Prevention and management of childhood obesity in the primary care setting

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INTRODUCTION

Prevention and treatment of overweight and obesity in children in the primary care setting focuses on modifying behaviors that lead to excessive energy intake and insufficient energy expenditure [1-5]. Guidance on cardiovascular health (rather than obesity per se) recommends similar health behaviors, with a slightly different perspective. (See "Pediatric prevention of adult cardiovascular disease: Promoting a healthy lifestyle and identifying at-risk children".)

This topic review addresses interventions to prevent and treat childhood obesity in the primary care setting, including an outline of practical approaches to incorporating them into a primary care practice, reflecting the author's experience. Related content on childhood obesity can be found in the following topic reviews:

- (See "Definition, epidemiology, and etiology of obesity in children and adolescents".)
- (See "Clinical evaluation of the child or adolescent with obesity".)
- (See "Overview of the health consequences of obesity in children and adolescents".)
- (See "Surgical management of severe obesity in adolescents".)

GENERAL APPROACH TO HEALTH BEHAVIOR AND LIFESTYLE COUNSELING

Overview — Obesity, which arises from a complicated mix of genetics, biology, and environment, leads to serious health problems. Children ≥2 years with excessive weight gain (body mass index [BMI] ≥85th percentile or rising sharply) warrant additional steps to monitor growth and potential obesity-related comorbidities and encourage healthy lifestyle behaviors (algorithm 1). (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Environmental factors'.)

For children with overweight or obesity, the American Academy of Pediatrics suggests early treatment using the highest level of intensity that is appropriate for and available to the child, rather than watchful waiting [5]. A practical application of this guidance is to tailor the intensity of treatment to the individual child and family, based on level of concern (severity of obesity and BMI trend), priorities of the family, and available local resources.

Intensive treatment is particularly important for children ≥6 years old with severe obesity or concerning trends. A referral to a specialized medical weight management program for children is helpful, but when these programs are not feasible or available, a primary care practice can offer appropriate services by collaborating with a registered dietitian and/or behavioral specialist and using community resources for nutrition (eg, food assistance) and physical activity (eg, sports and recreation programs).

The primary care clinician has a key role in managing childhood obesity, including prevention, diagnosis, monitoring, initiating lifestyle change, and supporting families in all appropriate and available treatment options. The discussion below provides ideas for how health behavior and lifestyle treatment can be implemented in a primary care setting.

Strategies for counseling about weight management — Counseling about weight and related habits should be supportive rather than blaming (table 1), collaborative rather than prescriptive, focused on long-term behavior change rather than short-term diet and exercise prescriptions, and involve the entire family rather than on the child alone.

Discussing weight — Many families with obesity are sensitive about discussing the issue, reflecting widespread cultural bias including within the medical community [6-8]. Individuals with obesity have often absorbed the bias themselves, leading to self-criticism, low self-esteem, and hopelessness; these feelings are often barriers to behavior change.

To form a therapeutic alliance and engage the family in addressing weight-related behaviors, the clinician should carefully avoid a blaming approach. This might include discussing weight in a "matter of fact" manner but focusing on health rather than weight or appearance. By using sensitive language (as outlined in the table (table 1)), the clinician demonstrates to the child

and family that their office is a place of support, not judgment, which is essential to engaging them in behavior change [7]. As examples:

- We initiate the discussion of weight management by acknowledging that some individuals gain weight more easily than others, in recognition of the role of genetics, epigenetics, physiology, and environment. It may be helpful to acknowledge the societal and environmental factors that promote weight gain, such as readily available energy-dense foods and mechanized transportation. These messages avoid blaming a patient or family with obesity, while still strongly encouraging them to invest in lifestyle change.

- We generally use neutral words like "excess weight" or "body mass index" because these terms are perceived by parents as less stigmatizing and more motivating than the terms "obese," "fat," or "chubby" [7,9]. We avoid discussing an "ideal weight" for the child, both because this is a moving target for a growing child but also because choosing a target ideal weight is often unrealistic and leads to discouragement.

- We choose terms that focus on health and function rather than appearance. We advise parents to also not comment on body size or weight, but instead use positive comments on healthy eating habits and goals to build the child's self-confidence. For children who already have overweight or obesity, we discuss the goal of "growing into a healthy body weight" and being "strong and healthy."

Approaches will vary from child to child and should take into account the child's age, maturity, and overall developmental stage. The clinician may choose to discuss the topic initially with the parent, without the child present. This is especially important if the child has experienced weight-related teasing from peers or if there is a concern that the child might misinterpret the discussion. In our practice, for children 8 to 12 years of age, we often talk in general terms with the child about health, linking the discussion to the importance of healthy habits. More frank discussions are typically held with the parent alone to prevent misunderstanding on the side of the child. For adolescents, if time permits, having separate discussions with similar content with the patient and parent can support the adolescent's desire for autonomy while including the family for support.

Understanding the family context

- **Economic and cultural considerations** – Economic or cultural factors may limit a family's ability or readiness to make changes in diet or physical activity [2]. Providers should share options with families and help them decide when to begin the change process and the intensity with which they are ready to pursue weight management. To initiate the discussion, the following factors should be assessed in selected patients:

- Economic and work schedule challenges – Ask about food insecurity (eg, whether they sometimes run out of money for food); the family's living conditions (eg, whether there is a working stove and/or refrigerator); access to income assistance such as food stamps; and whether/which caregivers are available to help plan, prepare, and supervise the child's meals.

- Cultural factors – Ask the parent(s)/caregiver(s) and child what they think of the child's weight. Misperception of the child's weight status, such as a cultural preference for overweight in children, may affect a family's ability to effectively address the problem. Conversely, excessive anxiety about the child's weight status also can interfere with effective management. To address this issue, it is important to explore reasons for the anxiety in the parent or child. As examples, a caregiver may have excessive anxiety about the child's weight if they overestimate the child's risk for future obesity, if they have experienced weight-related bias, or if they have a personal history of disordered eating.

- **Family's role**

  - **Rationale for family involvement** – Use family-based behavioral approaches to pediatric obesity treatment, incorporating at least one of the child's primary parents or caregivers [5,10]. Multiple studies demonstrate that having parents/caregivers involved is more effective for long-term weight management than targeting only the referred child without parental participation [11-15]. Indeed, some effective interventions for young children have targeted the parent/caregiver alone [16-19]. (See 'Treatment interventions' below.)

  - **Role of parenting style** – Asking a few probing questions to assess how parents handle common mealtime situations and conflicts can identify these patterns and provide opportunities for further discussion and education.

    Authoritarian parenting and feeding styles are associated with childhood obesity [20]. In this feeding style, the parent or caregiver exerts high levels of control over the child's eating. Examples of this parenting style include:

    - Exerting inappropriate pressure on the child to eat more of a certain food (typically, foods that are less desired by the child or considered "healthy" by the parent).

    - Attempting to restrict the amount or access to other foods (typically, foods that are more desired by the child or considered "unhealthy" by the parent).

- Insisting that the child finish all food on their plate, negotiating vegetable intake (must finish for dessert, no second helpings of other foods until vegetables eaten), or strictly limiting portion sizes and servings.

- **Family strategies to protect against disordered eating** – Obesity and eating disorders in adolescents have overlapping risk factors. To help address both issues and promote a healthy body image, clinicians can counsel the family to:

  - Discourage unhealthy weight control behaviors, such as dieting (ie, caloric restriction with a goal of weight loss) and skipping meals.

  - Encourage the child to adopt healthy behaviors, but avoid exerting excessive pressure. (See 'Behavioral strategies' below.)

  - Avoid blaming the child for their weight problem, and never tease about their weight or appetite. Address any bullying or teasing that occurs at school or within the community or family.

  - Avoid conversation that focuses on weight or weight-related appearance ("weight talk"), even if the comments are phrased as compliments or are focused on individuals other than the child, including the parents themselves. Weight talk by family members has been associated with subsequent weight gain, lower self-esteem, and eating disorders [10,21-23]. Similarly, avoid conversation that focuses on body dissatisfaction, media portrayals of bodies (which are often unrealistic), and dieting due to body dissatisfaction.

  - Instead, focus conversation on healthy choices and healthy eating behaviors rather than dieting [24]. Family conversation that focuses on healthful eating behaviors rather than dieting is not associated with eating disorders [25].

  - Encourage eating meals as a family when possible, and especially avoid conversation that is critical or focused on dieting during the meals.

Patient- and family-centered communication — Motivational interviewing is a collaborative patient-centered counseling technique that has been effectively adapted for weight management [2,10,26-29]. The technique addresses a patient's ambivalence to change and focuses on their own values as a means to resolve that ambivalence [30]. The clinician employs reflective listening to encourage patients to identify their own reasons for making a behavior change, as well as their own solutions. The tone of motivational interviewing is nonjudgmental, empathetic, and encouraging [26,30]. Practical tools are available to help clinicians learn and

apply motivational interviewing in clinical practice. (See 'Motivational approaches and training' below.)

To apply these techniques to weight management, clinicians should help the family focus on specific and achievable behavioral goals, which usually means selecting a few specific behaviors related to weight management and overall health and not goals for weight loss itself. Because the family and patient help to choose goals, they are more likely to be invested in the process and have confidence in their ability to change the behaviors, which greatly enhances the chance of success. A clinician using a motivational interviewing approach engages the family in a conversation to select specific behaviors to change, rather than dictates goals to the family [29]. The child should be directly involved in decision-making, as appropriate fo their age and with reasonable limits and expectations. For example, the child can participate in meal planning, but with proper limits, such as allowing them to help choose meals or recipes but within healthy bounds (eg, the child can choose a favorite vegetable or fruit as a side dish but not candy).

The efficacy of motivational interviewing in weight management was summarized in a systematic review of six randomized trials that found an overall beneficial effect of motivational interviewing on anthropometric outcomes [31].

Several approaches can be used to evaluate a patient's or family's readiness to change (or stage of change) [32], including global assessment through interviewing questions or use of a numerical or visual analog scale (eg, "On a scale of 1 to 10, how ready are you to consider making this change [to diet or exercise]?"). This assessment may help a patient and clinician recognize ambivalence, which is an important step in changing behaviors.

Motivational approaches and training — Recommended approaches to weight management counseling include:

- Use a nonjudgmental, empathetic, and encouraging tone, using preferred terms for discussing weight (most patients prefer terms such as "unhealthy weight" or "weight problem" rather than "obesity" (table 1)) [26]. (See 'Discussing weight' above.)
- Focus the intervention on modifying lifestyle habits of the entire family rather than the child alone [33,34].
- Eliciting the child's and family's motivations for change and what potentials goals may be, using open-ended questions and reflective listening. The conversation is then tailored to the family's level of readiness (stage of change). (See 'Patient- and family-centered communication' above.)

- Avoid using scare tactics (ie, conversation that emphasizes specific dire, long-term risks or discussion of invasive procedures used to assess comorbid conditions). Scare tactics may garner short-term attention but are rarely effective in achieving long-term change [35]. Although scare tactics are not recommended, health risks can and should be discussed in a balanced and realistic way.

Change Talk: Childhood Obesity is a brief self-guided course for clinicians to develop skills in motivational interviewing, available free of charge (browser or smartphone app) [36,37]. A conversation guide that uses motivational techniques is available from Maine Health [38].

Behavioral strategies — Nutrition and physical activity should be thought of as habitual behaviors, and weight loss counseling should focus on long-term behavior change rather than short-term weight loss. The best-established techniques used for pediatric obesity treatment use a behavioral change model rather than simply providing patients with education on obesity-related health risks, nutrition, and physical activity. Behavioral change counseling includes the following elements [2,5,33,34,39,40]:

- **Monitoring** of target behaviors (logs of food, activity, or other behaviors, recorded by the patient or family). This process allows the patient and family to recognize which behaviors may be contributing to weight gain. Clinician feedback throughout the self-monitoring process is essential to behavior change. A patient's food log may also identify other contributors to eating behaviors, such as mealtime environment, boredom, and level of hunger, all of which can be valuable in the evaluation of stimulus control.

- **Stimulus control** to reduce environmental cues that contribute to unhealthy behaviors. This includes reducing access to unhealthy behaviors (eg, removing some categories of food from the house or removing a television from the bedroom) and also efforts to establish new, healthier daily routines (such as making fruits and vegetables more accessible).

- **Goal-setting** for healthy behaviors rather than weight goals. Goal-setting is widely used for prompting behavior change. However, the process can be detrimental if goals are not realistic and maintainable. Appropriate goals are identified by the acronym "SMART," where goals should be should **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, and **T**imely.

- **Contracting** for selected nutrition or activity goals. Contracting is the explicit agreement to give a reward for the achievement of a specific goal. This helps children focus on specific behaviors and provides structure and incentives to their goal-setting process.

- **Positive reinforcement** of target behaviors. Positive reinforcement can be in the form of praise for healthy behaviors or in the form of rewards for achieving specific behavior goals (not weight goals). The reward should be negotiated by the parent and the child, ideally facilitated by the provider to ensure that the rewards are appropriate. For young children, specific behaviors can be rewarded by awarding tokens or recording stars in a log. When the child earns a certain number of tokens or stars, they receive a concrete reward. Rewards should be small activities or privileges that the child can participate in frequently rather than monetary incentives or toys; food should not be used as a reward.

Materials and resources — Several groups have developed messaging to support this type of brief clinical intervention, as outlined above. Materials to support patient education and practice process improvement are available at each of the following websites:

- Centers for Disease Control and Prevention-recognized family healthy weight programs – These evidence-based programs have curriculum and training for intensive health behavior and lifestyle intervention programs [41]. Some of these programs are delivered in community settings, and others could be adopted by practices. Though not broadly disseminated, providers can check for local availability and offer to eligible families.

- Let's Go! (MaineHealth) – MaineHealth provides an example of a coordinated intervention that has been implemented in primary care practices across the state of Maine, using common approaches and messaging. The Health Care Tool Kit includes extensive materials for patient education and improvement of practice processes and is available to download free of charge or can be ordered in hard copy from the website. Outcomes analysis suggest substantial increases in clinician support for several obesity-related interventions and improvements in adherence to healthy behaviors as reported by parents, although mean BMI Z-score was not affected [42-44]. The office-based initiative is closely integrated with initiatives in schools, afterschool programs, and communities and is supported by community partners.

- American Academy of Pediatrics – Numerous tools for clinical practices including a Clinical Practice Guideline and other resources for patients and families and for professional education [45].

- MyPlate (United States Department of Agriculture) – Information for patients and families based on government guidelines, replacing the previous food guide pyramid.

Office systems — The following office systems may facilitate a positive experience for families with obesity and efficient counseling:

- Office setup – Whenever possible, practices should have appropriate equipment to provide medical care to patients with obesity. This includes a wide range of blood pressure cuffs (including a "large adult" size) to ensure accurate measurements and high-capacity scales (ideally up to 500 or 1000 lbs). In addition, it is helpful to have office furniture that is appropriate for large patients and their families, including sturdy armless chairs and lower examination tables.

- Staff training – Training of office staff in sensitive approaches to weighing patients and how to handle discussions that may arise between children and parents regarding weight.

- Materials for patient education – Having educational materials readily available in the office improves efficiency and communication. In our practice, we have posters with health-related messages on the wall of each clinic room alongside related educational handouts. (See 'Materials and resources' above.)

- Community resources – To assist families in developing an action plan, the practice can collect and distribute information about resources in the local community, including options for physical activity, active afterschool programs, nutrition counseling services, and sources of healthy food (eg, local sources of fresh produce). Recommendations are most valuable if the provider reviews or becomes familiar with these local resources, such as a gym with adolescent- or child-focused activities or community centers with pediatric- or family-focused weight management classes.

EVIDENCE SUPPORTING HEALTH BEHAVIOR AND LIFESTYLE INTERVENTIONS

A preponderance of evidence suggests that routine assessments and counseling interventions are somewhat effective for preventing and treating obesity in children [5,46-50]. The efficacy varies widely among patients, likely depending on readiness/motivation, patient age, and sociocultural and economic barriers, as well as genetic or other fixed factors that contribute to obesity.

Treatment interventions — Available evidence suggests that the following factors are important determinants of efficacy:

- **Early intervention** – Several lines of evidence suggest that intervention during early or mid-childhood is often beneficial and may be more effective than intervention during adolescence [29,51-53]. This includes several randomized studies of treatment interventions in younger age groups (toddler, preschool, and school-age) that reported improvements in weight status [18,54,55]. In a study from Sweden, a behavioral

intervention encouraging healthy food choices and increased physical activity was more successful for young children than for adolescents [56,57]. Moreover, in the United States, low-income, preschool-aged children who participated in a comprehensive intervention that included educational enrichment on health and nutrition, family support, health resources, and community outreach services were less likely to have obesity as adults compared with a matched control group (any obesity 43 versus 48 percent, moderate or severe obesity 19 versus 23 percent) [58]. Other studies in these younger age groups did not see significant improvements in weight but did so in other obesity-related behaviors (ie, television viewing) [59-61]. There is some evidence that use of motivational interviewing in lower-intensity interventions can have durable beneficial effects [62,63], with up to two years of follow-up [62].

- **Longitudinal care** – Studies of obesity treatment during childhood with long-term follow-up usually report waning efficacy after completion of the intervention [29]. Obesity is a chronic disease, driven by ongoing heritable, environmental, and social risk factors. Accordingly, guidelines call for ongoing intervention and support throughout the lifespan, tailored to the individual's needs and weight-gaining trajectory [5].

- **Higher intensity of intervention** – Most available data suggest that substantial hours of lifestyle and behavior treatment contact are necessary to improve a child's weight status. As an example, systematic reviews concluded that behavioral interventions of moderate or high intensity (defined as 26 to 75 hours or >75 hours of provider contact, respectively) are effective in achieving short-term (up to 12 months) weight improvements in children [5,28,64,65]. Interventions at this level of intensity are usually impractical for use in a primary care setting, unless ample services from dietitians or other specialized counselors are readily available and funded.

  Low-intensity interventions (less than 25 hours of provider contact, typically spread over three to six months) are feasible in a primary care setting, although there is a limited evidence base to support their efficacy. Clinical trials suggest that these low-intensity interventions for treatment of childhood obesity generally have weak or inconsistent effects [47-49,65-67]. However, one randomized study of a guided self-help intervention reported modest but significant benefits on obesity at six months follow-up [68]. The program consisted of a one-hour orientation followed by 13 20-minute follow-up sessions (total of 5.3 hours of provider contact) and home use of a self-help manual that included topics such as the traffic light eating plan, stimulus control, physical activities, motivation, social support, and relapse prevention. Compared with a more intensive family-based

behavioral treatment program, guided self-help had similar effects on obesity but lower attrition from the program.

It is likely that low-intensity interventions may have important effects on obesity and health behaviors in some patients, even if they have little or no measurable effect on the study population as a whole. Moreover, meta-analyses suggest that lifestyle interventions to prevent and treat obesity in children are generally effective, even if some of the included studies are too small to show statistically significant changes in weight status [46,69]. (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Environmental factors'.)

- **Multicomponent interventions** – A wide spectrum of interventions have been trialed. Systematic analysis suggests that multicomponent interventions that target diet, physical activity, and behavior change are most likely to be effective [5,47-49].

- **Family involvement** – Involvement of parent(s) or primary caregivers is more effective for long-term weight management than targeting only the referred child without parental participation [11-15]. Indeed, some effective interventions for young children have targeted the parent/caregiver alone [16-19].

  Implementation and efficacy of family-based treatment in a primary care setting was evaluated in a randomized trial of 452 children aged 6 to 12 years with overweight or obesity (mean body mass index [BMI] percentile 97.3) [15]. The intervention consisted of diet, activity, and behavior change guidance delivered by a health coach in approximately 30 sessions over two years, compared with usual care. Longitudinal analysis revealed modest benefits on weight outcomes for children that were sustained during the two-year intervention, with minor benefits for parents and siblings. At the end of the intervention, the between-group difference in percentage above median BMI was -6.21 percent (95% CI -10.14 to -2.29), which is a smaller treatment effect than in similar trials performed in a specialty clinic setting and of borderline clinical significance. Nonetheless, the study provides proof of concept for a family-based intervention implemented by behaviorally trained coaches embedded in a primary care practice.

A primary care setting is well suited for most of these factors.

Prevention interventions — A meta-analysis reported that prevention interventions resulted in a modest mean reduction in adiposity compared with control groups [46]. As an example, physical activity interventions in children 6 to 12 years of age resulted in a mean difference in BMI of -0.1 kg/m^2 (95% CI -0.14 to -0.05). While the effect on mean BMI is small, some individuals will experience substantially greater benefits from this type of intervention and a

small change represents a clinically important difference across a population. The best supported strategies were interventions focusing on both diet and physical activity for preschool-aged children and physical activity with or without diet in school-aged children or adolescents. Because the intervention strategies and results varied widely among the included studies, the effect of each intervention component is not clear.

Accordingly, guidelines and policy statements in the United States have advocated for improvements in nutrition quality for children, including [70,71]:

- Consumption of a diverse, nutrient-dense diet and emphasizing vegetables, fruits, and whole grains
- Quality protein sources (ie, rich in protein and relatively low in fat, sodium, and added sugars) and low-fat or nonfat milk and dairy
- Limited intake of sugar-sweetened beverages
- Modest fat content
- Moderate portion sizes for age

Medical societies in the United States and Europe have issued policy statements discouraging access to sugar-sweetened beverages in schools and homes and encouraging clinicians to advocate for these goals [72,73]. In the United States, the nutrition quality of school meals has improved substantially over the past two decades, and these changes are associated with decreases in BMI among school-aged children [74,75]. National and international guidelines recommend specific targets for moderate to vigorous physical activity (generally >60 minutes daily for children and adolescents) and limiting sedentary activity behaviors [76-78]. In most countries, activity levels in youth are well below these targets [78].

Worldwide, many regions and countries have addressed childhood obesity through educational interventions, local programs, and/or legislation. An implementation plan with six key areas of action has been outlined in a report from the World Health Organization [79]. (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Trends'.)

PREVENTION

Preventing obesity in children should be a focus of preventive health care for all children. Each visit for well-child care should include routine monitoring, brief prevention counseling, and troubleshooting problems (algorithm 1). Key steps are:

Routine monitoring

- Measure body mass index (BMI), and plot results on a BMI chart to track changes over time [80-82]. BMI percentiles can be determined from a standard BMI-for-age growth chart (figure 1A-B) and are used to categorize weight status (table 2).

- Monitor risk factors for excessive weight gain, including:

  - Weight status and weight-related conditions in parents and other close family members (noting whether the relationship is biologic and whether they are a household member)

  - Dietary habits that promote weight gain

  - Physical and sedentary activity habits (time spent in sedentary activities, active play, and sports)

  - Sleep habits (typical sleep duration and sleep quality)

Counseling — Assess these key modifiable behaviors that contribute to weight gain, and provide counseling to parents or caregivers [2,83,84]:

- Family eating environment – Establish a healthy feeding relationship for young children; emphasize family-based meals starting by age two years. (See "Introducing solid foods and vitamin and mineral supplementation during infancy", section on 'Feeding environment'.)

- Healthy dietary habits – Encourage a diverse diet and meal-based eating; encourage the family to eat together as often as possible and to focus on foods with high nutritional value. Identify and address common obstacles to healthy eating, including frequent snacking, picky eating, and modeling of less healthy habits by other family members (table 3).

- Physical activity – Set limits on screen time and promote unstructured and structured physical activity, as appropriate to the child's age (table 4).

- Sleep – Target recommended sleep time for each age group (table 5) [85,86]. Strategies for improving sleep habits and sleep time are provided separately. (See "Behavioral sleep problems in children".)

  Short sleep duration or irregular sleep schedules have been associated with obesity in children and adults; a causal association has been proposed but not established. The evidence linking inadequate sleep to childhood obesity is outlined separately. (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Sleep'.)

Prevention efforts should focus on modifiable behaviors associated with weight gain [2,84], although other factors including genetics and gestational factors undoubtedly contribute to the risk for obesity [29,87]. (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Etiology'.)

Strategies to encourage behavior change are similar to those for managing established obesity, as detailed below. (See 'Health behavior and lifestyle counseling' below.)

CHILDREN WITH OVERWEIGHT OR OBESITY

Clinical assessment

- **Body mass index (BMI)**
  - At each visit, measure and plot BMI on a BMI-for-age growth chart (figure 1A-B) and use the results to categorize weight status (table 2).

    For children and adolescents with severe obesity (defined as BMI >120 percent of the 95th percentile or a BMI ≥35 kg/m^2), use a specialized growth chart (figure 2A-B) or extended BMI growth charts from the Centers for Disease Control and Prevention [88-90].
  - Monitor the BMI trend over time. A rapid increase in BMI percentile (eg, upward deflection on the BMI curve that is substantially steeper than the nearby centile curves over 6 to 12 months) warrants increased concern, while a relatively stable or improving BMI trend is reassuring.

  (See "Definition, epidemiology, and etiology of obesity in children and adolescents", section on 'Definitions'.)

- **Parents' weight status** – Assess the parents' weight status (eg, by asking whether the parents or other close family members struggle with their weight or by recording their BMI). Obesity in a child's biologic parents is an important predictor of the child's risk of persistent obesity; if both parents have obesity, the child's risk of being obese as an adult is increased 6- to 15-fold as compared with a child whose parents have healthy body weights [91,92]. This is probably primarily due to genetic factors, although shared social and nutritional factors also play a role.

- **Assessment of comorbidities** – For children with obesity, weight-related comorbidities should be assessed with:

- Focused review of systems, which includes markers for possible genetic or endocrinologic causes of obesity, symptoms suggesting an obesity-related comorbidity, and signs of an eating disorder or other mental health issues (table 6).
- Physical examination including blood pressure.
- Periodic laboratory monitoring, including measurement of a fasting lipid profile, hemoglobin A1c, or fasting glucose level; aminotransferase levels are suggested, depending on the child's age and risk factors (table 7).

Details of the assessment for weight-related comorbidities are discussed in separate topic reviews. (See "Clinical evaluation of the child or adolescent with obesity" and "Overview of the health consequences of obesity in children and adolescents".)

Health behavior and lifestyle counseling — For all children ≥2 years with excess weight (BMI ≥85th percentile), we suggest at least basic counseling to explore opportunities to improve healthy eating and activity, using a patient-centered and supportive approach (table 1) and motivational approaches to target key behaviors (see 'Strategies for counseling about weight management' above). This lifestyle intervention counseling is foundational for all other interventions, including for the subgroup of patients who are managed with pharmacotherapy or weight loss surgery (algorithm 1).

Key components — Effective lifestyle and behavior interventions are characterized by the following elements, collectively known as intensive health behavior and lifestyle counseling [29]:

- Nutrition education and support to establish healthy, sustainable eating and nutrition behaviors
- Physical activity education and support to establish healthy, sustainable activity patterns
- Behavior change strategies to establish these new behaviors in a nonstigmatizing way that enhances and maintains self-efficacy and self-esteem
- Family involvement in the program and targeting the household, not simply the patient, in healthy changes
- Intensive interventions, so called because at least 26 hours of face-to-face contact over 3 to 12 months are generally required to achieve effect

Comprehensive programs that offer all of these elements are often not available and may not be affordable. With a clear statement of evidence in the American Academy of Pediatrics Clinical Practice Guideline, programs like these may increase in availability and accessibility.

Below, we offer a practical approach to providing health behavior and lifestyle counseling in a primary care setting. If it is not possible to provide the necessary contact hours in the primary care setting, the primary care clinician still has an important role in overseeing longitudinal care and guiding the family to optimal care through community programs or consultants.

Site and providers of care — Health behavior and lifestyle counseling often can be done by the primary care clinician. If there are time constraints, counseling sessions can be brief (eg, 5 to 10 minutes) and use preprinted handouts. In some cases, an allied health care provider (eg, dietitian, nurse, or health coach) can provide some or all of the counseling. Implementation of these interventions in a primary care practice can be facilitated by using a standardized curriculum and training materials. (See 'Materials and resources' above.)

The primary care clinician can also explore other options for health behavior and lifestyle treatment with the family, including community programs focused on healthy diet and/or physical activity, referral to a comprehensive obesity treatment program, and/or adjunctive pharmacotherapy or weight loss surgery.

If families are investigating or interested in commercial or social media-based programs, the clinician should review the program with them, discuss whether it is appropriate for the child's age and development and nutritionally sound, and arrange for follow-up to review goals and to ensure healthy eating patterns. The approach to weight management for children is inherently different from that for adults, given the need to include family members and concerns of eating disorders. Thus, it is preferable to select a program specifically designed for the pediatric age group and that follows consensus guidelines [5].

Visit frequency — For all patients with overweight or obesity, we discuss counseling intervention options with the patient and their family, including the maximal level of intensity available. We then help families select a treatment path that they feel is feasible. The frequency and intensity of counseling are likely to change over time and should be increased when practical and desired by the patient and family, considering available resources.

At least two contact hours/month are suggested, but greater intensity of counseling (length and frequency of visits) generally improves efficacy. Children ≥6 years with severe or refractory obesity usually require management beyond monthly or bimonthly visits with a primary care provider. Available evidence suggests that at least 26 hours of face-to-face contact over 3 to 12 months are needed for optimal effect [5]. (See 'Treatment interventions' above.)

Note that intensive treatment refers to frequency of clinician contact and emphasis on healthy goals for nutrition and physical activity; it does not imply increased pressure or a focus on dieting [5]. Strategies to intensify care may include increased frequency of visits (which may

include group visits or telehealth visits, if available), utilizing community resources (eg, physical activity or wellness programs), and/or integrating other clinicians (dietitians, health educators, and/or behavioral health specialist) [5].

For children and families who are not ready to engage, we avoid pressuring them into intensive treatment but use motivational interviewing techniques to identify barriers to participation, problem-solve, and build confidence and motivation for lifestyle change. (See 'Patient- and family-centered communication' above and 'Motivational approaches and training' above.)

Behavior change skills — We explain to families how to support new habits. This includes goal setting, monitoring behaviors, avoiding triggers for less healthy habits (stimulus control), and positive reinforcement for target behaviors. (See 'Behavioral strategies' above.)

We use a practical, problem-oriented approach, working collaboratively with the patient and family to identify a few specific goals for behavior change, then tracking progress toward those goals during follow-up visits. We emphasize long-term changes in behaviors that are related to obesity risk rather than structured diet and exercise prescriptions. The approach is similar to that for obesity prevention, except with more specific goal setting and more time spent counseling and providing strategies to overcome obstacles.

Nutrition goals — We work collaboratively with the patient and family to set specific nutritional goals, including making a structured plan for meals and snacks, limiting foods with high energy density, and encouraging fruits and vegetables. Examples of goals and counseling tips are shown in the table (table 8). A more detailed assessment of caloric intake is often impractical in the primary care setting, has low accuracy, and is not usually necessary to support a brief counseling intervention. When possible, we encourage the entire family to participate in the dietary goals, based on positive long-term results of family-based nutritional interventions [93]. As treatment progresses, additional goals can be added.

Selection of goals also depends on the family's finances, available caregivers, and schedules. Identifying who is responsible for shopping and meal preparation, how the child spends time outside of school, who is responsible for supervision, and typical context for meals (location and who is at the table) helps to identify the most appropriate people and practices for focused counseling. In motivational interviewing, assisting the family in identifying goals will help establish goals that are achievable and pertinent to them.

This counseling may be performed by the primary care clinician or a dietitian. Counseling tools designed to support weight management in a pediatric practice are publicly available. (See 'Materials and resources' above.)

This type of intervention does not predispose to eating disorders, provided that it is focused on healthy eating behaviors rather than rigid or highly restrictive dieting and implemented in a supportive fashion (table 1) [10]. Indeed, there is some evidence that well-conceived interventions help to reduce unhealthy dieting behaviors [94]. Conversely, restrictive approaches to weight management, such as detailed monitoring of caloric intake and exercise, are not recommended, because they rarely produce long-term weight loss and can promote unhealthy eating patterns [10].

For most patients, we avoid highly structured diets, which include various forms of balanced low-calorie diets, low-fat diets, low-carbohydrate/low-glycemic index diets [95-98], or high-protein diets. These structured diets are reasonably effective in achieving short-term weight loss in a motivated patient and are safe if adequately selected and supervised. However, highly structured diets have poor adherence and success rates over longer periods of time. (See "Obesity in adults: Dietary therapy".)

Physical activity goals — We encourage specific and stringent physical activity goals, which typically include (table 4):

- **Limit recreational screen time/internet use** – The specific goal(s) should be developed collaboratively with the child and family to ensure that it is specific and achievable. Traditional recommendations are to limit screen time to ≤1 hour/day, with more stringent limits for children <2 years [99,100]. However, these goals may need to be modified because of the proliferation of social media and smartphone use among children. Children and families should first monitor their present amount of media use and then set goals to decrease it. We ask families to set firm and consistent media limits for all family members, including parents.

- **Moderate or vigorous physical activity for ≥1 hour/day** – Strategies for increasing physical activity are individualized. Clinicians should take into account the developmental stage of the child, family schedule, and personal preferences for types of activity.

  For children who are school-aged and older, we generally encourage structured physical activity (ie, participation in team or individual sports or supervised exercise sessions) rather than self-guided activities (eg, unscheduled walking or running). In structured activities, the presence of a coach or leader provides accountability and encourages consistent participation. However, whether a child is willing to engage in structured activities varies, particularly for adolescents. Some adolescents will enjoy engaging in sports or fitness centers, while others may not, due to lack of self-confidence or self-

esteem. Directly engaging adolescents in choosing activities to replace sedentary time is helpful.

For preschool-aged children, most physical activity will be unstructured; outdoor play is particularly helpful because it tends to be active and enjoyed by most children [101]. Providers can encourage physical activity in this age group by "prescribing" playground time and providing a list of local resources (playgrounds or other opportunities for active play).

Weight goals — We avoid setting specific weight loss goals during discussions with the patient and family and instead emphasize goals for dietary and physical activity behaviors. Weight goals are misleading because they change as the child grows, and patients may feel discouraged if they do not reach the goal. Throughout the process, the counseling should also emphasize healthy eating patterns and monitor for evidence of disordered eating or distorted body image.

An appropriate pace of weight loss is a function of a patient's age and degree of overweight or obesity [1]:

- For children and adolescents with mild obesity, the goal of maintaining current body weight is appropriate because this will lead to a decrease in BMI as the child grows taller. If the child is in a phase of rapid linear growth, merely slowing weight gain is more realistic and often improves weight status. For adolescents who have completed linear growth, focus on healthy behaviors and a positive body image, with a long-term goal of gradual weight loss.

- For children and adolescents with more severe obesity (ie, BMI substantially above the 95th percentile), gradual weight loss is safe and appropriate, depending on the child's age and degree of obesity.

  - For children between 2 and 11 years old with obesity and comorbidities, a weight loss of up to one pound (approximately 1/2 kg) per month is safe and beneficial but may be difficult to achieve.

  - For adolescents with obesity and comorbidities, it is safe to lose up to two pounds (approximately 1 kg) per week, although a weight loss of one to two pounds per month usually is more realistic. For those who take one of the more efficacious drugs, the rate of weight loss during the first six months of therapy is in this range [102]. For those who undergo weight loss surgery, more rapid weight loss is expected initially and is generally safe. (See 'Pharmacotherapy' below and "Surgical management of severe obesity in adolescents".)

ADDITIONAL INTERVENTIONS

Referrals — When comprehensive intensive health behavior and lifestyle treatment programs are not available, multidisciplinary care can be implemented by referrals to other specialists:

- **Dietitian** – Ideally, the dietitian should be experienced with the child's age group and weight management and use motivational techniques similar to those outlined above.
- **Mental health** – Clinicians should screen for possible mental or emotional health concerns, including bullying/teasing, depression, anxiety, and problems with self-esteem. Children with overweight/obesity have higher degrees of mental health symptomatology, which can impede treatment success [103,104]. We have found the Pediatric Symptom Checklist (PSC-17; available free of charge from Massachusetts General Hospital) to be a useful screening tool to help providers assess possible mental health issues and referral for additional evaluation, such as a psychologist, school counselor, mental health therapist, or social worker.
- **Management of comorbidities** – Patients with obesity-related comorbidities such as metabolic dysfunction-associated steatotic liver disease, type 2 diabetes, or obstructive sleep apnea may require referral to an appropriate subspecialist. (See "Overview of the health consequences of obesity in children and adolescents".)

Pharmacotherapy — Pharmacotherapy should be considered for adolescents 12 years and older with obesity (≥95th percentile) as an adjunct to diet and physical activity interventions. Evidence shows that medications are effective and generally safe. Appropriate use requires that prescribers are familiar with benefits and risks, counsel and monitor patients appropriately, and support ongoing intensive health behavior and lifestyle treatment, with close follow-up. This combination of expertise in lifestyle treatment and pharmacotherapy is typically offered in a comprehensive multidisciplinary weight management program but can also be offered by individual clinicians who develop the necessary expertise.

Pharmacotherapy options for adolescents with obesity are limited by cost considerations and availability. Short-term safety has been established, although information about long-term safety in adolescents is lacking. Glucagon-like peptide 1 (GLP-1) agonists (semaglutide, liraglutide) are the most efficacious; other drugs have lower efficacy [88,105,106].

Considerations for adolescents include (table 9):

- **High efficacy:**

- **Semaglutide** – Semaglutide is a GLP-1 analog designed for once-weekly subcutaneous administration. In a 68-week randomized trial in 201 adolescents with obesity, subcutaneous semaglutide (2.4 mg once weekly, in conjunction with diet and exercise) resulted in substantial weight loss compared with diet and exercise alone (placebo-adjusted change in body mass index [BMI] -6 kg/m^2 [95% CI -7.3 to -4.6]; change in weight -17.7 kg [95% CI -21.8 to -13.7]) [102]. The treatment effect was substantially greater than in the trial of liraglutide described below. Gastrointestinal adverse events were common in both semaglutide and placebo-treated groups but were generally mild and rarely led to treatment discontinuation. Subcutaneous semaglutide is licensed in the United States for treatment of obesity in adolescents [106,107] and is also a treatment for type 2 diabetes. An oral form of semaglutide (Rybelsus) is available and approved for type 2 diabetes in adults, but its use for weight management has not been evaluated. (See "Obesity in adults: Drug therapy", section on 'Subcutaneous semaglutide 2.4 mg'.)

- **Liraglutide** – Liraglutide, a GLP-1 analog, is associated with weight loss in patients with obesity. In a randomized trial in adolescents, liraglutide resulted in modest weight loss (placebo-adjusted change in BMI -1.58 kg/m^2 [95% CI -2.47 to -0.69]; change in weight -4.50 kg [95% CI -7.17 to -1.84]) [108]. Its use is limited by the high frequency of gastrointestinal side effects and need for daily subcutaneous injections [109]. Liraglutide is approved in the United States for weight loss in adolescents 12 years and older with obesity [110]. It is also a second-line treatment for adolescents with type 2 diabetes, using a lower dose than for weight loss. (See "Obesity in adults: Drug therapy", section on 'Liraglutide' and "Management of type 2 diabetes mellitus in children and adolescents", section on 'Pharmacologic agents'.)

- **Phentermine-topiramate** – The combination of phentermine and topiramate was evaluated in a 56-week, randomized, dose-ranging trial in 223 adolescents [111]. Treatment with phentermine-topiramate resulted in a modest BMI reduction compared with placebo, with slightly greater efficacy for the higher dose (15 mg/92 mg: BMI -5.3 kg/m^2, 95% CI -6.4 to -4.3) than mid-dose (7.5 mg/46 mg: BMI -3.7 kg/m^2, 95% CI -5.0 to -2.5). Overall outcomes are similar to those seen in larger studies in adults. Phentermine-topiramate is approved in the United States for treatment of obesity in individuals 12 years and older [112]. Disadvantages include adverse effects (sympathomimetic effects of phentermine and neuropsychiatric effects of topiramate) and lack of quality data on long-term use. It is a second- or third-line drug for weight management in adults and is contraindicated in pregnancy. (See "Obesity in adults: Drug therapy", section on 'Phentermine-topiramate'.)

- **Setmelanotide** – Setmelanotide, a melanocortin 4 receptor agonist, is an effective and approved treatment for individuals six years and older with the following specific genetic causes of obesity: pathogenic or likely pathogenic variants in *LEPR*, *POMC*, or *PCSK1* (confirmed by genetic testing) or a clinical diagnosis of Bardet-Biedl syndrome. It is not indicated or expected to be effective for other causes of obesity. (See "Obesity: Genetic contribution and pathophysiology", section on 'Monogenic forms of obesity'.)

- **Moderate efficacy:**

  - **Phentermine** – Phentermine is a norepinephrine reuptake inhibitor and amphetamine analog that reduces appetite and may increase energy expenditure. It is approved in the United States for short-term use (12 weeks) in adolescents older than 16 years of age [113]. A longer-term study (six months) showed modest to moderate effect on BMI, with side effects of increased heart rate and blood pressure [114]. Disadvantages include these and other sympathomimetic side effects (insomnia, dry mouth, constipation, nervousness) and lack of safety data for longer-term use. (See "Obesity in adults: Drug therapy", section on 'Sympathomimetic drugs for short-term use'.)

- **Low efficacy:**

  - **Metformin** – In adolescents with obesity but without diabetes, randomized trials of metformin demonstrate very modest effects on weight loss with 2 to 24 months of follow-up [115]. In a meta-analysis of six studies in children, mean BMI reduction was -0.86 kg/m^2 (95% CI -1.44 to -0.29) [65]. Because of these very limited benefits, its use for adolescents without type 2 diabetes is questionable; this is an off-label use. Metformin is generally well tolerated and is a first-line treatment for glycemic control in adolescents with type 2 diabetes. (See "Management of type 2 diabetes mellitus in children and adolescents", section on 'Pharmacologic agents'.)

  - **Orlistat** – Orlistat is approved in the United States for the indication of weight loss in adolescents; it has low efficacy (placebo-subtracted BMI reduction of <1 kg/m^2) [105,116]. Its mechanism is to alter fat digestion by inhibiting pancreatic lipases, which also causes gastrointestinal side effects that limit its acceptability for many patients. (See "Obesity in adults: Drug therapy", section on 'Orlistat'.)

These and other drugs used for medical management of adults with obesity, including drugs in development, are discussed in detail in a separate topic review. (See "Obesity in adults: Drug therapy".)

Weight loss surgery — Adolescents with severe obesity may be candidates for weight loss surgery. In most cases, surgery is undertaken after careful education and evaluation and in the context of lifestyle and counseling interventions. Primary care clinicians should refer adolescents interested in surgery to programs with substantial experience in weight loss surgery for adolescents. (See "Surgical management of severe obesity in adolescents".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Obesity in children".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topic (see "Patient education: Weight and health in children (The Basics)")

SUMMARY AND RECOMMENDATIONS

- **Approach to health behavior and lifestyle treatment**
  - **Rationale** – Obesity during childhood is influenced by genetic, epigenetic, societal, behavioral, and environmental factors. Among these, behavioral and environmental factors are modifiable during childhood and are the focus of foundational counseling for weight management. This foundational counseling is also important for patients

treated with pharmacotherapy. (See "Definition, epidemiology, and etiology of obesity in children and adolescents".)

- **General approach** – Counseling about weight and related habits should be supportive rather than blaming (table 1), collaborative rather than prescriptive, focused on long-term behavior change rather than short-term diet and exercise prescriptions, and involve the entire family rather than on the child alone. These approaches help to support an ongoing therapeutic alliance and avoid disordered eating patterns. (See 'Strategies for counseling about weight management' above.)

- **Tools** – Motivational interviewing techniques seek to engage the patient and family in behavior change. Training in motivational interviewing includes Change Talk: Childhood Obesity and this conversation guide. Materials to facilitate counseling are available from a variety of sources. (See 'Motivational approaches and training' above and 'Materials and resources' above.)

- **Prevention** – For all children, to help prevent obesity, include these steps in routine care (see 'Prevention' above):

  - Measure body mass index (BMI), plot results on a chart to categorize weight status (table 2), and track changes over time (figure 1A-B)

  - Provide routine counseling to support a healthy eating environment and diet (table 3), physical activity (table 4), and sleep (table 5)

- **Children with overweight or obesity** – Health behavior and lifestyle treatment is recommended for all children with overweight or obesity, tailored to the individual child and family, based on level of concern, priorities of the family, and available local resources (algorithm 1).

  - **Clinical assessment** – Monitor BMI, and assess obesity-related risk factors and weight-related comorbidities through a focused review of systems (table 6), physical examination, and laboratory screening (table 7). For children with severe obesity, extended BMI growth charts (figure 2A-B) are useful for tracking BMI. (See 'Clinical assessment' above.)

  - **Lifestyle and behavior change counseling** – For children ≥2 years with BMI ≥85th percentile or rising sharply, we offer family-focused education and support for healthy and sustainable eating practices (table 8) and physical activity habits (table 4) and

strategies to change behavior. (See 'Nutrition goals' above and 'Physical activity goals' above.)

The counseling intervention should be offered at the maximal level of intensity that is acceptable to the patient and their family and feasible in the available clinical setting. The frequency and intensity of counseling are likely to change over time and should be increased when practical and desired by the patient and family. Optimal counseling generally requires at least 26 hours of contact hours over 3 to 12 months. Primary care clinicians can provide the counseling directly or identify programs near their practice and/or optimize delivery of lifestyle treatment (even if not achieving 26 hours) through collaboration with other specialists. (See 'Site and providers of care' above and 'Visit frequency' above.)

- **Additional strategies for severe obesity** – For children with severe obesity (BMI ≥120 percent of the 95th percentile or BMI ≥35, whichever is lower) or refractory obesity (progressive increase in BMI percentiles despite maximal management in the primary care setting), higher-intensity approaches are needed.

  Options for adolescents include weight loss surgery or pharmacotherapy. Both treatment approaches can be offered, and both have advantages and disadvantages; the choice between them is largely based on patient values and preferences, while also considering comorbidities, cost, and availability:

  - **Surgery** – Surgery usually results in substantial durable weight loss (50 to 70 percent of excess body weight) and is associated with related improvements in obesity-related comorbidities. The main disadvantages are that it is an invasive procedure with significant recovery time, need for long-term nutritional monitoring, and risk of long-term adverse effects (eg, on bone health). (See "Surgical management of severe obesity in adolescents".)

  - **Pharmacotherapy** – Glucagon-like peptide 1 (GLP-1) agonists can also achieve substantial weight loss and are well tolerated, based on high-quality data (table 9). The main disadvantages are the need for long-term treatment, with associated costs, and some uncertainty about long-term outcomes. For patients who opt for pharmacologic therapy, we suggest subcutaneous semaglutide rather than other agents (**Grade 2C**). Other GLP-1 agonists, such as liraglutide, are reasonable alternatives to semaglutide, with due consideration for differences in efficacy, administration, and cost. For adolescents with type 2 diabetes, treatment with a GLP-1 agonist may be helpful for both weight loss and glycemic control, as discussed

separately. (See 'Pharmacotherapy' above and "Management of type 2 diabetes mellitus in children and adolescents".)

While head-to-head trials are lacking, indirect evidence from placebo-controlled trials suggest that semaglutide may achieve greater weight loss than was seen in trials of other agents (eg, liraglutide, phentermine-topiramate, phentermine, metformin, or orlistat). In addition, some of the other agents are limited by poor tolerability. Long-term data on use of these agents in adolescents are limited. Appropriate use of pharmacotherapy requires specific expertise in the use of these drugs, associated ongoing intensive health behavior and lifestyle treatment, and close follow-up; this combination of services is most readily available in a comprehensive weight management program. (See 'Pharmacotherapy' above and "Obesity in adults: Drug therapy".)

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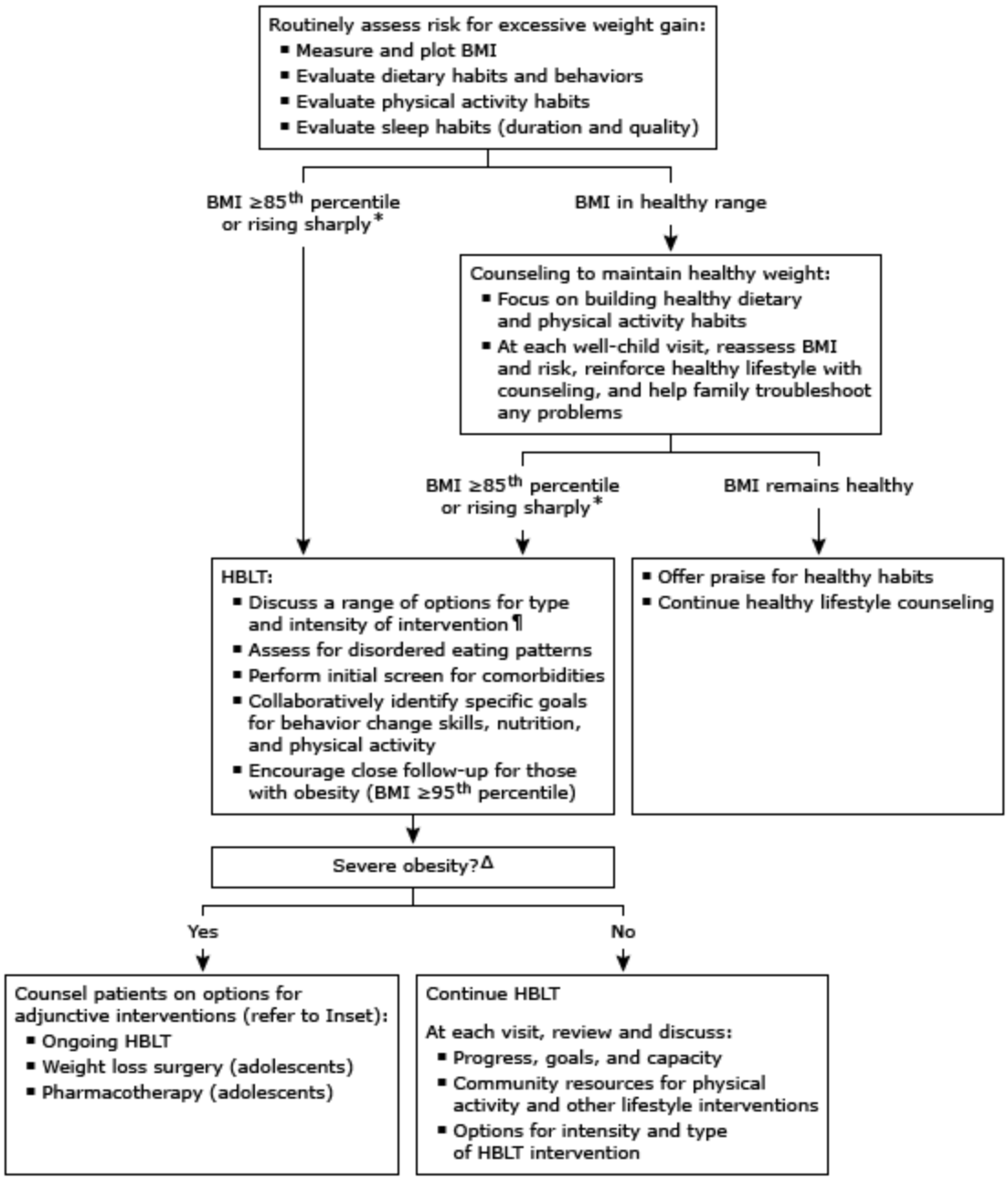
Topic 15848 Version 97.0

GRAPHICS

Prevention and management of childhood obesity in a primary care setting



Inset: Options for patients with severe obesityΔ

Interventions	Details	Benefits	Drawbacks
Ongoing HBLT	Multiple types of interventions are available¶, such as: ▪ Series of visits to the primary care practice for counseling ▪ Community programs for sports or physical activity ▪ Collaboration with a dietitian, psychologist, or health coach ▪ Comprehensive weight management program Interventions may be tried concurrently or in succession	▪ Low risk	Variable efficacy; depends on: ▪ Genetics ▪ Local and individual resources ▪ Intensity of intervention ▪ Patient's/family's ability to invest time and focus on goals
Weight loss surgery (adolescents)	▪ Surgical procedures include sleeve gastrectomy (most common) or Roux-en-Y gastric bypass ▪ Should only be performed in the context of a multidisciplinary program with expertise in adolescent medicine and extensive expertise in bariatric surgery	▪ Substantial and durable weight loss for most patients (average 20 to 30% decrease in BMI) ▪ Reverses or reduces risk for comorbidities (diabetes, cardiovascular risks)	▪ Approximately 5% of patients have significant weight regain ▪ Small short-term risks of complications ▪ Long-term risks for nutritional deficiencies and bone disease requiring ongoing monitoring

Pharmacotherapy (adolescents)	▪ GLP-1 agonists are first-line choices ▪ Requires specific expertise in the use of these drugs, ongoing intensive HBLT, and close follow-up◇	▪ Average 15% decrease in BMI (semaglutide) ▪ Improves cardiovascular risk factors	▪ Limited long-term data on safety ▪ May be costly, especially with long-term use ▪ Medications must be continued to maintain weight loss ▪ Drugs other than GLP-1 agonists are much less effective and/or raise safety concerns

This algorithm outlines a framework for prevention and management of childhood obesity in a primary care setting. The general approach and options are consistent with the clinical practice guideline from the American Academy of Pediatrics[1]. Strategies and implementation will vary widely depending on the patient's and family's values and preferences; financial or other barriers; and available medical, community, and programmatic resources. For details, refer to UpToDate content on management of childhood obesity and weight loss surgery.

BMI: body mass index; GLP-1: glucagon-like peptide 1; HBLT: health behavior and lifestyle treatment.

* A sharp rise in BMI refers to an upward deflection on the BMI curve that is substantially steeper than the nearby centile curves over 6 to 12 months.

¶ Greater intensity of counseling generally improves efficacy. The type and frequency of counseling should be selected collaboratively with the family, and the family should select a treatment path that they feel is feasible. Intensive treatment refers to length and frequency of visits and does not imply increased pressure or focus on dieting. If it is not possible to provide the necessary contact hours in the primary care setting, the primary care clinician still has an important role in overseeing longitudinal care and guiding the family to optimal care through community programs or consultants.

Δ Severe obesity is defined as BMI ≥120% of the 95^{th} percentile or ≥35 kg/m^2 (whichever is lower). This corresponds to approximately the 98^{th} percentile or BMI Z-score ≥2.2 (ie, 2.2 standard deviations above the mean).

◇ This combination of services is most readily available in a comprehensive multidisciplinary weight management program.

Reference:

1. *Hampl SE, Hassink SG, Skinner AC, et al. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. Pediatrics 2023; 151:e2022060640.*

Graphic 132073 Version 5.0

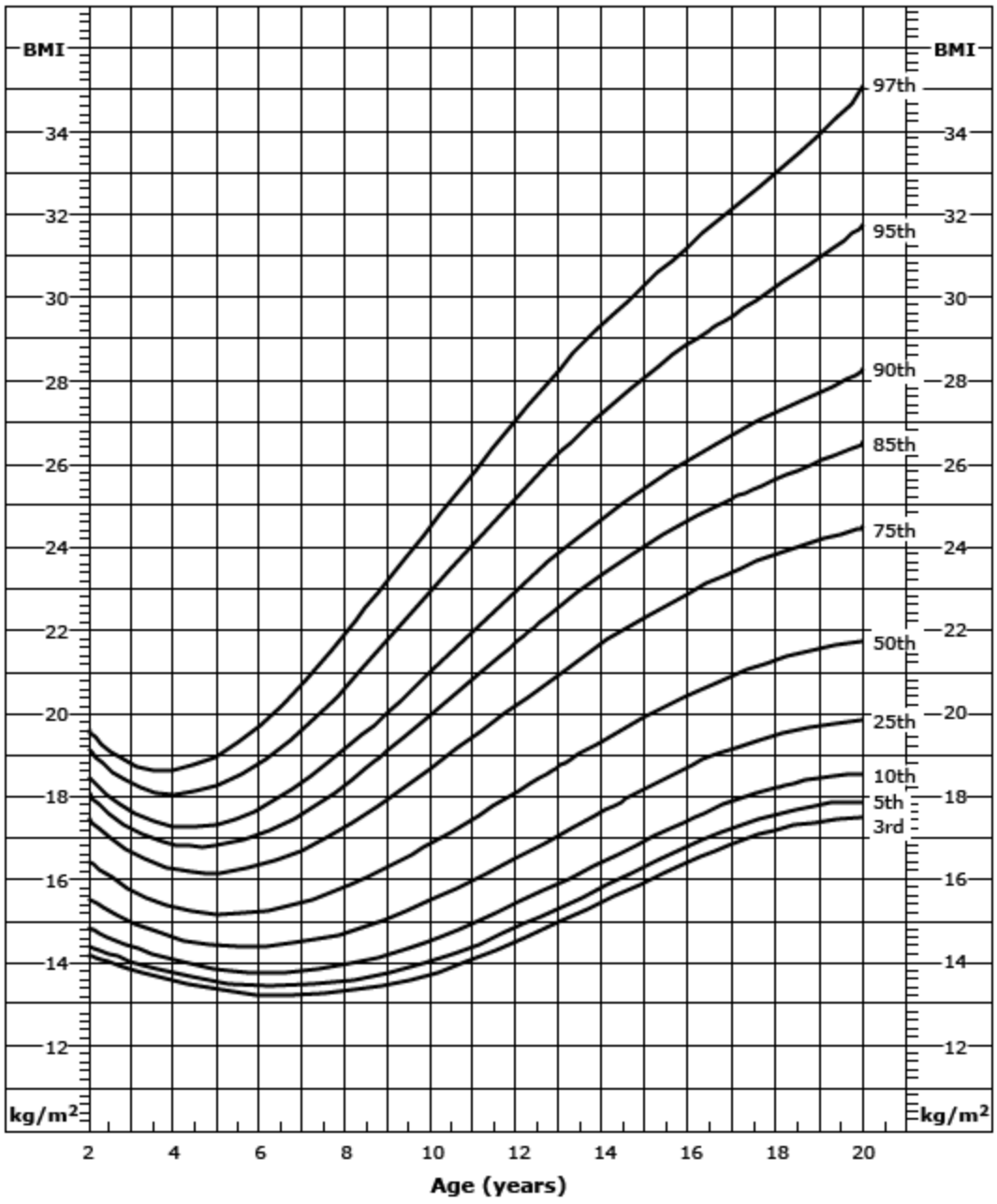
Framework for supportive and motivational counseling about healthy weight i children

Terms to avoid	Use instead
Obese, fat, chubby	▪ Unhealthy weight, excess weight, weight problem
Diet	▪ Healthy eating
Ideal weight	▪ Healthy body weight
Counseling approaches to avoid	**Use instead**
Discussion focused primarily on personal "bad" habits that lead to obesity	▪ Balanced discussion of genetic, physiologic, and environmental contributors to weight gain ▪ Acknowledgement that some people gain weigh more easily than others ▪ Discussion of environmental factors that promote weight gain, such as readily available energy-dense foods
Discussion centered primarily on child's weight, diet, and behaviors	▪ Discussion centered on family's health behavior ▪ Discussion centered on changes the parent can make to help the entire family (especially for young children)
Scare tactics*	▪ Balanced and realistic discussion of benefits of healthy eating and physical activity ▪ Discussion may include benefits of short- and long-term wellness and disease prevention without using scare tactics
Goals focused on weight or appearance	▪ Goals focused on healthy behaviors and overall health (strength and feeling well)
Endorsing food rewards or large rewards that are difficult to achieve	▪ Encourage parents to offer small, frequent rewards for meeting achievable goals ▪ Appropriate rewards include praise, tokens or stars, and activities or privileges (rather than food, monetary incentives, or toys)
Criticism for not meeting goals	▪ Clinician and parents offer praise for healthy behaviors or for meeting any behavior goals (even if incomplete or intermittent) ▪ Offer problem-solving and encouragement

* Scare tactics aim to motivate by emphasizing specific dire, long-term risks or invasive procedures to assess comorbid conditions. Scare tactics may garner short-term attention but are rarely effective in achieving long-term change and can be counterproductive. Long-term wellness and disease prevention may be used to frame the discussion of healthy eating without using scare tactics.

Graphic 141376 Version 2.0

Body mass index-for-age percentiles, females 2 to 20 years, CDC growth charts: United States

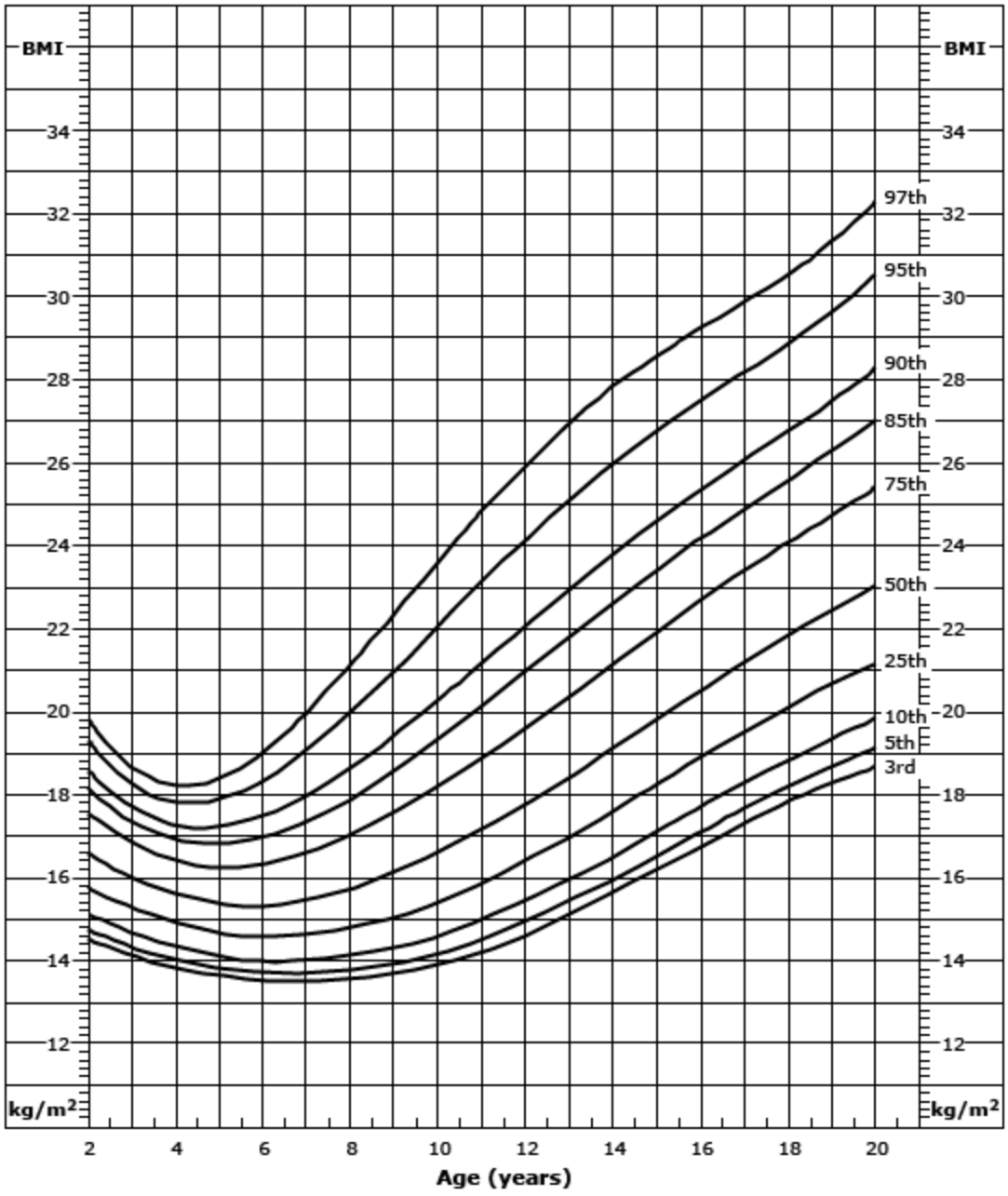


BMI: body mass index; CDC: Centers for Disease Control.

Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

Graphic 68478 Version 7.0

Body mass index-for-age percentiles, males 2 to 20 years, CDC growth charts: United States



BMI: body mass index; CDC: Centers for Disease Control and Prevention.

Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

Graphic 60784 Version 7.0

Weight categories for adults and youth

Category	Adults 18 years and older[1] (kg/m^2)	Youth 2 to 18 years (CDC, AAP, IOM, ES, IOTF[2]
Underweight	BMI <18.5	BMI <5th percentile for age
Normal weight	BMI 18.5 to <25	BMI ≥5th to <85th percentile
Overweight	BMI 25 to <30	BMI ≥85th to <95th percentile
Obesity		
▪ Class I obesity	BMI ≥30 to <35	BMI ≥95th percentile to <120% o the 95th percentile or BMI ≥30 t <35 (whichever is lower)
▪ Class II obesity	BMI ≥35 to <40	BMI ≥120 to 140% of the 95th percentile or a BMI ≥35 to <40 (whichever is lower)*
▪ Class III obesity	BMI ≥40	BMI ≥140% of the 95th percentil or a BMI ≥40 (whichever is lower

CDC: Centers for Disease Control and Prevention; AAP: American Academy of Pediatrics; IOM: Institute of Medicine; ES: Endocrine Society; IOTF: International Obesity Task Force; BMI: body mass index.

* 120% of the 95th percentile corresponds to approximately the 98th percentile or BMI Z-score ≥2 (ie, 2 standard deviations above the mean).

References:

1. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health. Obes Res 1998; 6 Suppl 2:51S.*
2. *Hampl SE, Hassink SG, Skinner AC, et al. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. Pediatrics 2023; e2022060640.*

Graphic 78725 Version 13.0

Tips for dietary counseling in children

Challenge	Counseling strategies
When and where food is consumed	
Family has little or no structure to eating patterns (few family meals, meals are not eaten at the table, television on during meals, grazing, etc)	▪ Advice to caregivers and/or older children: • Eat meals together as a family as often as possible. • Schedule regular times for meals and snacks. • Avoid skipping meals. • Limit mealtime distractions (eg, television, smartphones, tablets).
Family frequently eats meals away from home	▪ Identify barriers that prevent the family from eating at home more often. ▪ Provide meal-planning resources, initially using recipes tha are familiar to the family; begin the process of cooking more at home using these recipes. ▪ Assess the type of restaurant and usual selections, and discuss healthy alternatives.
Skipping meals	▪ Emphasize the importance of eating 3 regularly scheduled meals a day to have a healthy weight and metabolism. ▪ Explain that skipping meals can lead to increased hunger and excessive eating later. ▪ Start by establishing the goal that the child eats something (eg, just 1 food group) at the time that they would usually skip a meal. ▪ Increase the goal gradually by introducing other food groups as the child is ready; encourage the child to achieve a balanced meal.
Excessive snacking	▪ Set a snack schedule between meals to encourage less grazing. ▪ Work with the family to identify several choices for healthy snacks. ▪ Emphasize the importance of eating a single portion of food from 2 different food groups to encourage fullness until the next meal.
Food choices	
High intake of sugar-sweetened beverages	▪ Explain that sugar-containing beverages (including 100% fruit juice) often cause weight gain because they have high calories but may not help the child feel full.

	▪ Estimate the calories that the child is currently taking in from these beverages and how much of their daily energy needs are "used up." ▪ Recommend eliminating sugar-sweetened beverages from the home environment. ▪ Suggest low-sugar alternatives for the family to try. ▪ Substitute water or low-fat (skim or 1%) milk (unsweetened). Plant-based milks are acceptable if unsweetened; soy milks are preferred due to higher protein.
Lacks nutritional knowledge (no label reading, does not make shopping list, etc)	▪ Assess family's level of nutritional knowledge, and start by helping them set small goals, such as balancing their plates or providing a variety of foods. ▪ When the family is ready, increase goals gradually by discussing which foods should be eaten most often and which should be eaten sparingly. ▪ Teach the family to understand and interpret a food label, especially serving size and content of fat, added sugar, and fiber.
Poor dietary quality (lack of fruits/vegetables and whole grains, consumption of whole milk, etc)	▪ Provide education about food groups, discussing the importance of each food group as part of the daily diet. ▪ One approach is to discuss the concept of a "balanced plate," focusing on supplying ample vegetables, fruits, and fiber (approximately 1/4 plate each for vegetables, grains, fruits, and protein). Guidance is available at the MyPlate website.
Excessive refined grains (white bread, pasta) and simple carbohydrates (sugars)	▪ Emphasize the importance of including fiber in the diet as a means of decreasing hunger and feeling full after eating. ▪ Explain that whole grains are digested and absorbed at a slower rate than refined gains and sugars, resulting in a more stable blood sugar, which reduces hunger and is healthier.
High-fat dairy intake	▪ Compare nutritional information of high-fat dairy products with low-fat dairy products. ▪ Discuss types of fat: which fats are healthier and which fats should be avoided (ie, saturated fats).
Low fruit and vegetable intake	▪ Provide education regarding serving sizes of vegetables and fruits. ▪ Discuss the importance of fiber from vegetables and fruits. ▪ Have the family try new vegetables and fruits to increase variety.

	▪ Provide quick and easy recipes or products.
Managing the child's food preferences	
Picky eating	▪ Advice to caregivers: • Introduce the child to new foods gradually but consistently. Encourage (but without pressure) the child to explore food appearance, feel, and smell as well as taste. • Provide the same foods for each family member; no "special orders." • Provide meals and snacks on a predictable schedule, without compensating if the child chooses not to eat what is offered. • Encourage, but do not pressure, the child to eat a specific food. The caregivers should continue to offer the same food on >10 occasions even if the child declines to eat it.

Graphic 80182 Version 17.0

Assessment and counseling to promote physical activity in children

Assessment of sedentary behaviors	Examples of goals*	Counseling tips
Recreational screen time, including: ▪ Television, videos, or movies ▪ Video games ▪ Other internet, such as tablets ▪ Social media and smartphones	Goals vary by age[1]: ▪ <2 years – Little or no screen time ▪ ≥2 years – Maximum 1 hour daily	Household rules that may help to limit screen time: ▪ Set a specific screen time limit, which applies to all family members ▪ No television viewing during meals ▪ No television in child's bedroom ▪ No smartphone in bedroom at night ▪ Develop a "Family Media Agreement" that outlines family rules and objectives for online and media use (example available from HealthyChildren.org in English and Spanish)[2] ▪ Include children/adolescents in the goal-setting process; this is important because caregivers cannot continuously monitor and enforce these rules
Educational screen time: ▪ Homework ▪ Reading ▪ Computer-based learning		Educational screen time is not restricted. However, advise the family to: ▪ Track these activities for the purposes of awareness ▪ Do not mix with recreational screen time ▪ Balance with physical activity
Assessment of physical activity	**Examples of goals***	**Counseling tips**

Record type, frequency, and duration of: ▪ Unstructured activity/active play • Time outdoors • Routine activity, such as walking to school, work, or chores in yard or house • Spontaneous active games with friends and family ▪ Structured physical activity • Sports • Activity classes, such as dance, yoga, or martial arts • Physical conditioning	Goals vary by age: ▪ Preschool-aged – ≥2 hours of unstructured activity daily[3] ▪ School-aged and older – ≥1 hour moderate or vigorous structured physical activity daily[4,5] The daily total can consist of several shorter periods of activity	Strategies to promote physical activity[6,7]: ▪ Include family-based physical activity for modeling and encouragement ("game night," walks, hikes, family sports) ▪ Start with low-key recreational activities and progress to more structured, physically challenging activities as tolerated ▪ Offer options – Team-based or individual sports, coached or self-directed, competitive or noncompetitive ▪ Encourage children to participate in choice of activity ▪ A step counter (pedometer) may interest and motivate some children ▪ Consider physical activity levels when choosing daycare or afterschool programming To elicit practical options, ask the family about: ▪ Barriers to physical activity, including cost and access ▪ What opportunities are available (eg, school- or community-based program or facilities)

Examples of questions to ask for a brief semiquantitative assessment of physical activity in children, as well as tips for helping families achieve recommended goals. Evaluating activity in each of these areas provides an estimate of the child's overall activity level and helps identify areas for potential improvement.

* These are examples of optimal goals. Actual goals for counseling depend on the child's age, degree of obesity, current habits, and other considerations including family finances and local resources. In general, more stringent goals should be set as counseling progresses.

References:

1. *Daniels SR, Hassink SG, Committee on Nutrition. The role of the pediatrician in primary prevention of obesity. Pediatrics 2015; 136:e275.*
2. *Family Media Plan. American Academy of Pediatrics. https://www.healthychildren.org/english/fmp/pages/mediaplan.aspx (Accessed on October 2, 2023).*
3. *World Health Organization. Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age. 2019. https://apps.who.int/iris/handle/10665/311664 (Accessed on July 1, 2022).*
4. *Spear BA, Barlow SE, Ervin C, et al. Recommendations for treatment of child and adolescent overweight and obesity. Pediatrics 2007; 120:S254.*
5. *United States Department of Health and Human Services. Physical activity guidelines for Americans, 2nd edition (2018). https://health.gov/our-work/physical-activity/current-guidelines (Accessed on August 06, 2021).*
6. *Foster C, Moore JB, Singletary CR, Skelton JA. Physical activity and family-based obesity treatment: a review of expert recommendations on physical activity in youth. Clin Obes 2018; 8:68.*
7. *Brown HE, Atkin AJ, Panter J, et al. Family-based interventions to increase physical activity in children: a systematic review, meta-analysis and realist synthesis. Obes Rev 2016; 17:345.*

General guidance from: Hampl SE, Hassink SG, Skinner AC, et al. Clinical practice guideline for the evaluation and treatment of children and adolescents with obesity. Pediatrics 2023; 151:e2022060640.

Graphic 75838 Version 14.0

Recommended sleep times for children

Age group	Recommended sleep time
Infants 4 to 12 months	12 to 16 hours (including naps)
Toddlers 1 to 2 years	11 to 14 hours (including naps)
Children 3 to 5 years	10 to 13 hours (including naps)
Children 6 to 12 years	9 to 12 hours
Teens 13 to 18 years	8 to 10 hours

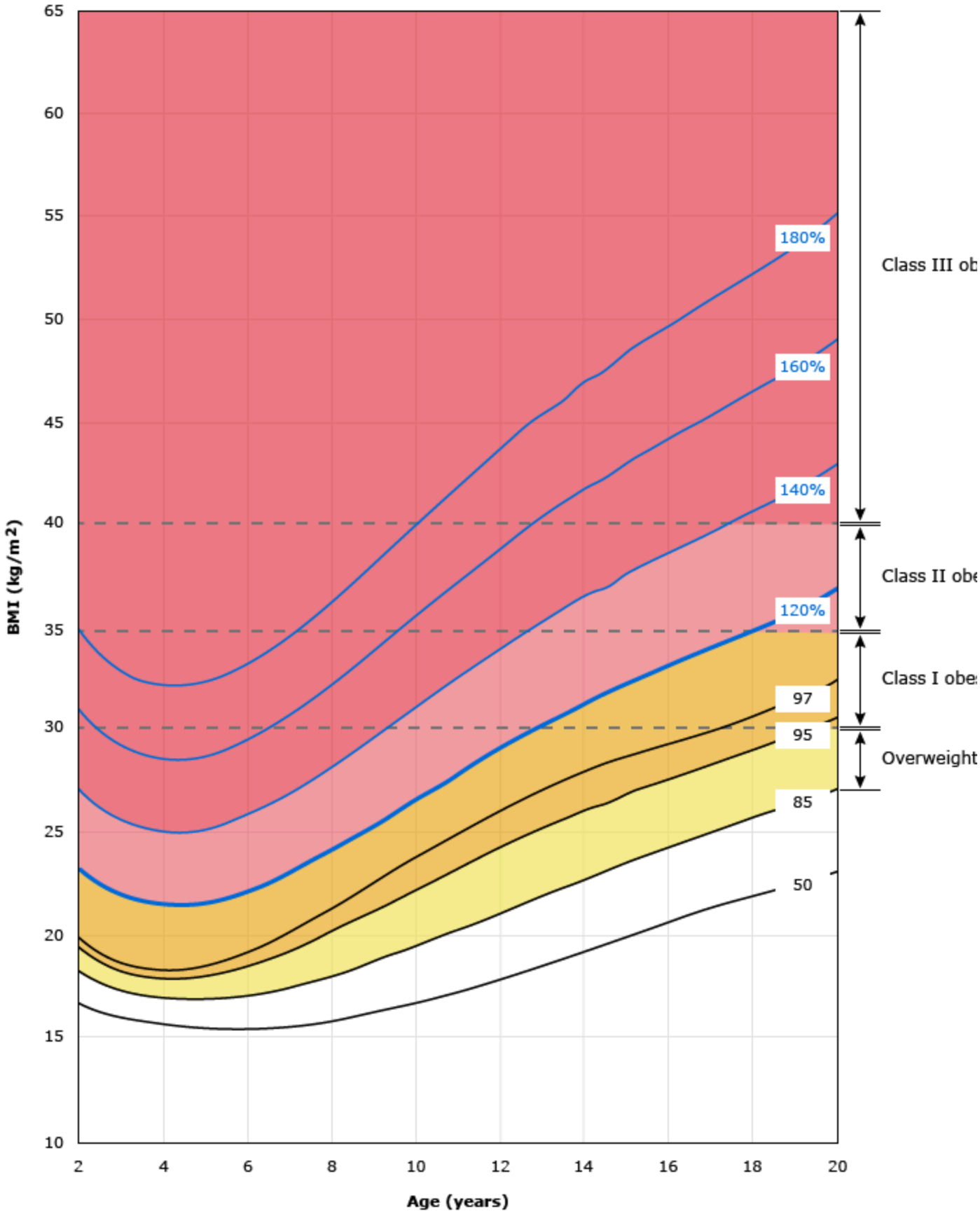
For optimal health, daytime functioning, and development, the above sleep times are recommended on a regular basis. These consensus recommendations were made by the American Academy of Sleep Medicine[1] and endorsed by the American Academy of Pediatrics[2].

References:

1. *Paruthi S, Brooks LJ, D'Ambrosio C, et al. Recommended Amount of Sleep for Pediatric Populations: A Consensus Statement of the American Academy of Sleep Medicine. J Clin Sleep Med 2016; 12:785.*
2. *Recommended Amount of Sleep for Pediatric Populations. Pediatrics 2016; 138.*

Graphic 109426 Version 5.0

Body mass index curves for males 2 to 20 years with severe obesity



Obesity in pediatric patients is classified by severity, using the following thresholds:

- Class I – BMI ≥95th percentile, or BMI ≥30 (whichever is lower)
- Class II – BMI ≥120% of the 95th percentile curve, or BMI ≥35 kg/m^2 (whichever is lower)
- Class III – BMI ≥140% of the 95th percentile curve, or BMI ≥40 kg/m^2 (whichever is lower)

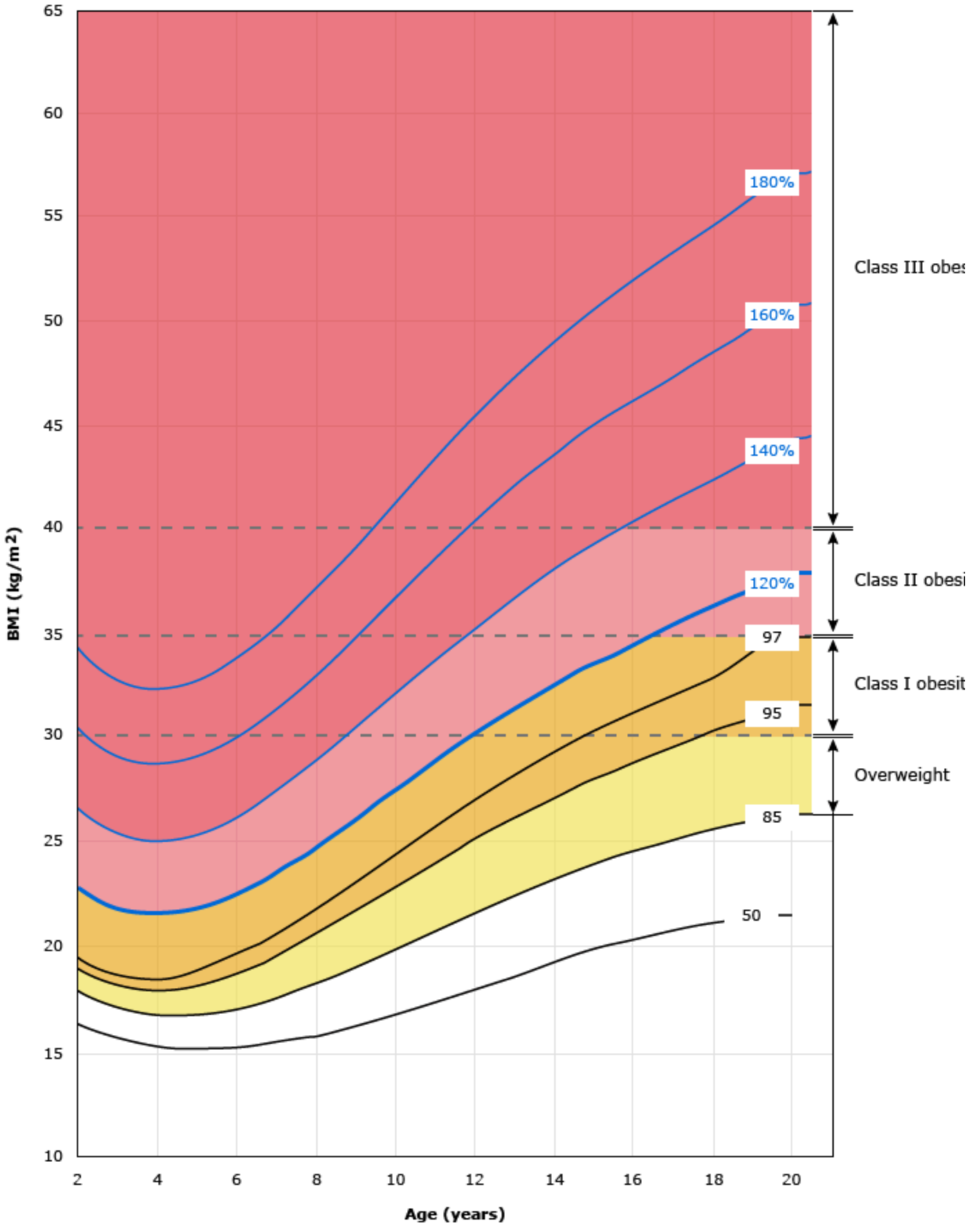
The black curves (50 through 97) represent BMI percentiles, based on the standard BMI growth reference from the CDC. The blue curves (120 through 180%) are derived by multiplying the 95th percentile values by 1.2 through 1.8, respectively.

BMI: body mass index; CDC: Centers for Disease Control and Prevention.

Adapted from: Kelly AS, Barlow SE, Inge TH, et al. Severe obesity in children and adolescents: Identification, associated health risks, and treatment approaches. A scientific statement from the American Heart Association. Circulation 2013; 128:1689.

Graphic 91083 Version 7.0

Body mass index curves for females 2 to 20 years with severe obesity



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Adapted from: Kelly AS, Barlow SE, Rao G, et al. Severe obesity in children and adolescents: Identification, associated health risks, and treatment approaches. A scientific statement from the American Heart Association. Circulation 2013; 128:1689.

Graphic 90747 Version 6.0

Important aspects of the review of systems in children with overweight or obesity

Symptom	Potential significance	Additional studies or referrals to consider
Markers for possible underlying causes of obesity		
Delayed development	▪ Genetic syndrome	▪ Refer to pediatric geneticist and/or neurologist
Short stature or reduced height velocity	▪ Genetic syndrome ▪ Endocrinologic etiology (eg, Cushing syndrome, hypothyroidism, ROHHADNET syndrome)	▪ Refer to pediatric geneticist ▪ 24-hour urine collection for free cortisol, thyroid function tests; referral to pediatric endocrinologist
Hypogonadism or delayed puberty	▪ Genetic syndrome ▪ Endocrinologic etiology (eg, Cushing syndrome, hypothyroidism, ROHHADNET syndrome)	▪ Refer to pediatric geneticist ▪ 24-hour urine collection for free cortisol, thyroid function tests; referral to pediatric endocrinologist
Symptoms suggesting an obesity-related comorbidity		
Central nervous system symptoms: ▪ Headaches (especially morning) ▪ Nausea or vomiting ▪ Blurred vision, double vision, or decreased vision	▪ Idiopathic intracranial hypertension	▪ Refer to pediatric neurologist
Sleep symptoms: ▪ Snoring ▪ Nocturnal enuresis ▪ Daytime sleepiness and/or inattentive behaviors	▪ Sleep apnea ▪ Obesity hypoventilation syndrome ▪ Inattentive behaviors may be symptoms of insufficient or disrupted sleep	▪ Polysomnogram (sleep study) and/or referral to a pediatric sleep medicine, pulmonologist, or ENT specialist
Abdominal pain (generalized or right upper quadrant)	▪ Gallbladder disease (eg, cholelithiasis) ▪ Gastroesophageal reflux or constipation (common in all	▪ AST, ALT, abdominal ultrasonography ▪ Refer to pediatric gastroenterologist

	populations but particularly in children with obesity) ▪ MASLD (formerly termed NAFLD), although this is usually asymptomatic	▪ For evaluation and management of MASLD, refer to related UpToDate content
Hip pain, knee pain, limp	▪ Slipped capital femoral epiphysis ▪ Blount disease (tibia vara), which is apparent on physical examination but is typically painless	▪ Radiographs; refer to pediatri orthopedist
Menstrual abnormalities (oligomenorrhea, amenorrhea, or excessive uterine bleeding)	▪ PCOS	▪ Serum testosterone, tests to exclude other causes of menstrual abnormalities (eg, hCG, LH, FSH) ▪ Refer to pediatric endocrinologist or adolescent specialist ▪ For details, refer to related UpToDate content on PCOS
Urinary frequency, nocturia, polydipsia, polyuria	▪ Diabetes	▪ Urinalysis, fasting blood glucose, hemoglobin A1c, ora glucose tolerance test ▪ If abnormal, refer to pediatric endocrinologist
Mental health issues		
Binge eating or purging	▪ Eating disorder	▪ Refer to specialist in eating disorders
Anhedonia, insomnia	▪ Depression	▪ Refer to pediatric psychologis or psychiatrist

ALT: alanine aminotransferase; AST: aspartate aminotransferase; ENT: ear/nose/throat; FSH: follicle-stimulating hormone; hCG: human chorionic gonadotropin; LH: luteinizing hormone; MASLD: metabolic dysfunction-associated steatotic liver disease; NAFLD: nonalcoholic fatty liver disease; PCOS: polycystic ovary syndrome; ROHHADNET syndrome: rapid-onset obesity with hypothalamic dysfunction, hypoventilation, autonomic dysregulation, and neural crest tumor.

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Graphic 67972 Version 18.0

Assessment for weight-related comorbidities in children and adolescents with obesity[1-5]

Condition	Clinical presentation/examination	Tests	Notes
Dyslipidemia	Asymptomatic or family history of CVD	**Screening test:** ▪ Fasting lipid profile **Timing:** ▪ Screen at age ≥10 years for all children with overweight or obesity[3] ▪ Evaluate earlier for selected children with multiple risk factors	▪ Additional risk factors include famil history of CVD, other obesity comorbidities (hypertension, diabetes), or tobacc use ▪ Refer to UpToDate content on dyslipidemia in children for interpretation and follow-up
Hypertension	Asymptomatic; detected on routine monitoring	**Screening test:** ▪ BP measurement **Timing:** ▪ Measure at all health care visits (and at least annually)	▪ Use appropriately sized cuffs and age-appropriate norms ▪ Multiple measurements are required to diagnose or exclude hypertension
		Follow-up tests: ▪ 24-hour ABPM ▪ CBC, metabolic panel, renin assay, urinalysis, kidney ultrasound	▪ ABPM is used to evaluate for "masked" hypertension; rule out "white coat" hypertension ▪ ABPM is suggested i the diagnosis is unclear from randor office BP measurements ▪ Blood tests are suggested if hypertension is confirmed to exclud

			other causes of hypertension
Metabolic dysfunction-associated steatotic liver disease (MASLD; formerly termed nonalcoholic fatty liver disease)	Generally asymptomatic; may have RUQ tenderness or hepatomegaly	**Screening test:** ▪ Serum ALT **Timing:** ▪ Initiate screening with serum ALT for all children with obesity starting at ≥10 years	▪ If ALT is normal, repeat at least every 2 to 3 years* ▪ Diagnosis also depends on cardiometabolic risk factors (lipids and HbA1c or fasting glucose)
		Follow-up tests: ▪ Abdominal ultrasound to evaluate for anatomical abnormalities ▪ Laboratory tests for cardiometabolic risk factors¶; evaluation for viral hepatitis, autoimmune hepatitis, and endocrine disorders ▪ Exclude genetic disorders in selected patients ▪ Liver biopsy	▪ Perform these follow-up tests if ALT is >80 units/L, persistently elevated >2 times the ULN* for 6 months, or other signs/symptoms of advanced liver disease are present ▪ The purpose of follow-up tests is to determine the cause of elevated transaminases ▪ Liver biopsy may be helpful in some cases, such as when diagnosis is uncertain or there is concern for severe progression ▪ A definitive diagnosis of MASH can only be made by liver biopsy but this is not always necessary for clinical management (refer to UpToDate content on MASLD)
Gallbladder disease	Recurrent RUQ abdominal pain, sometimes with fatty food	▪ Abdominal ultrasound ▪ AST, ALT, GGTP, total bilirubin	▪ Complications may include acute

	intolerance, nausea, vomiting, or jaundice	▪ Amylase, lipase	pancreatitis or cholangitis
Type 2 diabetes mellitus or impaired glucose tolerance	Often asymptomatic; may present with urinary frequency, nocturia, polydipsia, or polyuria	**Screening test:** ▪ Fasting glucose, HbA1c, or oral glucose tolerance test **Indications:** ▪ Perform in children ≥10 years old with overweight or obesity **and** 1 or more risk factors for type 2 diabetes[Δ]	▪ Diabetes is diagnosed if fasting glucose ≥126 mg/dL or HbA1c ≥6.5% on 2 occasions ▪ Prediabetes is diagnosed if fasting glucose 100 to 125 mg/dL or HbA1c 5.7 to 6.4% on 2 occasions
Sleep apnea	Habitual snoring, mouth breathing, daytime sleepiness, or inattentive behaviors and/or adenotonsillar hypertrophy	**Screening:** ▪ Routinely evaluate signs and symptoms ▪ Assess tonsil size **Diagnostic test:** ▪ Polysomnogram (sleep study)	▪ Perform polysomnogram in patients who have obesity and symptoms suggesting obstructive sleep apnea[◇]
SCFE	Unexplained limp or aching pain in hip, groin, thigh, or knee	▪ Hip radiographs	▪ Use frog-leg positioning for radiograph ▪ Children with acute symptoms of SCFE should immediately stop all weightbearing activity (including walking) to prevent further displacement[3]
Varus (Blount disease) or valgus deformity	Varum (bow legs) or varus (knock knees) deformity on examination, with or without knee pain	▪ Knee radiographs	
Polycystic ovary syndrome	Menstrual irregularity, excessive acne, hirsutism	**Initial tests:** ▪ Total testosterone (or free testosterone) ▪ Beta-hCG, TSH, prolactin, DHEAS, 17-	▪ Initial tests are to confirm whether hyperandrogenemia is present and exclude other causes

		hydroxyprogesterone (early morning)	of hyperandrogenemia and/or abnormal menses ▪ If laboratory testing is abnormal, additional workup is indicated
Impaired kidney function	Asymptomatic	**Screening:** ▪ BUN, creatinine ▪ Urine for UACR **Indications:** ▪ Perform in adolescents with severe obesity, hypertension, or type 2 diabetes[§]	▪ Perform in adolescents with severe obesity, hypertension, or type 2 diabetes[§] ▪ UACR >30 mg/g is abnormal
Precocious puberty	Appearance of secondary sexual characteristics <8 years (females) or <9 years (males)	**Initial tests:** ▪ LH, FSH, testosterone or estradiol	▪ Physical examinatior is often sufficient to evaluate ▪ Laboratory testing depends on child's age and pubertal progression ▪ Central nervous system imaging may be indicated in selected children with central precocious puberty
Pseudotumor cerebri	Headaches (especially morning), nausea/vomiting, blurred or decreased vision	**Initial test:** ▪ Funduscopic examination and/or refer to pediatric neurologist or ophthalmologist	▪ Increased intracranial pressure suggested by papilledema and confirmed by lumba puncture

This table summarizes the evaluation for obesity-related comorbidities in children. For details on the evaluation, refer to UpToDate content on the health consequences of obesity in children and adolescents and relevant topic reviews.

ABPM: ambulatory blood pressure monitoring; ALT: alanine aminotransferase; AST: aspartate aminotransferase; BP: blood pressure; BUN: blood urea nitrogen; CBC: complete blood count; CVD: cardiovascular disease; DHEAS: dehydroepiandrosterone sulfate; FSH: follicle-stimulating hormone; GGTP: gamma-glutamyl transpeptidase; HbA1c: glycated hemoglobin; hCG: human chorionic gonadotropin; LH: luteinizing hormone; MASH: metabolic dysfunction-associated steatohepatitis; MASLD: metabolic dysfunction-associated steatotic liver disease; RUQ: right upper quadrant; SCFE: slipped capital femoral epiphysis; TSH: thyroid-stimulating hormone; UACR: urine albumin-to-creatinine ratio; ULN: upper limit of normal.

* For interpretation of serum ALT, use the ULN of 22 units/L for females and 26 units/L for males, as determined from healthy lean children in the National Health and Nutrition Examination Survey[4]. Note that these values are substantially lower than the ULNs reported in most pediatric hospital laboratories.

¶ Screening laboratory tests for suspected MASLD include a CBC with platelets, HbA1c, and lipid panel.

Δ Risk factors for type 2 diabetes include: family history of type 2 diabetes, high-risk race/ethnicity (Native American, African American, Latino, Asian American, Pacific Islander), signs of insulin resistance (eg, acanthosis nigricans), or conditions associated with diabetes (hypertension, dyslipidemia, polycystic ovary syndrome).

◇ Symptoms suggesting obstructive sleep apnea include persistent snoring (most nights, most sleeping positions), observed gasping or apneas, nocturnal enuresis, and morning headaches.

§ Screening for impaired kidney function is recommended for patients with type 2 diabetes[5]. If the initial test is abnormal, repeat with confirmation in two of three samples over six months. UpToDate authors also suggest this screening for patients with other risk factors for developing chronic kidney disease, including severe obesity and hypertension.

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Graphic 65547 Version 32.0

Goals and counseling on nutritional factors related to childhood obesity

Contribution to weight gain	Examples of goals*	Counseling tips
Parent/caregiver role		
▪ Parent/caregiver is an important role model for healthy eating.	▪ Family members have diet and activity goals that are similar to those expected of the child.	▪ Be a good role model for healthy eating and exercise (regardless of your weight). ▪ Try to get all family members to do the same. ▪ Tell your child about your diet and activity goals; be honest i you don't meet them, and say that you will keep trying.
▪ Parent/caregiver is often responsible for meal planning and influences the home environment[1].	▪ Family plans and eats meals together. ▪ Aim to have a single meal prepared for the entire family, rather than making separate items for different members of the family.	▪ Control the grocery list – It's easier to make healthy choice if almost all of the foods in the house are healthy. ▪ Prepare the same meal for all family members. ▪ Include at least 1 food that th child likes, and don't pressure the child to try every food.
▪ Parent/caregiver can support the child's positive self-perception.	▪ Support a healthy body image for the child. ▪ Model a healthy relationship with food.	▪ Find positive things to say about the child that do not focus on their weight. ▪ Parents should use the same positive talk to themselves. ▪ Be positive about trying new foods. ▪ Model a healthy relationship with food – Focus on the importance of food for our bodies, and avoid negative comments about calories and eating.
Goals for specific food types		
Sweetened beverages		

▪ High intake of sugar-sweetened beverages is linked to increased prevalence of obesity in children, but causality has not been established[2-5]. ▪ Fruit juice should also be considered a sweetened beverage. ▪ Artificially sweetened beverages are safe and may help with weight control[6,7].	▪ Avoid all sugar-sweetened beverages and juice. This can be facilitated by eliminating these beverages from the home environment.	▪ Main beverages should be water or low-fat milk (unsweetened). ▪ "Diet" (artificially sweetened) beverages are OK but in moderation.
Fruits and vegetables		
▪ Eating fruits and vegetables may displace more energy-dense foods and increase satiety. There is some evidence that low consumption of these foods is associated with obesity[8-10].	▪ Encourage at least 5 servings of vegetables and fruits daily (fresh, cooked, frozen, or canned). ▪ These should not be in the form of juice or candy-like "fruit snacks."	▪ Plan a "field trip" to the grocery store or produce stand, allowing the child to pick out fruits and vegetables they want to try. ▪ Involve the child in meal planning, allowing them to choose fruits and vegetables for meals. ▪ Serve fruits and vegetables with meals, but don't pressure the child to eat or try them (which can cause negative reactions). ▪ Continue to offer new foods, even if child does not eat them initially. Offer them gently, but do not force the child to try them. Pair new foods with familiar ones.
Restaurants, fast food, and convenience foods		
▪ Meals eaten away from home increase portion size and total energy intake and are of poorer nutrient quality[11-13]. ▪ Increased frequency of eating meals away from	▪ 1 or fewer take-out or fast food meals weekly. ▪ Plan meals for the week, including which meals will be at restaurants.	▪ Practice more family meals; start with takeout that is brought home and put on plates to be eaten as a family. ▪ Make a family meal plan, including the child in planning.

home is associated with increased BMI[14,15].		▪ Schedule a day to grocery shop, and build the grocery list from the meal plan. Utilize meal planning websites for the family. ▪ Explore cooking and food preparation classes and websites; encourage the parent and child to participate together.
Energy-dense foods		
▪ An association between energy-dense foods and obesity has been established in adults but not yet in children[16].	▪ Avoid serving fried foods at meals. ▪ Eliminate high-calorie snack foods from the house (eg, cookies, chips, ice cream). ▪ Offer only low-fat or skim milk, limit quantities of cheese, and choose cereals with relatively low sugar content.	▪ Have snacks at home made from 2 food groups. ▪ Make homemade "snack packs" using small bags or containers. ▪ Schedule snack times instead of snacking when hungry and close to mealtimes.
Meal timing and planning		
Breakfast		
▪ Skipping breakfast is associated with obesity in children despite perceived decrease in daily caloric intake[17-21] and has adverse effects on school performance[22-24].	▪ Eat a moderate breakfast daily. Avoid breakfast foods with high sugar or energy density (eg, high-sugar cereals or pastries).	▪ Let the child have non-breakfast food items in the morning if desired ("breakfast doesn't have to be breakfast foods"). ▪ Prepare items ahead of time or wake up earlier to eat breakfast. ▪ If the child is reluctant to eat breakfast, let them have smaller breakfast meals to establish the habit of eating in the morning.
Other meals and snacks		
▪ Snacking tends to result in increased energy intake and poorer diet quality; a direct	▪ Offer 3 meals daily on a regular schedule. ▪ 1 or 2 additional healthy snacks may be appropriate for	▪ Schedule a snack time. ▪ Establish "kitchen hours" to encourage the child to eat at mealtimes.

association between snacking and obesity in children has not been established.	some children.	▪ Teach about hunger and fullness; if meals are offered at regular times, the child will get the needed nutrition.
Portion sizes		
▪ Larger portions lead to increased energy intake[25-26].	▪ Goals depend on child's age, degree of obesity, and level of physical activity. ▪ Use a balanced plate approach to subtly decrease portion size.	▪ Caution parents against focusing too much on portion sizes (to avoid excessive conflict over food). ▪ Encourage a balanced plate¶.

These "tips" reflect approaches used by UpToDate contributors but are consistent with guidance from the American Academy of Pediatrics[27].

BMI: body mass index.

* These are examples of optimal goals. Actual goals for counseling depend on the child's age, degree of obesity, and current habits and other considerations including family finances and local resources. In most cases, more stringent goals should be set as counseling progresses. Goals need not be absolute: For example, high-calorie snack foods should ideally be eliminated from the house but might be permitted occasionally as a "treat." Refer also to UpToDate content and tables on tips for maintaining a healthy weight.

¶ The "balanced plate" approach gives approximately 1/4 of the meal plate to each of 4 food groups: vegetables, grains, fruits, and protein. This is a way to teach and encourage ample intake of vegetables, fruits, and fiber and may help to subtly limit portion size. Guidance is available at the MyPlate website.

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Pharmacotherapy for weight loss in adolescents[1]

Drug	Comments	Dose	Efficacy for weight loss*	Side effe
High efficacy				
GLP-1 receptor agonists: ▪ **Semaglutide** ▪ **Liraglutide**	▪ Semaglutide and liraglutide are approved for weight loss for 12 years and older (United States) ▪ Decrease hunger by acting directly on the central nervous system to decrease appetite and increase satiety and by slowing gastric emptying ▪ Other GLP-1 receptor agonists are approved for treatment of T2DM but not for obesity	▪ Semaglutide – Starting dose 0.25 mg subcutaneously once weekly; titrate gradually as tolerated to target dose of 2.4 mg once weekly ▪ Liraglutide – Starting dose is 0.6 mg subcutaneously once daily; titrate gradually as tolerated to target dose of 3 mg once daily	▪ Semaglutide – Mean weight loss 17.7 kg; BMI loss 6.0 kg/m^2 (16.7%)[2] ▪ Liraglutide – Mean weight loss 4.5 kg; BMI loss 1.6 kg/m^2 (4.6%)[3]	▪ Nausea ▪ Vomiting ▪ Increased r medullary t cancer amc patients wi personal or history of medullary t cancer or M
Phentermine-topiramate	▪ This combination medication is approved for weight loss in patients ≥12 years ▪ Phentermine is a sympathomimetic stimulant ▪ Topiramate has multiple mechanisms of action and is also an anticonvulsant ▪ Both drugs are centrally acting	▪ Starting dose – 3.75 mg/23 mg orally once daily ▪ Mid-dose – 7.5 mg/46 mg orally once daily ▪ High dose – 15 mg/92 mg orally once daily ▪ Refer to clinical drug reference or prescribing	▪ High dose – Mean weight loss 15.8 kg; BMI loss 5.3 kg/m^2 (10%)[4] ▪ Mid-dose – Mean weight loss 12.1 kg; BMI loss 5.3 kg/m^2 (8.1%)[4]	▪ Phentermi sympathon side effects dependent ▪ Topiramate have neuropsych side effects including c slowing; withdrawal cause seizu must taper discontinue ▪ Contraindic pregnancy

	and suppress appetite	information for titration		(increased orofacial cl
Setmelanotide	▪ Approved for weight loss in individuals ≥6 years of age with POMC deficiency, PCSK1 deficiency, LEPR deficiency confirmed by genetic testing, or Bardet-Biedl syndrome ▪ Specifically targets the MC4R pathway, including leptin signaling	▪ Starting dose is 1 to 2 mg subcutaneously once daily depending on patient age; may titrate based on response and tolerability ▪ Maximum dose 3 mg once daily	▪ From small open-label studies ages ≥6 years: • POMC or PCSK1 – Mean weight loss 23.1 kg; 80% achieved at least 10% weight loss[5] • LEPR – Mean weight loss 9.7 kg; 46% achieved at least 10% weight loss[5] • Bardet-Biedl syndrome – Mean BMI loss 7.9 kg/m^2; 39% achieved at least 10% decrease in BMI[6]	▪ Injection si reaction ▪ Nausea ▪ Skin hyperpigm
Moderate efficacy				
Phentermine (as monotherapy)	▪ Approved for 16 years and older and for short-term use only (3	▪ Capsule (15 mg, 30 mg, or 37.5 mg) or tablet (37.5 mg)	▪ Observational studies: • In adults – Weight	▪ Side effects dependent • Elevate

	months; United States) ▪ Limited safety and efficacy data for longer-term use (and only in adults)[7] ▪ Sympathomimetic stimulant	– 15 to 37.5 mg orally once daily **or** 18.75 mg (one-half tablet) 1 to 2 times daily ▪ Tablet (8 mg) – 4 to 8 mg orally 3 times daily	decrease 6 to 8% at 6 and 12 months[7]; early response correlated with efficacy • In children – Weight decrease 3.2 kg, BMI decrease 4% at 6 months[8] • Higher doses are associated with increased adverse effects but not necessarily increased efficacy	• Increas rate • Dizzine • Headac • Tremor • Dry mo • Abdom pain • Constip • Nervou
Low efficacy				
Lisdexamfetamine	▪ Not approved for weight management ▪ Approved for treatment of BED (adults) or for ADHD (ages 6 years and older) ▪ Stimulant	▪ Starting dose is 20 to 30 mg orally in the morning; may increase dose in increments of 10 mg/day ▪ No clear effective dose for BMI reduction	▪ Limited evidence for weight loss: • Adults with BED – Mean 6% weight loss[9]	▪ Elevated BF ▪ Insomnia ▪ Irritability
Metformin	▪ 10 years and older (for T2DM) ▪ Inhibits hepatic gluconeogenesis;	▪ Recommended starting dose is 500 mg orally 1 or 2 times daily	▪ Meta-analysis in children – Mean BMI decrease 0.86	▪ Lactic acidc (rare but se ▪ Side effects dose deper

	increases peripheral tissue uptake of glucose	▪ Gradual increase up to 2000 mg ▪ Extended release recommended for fewer side effects	kg/m^2 after 6-12 months[10] ▪ Use for weight loss in children without T2DM is questionable due to low efficacy	and include bloating, na flatulence, diarrhea
Orlistat	▪ 12 years and older ▪ Intraluminal inhibitor of pancreatic and gastric lipase; causes fat malabsorption	▪ 120 mg orally 3 times per day with each fat-containing meal	▪ Meta-analysis in children – Mean BMI decrease 0.79 kg/m^2 after 6-12 months[11]	▪ Steatorrhea ▪ Fecal urger ▪ Flatulence ▪ Decreased absorption soluble vita

Pharmacotherapy for weight loss in adolescents should be used in conjunction with diet and physical activity interventions. Appropriate use requires that prescribers are familiar with benefits and risks, counsel and monitor patients appropriately, and support ongoing intensive health behavior and lifestyle treatment, with close follow-up. This combination of expertise in lifestyle treatment and pharmacotherapy is typically offered in a comprehensive multidisciplinary weight management program but can also be offered by individual clinicians who develop the necessary expertise. Dosing in this table is for pediatric patients with normal kidney and liver function. For additional detail including dose titration and adjustment, drug interactions, and adverse drug reactions, refer to a clinical drug reference or local prescribing information.

ADHD: attention deficit hyperactivity disorder; BED: binge eating disorder; BMI: body mass index; BP: blood pressure; GLP-1: glucagon-like peptide 1; LEPR: leptin receptor; MC4R: melanocortin 4 receptor; MEN2: multiple endocrine neoplasia type 2; PCSK1: proprotein convertase subtilisin/kexin type 1; POMC: pro-opiomelanocortin; T2DM: type 2 diabetes mellitus.

* Unless otherwise specified, values reflect outcomes after approximately 1 year of therapy, based on the cited trials.

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Contributor Disclosures

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