their overeating during the episode</p> <p>The binge-eating episodes include 3 or more of the following: eating much more quickly than normal, eating until uncomfortably full, eating large amounts of food when not feeling hungry, eating alone because of embarrassment at how much one is eating, and feeling guilty, disgusted, or depressed afterward</p> <p>Marked anguish is experienced regarding binge eating</p> <p>On average, the binge eating occurs at least once a week for 3 mo</p> <p>The binge eating is not associated with the use of inappropriate compensatory behavior as in BN and does not occur only in the context of BN or AN</p>
Avoidant/restrictive food intake disorder (ARFID)	<p>A disrupted eating pattern (eg, seeming lack of interest in eating or food; avoidance based on the sensory qualities of food; concern about unpleasant consequences of eating) as evidenced by persistent failure to meet appropriate nutritional and/or energy needs associated with 1 (or more) of the following: significant weight loss or, in children, failure to achieve expected growth and/or weight gain, marked nutritional deficiency, reliance on enteral feeding or oral nutritional supplements, significant interference with psychosocial functioning</p> <p>The disturbance cannot be better explained by lack of available food or by an associated culturally sanctioned practice</p> <p>The eating disturbance cannot be attributed to a coexisting medical condition nor better explained by another mental disorder. If the eating disturbance occurs in the context of another condition or disorder, the severity of the eating disturbance exceeds that routinely associated with the condition or disorder</p>
Other specified feeding or eating disorders, examples	<p>Atypical AN: all of the criteria for AN are met yet the individual's weight is within or above the normal range despite significant weight loss</p> <p>BN (of low frequency and/or limited duration): All of the criteria for BN are met, but, on average, the binge eating and compensatory behaviors occur less than once a week and/or for &lt;3 mo</p> <p>BED (of low frequency and/or limited duration): All of the criteria for BED are met, but, on average, the binge eating occurs less than once a week and/or for &lt;3 mo</p> <p>Purging disorder: recurrent purging behavior (eg, self-induced vomiting; misuse of laxatives, diuretics, or other medications) in the absence of binge eating with the intent to influence weight or body shape</p>

Adapted from the *DSM-5*, American Psychiatric Association, 2013.<sup>2</sup>

eliminated, and several diagnoses have been added, including binge-eating disorder (BED) and avoidant/

restrictive food intake disorder (ARFID).<sup>3-5</sup> The diagnosis of ARFID encompasses feeding behaviors

previously categorized in the fourth edition (*DSM-IV*) as "feeding disorder of infancy and early childhood" and

expands these into adolescence and adulthood. Individuals with ARFID intentionally limit intake for reasons other than for concern for body weight, such as the sensory properties of food, a lack of interest in eating, or a fear of adverse consequences with eating (eg, choking or vomiting). As a result, they may experience weight loss or failure to achieve expected weight gain, malnutrition, dependence on nutritional supplementation, and/or interference with psychosocial functioning.<sup>6-9</sup> The category “other specified feeding and/or eating disorder” is now applied to patients whose symptoms do not meet the full criteria for an eating disorder despite causing significant distress or impairment. Among these disorders is atypical AN in which diminished self-worth, nutritional restriction, and weight loss mirrors that seen with AN, although body weight at presentation is in the normal or above-normal range. Efforts are ongoing to further categorize abnormal eating behaviors and refine diagnoses.<sup>10</sup>

### Epidemiology

Prevalence data for eating disorders vary according to study populations and the criteria used to define an eating disorder.<sup>11</sup> A systematic review of prevalence studies published between 1994 and 2013 found widely varied estimates in the lifetime prevalence of eating disorders, with a range from 1.0% to 22.7% for female individuals and 0.3% to 0.6% for male individuals.<sup>12</sup> A 2011 cross-sectional survey of more than 10 000 nationally representative US adolescents 13 to 18 years of age estimated prevalence rates of AN, BN, and BED at 0.3%, 0.9%, and 1.6%, respectively. Behaviors suggestive of AN and BED but not meeting diagnostic thresholds were identified in another 0.8% and 2.5%, respectively. The mean age of onset for each of these disorders was 12.5 years.<sup>13</sup> Several studies have

suggested higher BED prevalence rates of 2% to 4%, with a more equal distribution between girls and boys, making it perhaps the most common eating disorder among adolescents.<sup>14</sup> In contrast, the diagnoses seen in treatment may belie the relative prevalence of these disorders. In a review of 6 US adolescent eating disorder treatment programs, the distribution of diagnoses was 32% AN, 30% atypical AN, 9% BN, 19% ARFID, 6% purging disorder, and 4% others.<sup>15</sup> This may reflect the underrecognition and/or undertreatment of disorders such as BED.

Although previously mischaracterized as diseases of non-Hispanic white, affluent adolescent girls, eating disorder behaviors are increasingly recognized across all racial and ethnic groups<sup>16-20</sup> and in lower socioeconomic classes,<sup>21</sup> preadolescent children,<sup>22</sup> males, and children and adolescents perceived as having an average or increased body size.

Preteens with eating disorders are more likely than older adolescents to have premorbid psychopathology (depression, obsessive-compulsive disorder, or other anxiety disorders) and less likely to have binge and purge behaviors. There is a more equal distribution of illness by sex among younger patients and, frequently, more rapid weight loss, leading to earlier presentation to health care providers.<sup>23</sup>

Although diagnosis in males may increase with the more inclusive *DSM-5* criteria,<sup>24,25</sup> it is often delayed because of the misperception of health care providers that eating disorders are female disorders.<sup>26</sup> In addition, disordered eating attitudes may differ in male individuals,<sup>27</sup> focusing on leanness, weight control, and muscularity. Purging, use of muscle-building supplements, substance abuse, and comorbid

depression are common in males.<sup>28-30</sup>

Eating disorders can occur in individuals with various body habitus, and their presence in those of larger body habitus is increasingly apparent.<sup>31-34</sup> Weight stigma (the undervaluation or negative stereotyping of individuals because they have overweight or obesity) seems to play a role. Adolescents with larger body habitus are exposed to weight stigma through the media, their families, peers, and teachers, and health care professionals, resulting in depression, anxiety, poor body image, social isolation, unhealthy eating behaviors, and worsening obesity.<sup>35</sup> When presenting with significant weight loss but a BMI still classified in the “healthy,” overweight, or obese ranges, patients with eating disorders such as atypical AN may be overlooked by health care providers<sup>36,37</sup> but may experience the same severe medical complications as those who are severely underweight.<sup>38-40</sup>

Increased rates of disordered eating may be found in sexual minority youth.<sup>41-43</sup> Analysis of Youth Risk Behavior Survey data reveals lesbian, gay, and bisexual high school students have significantly higher rates of unhealthy and disordered weight-control behaviors than their heterosexual peers.<sup>44,45</sup> Transgender youth may be at particular risk.<sup>46,47</sup> In a survey of nearly 300 000 college students, transgender students had the highest rates of self-reported eating disorder diagnoses and compensatory behaviors (ie, use of diet pills or laxatives or vomiting) compared with all cisgender groups. Nearly 16% of transgender respondents reported having been diagnosed with an eating disorder, as compared with 1.85% of cisgender heterosexual women.<sup>48</sup>

Adolescents with chronic health conditions requiring dietary control

**TABLE 2** Example Questions to Ask Adolescents With a Possible Eating Disorder

History/Information	Example Questions
Weight history	What was your highest weight? How tall were you? How old were you? What was your lowest weight? How tall were you? How old were you?
Body image	What do you think your weight should be? What feels too high? What feels too low? Are there body areas that cause you stress? Which areas? Do you do any body checking (ie, weighing, body pinching or checking, mirror checking)? How much of your day is spent thinking about food or your body?
Diet history	24-h diet history Do you count calories, fat, carbohydrates? How much do you allow? What foods do you avoid? Do you ever feel guilty about eating? How do you deal with that guilt (ie, exercising, purging, eating less)? Do you feel out of control when eating?
Exercise history	Do you exercise? What activities? How often? How intense is your workout? How stressed do you feel when you are unable to exercise?
Binge eating and purging	Do you ever binge? On what foods? How much? How often? Any triggers? Do you vomit? How often? How soon after eating? Do you use laxatives, diuretics, diet pills, caffeine? What types? How many? How often?
Family history	Does anyone in your family have a history of dieting or an eating disorder? Anyone on special diets (eg, vegetarian, gluten-free)? Anyone with obesity? Does anyone in your family have a history of depression, anxiety, bipolar disorder, obsessive-compulsive disorder, substance abuse, or other psychiatric illness? Does anyone in your family take psychiatric medication?
Review of systems	Dizziness, syncope, weakness or fatigue? Pallor, easy bruising or bleeding, cold intolerance? Hair loss, lanugo, dry skin? Constipation, diarrhea, early fullness, bloating, abdominal pain, heartburn? Palpitations, chest pain? Muscle cramps, joint pains? Excessive thirst and voiding? For girls: Age at menarche? Frequency of menses? LMP? Weight at time of LMP?
Psychosocial history (HEADSS) Home	Who lives in the home? How well do the family members get along with each other? Is the family experiencing any stressors?
Education	Where do you attend school? What grade? Regular classroom? Is school challenging for you? What grades do you receive? Has there been a change in your grades?
Activities	What activities are you involved in outside of the classroom? Do you have friends you can trust? Have you experienced any bullying? What Web sites do you most often visit when you go online? How much time is spent each day online?
Drug use	Have you ever used tobacco, e-cigarettes, alcohol, or drugs? Which ones? How much? How often? Have you ever used anabolic steroids or stimulants? Caffeine consumption? Other substances?
Depression/suicide	How is your mood? Increased irritability? Feelings of depression or hopelessness? Any anxiety or obsessive-compulsive thoughts or behaviors? Any history of cutting or self-injury? Have you ever wished you were dead? How often do you have these thoughts? When was the last time? Any thoughts of suicide? What methods have you imagined? Any attempts? History of physical, sexual or emotional abuse? Any previous mental health care?

**TABLE 2** Continued

History/Information	Example Questions
Sexual history	<p>Do you feel that the gender you feel inside matches your body on the outside?</p> <p>Are you romantically or sexually attracted to guys, girls, or both? Not sure?</p> <p>Have you had any sexual contact with another person? If yes, was it with guys, girls or both? Use of condoms? Use of contraceptives? History of pregnancy or sexually transmitted infection?</p> <p>Has anyone touched you sexually when you didn't want to be touched?</p>

Adapted from Rome and Strandjord.<sup>89</sup> LMP, last menstrual period.

(eg, diabetes, cystic fibrosis, inflammatory bowel disease, and celiac disease) may also be at increased risk of disordered eating.<sup>49–51</sup> Among teenagers with type 1 diabetes mellitus, at least one-third may engage in binge eating, self-induced vomiting, insulin omission for weight loss, and excessive exercise,<sup>52,53</sup> resulting in poorer glycemic control.<sup>54</sup>

Many adolescents engage in dietary practices that may overlap with or disguise eating disorders. The lay term "orthorexia" describes the behavior of individuals who become increasingly restrictive in their food consumption, not based on concerns for quantity of food but the quality of food (eg, specific nutritional content or organically produced). The desire to improve one's health through optimal nutrition and food quality is the initial focus of the patient, and weight loss and/or malnutrition may ensue as various foods are eliminated from the diet. Individuals with orthorexia may spend excessive amounts of time in meal planning and experience extreme guilt or frustration when their food-related practices are interrupted.<sup>55,56</sup> Psychologically, this behavior appears to be related to AN and obsessive-compulsive disorder<sup>57</sup> and is considered by some to be a subset within the restrictive eating disorders. Vegetarianism is a lifestyle choice adopted by many adolescents and young adults that may sometimes signal underlying eating pathology.<sup>58,59</sup> In a comparison of adolescent and young adult females with and without a history of eating

disorders, those with eating disorders were more likely to report ever having been vegetarian. Many of these young women acknowledged that their decision to become vegetarian was primarily motivated by their desire for weight loss, and most reported that they had done so at least a year after first developing eating disorder symptoms.<sup>60</sup>

In an attempt to improve performance or achieve a desired physique, adolescent athletes may engage in unhealthy weight-control behaviors.<sup>61</sup> The term "female athlete triad" has historically referred to (1) low energy availability that may or may not be related to disordered eating; (2) menstrual dysfunction; and (3) low bone mineral density (BMD) in physically active females.<sup>62–65</sup> Inadequate caloric intake in comparison to energy expenditure is the catalyst for endocrine changes and leads to decreased bone density and menstrual irregularities. Body weight may be stable. This energy imbalance may result from a lack of knowledge regarding nutritional needs in the athlete or from intentional intake restriction associated with disordered eating.

Hormonal disruption and low BMD can occur in undernourished male athletes as well.<sup>66</sup> Increased recognition of the role of energy deficiency in disrupting overall physiologic function in both male and female individuals led a 2014 International Olympic Committee consensus group to recommend replacing the term female athlete triad to the more inclusive term,

"relative energy deficiency in sport."<sup>67,68</sup> Athletes participating in sports involving endurance, weight requirements, or idealized body shapes may be at particular risk of relative energy deficiency in sport. Signs and symptoms of relative energy deficiency, such as amenorrhea, bradycardia, or stress fractures, may alert pediatricians to this condition.

**SCREENING FOR EATING DISORDERS**

Pediatricians are in a unique position to detect eating disorders early and interrupt their progression. Annual health supervision visits and preparticipation sports examinations offer opportunities to screen for eating disorders. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, fourth edition, offers sample screening questions about eating patterns and body image.<sup>69</sup> Reported dieting, body image dissatisfaction, experiences of weight-based stigma, or changes in eating or exercise patterns invite further exploration. Positive responses on a standard review of symptoms may need further probing. For example, oligomenorrhea or amenorrhea (either primary or secondary) may indicate energy deficiency.<sup>70</sup> Serial weight and height measurements plotted on growth charts are invaluable. Weight loss or the failure to make expected weight gain may be more obvious when documented on a graph. Similarly, weight fluctuations or rapid weight gain may cue a health care provider to question binge eating or BN symptoms. Recognizing that

**TABLE 3** Notable Physical Examination Features in Children and Adolescents With Eating Disorders

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Features related to inadequate energy intake or malnutrition:

- Deviation from previous growth trajectory when plotted on height, weight, and BMI graphs
- Abnormal vital signs:
  - Low resting HR or BP
  - Orthostatic increase in HR (>20 beats per min) or decrease in BP (>10 mm Hg)
- Hypothermia
- Flat or anxious affect
- Pallor, dry sallow skin; carotenemia (particularly palms and soles)
- Cachexia: facial wasting, decreased subcutaneous fat, decreased muscle mass
- Dull, thin scalp hair or lanugo
- Cardiac murmur (one-third with mitral valve prolapse), cool extremities; acrocyanosis; poor perfusion
- Stool mass left lower quadrant
- Delayed or interrupted pubertal development
  - Small breasts; vaginal dryness
  - Small testes

Features related to purging:

- Abnormal vital signs:
  - Orthostatic increase in HR (>20 beats per min) or decrease in BP (>10 mm Hg)
- Angular stomatitis; palatal scratches; dental enamel erosions
- Russell's sign (abrasion or callous on knuckles from self-induced emesis)
- Salivary gland enlargement (parotid and submandibular)
- Epigastric tenderness
- Bruising or abrasions over the spine (related to excessive exercise or sit ups)

Features related to excess energy intake:

- Deviation from previous growth trajectory when plotted on height, weight, and BMI curves
- Obesity
- Elevated BP or hypertension
- Acanthosis nigricans, acne, hirsutism
- Hepatomegaly
- Premature puberty
- Musculoskeletal pain

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Adapted from Rosen; American Academy of Pediatrics.<sup>208</sup>

many patients who present to eating disorder treatment programs have or previously had elevated weight according to criteria from the Centers for Disease Control and Prevention,<sup>71</sup> it is worthwhile to carefully inquire about eating and exercise patterns when weight loss is noted in any child or adolescent. Screening for unhealthy and extreme weight-control measures before praising desirable weight loss can avoid inadvertently reinforcing these practices.

### **ASSESSMENT OF CHILDREN AND ADOLESCENTS WITH SUSPECTED EATING DISORDERS**

A comprehensive assessment of a child or adolescent suspected of having an eating disorder includes a thorough medical, nutritional, and psychiatric history, followed by

a detailed physical examination. A useful web resource for assessment is published in multiple languages by the Academy for Eating Disorders.<sup>72</sup> Relevant interview questions are listed in Table 2. A collateral history from a parent may reveal abnormal eating-related behaviors that were denied or minimized by the child or adolescent.

A full psychosocial assessment, including a home, education, activities, drugs/diet, sexuality, suicidality/depression (HEADSS) assessment is vital. This evaluation includes screening for physical or sexual abuse by using the principles of trauma-informed care and responding according to American Academy of Pediatrics guidance on suspected physical or sexual abuse or sexual assault<sup>73–75</sup> as well as state laws. Vital to the HEADSS assessment

is an evaluation for symptoms of other potential psychiatric diagnoses, including suicidal thinking, which may have been unrecognized previously.

A comprehensive physical examination, including close attention to growth parameters and vital signs, allows the pediatrician to assess for signs of medical compromise and for signs and symptoms of eating disorder behaviors; findings may be subtle and, thus, overlooked without careful notice. For accuracy, weights are best obtained after the patient has voided and in an examination gown without shoes. Weight, height, and BMI can be evaluated by using appropriate growth charts. Low body temperature, resting blood pressure (BP), or resting heart rate (HR) for age may suggest energy restriction. Because a HR of 50 beats per minute or less is unusual even in college-aged athletes,<sup>76</sup> the finding of a low HR may be a sign of restrictive eating. Orthostatic vital signs (HR and BP, obtained after 5 minutes of supine rest and repeated after 3 minutes of standing)<sup>77,78</sup> revealing a systolic BP drop greater than 20 mm Hg, a diastolic BP drop greater than 10 mm Hg, or tachycardia may suggest volume depletion from restricted fluid intake or purging or a compromised cardiovascular system.

Pertinent physical findings in children and adolescents with eating disorders are summarized in Table 3. A differential diagnosis for the signs and symptoms of an eating disorder is found in Table 4, and selected medical complications of eating disorders are provided in Table 5.

### **LABORATORY EVALUATION**

Initial laboratory evaluation is performed to screen for medical complications of eating disorders or to rule out alternate diagnoses (Tables 4 and 5). Typical initial laboratory testing includes

**TABLE 4** Selected Differential Diagnosis for Eating Disorders According to Presentation

Clinical Presentations	Differential Diagnosis
Weight loss	
Gastrointestinal	Inflammatory bowel disease; celiac disease
Endocrine	Hyperthyroidism; diabetes mellitus; adrenal insufficiency
Infectious	Chronic infections, such as tuberculosis or HIV; intestinal parasite
Psychiatric	Depression; psychosis; anxiety or obsessive-compulsive disorder; substance use
Other	Neoplasm; superior mesenteric artery syndrome
Vomiting	Gastroesophageal reflux disease
Gastrointestinal disease	Gastroesophageal reflux disease Eosinophilic esophagitis Pancreatitis Cyclic vomiting
Neurologic	Increased intracranial pressure Migraine
Other	Food allergy
Binge eating or unexplained weight gain	
Endocrine	Hypothyroidism; hypercortisolism
Psychiatric	Depression
Iatrogenic	Medication side effect
Genetic	Prader Willi syndrome; Kleine-Levin syndrome

Adapted from Rome and Strandjord<sup>89</sup> and Rosen; American Academy of Pediatrics.<sup>208</sup>

a complete blood cell count; serum electrolytes, calcium, magnesium, phosphorus, and glucose; liver transaminases; urinalysis; and thyroid-stimulating hormone concentration.<sup>72</sup> Screening for specific vitamin and mineral deficiencies (eg, vitamin B<sub>12</sub>, vitamin D, iron, and zinc) may be indicated on

the basis of the nutritional history of the patient. Laboratory investigations are often normal in patients with eating disorders; normal results do not exclude the presence of serious illness with an eating disorder or the need for hospitalization for medical stabilization. An electrocardiogram is important for those with significant

weight loss, abnormal cardiovascular signs (such as orthostasis or bradycardia), or an electrolyte abnormality. A urine pregnancy test and serum gonadotropin and prolactin levels may be indicated for girls with amenorrhea; a serum estradiol concentration may serve as a baseline for reassessment during

**TABLE 5** Selected Medical Complications Resulting From Eating Disorders

Eating Disorder Behaviors	Medical Complications
Related to dietary restriction or weight loss	
Fluids and electrolytes	Dehydration; electrolyte abnormalities: hypokalemia, hyponatremia
Psychiatric	Depressed mood or mood dysregulation; obsessive-compulsive symptoms; anxiety
Neurologic	Cerebral cortical atrophy; cognitive deficits; seizures
Cardiac	Decreased cardiac muscle mass, right axis deviation, low cardiac voltage; cardiac dysrhythmias, cardiac conduction delays; mitral valve prolapse; pericardial effusion; congestive heart failure; edema
Gastrointestinal	Delayed gastric emptying, slowed gastrointestinal motility, constipation; superior mesenteric artery syndrome; pancreatitis; elevated transaminases; hypercholesterolemia
Endocrinologic	Growth retardation; hypogonadotropic hypogonadism: amenorrhea, testicular atrophy, decreased libido; sick euthyroid syndrome; hypoglycemia/hyperglycemia, impaired glucose tolerance; hypercholesterolemia; decreased BMD
Hematologic	Leukopenia, anemia, thrombocytopenia, elevated ferritin; depressed erythrocyte sedimentation rate
Related to vomiting	
Fluid and electrolytes	Electrolyte disturbance: hypokalemia, hypochloremia, metabolic alkalosis
Dental	Dental erosions
Gastrointestinal	Gastroesophageal reflux, esophagitis; Mallory-Weiss tears; esophageal or gastric rupture
Related to laxative use	
Fluids and electrolytes	Hyperchloremic metabolic acidosis; hypocalcemia
Gastrointestinal	Laxative dependence
Related to binge eating	Obesity with accompanying complications
Related to refeeding	Night sweats; polyuria, nocturia; refeeding syndrome: electrolyte abnormalities, edema, seizures, congestive heart failure (rare)
Seen among all eating disorder behaviors	Suicide

Adapted from Rosen; American Academy of Pediatrics.<sup>208</sup>

recovery.<sup>79</sup> Similarly, serum gonadotropin and testosterone levels can be useful to assess and monitor for central hypogonadism in boys with restrictive eating. Bone densitometry, by using dual radiograph absorptiometry analyzed with age-appropriate software, may be considered for those with amenorrhea for more than 6 to 12 months.<sup>80,81</sup> If there is uncertainty about the diagnosis, other studies including inflammatory markers, serological testing for celiac disease, serum cortisol concentrations, testing stool for parasites, or radiographic imaging of the brain or gastrointestinal tract may be considered. In the occasional patient, both an eating disorder and an organic illness, such as celiac disease, may be discovered.<sup>82</sup>

### **MEDICAL COMPLICATIONS IN PATIENTS WITH EATING DISORDERS**

Eating disorders can affect every organ system<sup>83,84</sup> with potentially serious medical complications that develop as a consequence of malnutrition, weight changes, or purging. Details of complications are described in reviews<sup>85-89</sup> and are summarized in Table 5. Most medical complications resolve with weight normalization and/or resolution of purging. Complications of BED can include those of obesity; these are summarized in other reports and not reiterated here.<sup>84,90</sup>

### **Psychological and Neurologic Effects**

Psychological symptoms can be primary to the eating disorder, a feature of a comorbid psychiatric disorder, or secondary to starvation. Initial symptoms of depression and anxiety may abate with refeeding.<sup>91</sup> Rumination about body weight and size is a core feature of AN, whereas rumination about food decreases as starvation reverses.<sup>92</sup> Difficulty in emotion regulation occurs across the spectrum of eating disorders but is more severe in those who binge eat

or purge.<sup>93</sup> Cognitive function studies in a large population-based sample of adolescents revealed eating disorder participants had deficits in executive functioning, including global processing and cognitive flexibility but performed better than control participants on measures of visual attention and vigilance.<sup>94</sup>

Structural brain imaging studies to date have yielded inconsistent results, likely explained, at least in part, by methodologic differences and the need to control for many variables, including nutritional state, hydration, medication use, and comorbid illness.<sup>95</sup> A longitudinal study revealed that global cortical thinning in acutely ill adolescents and young adults with AN normalized with weight restoration over a period of approximately 3 months.<sup>96</sup>

### **Dermatologic Effects**

Common skin changes in underweight patients include lanugo, hair thinning, dry scaly skin, and yellow discoloration related to carotenemia. Brittle nails and angular cheilitis may also be observed. Acrocyanosis can be observed in underweight patients and may be a protective mechanism against heat loss. Abrasions and calluses over the knuckles can occur from cutting the skin on incisors while self-inducing emesis.<sup>97</sup>

### **Dental and/or Oral Effects**

Patients with eating disorders experience higher rates of dental erosion and caries. This occurs more frequently in those who self-induce emesis but can also be observed in those who do not.<sup>98</sup> Normal dental findings do not preclude the possibility that purging is occurring.<sup>99</sup> Hypertrophy of the parotid and other salivary glands, accompanied by elevations in serum amylase concentrations with normal lipase concentrations, may be a clue to vomiting.<sup>99</sup> Xerostomia, from either salivary gland dysfunction or

psychiatric medication side effect, can reduce the oral pH, which can lead to increased growth of cariogenic oral bacteria.<sup>98,100</sup>

### **Cardiovascular Effects**

Reports of cardiac complications in eating disorders are focused predominantly on restrictive eating disorders. Common cardiovascular signs include low HR, orthostasis, and poor peripheral perfusion. Orthostatic intolerance symptoms (eg, lightheadedness) and vital sign findings may resemble those of postural orthostatic tachycardia syndrome<sup>101,102</sup> and may contribute to a delay in referral to appropriate care if eating disorder behaviors are not disclosed or appreciated.

Cardiac structural changes include decreased left ventricular (LV) mass, LV end diastolic and LV end systolic volumes, functional mitral valve prolapse, pericardial effusion, and myocardial fibrosis (noted in adults).<sup>103-105</sup> Electrocardiographic abnormalities, including sinus bradycardia, and lower amplitude LV forces are more common in AN than in nonrestrictive eating disorders.<sup>106</sup> One study reported a nearly 10% prevalence of prolonged (>440 milliseconds) QTc interval in hospitalized adolescents and young adults with a restrictive eating disorder.<sup>107</sup> Repolarization abnormalities, a potential precipitant to lethal arrhythmia,<sup>108</sup> may prompt clinicians to also consider other factors, such as medication use or electrolyte abnormalities, that may affect cardiac conduction.<sup>107,109</sup>

### **Gastrointestinal Tract Effects**

Gastrointestinal complaints are common and sometimes precede the diagnosis of the eating disorder. Delayed gastric emptying and slow intestinal transit time often contribute to reported sensations of nausea, bloating, and postprandial fullness<sup>110</sup> and may be a presenting feature of restrictive eating.



Constipation is a frequent experience for patients and multifactorial in etiology.<sup>111</sup> Esophageal mucosal damage from self-induced vomiting, including scratches, and bleeding secondary to Mallory-Weiss tears can occur.<sup>99</sup> Superior mesenteric artery syndrome may develop in the setting of severe weight loss.<sup>111</sup> Hepatic transaminase concentrations and coagulation times can be elevated as a consequence of malnutrition and, typically, normalize with appropriate nutrition.<sup>110</sup>

### Renal and Electrolyte Effects

Fluid and electrolyte abnormalities may occur as a result of purging or cachexia.<sup>99,112</sup> Dehydration can be present in any patient with an eating disorder. Disordered osmotic regulation can present in many patterns (central and renal diabetes insipidus, syndrome of inappropriate antidiuretic hormone).<sup>112</sup> Patients who vomit may have a hypokalemic, hypochloremic metabolic alkalosis resulting from loss of gastric hydrochloric acid, chronic dehydration, and the subsequent increase in aldosterone that promotes sodium reabsorption in exchange for potassium and acid at the distal tubule level.<sup>113</sup> Patients who abuse laxatives may experience a variety of electrolyte and acid-base derangements.<sup>113</sup> Dilutional hyponatremia can be observed in patients who intentionally water load to induce satiety or to misrepresent their weight at clinic visits. Abrupt cessation of laxative use may be associated with peripheral edema and, therefore, motivate further laxative<sup>114</sup> or diuretic misuse.

### Endocrine Effects

Restrictive eating disorders commonly cause endocrine dysfunction.<sup>80,115</sup> Euthyroid sick syndrome (low triiodothyronine, elevated reverse triiodothyronine, or normal or low thyroxine and thyroid-stimulating hormone) is the most common thyroid abnormality.<sup>116</sup>

Functioning as an adaptive mechanism to starvation, supplemental thyroid hormone is not indicated when this pattern is noted.<sup>116</sup> Hypercortisolemia may be seen in AN.<sup>81,116</sup> Hypothalamic-pituitary-gonadal axis suppression may be attributable to weight loss, physical overactivity, or stress.

Female individuals with AN may have amenorrhea, and male individuals can have small testicular volumes<sup>117</sup> and low testosterone concentrations.<sup>118</sup>

Growth retardation, short stature, and pubertal delay may all be observed in prepubertal and peripubertal children and adolescents with eating disorders.<sup>115</sup> AN is associated with low levels of insulin-like growth factor-1 and growth hormone resistance.<sup>119</sup> Catch-up growth has been inconsistently reported in the literature; younger patients may have greater and more permanent effects on growth.<sup>120,121</sup> Adolescent boys may be at an even greater risk for height deficits than girls; because boys typically enter puberty later than girls and experience their peak growth at a later sexual maturity stage, they are less likely to have completed their growth if an eating disorder develops in the middle teenage years.<sup>119</sup>

Low BMD is a frequent complication of eating disorders in both male and female patients<sup>117</sup> and is a risk in both AN and BN.<sup>122</sup> Low BMD is worrisome not only because of the increased risk of fractures in the short-term<sup>123</sup> but, also, because of the potential to irreversibly compromise skeletal health in adulthood.<sup>124</sup>

### TREATMENT PRINCIPLES ACROSS THE EATING DISORDER SPECTRUM

The ultimate goals of care in eating disorders are that children and adolescents are nourished back to their full healthy weight and growth trajectory, that their eating patterns and behaviors are normalized, and that they establish a healthy

relationship with food and their body weight, shape, and size as well as a healthy sense of self. Independent of a specific *DSM* diagnosis, treatment is focused on nutritional repletion and psychological therapy. Psychotropic medication can be a useful adjunct in select circumstances.

### The Pediatrician's Role in Care

After diagnosing an eating disorder, the pediatrician arranges appropriate care. Patients who are medically unstable may require urgent referral to a hospital (Table 6). Patients with mild nutritional, medical, and psychological dysfunction may be managed in the pediatrician's office in collaboration with outpatient nutrition and mental health professionals with specific expertise in eating disorders. Because an early response to treatment may be associated with better outcomes,<sup>125,126</sup> timely referral to a specialized multidisciplinary team is preferred, when available. If resources do not exist locally, pediatricians may need to partner with health experts who are farther away for care. For patients who do not improve promptly with outpatient care, more intensive programming (eg, day-treatment programs or residential settings) may be indicated.

Often, an early task of the pediatrician is to identify a treatment goal weight. This goal weight may be determined in collaboration with a registered dietitian. Pediatricians who are planning to refer the patient to a specialized treatment team may opt to defer the task to the team. Acknowledging that body weights naturally fluctuate, the treatment goal weight is often expressed as a goal range. Individualized treatment goal weights are formulated on the basis of age, height, premorbid growth trajectory, pubertal stage, and menstrual history.<sup>87,127</sup> In a study of adolescent girls with AN, of those who resumed menses during

**TABLE 6** Indications Supporting Hospitalization in an Adolescent With an Eating Disorder

One or More of the Following Justify Hospitalization
1. $\leq 75\%$ median BMI for age and sex (percent median BMI calculated as patient BMI/50th percentile BMI for age and sex in reference population $\times 100$ )
2. Dehydration
3. Electrolyte disturbance (hypokalemia, hyponatremia, hypophosphatemia)
4. ECG abnormalities (eg, prolonged QTc or severe bradycardia)
5. Physiologic instability: <ul style="list-style-type: none"><li>a. Severe bradycardia (HR <math>&lt; 50</math> beats per min daytime; <math>&lt; 45</math> beats per min at night);</li><li>b. Hypotension (90/45 mm Hg);</li><li>c. Hypothermia (body temperature <math>&lt; 96^\circ\text{F}</math>, <math>35.6^\circ\text{C}</math>);</li><li>d. Orthostatic increase in pulse (<math>&gt; 20</math> beats per min) or decrease in BP (<math>&gt; 20</math> mm Hg systolic or <math>&gt; 10</math> mm Hg diastolic)</li></ul>
6. Arrested growth and development
7. Failure of outpatient treatment
8. Acute food refusal
9. Uncontrollable binge eating and purging
10. Acute medical complications of malnutrition (eg, syncope, seizures, cardiac failure, pancreatitis and so forth)
11. Comorbid psychiatric or medical condition that prohibits or limits appropriate outpatient treatment (eg, severe depression, suicidal ideation, obsessive-compulsive disorder, type 1 diabetes mellitus)

Reprinted with permission from the Society for Adolescent Health and Medicine.<sup>85</sup> ECG, electrocardiogram.

treatment, this occurred, on average, at 95% of the treatment goal weight.<sup>128</sup> Health care providers may be pressured by patients, their patients' parents, or other health care providers to target a treatment goal weight that is lower than the previous growth trajectory or other clinical indicators would suggest is appropriate. If a treatment goal weight is inappropriately low, there is an inherent risk of offering only partial weight restoration and insufficient treatment.<sup>129</sup> The treatment goal weight is reassessed at regular intervals (eg, every 3–6 months) to account for changes in physical growth and development (in particular, age, height, and sexual maturity).<sup>87,127</sup>

An important role for the pediatrician is to offer guidance regarding eating and to manage the physical aspects of the illnesses. For all classifications of eating disorders, reestablishing regular eating patterns is a fundamental early step. Meals and snacks are reintroduced or improved in a stepwise manner, with 3 meals and frequent snacks per day. Giving the message that “food is the medicine that is required for recovery” and promoting adherence to taking that medicine at scheduled intervals often helps

patients and families get on track.<sup>130</sup> A multivitamin with minerals can help ensure that deficits in micronutrients are addressed. To optimize bone health, calcium and vitamin D supplements can be dosed to target recommended daily amounts (elemental calcium: 1000 mg for patients 4–8 years of age, or 1300 mg for patients 9–18 years of age; vitamin D: 600 IU for patients 4–18 years of age).<sup>87,131</sup> Patients can be reassured that the bloating discomfort caused by slow gastric emptying improves with regular eating. When constipation is troubling, nutritional strategies, including weight restoration, are the treatments of choice.<sup>111</sup> When these interventions are inadequate to alleviate constipation, osmotic (eg, polyethylene glycol 3350) or bulk-forming laxatives are preferred over stimulant laxatives. The use of nonstimulant laxatives decreases the risks of electrolyte derangement and avoids the potential hazard of “cathartic colon syndrome” that may be associated with abuse of stimulant cathartics (senna, cascara, bisacodyl, phenolphthalein, anthraquinones).<sup>99,114</sup>

To optimize dental outcomes, patients can be encouraged to

disclose their illness to their dentist. Current dental hygiene recommendations for patients who vomit include the use of topical fluoride, applied in the dental office or home, or use of a prescription fluoride (5000 ppm) toothpaste. Because brushing teeth immediately after vomiting may accelerate enamel erosion, patients can be advised to instead rinse with water, followed by using a sodium fluoride rinse whenever possible.<sup>132</sup>

## AN

### *Collaborative Outpatient Care*

Most patients with AN are treated in outpatient settings.<sup>85,133</sup> Pediatricians play an important role in the medical management and coordination of the treatment of these patients. The pediatrician plays a primary role in assessing for and managing acute and long-term medical complications, monitoring treatment progress, and coordinating care with nutritional and mental health colleagues.<sup>85,130,134</sup> Although some primary care pediatricians feel comfortable coordinating care, others choose to refer patients to providers with expertise in pediatric eating disorders. Ideally, all members of the treatment team are sensitive to the unique

developmental needs of children and adolescents.<sup>133</sup>

Educating young people and their parents about the physiologic and psychological effects of food restriction is an early component of care. Parents are empowered to feed their children regularly (typically 3 meals and 2–3 snacks per day) and adjust portion size and energy richness based on weight progress. Many parents are amazed to discover the amount of energy (3500 kcal or more) that may be required to restore weight for their children. Detailed tracking of caloric intake is not necessary. Serving foods with high caloric density and ensuring that beverages are energy rich (eg, choosing fruit juice or milk instead of water) are effective strategies to maximize energy intake without requiring large increases in volume. Parents can relieve adolescents of having to decide on appropriate serving sizes by plating meals for them. Accommodating special diets, such as vegetarian or vegan, can make meeting nutritional goals especially challenging. Reintroducing foods that have been avoided or that induce fear of weight gain are essential steps on the path to recovery.

#### *Family-Based Treatment and Parent-Focused Therapy*

Over the past 2 decades, a specialized eating disorder–focused, family-based intervention, commonly referred to as family-based treatment (FBT), has emerged as the leading first-line treatment approach for pediatric eating disorders.<sup>135</sup> Effectiveness is well established for AN.<sup>133,136</sup> Rather than dwelling on possible causes of the eating disorder, FBT is focused on recovery from the disease. FBT consists of 3 phases and contends that parents are not to blame for their child's illness, eating disorders are not caused by dysfunctional families, and parents play an essential role in

recovery.<sup>136</sup> During appointments, the entire family unit meets with the therapist. In phase 1, weight restoration is the primary goal. Parents, supported by the therapist, take responsibility to ensure that their child eats sufficiently and limit pathologic weight-control behaviors. Parents are encouraged to take responsibility for meal planning and preparation. Pediatricians can be helpful by reminding parents of the importance of fighting the disease effectively in the early stages, with the goals of reaching a truly healthy weight, resuming pubertal development, reversing medical complications, and restoring normal cognitions. Early weight gain (4–5 pounds by session 4, typically correlating with 4 weeks of treatment) is predictive of better outcomes in adolescents.<sup>126,137,138</sup> By phase 2, substantial weight recovery has occurred, and the adolescent gradually resumes responsibility for his or her own eating. By phase 3, weight has been restored, and the therapy shifts to address general issues of adolescent psychosocial development.<sup>136</sup> This therapy is detailed in manuals for providers<sup>137</sup> and families.<sup>139</sup> FBT with experienced providers is not available in all communities. Nevertheless, community providers may integrate the essential principles of FBT in their work with patients and families.<sup>130</sup>

Parent-focused therapy is an adaptation of FBT wherein the therapist supports the parents to renourish the patient and limit weight-control behaviors but, after the initial appointment, meets only with the parents.<sup>140</sup> The patient has brief visits with a nurse or physician for the assessment of weight and acute mental health issues but is not directly involved with a therapist.

The role pediatricians serve in the care of an adolescent in FBT differs from the customary role of a physician with patients.<sup>134</sup> In the

FBT setting, the pediatrician does not weigh the patient because that task is performed by the therapist. The pediatrician directs the care only when there are immediate medical safety concerns. If the pediatrician identifies an urgent medical issue that requires intervention or hospitalization, he or she is obligated to provide recommendations to the patient, the parents, and the primary therapist. For the medically stable patient, the pediatrician acts as a consultant to the parents and primary therapist. When a parent asks a question related to treatment, instead of directly advising the parents what to do, the pediatrician, ideally, redirects that treatment decision back to the parent: “You know your child the best. What do you think will best help in your child's recovery?” In this way, the physician empowers parents to make their own decisions, enhancing their confidence to care for their ill child.

#### *Day-Treatment Programs*

Day-treatment programs (day hospitalization and partial hospitalization) provide an intermediate level of care for patients with eating disorders who are medically stable and do not require 24-hour supervision but need more than outpatient care.<sup>133,141</sup> These programs may prevent the need for higher levels of care or may be a “step-down” from inpatient or residential to outpatient care. Day treatment typically involves 8 to 10 hours per day of care (including meals, therapy, groups, and other activities) by a multidisciplinary staff 5 days per week. Reported evaluations of child and adolescent day-treatment programs are few and observational in design.<sup>142–145</sup> Despite the absence of systematic data supporting their usefulness, these programs are generally believed to have an important role in the continuum of care.

### *Residential Treatment*

Residential treatment may be necessary for a minority of medically stable patients with eating disorders. Indications for residential treatment include a poor motivation for recovery, need for structure and supervision to prevent unhealthy behaviors (eg, food restriction, compulsive exercise), lack of a supportive family environment, absence of outpatient treatment in the patient's locale,<sup>146</sup> or outpatient interventions having been unsuccessful.<sup>133</sup> Residential treatment typically includes 24 hour per day supervision, medical oversight, group-based psychoeducational therapy, nutritional counseling, individual therapy, and family therapy. The length of stay can be weeks to months, depending on the severity of illness and financial resources. Outcome studies reported by residential programs, generally, reveal improved symptomatology at discharge,<sup>147</sup> but the results at long-term follow-up are mixed.<sup>148,149</sup> However, few outcome studies are focused on adolescents, compare the efficacy of residential to outpatient treatment, or make comparisons across programs or treatment modalities.

Although some adolescents require this higher level of care, health care providers and families are encouraged to exercise caution when selecting a residential treatment program. The number of residential programs has more than tripled in the last decade, with many operated by for-profit companies. Marketing practices by some are questionable.<sup>150</sup> Outcome studies demonstrating program efficacy may be misleading because of a lack of rigorous design or peer review.<sup>151</sup> Until recently, there was no certification process to ensure program quality and safety. In 2016, The Joint Commission implemented new accreditation standards for

behavioral health care organizations that provide outpatient or residential eating disorder treatment.<sup>152</sup> It remains to be seen how many programs will pursue this accreditation.

The National Eating Disorders Association Web site offers useful suggestions for evaluating treatment programs ([www.nationaleatingdisorders.org](http://www.nationaleatingdisorders.org)).

### *Hospital-Based Stabilization*

Suggested indications for the hospitalization of children and adolescents with eating disorders published by the Society for Adolescent Health and Medicine are listed in Table 6.

The most common goal for hospital-based stabilization is nutritional restoration. Variation occurs with regard to how quickly hospitalized patients with AN are refeed.<sup>153,154</sup> It is important to balance 2 competing goals: achieve weight gain swiftly and avoid refeeding syndrome.<sup>155</sup> Refeeding syndrome refers to the metabolic and clinical changes that occasionally occur when a malnourished patient is aggressively nutritionally rehabilitated; the hallmarks are hypophosphatemia and multiorgan dysfunction.<sup>155-157</sup> A systematic review of hospitalized adolescents with AN reported an average incidence of refeeding hypophosphatemia (without necessarily organ dysfunction) of 14%.<sup>158</sup> Over the past decade, a long followed maxim, "start low and go slow," has been challenged.<sup>87,155</sup> Several centers have described starting calories at 1400 kcal or more per day,<sup>154</sup> including recent reports demonstrating safe treatment of mildly and moderately malnourished adolescents by using initial caloric prescriptions of 2200 to 2600 kcal per day, while achieving a weight gain of approximately 3 to 4.5 pounds per week.<sup>159,160</sup> Because the risk of refeeding hypophosphatemia may

correlate with the degree of starvation, pediatricians may opt to take a more cautious approach in severely malnourished (<70% median BMI) children until further studies are reported.<sup>87,154</sup>

Nasogastric tube (NGT) feeding may be necessary for some hospitalized adolescents, but opinions vary regarding when they should be initiated.<sup>161</sup> Most North American programs reserve NGT feeds for when patients are not able to complete meals; however, internationally, some centers report the routine use of NGT feeding, either exclusively at first or in combination with meals.<sup>162,163</sup> Potential benefits of NGT feeding include faster weight gain and medical stabilization, with a possibility for a reduced hospital length of stay.<sup>162,163</sup> Although viewed by some health care providers as invasive or punitive, others view NGT feeding as empathic, by reducing both physical and psychological pain in the early treatment stages.<sup>161</sup> There is insufficient evidence to recommend one approach over another.<sup>154</sup> Independent of whether NGT feeds are used routinely, physicians involved in the treatment of hospitalized medically unstable patients may be called on to provide nutrition via an NGT when nutritional needs are not being met. The use of total parenteral nutrition carries higher risks of medical complications, is costly, and is not recommended unless other forms of refeeding are not possible.<sup>154</sup>

High-quality studies in which researchers examine the impact of inpatient care are limited, and the best end point for hospital treatment of children and adolescents is unclear. A US multicenter research collaborative showed that, in a national cohort of low-weight 9- to 21-year-olds with restrictive eating disorders, those who were hospitalized had a greater odds of being at 90% of the median BMI at 1-year follow-up.<sup>164</sup> However,

a randomized controlled trial (RCT) of treatment of adolescent AN in the United Kingdom revealed no benefits of inpatient over outpatient care<sup>165</sup>; this study was limited by poor adherence to the allocated treatment. An RCT in Germany in 2014 revealed that inpatient adolescents discharged earlier to outpatient treatment fared as well as those discharged later.<sup>141</sup> Similarly, an RCT conducted in Australia in 2015 revealed that adolescents who were discharged to FBT as soon as they were medically stable fared at least as well as adolescents who remained inpatients until achieving 90% of their treatment goal weight.<sup>166</sup> The recently reported average length of stay in the United States for patients admitted for medical stabilization by using higher caloric prescriptions was 3 to 12 days.<sup>159,167,168</sup>

#### *Pharmacotherapy for AN*

A variety of medications have been studied for the treatment of AN, primarily in adults, but none have been approved for this indication by the US Food and Drug Administration (FDA).<sup>169</sup> Despite their demonstrated ineffectiveness,<sup>170</sup> more than one-half of adolescents with restrictive eating disorders are prescribed psychotropic medications, most likely in attempts to treat comorbid conditions, such as depression and anxiety.<sup>171</sup> Selective serotonin-reuptake inhibitors (SSRIs) have been tried but are not effective in acutely ill, malnourished patients and have not been shown to prevent disease relapse in those who are weight restored.<sup>172-174</sup> A number of atypical antipsychotic medications have also been studied, including quetiapine, risperidone, and olanzapine. Results have generally revealed little benefit in weight gain or improvement in eating-disorder thinking.<sup>169,175-178</sup> Initial studies of augmentation of SSRIs with atypical antipsychotics in adult patients have been promising.<sup>179</sup>

The current recommendations to optimize bone health are full weight restoration with physiologic resumption of menses and supplementation with calcium and vitamin D.<sup>79,81,87,115</sup> Bisphosphonate treatment is not recommended.<sup>79,87,115</sup> Estrogen supplementation in the form of combined estrogen-progesterone oral contraceptive pills is not effective in enhancing BMD in adolescents with AN.<sup>81</sup> Small trials with transdermal estrogen<sup>180</sup> or with low-dose combined oral contraceptive pills plus dehydroepiandrosterone<sup>181</sup> have shown a positive effect on BMD compared with controls, but further studies are needed before these are considered standard care. Although cyclic vaginal bleeding may be induced with the use of exogenous hormones, this may reinforce a patient's denial of the medical consequences of her disease and masks the spontaneous return of menses.

#### **BN and BED**

##### *Collaborative Outpatient Care*

Most patients with BN and BED are managed in outpatient settings with the collaboration of a medical and mental health care providers as well as a dietitian, as needed.

Psychological treatment studies are more limited in BN compared with AN and are especially lacking in BED.<sup>133</sup> Cognitive behavioral therapy (CBT) has a modest evidence-base for BN and BED.<sup>133,182</sup> CBT explicitly recognizes the interrelationships among an individual's thoughts, feelings, and actions, and its principles can be used by all disciplines. Reestablishing regular eating patterns is a central goal, and educating patients about the perpetuating nature of the restriction-binge-purge cycle is an early focus. Patients with BN and BED can minimize the urge to binge that is typically experienced late in the day,

if they eat regularly throughout the day. Decreasing the binge amount and frequency may decrease guilt and shame and the ensuing negative self-assessment. During CBT, patients are taught to question their distorted thoughts and remodel their eating behaviors.<sup>182</sup>

##### *FBT*

Although there is a manual to guide FBT for patients with BN,<sup>183</sup> it is based on more limited evidence than FBT for AN.<sup>182</sup> An RCT comparing FBT with CBT revealed patients in the FBT group were more likely to abstain from binge eating and purging at the end of the 18-week treatment (39% vs 20%) with no statistical difference (49% vs 32%) at 1-year follow-up.<sup>184</sup> There are no published studies in which researchers examine FBT for BED.

##### *Pharmacotherapy for BN*

As with other pharmacotherapy research, studies of treatment of BN have primarily been in adult subjects. Several pharmacologic agents, including SSRIs, have been demonstrated to be effective for the treatment of adult BN, although only fluoxetine has FDA approval. Although not approved for pediatric BN, fluoxetine is FDA approved for child and adolescent depression and obsessive-compulsive disorder, so it is a reasonable option if pharmacologic treatment of BN is considered.<sup>169</sup> The antiepileptic topiramate has been shown to significantly decrease binge eating in adults who do not respond to or are not able to tolerate SSRIs. However, cases of topiramate triggering eating disorder symptoms in adolescents have been reported.<sup>185</sup> Other drugs, including naltrexone and ondansetron, are being used with some success in adult BN, although data are lacking to recommend their use more broadly.<sup>169</sup>

### Pharmacotherapy for BED

Research on the treatment of binge eating lags behind that for other eating disorders and has been focused on adult subjects. SSRIs have rarely differed from placebo in their effect on BED and show no better outcome than behavioral therapy alone. Although the use of topiramate has been shown to reduce binge eating and help with weight loss, the rates of adverse effects are relatively high.<sup>186</sup>

Lisdexamfetamine, a central nervous system stimulant approved for treatment of attention-deficit/hyperactivity disorder, was approved by the FDA in 2015 for the treatment of moderate to severe BED in adults. Although it has been demonstrated to reduce the frequency of binge-eating episodes, lisdexamfetamine is not indicated for weight loss. As with the use of other central nervous system stimulants, there is a potential for abuse and dependence as well as serious cardiovascular reactions.<sup>187</sup>

### ARFID

ARFID is a relatively new diagnosis, and, consequently, there is limited literature describing treatment.<sup>188,189</sup> Because patients with ARFID vary in terms of underlying psychological motivations for restrictive eating, individualized behavioral treatment strategies are needed.<sup>182,190</sup>

Despite varying characteristics of the disorder, the dual goals of refeeding and normalization of eating align with the goals of treating other eating disorders. A study of pediatric and young adult patients admitted with ARFID at a single academic medical center reported that ARFID patients were more likely to require enteral nutrition and stayed in the hospital longer than patients with AN.<sup>9</sup>

No medication is specifically indicated for use in ARFID; pharmacotherapy is directed at treating underlying comorbid illness (eg, anxiety) as necessary.

### FINANCIAL CONSIDERATIONS

The treatment of eating disorders is multidisciplinary, often long-term, and may require expensive, high-level care, such as inpatient stabilization or residential or partial hospitalization programs. The costs associated with treatment can create substantial financial burdens for families.<sup>191</sup>

Having medical insurance, public or private, is no guarantee that these costs will be covered.<sup>192</sup> Insurance carriers are able to define their own criteria for eating disorder treatment, leading to wide variations in coverage from state to state. Some states do not identify eating disorders as life-threatening conditions, thereby limiting treatment coverage. State-sponsored public insurance plans may not cover out-of-state treatment programs, even when no comparable treatment programs exist within that state. Outpatient mental health providers who are willing to accept the lower payments from public insurance may have no expertise in treating eating disorders. Those who do and will see publicly insured patients or those in managed care plans typically limit the number of these patients in their panels. Private insurance may increase access to treatment but dictate lower levels and shorter periods of care than is indicated by a patient's clinical status and health care provider recommendation. Families of patients with eating disorders typically will need assistance navigating the financial aspects of treatment. The National Eating Disorders Association offers general information online for families regarding financial coverage for treatment ([www.nationaleatingdisorders.org](http://www.nationaleatingdisorders.org)).

### PROGNOSIS

The prognoses reported for adolescents with eating disorders vary widely, depending on research

methodology, definitions of recovery, and duration of follow-up. Generally, adolescents have greater success in recovery from eating disorders than their adult counterparts,<sup>193</sup> with overall recovery rates of approximately 70%.<sup>194</sup>

In a review of 11 adolescent eating disorder treatment programs, 54% of patients treated for restrictive disorders had restored to at least 90% of their median body weight (MBW) for age and height at 1-year follow-up. This is essential for catch-up growth and resumption of menses in girls. Two significant predictors of weight recovery were a higher percentage of MBW at initial presentation and shorter duration of symptoms, highlighting the importance of early identification of these disorders. Outcomes did not vary meaningfully across programs, suggesting that all treatment models were helpful.<sup>195</sup>

In a more-recent study, researchers examined the weight restoration of patients from 14 adolescent treatment programs with a diagnosis of a restrictive eating disorder by *DSM-5* criteria. At 1-year follow-up, those with ARFID were the least likely (43%) to have regained  $\geq 90\%$  MBW and were also more likely to be younger, have had a longer duration of symptoms, and have left treatment prematurely. Eighty-two percent of those with atypical AN and 64% of those with AN had regained  $\geq 90\%$  MBW. Having received a higher level of care (eg, partial hospitalization and/or residential care) did not increase the likelihood of weight recovery. Again, there were no significant differences in outcomes between programs, despite various treatment modalities.<sup>196</sup>

Information on the long-term prognosis of adolescents with AN

is limited. In a study of adolescents who completed a 12-month outpatient AN treatment study (either FBT or adolescent-focused therapy), approximately one-third of patients were in full remission 1 year after completion, with better rates in the FBT group (49%) than in the adolescent-focused therapy group (23%).<sup>197</sup> Follow-up in a convenience sample of the original study 2 to 4 years after treatment revealed less than 10% of patients relapsed, with no difference between the 2 groups.<sup>198</sup> An RCT comparing parent-focused therapy with FBT demonstrated equivalent outcomes between the groups at 12-month follow-up (37% vs 29%).<sup>140</sup>

Information about recovery from BN, BED, and purging disorder in adolescents is less available but suggests higher rates of relapse and the development of comorbidities. Outcome studies on BN in adults reveal variable recovery rates, ranging from approximately 50% to 70% at 4- to 6-year follow-up, with relapse rates of 30% and about 25% having chronic disease.<sup>194</sup> A longitudinal study of adolescent girls with BED and purging disorders into early adulthood revealed that one-quarter of these girls started to use drugs other than marijuana, more than one-third began to binge drink frequently, and 27% demonstrated high levels of depressive symptoms.<sup>199</sup> Not surprisingly, misuse of drugs and alcohol among patients with eating disorders is associated with a poorer outcome or death.<sup>193</sup>

Mortality rates among individuals with eating disorders are substantially elevated in comparison with those of the general population, with death typically occurring in adulthood. Premature death is 4 to 5 times higher for patients with AN and 2 to 3 times as high for those

with BN.<sup>200-203</sup> Suicide rates are increased among patients with eating disorders<sup>204</sup> and, in one study, accounted for 30% deaths.<sup>203</sup> In a national survey of adolescents, 35% of those meeting criteria for BN, 15% of those meeting criteria for BED, and 8% of those meeting criteria for AN reported having made a suicide attempt.<sup>205</sup> The risk of suicide among patients with eating disorders appears to be declining and has been attributed to an increased recognition of eating disorders and effective treatment.<sup>206</sup>

### **PEDIATRICIAN'S ROLE IN PREVENTION AND ADVOCACY**

Efforts to prevent eating disorders may occur in clinical practice and community settings. By using sensitive, nonstigmatizing language and demonstrating supportive attitudes toward children and adolescents of all body shapes and sizes, pediatricians create a welcoming clinical setting for discussions about weight and weight-related behaviors. The American Academy of Pediatrics clinical report "Preventing Obesity and Eating Disorders in Adolescents" highlights steps that pediatricians can take to prevent both conditions.<sup>207</sup> These steps include focusing on healthy habits with patients and families rather than weight and dieting, encouraging more frequent family meals, discouraging "weight talk" and "weight teasing" in the home, closely monitoring weight loss in patients advised to lose weight, and promoting a healthy body image in all children and adolescents.<sup>207</sup> Pediatricians may also advise teachers, coaches, and athletic trainers about healthy approaches to nutrition and exercise, raise awareness of the detrimental effects of weight stigmatization, and alert them to the warning signs of eating disorders.

Pediatricians can join others in advocating for improved access to quality eating disorder treatment services. The limited availability of developmentally appropriate mental health services, lack of mental health parity, and service "carve-outs" all have been barriers to patients and families who seek necessary treatment and seem to be disproportionately problematic for patients with eating disorders. Despite evidence of its effectiveness, FBT is not available in many communities. Through advocacy, pediatricians can help support health care reform efforts that will enable children and adolescents with eating disorders to access necessary care.

### **GUIDANCE FOR PEDIATRICIANS**

1. Pediatricians should be knowledgeable about the variety of risk factors and early signs and symptoms of eating disorders in both male and female children and adolescents. Pediatricians should screen patients for disordered eating and unhealthy weight-control behaviors at annual health supervision visits. Pediatricians should evaluate weight, height, and BMI by using age- and sex-appropriate charts, assess menstrual status in girls, and recognize the changes in vital signs that may signal the presence of an eating disorder.
2. When an eating disorder is suspected, pediatricians, in conjunction with appropriate consultants, should initiate a comprehensive evaluation of the patient that includes both medical and psychological assessments as well as suicide risk appraisal. Once diagnosed, patients should be monitored for medical and nutritional

complications by their pediatrician or referred to other qualified practitioners for medical oversight.

- To facilitate multidisciplinary care, pediatricians should refer their patients with eating disorders to treatment resources in their region when available. Ideally, these treatment program providers should have expertise in the unique developmental needs of this age group.
- Pediatricians are encouraged to advocate for legislation and policy changes that ensure appropriate services for patients with eating disorders, including medical care, nutritional intervention, mental health treatment, and care coordination, in settings that are appropriate for the developmental level of the patient and severity of the illness.

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#### ABBREVIATIONS

AN: anorexia nervosa  
ARFID: avoidant/restrictive food intake disorder  
BED: binge-eating disorder  
BMD: bone mineral density  
BN: bulimia nervosa  
BP: blood pressure  
CBT: cognitive behavioral therapy  
DSM-5: *Diagnostic and Statistical Manual of Mental Disorders Fifth Edition*  
FBT: family-based treatment  
FDA: Food and Drug Administration  
HEADSS: home, activities, drugs/diet, sexuality, suicidality/depression  
HR: heart rate  
LV: left ventricular  
MBW: median body weight  
NGT: nasogastric tube  
RCT: randomized controlled trial  
SSRI: selective serotonin-reuptake inhibitor

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