Review article

Update on the Medical Management of Eating Disorders in Adolescents

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A B S T R A C T

The medical practitioner has an important role to play in the management of adolescents with eating disorders, usually as part of a multidisciplinary team. This article reviews the role of the medical practitioner in the diagnosis and treatment of eating disorders, updating the reader on the changing epidemiology of eating disorders, revised diagnostic criteria, newer methods of assessing degree of malnutrition, more aggressive approaches to refeeding, and current approaches to managing low bone mass.

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IMPLICATIONS AND CONTRIBUTION

New diagnostic criteria, advances in epidemiological understandings, more scientific underpinnings for different levels of clinical care, together with greater evidence for specific psychological, nutritional, and medical interventions provide a strong rationale for an update on the medical management of eating disorders in adolescents.

Eating disorders are complex biopsychosocial disorders that usually have their onset during adolescence. Adolescents with eating disorders are best managed by a multidisciplinary team with the medical provider an essential member of that team. The role of the medical provider includes making the diagnosis, excluding other causes of weight loss or vomiting, evaluating the
degree of malnutrition, and assessing and monitoring medical complications.

The objective of this article is to provide an update on specific issues relevant to the medical management of eating disorders in adolescents, including recent changes to diagnostic criteria, different levels of care, determining the degree of malnutrition and the treatment goal weight, and approaches to refeeding and managing low bone mass. The role of the medical provider in family-based therapy (FBT) is also reviewed.

**Diagnostic Criteria**

The newly published Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) is intended to improve clinical utility and includes several changes to better represent disturbances in eating across the life course [1]. Modifications to the diagnostic criteria for anorexia nervosa (AN) include removal of a numeric cutoff for low weight; reliance on behavioral manifestations in addition to cognitive symptoms; and elimination of amenorrhea as a criterion necessary for the diagnosis. Although there is less emphasis on a specific weight cutoff, DSM-5 recommends less than the fifth percentile body mass index (BMI)—for-age as suggestive of low weight. The criteria for bulimia nervosa (BN) include binging and compensatory behaviors once weekly for the past 3 months. Because the revised diagnostic criteria for AN and BN are more inclusive, application of DSM-5 criteria leads to a modest increase in both AN and BN. It also captures a significant number of young people who meet criteria for a new diagnostic category called Avoidant/Restrictive Food Intake Disorder (ARFID) [2–4]. Patients with ARFID do not have weight or shape concerns but restrict their dietary intake because of concerns about taste, texture, color, or smell or may not eat because of fear of swallowing or vomiting. As a result, they do not meet appropriate nutritional and/or energy needs [1]. Another new category called atypical AN describes patients who have lost significant amounts of weight and have other diagnostic features of AN but are not underweight. Binge eating disorder (BED) is officially recognized with similar binge criteria to BN but no compensatory behaviors. Eating Disorder Not Otherwise Specified is no longer a diagnostic category in DSM-5.

**Epidemiology**

Although eating disorders have historically been considered diseases of affluent, Caucasian adolescent females, the epidemiology has been slowly changing over the past few decades. Increased prevalence rates have been found in males and ethnic/racial minorities [5–8], as well as in countries where eating disorders were not previously reported [9–13]. Population prevalence of eating disorders using DSM-5 criteria is not yet available. Using DSM-IV criteria for AN, adolescent females have a lifetime prevalence of .3%–.6%. In clinical samples, increasing prevalence of AN is found in males, but there is little population prevalence data [2,14,15]. A greater proportion of males among younger patients with restrictive eating disorders is found [16–18]. Although incidence rates of AN have largely been stable, there has been a notable increase in incidence in 15- to 19-year-old females [19]. The prevalence of BN in adolescents is approximately 1%–2% for females and .5% for males [2,15]. Although the age of onset of eating disorders has typically occurred during mid- to late adolescence, the age of onset of both AN and BN has been decreasing [19,20] with a significant percentage now presenting at less than 12 years old [16,21]. In the general population, the prevalence of ARFID or atypical AN is not known. Of patients referred to pediatric tertiary care eating disorders programs, 5%–23% meet criteria for ARFID [4,22–25]. Compared with adolescents with other forms of restrictive eating disorders, adolescents with ARFID are more likely to be male and younger [23–25]. Similarly, recent studies have demonstrated that a quarter to one third of new patients presenting for eating disorder treatment at adolescent medicine clinics would be diagnosed with atypical AN [4,25], and an increase in the proportion with atypical AN has been reported in a tertiary care service for adolescents admitted with eating disorders [26].

Onset of BED occurs in late adolescence or young adulthood. In a large cohort of adolescents and young adults aged 16–24 years, binge eating was identified in 2.3%–3.1% of females and .3%–1.0% of males and was associated with the development of obesity [27]. These findings are similar to population prevalence data showing the female preponderance and the association with obesity. In adults, the prevalence of BED is higher than that of either AN or BN [28].

**Role of the Medical Provider at Each Level of Care**

### Initial assessment

Adolescents with a suspected eating disorder often first present to the medical provider, who plays a crucial role in early identification, diagnosis and management. Timely intervention is important because shorter duration of illness is associated with improved outcome [29]. Initial evaluation includes making a diagnosis; assessing nutritional and psychosocial status; evaluating the acute medical complications; and determining the degree of malnutrition. The medical provider needs to identify abnormal eating attitudes and behaviors (including dieting, fasting, excessive exercising, binging, vomiting, and using laxatives, diuretics, and over-the-counter or prescription “diet” pills), and recognize aberrations in weight (loss, fluctuation, or failure to gain), height, and sexual development. Other medical and psychiatric conditions that could account for the presenting symptoms should be considered.

### Assessment of the degree of malnutrition

Height and weight should be measured and BMI calculated (weight in kg divided by height in m²) and plotted on growth charts. In the United States, the Centers for Disease Control and Prevention (CDC) recommend using the 2000 CDC growth charts (www.cdc.gov/growthcharts) to compare anthropometric variables to the reference population; the American Society for Parenteral and Enteral Nutrition endorses this recommendation for children and adolescents aged 2–20 years. These charts provide graphs and tables of weight-for-age, height-for-age, and BMI-for-age but not weight-for-height and age. Other countries use World Health Organization growth charts [30] or nationally derived population norms. Growth charts should be obtained and reviewed to assess current height, weight, and BMI percentiles in the context of earlier growth patterns. Percent median BMI can be calculated (current BMI/50th percentile BMI for age and sex × 100) to compare the patient’s BMI to that of the reference population [31]. The American Academy of Pediatrics, the American Society for Parenteral and Enteral Nutrition, and the Academy of Nutrition and Dietetics propose utilizing a combination of percent median BMI, z scores, and percent weight loss to classify the
degree of malnutrition [32–34]. A suggested adaptation of existing classifications for use in adolescents and young adults with eating disorders is shown in Table 1 [35]. The limitations of classifying malnutrition on the basis of body weight is underscored by evidence that adolescents admitted with restrictive eating disorders who are not underweight (atypical AN) experience the same profile of life-threatening complications as adolescents with AN [26,36].

Ongoing management

Effective treatment of eating disorders optimally considers different levels of care suited to individual patient needs. The medical provider can help determine the appropriate level of care, establish the treating team, and perform regular medical monitoring at each level of care.

Outpatient management. Most adolescents can be managed as outpatients with ongoing medical assessment and monitoring. FBT is an outpatient-based intervention that has the strongest evidence of effect in adolescents with AN [37,38]. It can also be an effective option for some young adults with AN living at home and some adolescents with BN [39–41]. FBT is based on the principle that parental involvement in treatment is vital to therapeutic success and that mobilizing and empowering parental strengths is central to changing the behaviors of adolescents with eating disorders. In FBT, parents take on a critical role in ensuring early and lasting weight restoration for those patients who are underweight and stabilization of eating behaviors in normal and overweight individuals with eating disorders. FBT is structured into three phases with distinct goals: (1) phase 1 focuses on restoring the patient’s weight; (2) phase 2 returns control over eating back to the adolescent; and (3) phase 3 addresses adolescent development and treatment termination.

Over the course of FBT, the medical provider’s role is primarily to monitor and manage the medical status of the adolescent and to take a lead role in communicating with the patient, family, and primary therapist about the physical findings [42]. As the adolescent moves through the three phases of FBT, less frequent medical monitoring is required.

Inpatient medical treatment. Indications supporting hospitalization of adolescents with eating disorders are summarized in Table 2 [43–45]. The definitions of hypotension and orthostatic hypotension have been updated from an earlier Society for Adolescent Health and Medicine position paper [43] to better reflect blood pressure cutoffs in older adolescents as opposed to younger patients, to be consistent with recommendations from other organizations [44,45], and to incorporate updated definitions of orthostatic hypotension [46]. Occasionally the seriousness of a single parameter will indicate the need for admission (e.g., severe bradycardia). More commonly, decisions about admission are on the basis of a comprehensive clinical assessment that takes into account the seriousness of the patient’s physical and emotional health, the rapidity of weight loss, available outpatient resources, and family circumstances in the context of previous or current management approaches.

Hospitalization of adolescents with eating disorders requires access to an experienced medical, nutrition, mental health, and nursing team, standardized refeeding protocols, and cardiac monitoring. The primary goal of medical hospitalization is to safely restore physiological stability through nutritional rehabilitation. This process should be approached with caution as it can result in the refeeding syndrome, characterized by a variety of metabolic and clinical features, including but not limited to hypophosphatemia, cardiac arrest, and delirium [47–49]. Consensus-based recommendations have previously advised that nutritional rehabilitation should “start low and go slow,” often starting at 600–1,200 kcals/d and advancing by 200 kcals/d [45,50,51]. This approach has been linked to the “underfeeding syndrome”, characterized by poor weight gain, prolonged illness, and in some cases even death [52]. Recent research supports initiating higher caloric prescription on admission to the hospital, starting patients on 1,400–2,000 kcals/d with close medical monitoring [53–59]. These studies indicate that such practices shorten hospital stay [54,55] and increase the rate of weight gain [54,56] without increasing the rate of refeeding syndrome [54,55,57–59].

Rates of refeeding hypophosphatemia, the hallmark biochemical feature of refeeding syndrome, range from 0%–38% [54–58,60,61] reflecting differences in refeeding practices, phosphate supplementation protocols, and the phosphate level considered to constitute hypophosphatemia [62]. Refeeding hypophosphatemia is correlated with the degree of malnutrition on admission rather than the initial calories prescribed in

<table>
<thead>
<tr>
<th>Table 1</th>
<th>A proposed classification of the degree of malnutrition for adolescents with eating disorders [35]</th>
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<tbody>
<tr>
<td>Mild</td>
<td>Moderate</td>
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<tr>
<td>% median BMI</td>
<td>80%–90%</td>
</tr>
<tr>
<td>BMI z score</td>
<td>–1 to –1.9</td>
</tr>
<tr>
<td>Weight loss</td>
<td>&gt;10% body mass loss</td>
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BMI = body mass index.
One or more of the above mentioned classification would suggest mild, moderate, or severe malnutrition.

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<tr>
<th>Table 2</th>
<th>Indications supporting hospitalization in an adolescent with an eating disorder</th>
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<tbody>
<tr>
<td>One or more of the following justify hospitalization:</td>
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<tr>
<td>1. ≤75% median body mass index for age and sex</td>
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<tr>
<td>2. Dehydration</td>
<td></td>
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<tr>
<td>3. Electrolyte disturbance (hypokalemia, hyponatremia, and hypophosphatemia)</td>
<td></td>
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<td>4. EKG abnormalities (e.g., prolonged QTc or severe bradycardia)</td>
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<tr>
<td>5. Physiological instability</td>
<td></td>
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<tr>
<td>• Severe bradycardia (heart rate &lt;50 beats/minute at daytime; &lt;45 beats/minute at night)</td>
<td></td>
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<tr>
<td>• Hypotension (&lt;90/45 mm Hg)</td>
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<tr>
<td>• Hypothermia (body temperature &lt;96°F, 35.6°C)</td>
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<tr>
<td>• Orthostatic increase in pulse (&gt;20 beats per minute) or decrease in blood pressure (&lt;20 mm Hg systolic or &gt;10 mm Hg diastolic)</td>
<td></td>
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<tr>
<td>6. Arrested growth and development</td>
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<td>7. Failure of outpatient treatment</td>
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<tr>
<td>8. Acute food refusal</td>
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<tr>
<td>9. Uncontrollable binging and purging</td>
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<tr>
<td>10. Acute medical complications of malnutrition (e.g., syncope, seizures, cardiac failure, pancreatitis, etc.)</td>
<td></td>
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<tr>
<td>11. Comorbid psychiatric or medical condition that prohibits or limits appropriate outpatient treatment (e.g., severe depression, suicidal ideation, obsessive compulsive disorder, type 1 diabetes mellitus)</td>
<td></td>
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</tbody>
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EKG = electrocardiogram; QTc = Corrected QT interval.
hospitalized adolescents with AN [55,57,61,63]. The optimal starting caloric prescription or rate of advancement of calories to maximize nutritional rehabilitation without increasing risks for the refeeding syndrome is not known, especially in the most severely malnourished patients.

Weight gain of 1–2 kg/week normalizes cardiovascular instability [64], but the time required for all physiological parameters to normalize is highly variable. Treatment outcomes are at least as good for adolescents admitted with AN if they have a short admission for medical stabilization compared with a longer admission for weight restoration, if they are able to be treated with FBT by an experienced team after hospitalization [65].

Residential and partial hospitalization programs. Residential treatment provides intensive treatment in a facility where patients live outside their homes and receive full-time supervision and therapy in a structured environment. In partial hospitalization programs (PHPs) (sometimes called day treatment programs), patients reside at home (or in a residence outside the hospital), but commute to the treatment center from a few days to as many as seven days a week. One study from Germany found that a PHP after a short inpatient psychiatric stay was equivalent to a more prolonged inpatient psychiatric stay with respect to weight restoration in adolescents with AN [66]. Intensive outpatient programs (IOPs) provide structured programming at least three times a week for 1–3 hours of treatment a day. Adolescents in residential, PHP, or IOP treatment require regular medical monitoring and may require inpatient care in the face of medical or psychiatric instability. Further studies are needed to determine the effectiveness of partial programs (PHPs and IOPs) in comparison to treatments provided in other levels of care.

Treatment Goal Weight

A healthy weight supports the normal physiology of adolescence, including puberty, growth and development, and physical activity and is also associated with improved psychological functioning. For adolescents, determination of an individual’s treatment goal weight range should take into account the premorbid trajectory for height, weight, and BMI, age at pubertal onset, and current pubertal stage. A two-step process is helpful as follows: (1) determination of the degree of malnutrition compared with the current pubertal stage. A two-step process is helpful as follows: (1) trajectory for height, weight, and BMI, age at pubertal onset, and activity and is also associated with improved psychological functions and treatment in a structured environment. In partial hospitalization programs (PHPs) (sometimes called day treatment programs), patients reside at home (or in a residence outside the hospital), but commute to the treatment center from a few days to as many as seven days a week. One study from Germany found that a PHP after a short inpatient psychiatric stay was equivalent to a more prolonged inpatient psychiatric stay with respect to weight restoration in adolescents with AN [66]. Intensive outpatient programs (IOPs) provide structured programming at least three times a week for 1–3 hours of treatment a day. Adolescents in residential, PHP, or IOP treatment require regular medical monitoring and may require inpatient care in the face of medical or psychiatric instability. Further studies are needed to determine the effectiveness of partial programs (PHPs and IOPs) in comparison to treatments provided in other levels of care.

Management of Low Bone Mineral Density

Failure to achieve peak bone mass during adolescence, the period during which 40%–60% of peak bone mass is normally accrued [67], may have long-lasting implications. AN is associated with low bone mineral density (BMD) for age in both females and in males [68–74]. Contributing factors include low body weight, hormonal alterations including hypogonadism, low insulin-like growth factor–1 (IGF-1) levels, hypercortisolism, and deficiencies of nutrients including protein, calcium, and vitamin D. Patients with BN may also have reductions in BMD, especially if they were previously amenorrheic or low weight [75]. A history of AN results in a 2- to 3-fold increased fracture risk in adults [76,77], and the risk of fracture during childhood and adolescence is significantly higher in patients with AN than in age-matched controls [78]. The optimal management of low BMD in adolescents with eating disorders is unresolved. Weight gain and spontaneous resumption of menses is associated with partial recovery but BMD may not normalize [71,79,80]. Weight gain without resumption of menses is not accompanied by significant increases in BMD [81]. Although calcium and vitamin D supplementation increase BMD in the short term in healthy adolescents, no randomized controlled trials have been done in AN [82,83]. Oral estrogen–progestin has not been found to effectively increase BMD in AN [71,84–86]. One study found that physiologic doses of transdermal estrogen increased spine and hip BMD compared to controls [87]. Although bisphosphonates have been found to increase BMD in adolescents and young adults with AN, the effect is modest and their use is not recommended [88,89]. Adolescents with eating disorders should have serum 25-hydroxy vitamin D tested; levels <30 ng/mL (75 nmol/L) should be treated with vitamin D 50,000 IU weekly or 2,000 IU daily for 6–8 weeks [90]. Current recommendations for low BMD in AN include weight restoration with resumption of spontaneous menses, optimal calcium (1,300 mg/day of elemental calcium) and vitamin D (600 IU units/day) intake, and treatment of vitamin D deficiency. Given the increased fracture risk, dual-energy X-ray absorptiometry scans should be obtained when amenorrhea is present for 6 months or more [90,91].

Summary

Eating disorders are serious health problem for adolescents. Recent research has yielded important new knowledge with respect to revisions to the diagnostic criteria, assessment of malnutrition, indications for hospitalization, approaches to weight restoration, determination of treatment goal weight, initiation of FBT, and the management of low BMD. As the medical provider plays a critical role in the diagnosis, assessment, and management of the adolescent with an eating disorder, awareness of these advances is the first step to being able to provide evidence-based treatment for adolescent with eating disorders.

References


