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Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report

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Pediatrics 2007;120;S164
DOI: 10.1542/peds.2007-2329C

SUPPLEMENT ARTICLE

Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report

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The author has indicated she has no financial relationships relevant to this article to disclose.

ABSTRACT

To revise 1998 recommendations on childhood obesity, an Expert Committee, comprised of representatives from 15 professional organizations, appointed experienced scientists and clinicians to 3 writing groups to review the literature and recommend approaches to prevention, assessment, and treatment. Because effective strategies remain poorly defined, the writing groups used both available evidence and expert opinion to develop the recommendations. Primary care providers should universally assess children for obesity risk to improve early identification of elevated BMI, medical risks, and unhealthy eating and physical activity habits. Providers can provide obesity prevention messages for most children and suggest weight control interventions for those with excess weight. The writing groups also recommend changing office systems so that they support efforts to address the problem. BMI should be calculated and plotted at least annually, and the classification should be integrated with other information such as growth pattern, familial obesity, and medical risks to assess the child's obesity risk. For prevention, the recommendations include both specific eating and physical activity behaviors, which are likely to promote maintenance of healthy weight, but also the use of patient-centered counseling techniques such as motivational interviewing, which helps families identify their own motivation for making change. For assessment, the recommendations include methods to screen for current medical conditions and for future risks, and methods to assess diet and physical activity behaviors. For treatment, the recommendations propose 4 stages of obesity care; the first is brief counseling that can be delivered in a health care office, and subsequent stages require more time and resources. The appropriateness of higher stages is influenced by a patient's age and degree of excess weight. These recommendations recognize the importance of social and environmental change to reduce the obesity epidemic but also identify ways healthcare providers and health care systems can be part of broader efforts.

www.pediatrics.org/cgi/doi/10.1542/peds.2007-2329C

doi:10.1542/peds.2007-2329C

Key Words
obesity, prevention, assessment, treatment, clinical practice pattern, chronic care model, office management, motivational interviewing, overweight, patient education, nutrition assessment

Abbreviations
AST—aspartate aminotransferase
ALT—alanine aminotransferase
CDC—Centers for Disease Control and Prevention
NAFLD—nonalcoholic fatty liver disease
USDA—US Department of Agriculture
CE—consistent evidence
ME—mixed evidence

Accepted for publication Aug 31, 2007

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In 1997, when the Department of Health and Human Services Health Resources and Service Administration convened the first expert committee to develop recommendations on the evaluation and treatment of child and youth obesity, few studies of this problem had been conducted to provide evidence for the recommendations. Since then, increasing scientific attention has resulted in an expanded body of literature on the causes, comorbidities, and treatment of this problem. The condition remains frustrating and difficult to treat but, with more-current scientific information available, in 2005 the American Medical Association, in collaboration with the Health Resources and Service Administration and the Centers for Disease Control and Prevention (CDC), convened a new expert committee that was charged with providing revised recommendations. These new recommendations use current, evidence-based data, as well as clinical experience when evidence does not exist, to provide updated practical guidance to practitioners (see Appendix for the complete recommendations).

Representatives from 15 national health care organizations formed the expert committee. The steering committee, composed of representatives from the American Medical Association, the Health Resources and Service Administration, and the CDC, invited these member organizations because they serve children at high risk of obesity, they represent experts in obesity-related conditions, or they represent experts in aspects of obesity treatment. The representatives from the 15 member organizations submitted nominations for the experts who would compose the 3 writing groups and work on the following 3 areas of focus: prevention, assessment, and treatment of childhood overweight and obesity. Special care was taken both to ensure that a broad range of disciplines, including medicine, nutrition, nursing, psychology, and epidemiology, was represented and to capture the interests of diverse cultural groups. The experts in these groups reviewed the scientific information that forms the basis of the expert committee recommendations. Their work is referred to throughout this report according to the area of review (prevention, assessment, or treatment), and their reports accompany this article.[1–3]

Each multidisciplinary writing group reviewed the current literature to develop the recommendations. Because the science continues to lag behind the obesity epidemic, many gaps in evidence-based recommendations remain. With few exceptions, randomized, controlled, intervention trials have not been performed to prove or to disprove the effect of a particular behavior on weight control in obese children. The available studies often examine associations between health behaviors and weight or between health behaviors and energy balance. Even less evidence exists about the process of addressing obesity in a primary care setting. The purpose of the expert committee was to offer practical guidance to clinicians by providing recommendations in all areas of obesity care, including those that lack the best possible evidence. When evidence of an effect on obesity was not available, the writing groups considered the literature, clinical experience, the likelihood of other health benefits, the possible harm, and the feasibility of implementing a particular strategy before including it. Although a thorough evidence-based review was beyond the scope of this project, the writing groups provided a broad rating of the evidence, so that readers can appreciate the limitations of these recommendations and watch for new studies that will refine them. The rating categories were as follows:

1. recommends with consistent evidence (CE), that is, multiple studies generally show a consistent association between the recommended behavior and either obesity risk or energy balance;
2. recommends with mixed evidence (ME), that is, some studies demonstrated evidence for weight or energy balance benefit but others did not show significant associations, or studies were few in number or small in sample size;
3. suggests, that is, studies have not examined the association of the recommendation with weight or energy balance, or studies are few, small in number, and/or without clear findings; however, the expert committee thinks that these recommendations could support the achievement of healthy weight and, if future studies disprove such an effect, then these recommendations are likely to have other benefits and are unlikely to cause harm.

The report provides qualitative ratings of evidence for the recommended lifestyle behaviors. The summary report recommends assessment of the lifestyle behaviors that are targets for change but does not rate evidence for the assessment process; the literature in this area, cited in the assessment report,[2] is sparse and has limited applicability to an office setting. The writing groups also addressed the implementation of clinical care for obesity. At the level of the family, the writing groups suggested strategies to encourage and to support a patient or family that chooses to change eating or physical activity behaviors. At the level of the provider office, the committee suggested ways in which the office system can change to track overweight and obese children and to support family management of this chronic condition. The scarcity of studies about the process of obesity treatment precluded an evidence review. The recommendations represent a consensus based on the best available information. Ongoing research will eventually provide the best possible evidence for childhood obesity care, and future recommendations will reflect new knowledge. In the meantime, clinicians, who routinely make clinical

decisions in the absence of the best possible evidence, will find updated guidance for this pervasive condition.

The writing groups presented their recommendations to the expert committee for discussion and revision in May 2006. Once consensus was reached, the committee members then presented the recommendations to their member organizations for endorsement (see "Acknowledgments" for expert committee and writing group participants).

EPIDEMIOLOGIC FEATURES

Childhood Obesity Epidemic

The rapid increase in the prevalence of childhood obesity has alarmed public health agencies, health care clinicians, health care researchers, and the general public. On the basis of measured heights and weights from nationally representative samples of US children assessed approximately every 5 years, obesity prevalence has increased from ~5% in 1963 to 1970 to 17% in 2003 to 2004.[4] Clinicians are faced with addressing this problem with a steadily increasing number of patients.

Obesity and overweight are defined on the basis of age- and gender-specific BMI normative values that were established when the distribution of BMI values was constant.[5] The increase in obesity prevalence is therefore measured against a stable cutoff point, the 95th percentile BMI for gender and age.

Demographic Features

The obesity epidemic has disproportionately affected some racial/ethnic groups. In 2003–2004, the prevalence rates were particularly high among black girls (24%) and among Mexican American boys (22%).[4] Rates have also increased among Native American and Asian American youths.[6,7] Overall, poverty has been associated with greater obesity prevalence among adolescents; however, subgroups have differed. In 1 report, for example, obesity prevalence among younger black male adolescents was higher in nonpoor families than in poor families but prevalence among older black male adolescents was higher in poor families.[8] Higher family socioeconomic status is associated with lower obesity prevalence among white girls but not among black girls.[7]

Causes

Both genes and environment contribute to obesity risk. Twin studies have clearly demonstrated a genetic risk,[9] and the discovery of leptin, ghrelin, adiponectin, and other hormones that influence appetite, satiety, and fat distribution provides insight into metabolic mechanisms for physiologic risk.[10] With multiple substances and multiple gene sites associated with obesity, the system is complex, redundant, and likely not amenable to a simple pharmaceutical intervention. However, genes are not destiny. Just as behavior and environment strongly influence a person's risk of developing skin cancer, behavior and environment influence the development of obesity in genetically at-risk people. At a population level, the increase in prevalence is too rapid to be explained by a genetic shift; rather, it must result from changes in eating and physical activity behaviors that have shifted the balance of energy intake and energy expenditure.

The influence of specific behavior changes on energy balance is difficult to determine. Many cross-sectional studies and some longitudinal studies have examined the relationships between specific behaviors (for instance, intake of sugar-sweetened beverages or participation in daily physical education classes) and obesity. Interventional studies that examine prospectively the impact of a behavior on weight or BMI are rare. Each of the writing groups reviewed the literature for evidence of the influence of behaviors on either energy balance or BMI. The review found evidence for only a few behaviors. One important limitation of these studies is measurement validity. For assessment of energy intake under normal, free-living circumstance, subjects must report the food they consume, through either recall or a food diary. These methods are inaccurate and subject to underreporting.[11,12] Measuring physical activity is somewhat less problematic, with improved accelerometers and the capacity to measure accurately the total energy expenditure through labeled-water techniques. Probably a bigger challenge in this scientific area is the large number of possible eating and activity behaviors that may contribute to energy imbalance. If greater sugar-sweetened beverage intake, larger portion sizes at all meals and snacks, more-frequent snacks, more ready-to-eat foods, more restaurant eating, more television viewing, fewer physical education classes, less walking to and from school, less outside play at home, more escalators, elevators, and automatic doors, and so forth, all coexist, then the impact of any one of those behaviors on obesity prevalence may be unmeasurable.

Scientists continue to study obesity but, given its complex causes, years or decades may pass before the most effective intervention or prevention strategies are identified. The recommendations presented here are evidence based where evidence is available; where evidence is not available or is incomplete, the expert committee has combined data with clinical judgment, including selected interventions when such interventions are reasonable and are unlikely to cause harm. An example is the recommendation to increase fiber intake. Although studies have not demonstrated that increased fiber intake leads to improved weight, foods that are high in fiber have lower energy density and could displace other foods, resulting in overall reduced energy intake. This diet change, even if unproven, has other nutritional benefits and is unlikely to cause harm. As discussed above, this summary report includes a general

assessment of the quality of evidence for each behavior. The prevention, assessment, and treatment reports provide detailed descriptions of studies for each topic.[1–3]

DEFINITIONS AND TERMINOLOGY

Measurement of Body Fat

High levels of body fat are associated with increasing health risks. However, no single body fat value, whether measured as fat mass or as percentage of body weight, clearly distinguishes health from disease or risk of disease. Even if body fat level could be measured easily, other factors, such as fat distribution, genetics, and fitness, contribute to the health assessment.

BMI, a measure of body weight adjusted for height, is a useful tool to assess body fat. BMI is defined as weight (in kilograms) divided by the square of height (in meters). BMI levels correlate with body fat[13,14] and also correlate with concurrent health risks, especially cardiovascular risk factors.[15] High BMI predicts future adiposity, as well as future morbidity and death.[16] The sensitivity of BMI of >85th percentile for identifying the fattest children is good,[17] and, in contrast to more-precise measures of body fat (such as dual-energy x-ray absorptiometry), health care providers can assess weight and height routinely. Although BMI does not measure body fat directly and therefore may lead to imprecise assessment of adiposity, it is feasible and has acceptable clinical validity if used thoughtfully. Another practical benefit of BMI use for children is the continuity with recommended assessments of adult body weight.

For children, the distribution of BMI changes with age, just as weight and height distributions change. As a result, although absolute BMI is appropriate to define body weight in adults, percentiles specific for age and gender define underweight, healthy weight, overweight, and obesity in children.

The validity of BMI depends in part on the cutoff points used. Like body fat levels, BMI and BMI percentiles are continuous, and any cutoff point will be imperfect in distinguishing those with health risks from those without. When a high cutoff point is selected, patients with "normal" BMI despite high body fat levels will be misclassified as healthy. When the cutoff point is low, patients with high BMI despite normal body fat levels (for example, muscular athletes) will be misclassified as unhealthy. The cutoff point selection must balance overdiagnosis and underdiagnosis. Because body fat levels and health risks are continuous, clinicians should rely on BMI as a useful tool that triggers concern and assessment, but they should recognize that other clinical information influences the need for intervention.

Pediatric Cutoff Points and Terminology: Same Cutoff Points, New Terms

The use of 2 cutoff points, namely, BMI of 95th percentile and 85th percentile, captures varying risk levels and minimizes both overdiagnosis and underdiagnosis. When BMI is <85th percentile, body fat levels are likely to pose little risk. When BMI is ≥95th percentile, body fat levels are likely to be high. BMI of 85th to 94th percentile indicates health risks that vary depending on body composition, BMI trajectory, family history, and other factors. These cutoff points are unchanged from the 1998 expert committee recommendations[18] and CDC[5] and Institute of Medicine[19] recommendations.

The expert committee recommends different terminology. The committee suggests that, when BMI is ≥95th percentile, the term "obesity" should replace "overweight" and, when BMI is 85th to 94th percentile, "overweight" should replace "at risk of overweight." The compelling reasons for this revision are clinical. The term obesity denotes excess body fat more accurately and reflects the associated serious health risks more clearly than does the term overweight, which is not recognized as a clinical term for high adiposity. Overweight denotes high weight from high lean body mass as well as from high body fat levels and so is appropriate for the 85th to 94th percentile category, which includes children with excess body fat as well as children with high lean body mass and minimal health risks. These terms provide continuity with adult definitions and avoid the vagueness of "at risk of overweight," which has been confusing to patients and health care providers. Because the recommended cutoff points have not changed, these terms will not affect the prevalence rates of the BMI categories.

Exceptions to the use of 85th and 95th percentile BMI values as cutoff points occur for older and younger children. For older adolescents, BMI of 95th percentile is higher than BMI of 30 kg/m^2, the adult obesity cutoff point. The committee therefore recommends that obesity in youths be defined as BMI of 95th percentile or BMI of ≥30 kg/m^2, whichever is lower. For children <2 years of age, BMI normative values are not available. Weight-for-height values above the 95th percentile in this age group can be categorized as overweight.

Stigmatization associated with the term obesity has been one reason for the use of the term overweight. The negative connotation of obesity results from pervasive social prejudice and deserves attention.[20–22] However, the committee recommends that clinicians address this concern through supportive demeanor and language in the clinical encounter. The terminology and cutoff points for both adults and children have been debated, but several groups have weighed the advantages and disadvantages and made similar recommendations (Table 1).

Calculators, wheels, tables, and nomograms are some of the tools used to calculate absolute BMI, which then is plotted on current growth charts available on-line from the CDC. Personal digital assistant devices and Internet-based programs can calculate BMI and also report percentiles; to monitor a child's growth pattern over

TABLE 1 **Terminology for BMI Categories**

BMI Category	Former Terminology	Recommended Terminology
<5th percentile	Underweight	Underweight
5th–84th percentile	Healthy weight	Healthy weight
85th–94th percentile	At risk of overweight[ab]	Overweight[c]
≥95th percentile	Overweight[ab] or obesity[a]	Obesity[cd]

[a] Expert committee recommendations, 1998.[15]
[b] CDC recommendations, 2002.[2]
[c] International Obesity Task Force, 2000.[45]
[d] Institute of Medicine, 2005.[16]

TABLE 2 **BMI Tools**

Tools	BMI Calculation	BMI Percentile Classification	BMI Percentile Plotting	BMI *z* Score[a]
Standard calculator[b]	X			
BMI wheel	X			
BMI nomogram	X			
BMI growth curves		X	X	
Internet-based calculator[c]	X	X		X
Personal digital assistant program[d]	X	X		[e]
Electronic health record	X	X	X	X

BMI calculation, percentile classification, and BMI percentile plotting are required to monitor a child's growth over time.
[a] Generally not needed in clinical care.
[b] Metric: kilograms/meters/meters; English: pounds/inches/inches × 703.
[c] Example: www.rch.org.au/genmed/clinical.cfm?doc_id=2603.
[d] Example: http://hp2010.nhlbihin.net/bmi_palm.htm.
[e] Potential application; not currently available.

time, however, clinicians must plot BMI values on a BMI curve. Electronic health record programs can calculate BMI values, report percentiles, and automatically plot a child's BMI values over time on a BMI curve (Table 2). For children <2 years of age, providers should plot weight-for-height values over time.

Once a child's BMI is measured, clinicians must exercise judgment, first in assessing the child's health and then in choosing language to inform the child and family. Especially for a child with BMI in the overweight category (85th–94th percentile), a clinician may decide that the health risk is low, but he or she should make that decision with knowledge of the BMI category, rather than a visual impression of normal weight, and with a deliberate review or update of the patient's family and medical history, a review of the BMI trajectory, and an assessment of body fat distribution, diet and activity habits, and appropriate laboratory tests. The clinician may conclude that the overweight child is not "overfat" and can safely reinforce the obesity prevention messages that are appropriate for children with healthy BMI values. Future scientific data on the risk of obesity and the risk of medical problems may improve clinicians' ability to predict which children need early intervention; currently, however, primary health care providers must use clinical judgment and must regularly review the child's BMI and reassess health risks. Rarely, children with BMI of >95th percentile are also deemed healthy, although this is less likely to be the case the farther values are above the 95th percentile curve, and some children with BMI somewhat below the 85th percentile may have fat-related health risks. The BMI is an important screening tool, but it must be integrated with other information in the health assessment.

Much legitimate concern exists about stigmatization of overweight and obese children.[21,23] Public concern followed decisions to assess BMI in schools, because of the potential harm of labeling a child with a condition that is a target of prejudice.[24] Health care visits are generally a good place to identify excess weight, because the setting frames the condition as a health problem and because the visit is private. Therefore, clinicians must take responsibility for identification but must approach the subject sensitively, to minimize embarrassment or harm to self-esteem. Consistent with the 1998 recommendations,[18] the expert committee urges clinicians to be supportive, empathetic, and nonjudgmental. A careful choice of words will convey an empathetic attitude. Adult patients have identified "fatness," "excess fat," and "obesity" as derogatory terms,[25] and obese adolescents prefer the term "overweight."[26] Younger children and their families may respond similarly, and clinicians should discuss the problem with individual families by using more-neutral terms, such as "weight," "excess weight," and "BMI." Therefore, the expert committee recommends the use of the clinical terms overweight and obesity for documentation and risk assessment but the use of different terms in the clinician's office, to avoid an inference of judgment or repugnance.

Recognition of the need for a third cutoff point to define severe obesity in childhood obesity seems to be evolving. An adolescent weighing 180 pounds and another weighing 250 pounds are in the same BMI category (>95th percentile) but face markedly different social and medical effects. New data indicate that extreme obesity in children is increasing in prevalence, and these children are at high risk for multiple cardiovascular disease risk factors.[27] A definition of severe childhood obesity would help identify these children so that their particular risks and treatment needs can be established. The expert committee proposes recognition of the 99th percentile BMI, which is BMI of ~30 to 32 kg/m^2 for youths 10 to 12 years of age and ≥34 kg/m^2 for youths 14 to 16 years of age. The marked increase in risk factor prevalence at this percentile provides clinical justification for this additional cutoff point. Although much additional study with larger and more-diverse samples is needed to characterize the medical and social risks of this category, the committee recommends that clinicians recognize this BMI cutoff point and ensure that best efforts are made to provide treatment to these youths and their families. Because the 97th percentile is the highest curve

TABLE 3 **Cutoff Points for 99th Percentile BMI According to Age and Gender**

Age, y[a]	99th Percentile BMI Cutoff Point, kg/m²	
	Boys	Girls
5	20.1	21.5
6	21.6	23.0
7	23.6	24.6
8	25.6	26.4
9	27.6	28.2
10	29.3	29.9
11	30.7	31.5
12	31.8	33.1
13	32.6	34.6
14	33.2	36.0
15	33.6	37.5
16	33.9	39.1
17	34.4	40.8

The data were derived from ~500 children in each year from 5 through 11 years of age and ~850 children in each year from 12 through 17 years of age (adapted from Freedman et al,[24] with permission).

[a] Cutoff points are at the midpoint of the child's year (eg, 5.5 years).

available on the growth charts, Table 3 provides 99th percentile cutoff points according to age and gender.

OVERVIEW OF PROVIDER OFFICE PROCESS

Universal Assessment of Obesity Risk

These recommendations support a shift from simple identification of obesity, which often occurs when the condition is obvious and intractable, to universal assessment, universal preventive health messages, and early intervention. If primary care providers are to have an impact on the childhood obesity epidemic, then their best approach is assessment of obesity risk for all patients, with anticipatory guidance on healthy behaviors to minimize that risk. The work of the expert committee and writing groups addresses all stages of care, from normal-weight, low-risk children to severely obese children. Figure 1 presents an overview of the process to assess obesity risk.

Although it is not a precise measure of body fat or health risk, BMI is the initial screen that should be calculated at each well-child visit and should serve as the starting point for classification of health risks. Children in the healthy-weight category (BMI of 5th–84th percentile) have lower risks, although parental obesity, family medical history, and current diet and physical activity behaviors may alter that assessment. These children and their families should receive support in maintaining or establishing healthy lifestyle (prevention) behaviors. The likelihood of health risks increases in the 85th to 94th percentile (overweight) category and again is influenced by parental obesity, family medical history, and current lifestyle habits, as well as BMI trajectory and current cardiovascular risk factors. Some of these children should receive prevention counseling, whereas others should receive more-active intervention. Children with a BMI above the 95th percentile (obese) are very likely to have obesity-related health risks, and most should be encouraged to focus on weight control practices. Providers must use clinical judgment in assessing

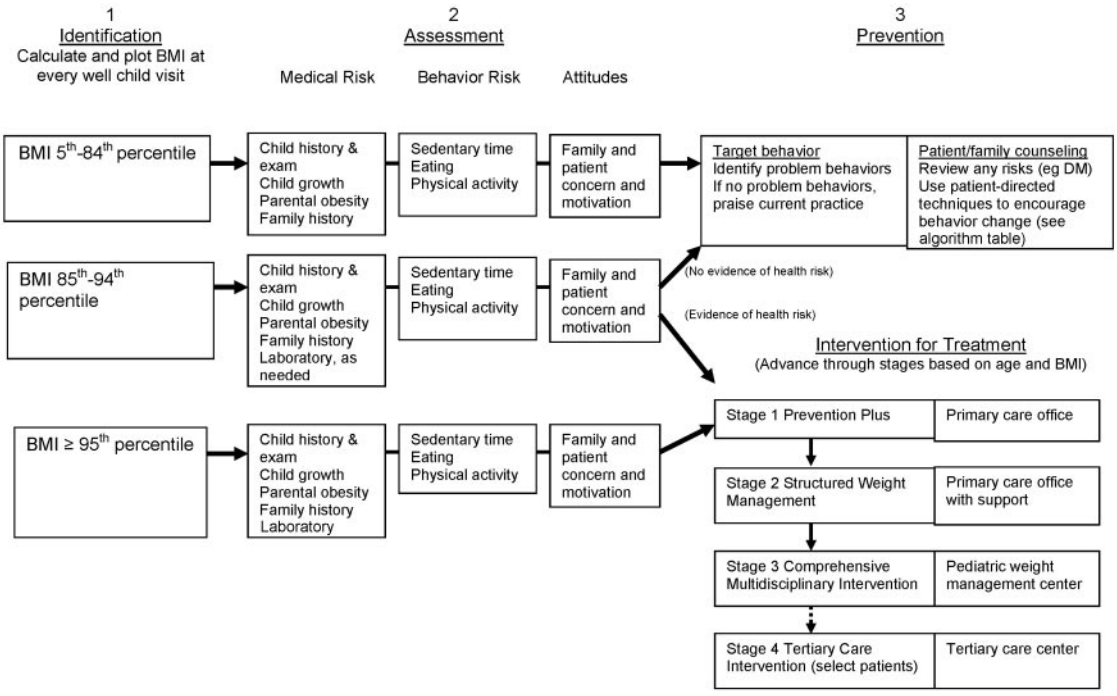

FIGURE 1
Universal assessment of obesity risk and steps to prevention and treatment. DM indicates diabetes mellitus.

health risks, because no formula exists that can integrate BMI pattern, family background, and health behaviors to determine future weight and health. Clinicians use similar information to evaluate underweight children for failure to thrive. Because ideally the children will return to the same provider, the assessment can be revised and the approach adjusted.

Chronic Care Model

The expert committee recommendations are comprehensive and ambitious. Health care-centered efforts alone cannot effect change, but they can complement and potentially enhance evolving public health efforts, such as school wellness policies, parks and recreation programs, and shifts in child-targeted food advertisements. In addition, health care provider offices and health care systems will need to change, in many cases, to implement these recommendations. These recommendations can serve as guides that will improve as new information becomes available.

The traditional office visit model works best for acute problems, such as otitis media or joint injury; the clinician assesses the single problem, orders additional testing as needed, and presents a treatment plan (generally short-term) to the patient. However, the complexity of chronic problems, such as diabetes mellitus or obesity, and their requirement for patient education about self-management often overwhelm both the patient and the clinician during an office visit. The chronic care model[28] envisions a new structure that integrates community resources, health care, and patient self-management to provide more-comprehensive and more-useful care. This paradigm envisions offices linked to community resources, such as exercise programs; support for self-management, which requires educating patients and families about assessment and monitoring; an expanded practice team that supports patient self-management and monitors adherence to evidence-based care pathways; and clinical information systems that can remind the team of routine tests and treatments and can monitor the practice's adherence to goals.[28,29] Changes in office procedure require deliberate planning and evaluation, and the rapid-cycle quality improvement method may be a useful approach for continuous quality improvement.[30] In this model, practices plan a change and a method to measure that change, implement the change, and then examine the measure of change. The plan is modified depending on how well the goals are met. The cycle is repeated until the practice is satisfied with the change. For example, a practice could plan to include the BMI category next to the vital signs on the patient's chart for well-child visits. After 3 months, the practice would measure the percentage of charts that included the BMI category. If only 60% of charts included the BMI category, then staff members would discuss barriers and propose a new plan, such as readily available BMI calculators or the need for the office secretary to add growth charts with BMI curves to records of established patients with weight-for-height curves. With the new routine in place, progress toward the goal would again be measured.

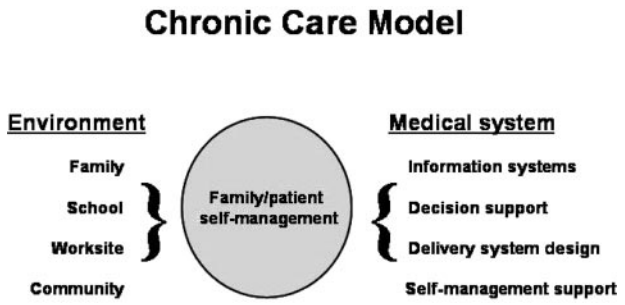

FIGURE 2
Obesity care model.

The chronic care model has obvious applications in childhood obesity, and several large health maintenance organizations have initiated some of these approaches. Kaiser Permanente has trained staff members to use motivational interviewing, and Wellpoint has distributed parental toolkits in primary care clinics, to help educate office personnel about children's development and appropriate nutrition and physical activity. Several programs have linked to community efforts, such as community-based exercise programs. The care model for obesity recognizes the importance of changes in the school, worksite, and community. Figure 2 shows how the environment and the medical system support the patient and the family in their management of the condition.

Providers have reported that lack of reimbursement often is a barrier to obesity care.[31] Currently, insurance carriers may exclude obesity treatment from the benefits packages they offer. The American Academy of Pediatrics has a fact sheet about appropriate coding (www.aap.org/healthtopics/overweight.cfm) and can answer specific coding questions through electronic mail (aapcodinghotline@aap.org). The prevention report includes tables with billing codes for obesity-related preventive care, as well as diagnostic codes.[1] Currently, health maintenance organizations may invest in preventive care more willingly than traditional fee-for-service insurance.

Obesity Care and Cultural Values of Patients

Beliefs about what is an attractive weight or a healthy weight, what foods are desirable or appropriate for parents to provide children, how families should share meals, the importance or enjoyment of physical activity, and the authority parents have over children at different ages, as well as many other attitudes that affect lifestyle habits, are influenced by cultural values and beliefs. Some studies have examined differences between iden-

tified racial, ethnic, or cultural groups, such as the observation that black girls are more satisfied with heavier bodies than are white girls.[32] Low-income mothers may recognize obesity as a problem, not on the basis of growth curves but when they perceive that high weight restricts their child's tolerance for physical activity.[33] A study of low-income minority parents of preschool-aged children showed that Hispanic parents had indulgent feeding styles more often than did low-income black parents.[34] Population studies indicate that levels of vigorous physical activity differ according to age and racial group.[35,36] However, studies in these areas are incomplete. Barriers to behavior change may be related to community circumstances, such as lack of safe recreation areas, rather than values and preferences. Clinicians should inform themselves about the values or circumstances that may be common in the population they serve, especially if that population differs from their own. However, a clinician's knowledge of an individual family's personal values and circumstances, which are not dictated by the family's ethnic, racial, or economic group, may be most helpful in tailoring recommendations.

PREVENTION

Importance

Given the difficulty of behavior-based weight loss and subsequent weight maintenance and the expense and potential harm of medication and surgery, obesity prevention should be a public health focus. Efforts must begin early in life, because obesity in childhood, especially among older children and those with more-severe obesity, is likely to persist into adulthood.[37] Therefore, childhood represents an important opportunity to establish healthy eating and activity behaviors that can protect children against future obesity. Pediatric providers are accustomed to addressing health behaviors, such as car seat use, tobacco avoidance, and avoidance of risky sexual behavior, and they provide guidance on nutrition in early childhood routinely. In addition, they know the family's medical history and social and behavioral interactions. They are well positioned to guide families in the areas of eating and activity.

The targets of obesity prevention should be all children, starting at birth. Lifestyle behaviors to prevent obesity, rather than intervention to improve weight, should be aimed at children with healthy BMIs (5th–84th percentile) and some children with BMIs in the overweight category (85th–94th percentile), depending on their growth pattern and risk factors. Clinicians should be aware of the increased risk of obesity for children with obese parents and those whose mothers had diabetes mellitus during the child's gestation. Indeed, young children with 1 or 2 obese parents are at high risk of obesity in young adulthood, even if their current weight is normal.

Target Behaviors

The expert committee recommends that clinicians advise patients and their families to adopt and to maintain the following specific eating, physical activity, and sedentary behaviors. These healthy habits may help prevent excessive weight gain and also are unlikely to cause harm, on the basis of current knowledge. The level of evidence is indicated, and the prevention report provides references.[1]

Evidence supports the following:

1. limiting consumption of sugar-sweetened beverages (CE);
2. encouraging consumption of diets with recommended quantities of fruits and vegetables; the current recommendations from the US Department of Agriculture (USDA) (www.mypyramid.gov) are for 9 servings per day, with serving sizes varying with age (ME);
3. limiting television and other screen time (the American Academy of Pediatrics[38] recommends no television viewing before 2 years of age and thereafter no more than 2 hours of television viewing per day), by allowing a maximum of 2 hours of screen time per day (CE) and removing televisions and other screens from children's primary sleeping area (CE) (although a relationship between obesity and screen time other than television viewing, such as computer games, has not been established, limitation of all screen time may promote more calorie expenditure);
4. eating breakfast daily (CE);
5. limiting eating out at restaurants, particularly fast food restaurants (CE) (frequent patronage of fast food restaurants may be a risk factor for obesity in children, and families should also limit meals at other kinds of restaurants that serve large portions of energy-dense foods);
6. encouraging family meals in which parents and children eat together (CE) (family meals are associated with a higher-quality diet and with lower obesity prevalence, as well as with other psychosocial benefits); and
7. limiting portion size (CE) (the USDA provides recommendations about portions, which may differ from serving sizes on nutrition labels, and a product package may contain >1 serving size).

The prevention writing group also suggests, on the basis of analysis of available data and expertise, the following behaviors:

1. eating a diet rich in calcium (the USDA provides recommendations about serving size and daily number of dairy product servings);

2. eating a diet high in fiber;
3. eating a diet with balanced macronutrients (energy from fat, carbohydrates, and protein in proportions for age, as recommended by Dietary Reference Intakes)[39];
4. encouraging exclusive breastfeeding to 6 months of age and maintenance of breastfeeding after introduction of solid food to 12 months of age and beyond, consistent with American Academy of Pediatrics recommendations[40,41];
5. promoting moderate to vigorous physical activity for at least 60 minutes each day[42]; and
6. limiting consumption of energy-dense foods.

Implementation

The complexity of obesity prevention lies less in the identification of target health behaviors and much more in the process of influencing families to change behaviors when habits, culture, and environment promote less physical activity and more energy intake. Handing families a list of recommended eating and activity habits as if it were an antibiotic prescription fits into traditional medical training and the structure of the office visit, but such an approach is rarely effective. The prevention writing group has provided suggestions on how to interact with families to promote target behaviors and how to create office systems that support the clinician's ongoing commitment to obesity prevention. The appendix of the prevention report presents an example of office visit structure, interaction between provider and patient, and specific language to illustrate this approach.[1]

The Role of the Family

Several studies of obesity treatment in children have demonstrated the importance of parents' participation in weight control programs.[43–45] The commitment of parents and other caregivers to helping the child develop healthy habits to prevent obesity is likely to be very important. Parents can serve as role models, authority figures, and behavioralists to mold their children's eating and activity habits. Clinicians can influence children's habits indirectly by teaching and motivating parents to use their authority effectively. For very young children, clinicians should focus the discussion on parenting behavior. The greater independence of adolescents means that clinicians should discuss health behaviors directly with them, although clinicians should encourage parents to make the home environment as healthy as possible.

Parenting actions that support the target behaviors differ with the age of the child, and clinicians can provide appropriate material to assist parents. For instance, clinicians can discuss or provide information about encouraging free safe movement for infants, appropriate food portions for toddlers, limited stroller use for preschoolers, and easy breakfast alternatives for teenagers. The prevention report contains a list of age-specific parenting actions.[1]

Clinicians function as counselors in obesity prevention and obesity care. Briefly presented below are some counseling techniques that can be used to encourage parents and patients to improve healthy behaviors. Short courses at local or national meetings can give clinicians greater opportunities to learn counseling techniques, which are generally not taught as part of the usual health care education.

Patient-Centered Communication

The theories that follow assume that a clinician's instruction to change a behavior will be effective only if the parent or family recognizes a potential problem and wants to address or to prevent that problem. Therefore, part of the clinician's task is to help motivate families. Counseling techniques are presented here as ways to encourage obesity prevention behaviors, but the same approach has applications in obesity treatment behaviors.

The stages of change theory describes several cognitive stages that precede actual behavior change.[46] According to this theory, a person may initially be unaware of a problem, then move to awareness of the problem but have no plans to address it, then plan a new behavior, and finally actually begin the new behavior. A clinician can help patients and families move along these stages, rather than prescribing a new behavior to those who are not ready. Recent work indicates that parents of overweight and obese children are often unaware of the condition.[47]

The technique of motivational interviewing, which also takes into account patients' readiness to change, uses nonjudgmental questions and reflective listening to uncover the beliefs and values of a parent or patient. By eliciting the concerns of patients, the clinician can evoke motivation, rather than try to impose it, and then help patients formulate a plan that is consistent with their own values. This approach avoids the defensiveness created by a more-directive style.

1. nondirective questions about the parent's or patient's attitude should be used ("Your child's BMI is above the 95th percentile. What concerns, if any, do you have about her weight?") The clinician's next steps depend on the parent's response. This approach differs from a directive style, in which the clinician informs the family of the seriousness of the condition ("Your child's BMI is very high, and it is important that your child gets control of her weight before it becomes a bigger problem.");
2. reflective listening, in which the clinician summarizes the parent's comments without judging them, should

TABLE 4 **Fifteen-Minute Obesity Prevention Protocol**

Step	Sample Language
Step 1. Assess	
Assess weight and height and convert to BMI	
Provide BMI information	We checked your child's BMI, which is a way of looking at weight and taking into consideration how tall someone is. Your child's BMI is in the range where we start to be concerned about extra weight causing health problems.
Elicit parent's concerns	What concerns, if any, do you have about your child's weight? "He did jump 2 sizes this year. Do you think he might get diabetes someday?"
Reflect/probe	So you've noticed a big change in his size and you are concerned about diabetes down the road. What makes you concerned about diabetes in particular?
Assess sweetened beverage, fruit, and vegetable intake, television viewing and other sedentary behaviors, frequency of fast food or restaurant eating, consumption of breakfast, and other factors	(Use verbal questions or brief questionnaires to assess key behaviors) Example: About how many times a day does your child drink soda, sports drinks, or powdered drinks like Kool-Aid?
Provide/elicit	
Provide positive feedback for behavior(s) in optimal range; elicit response; reflect/probe	You are doing well with sugared drinks. "I know it's not healthy. He used to drink a lot of soda, but now I try to give him water whenever possible. I think we are down to just a few sodas a week." So, you have been able to make a change without too much stress.
Provide neutral feedback for behavior(s) not in optimal range; elicit response; reflect/probe	Your child watches 4 hours of television on school days. What do you think about that? "I know it's a lot, but he gets bored otherwise and starts picking an argument with his little sister." So, watching TV keeps the household calm.
Step 2. Set agenda	
Query which, if any, of the target behaviors the parent/child/adolescent may be interested in changing or which might be easiest to change	We've talked about eating too often at fast food restaurants, and how television viewing is more hours than you'd like. Which of these, if either of them, do you think you and your child could change? "Well, I think fast food is somewhere we could do better. I don't know what he would do if he couldn't watch television. Maybe we could cut back on fast food to once a week."
Agree on possible target behavior	That sounds like a good plan.
Step 3. Assess motivation and confidence	
Assess willingness/importance	On a scale of 0 to 10, with 10 being very important, how important is it for you to reduce the amount of fast food he eats?
Assess confidence	On a scale of 0 to 10, with 10 being very confident, assuming you decided to change the amount of fast food he eats, how confident are you that you could succeed?
Explore importance and confidence ratings with the following probes:	
Benefits	You chose 6. Why did you not choose a lower number? "I know all that grease is bad for him."
Barriers	You chose 6. Why did you not choose a higher number? "It's quick and cheap and he loves it, especially the toys and fries." Reflection: So there are benefits for both you and him.
Solutions	What would it take you to move to an 8? "Well, I really want him to avoid diabetes. My mother died of diabetes, and it wasn't pretty; maybe if he started showing signs of it; maybe if I could get into cooking a bit more."
Step 4. Summarize and probe possible changes	
Query possible next steps	So where does that leave you? or From what you mentioned it sounds like eating less fast food may be a good first step, or How are you feeling about making a change?
Probe plan of attack	What might be a good first step for you and your child? or What might you do in the next week or even day to help move things along? or What ideas do you have for making this happen? (If patient does not have any ideas) If it's okay with you, I'd like to suggest a few things that have worked for some of my patients.
Summarize change plan; provide positive feedback	Involving child in cooking or meal preparation, ordering healthier foods at fast food restaurants, and trying some new recipes at home.
Step 5. Schedule follow-up visit	
Agree to follow-up visit within *x* weeks/months	Let's schedule a visit in the next few weeks/months to see how things went.
If no plan is made	Sounds like you aren't quite ready to commit to making any changes now. How about we follow up with this at your child's next visit? or Although you don't sound ready to make any changes, between now and our next visit you might want to think about your child's weight gain and lowering his diabetes risk.

be used ("If I heard you correctly, you are concerned about how much television your child is watching, but you know your child is safe and happy watching television when he is home alone.") Reflections help build rapport and allow the patient to understand and to resolve ambivalence;

3. values and current health practices should be compared; if a parent values her child being healthy and a good student, then the clinician can help the parent examine how activities other than television could improve the child's health and academic performance;

4. importance/confidence rulers should be used ("On a scale from 0 to 10, with 10 being the highest, how important is it to you to change your child's television viewing?" "On a scale from 0 to 10, with 10 being the highest, how confident are you that you could decrease his television viewing to 2 hours a day?") The number the parent gives leads the clinician to ask, "What would it take to get you to a higher number?" The clinician should thus help the parent think of solutions to the problem.

Table 4 presents an example of an interchange during an office visit that focuses on obesity prevention and incorporates motivational interviewing techniques.

Cognitive and behavioral techniques can help patients and families who are prepared to modify behaviors to achieve these changes. Providers can encourage goal setting, monitoring of behaviors targeted for change, and use of positive reinforcement. Initial goals should be easily achievable, such as engaging in 15 minutes of physical activity or having only 1 serving of a sugar-sweetened beverage each day. Reinforcement by parents should be given for behavior goals rather than weight change and can take the form of verbal praise or an extra privilege but not food. Providers should expect imperfect adherence and should communicate to parents and patients that they are making progress even if they do not achieve their goals every day. Providers and parents should focus on successes and not failures.

The Role of the Provider's Office

The provider's office system can enhance or undermine the clinician's efforts to address obesity prevention consistently. The expert committee endorses the following office practices.

1. routine documentation of BMI. Although clinicians visually recognize obesity in many children without seeing the plotted BMI values, they may overlook excess body fat in children in the overweight (85th–94th percentile BMI) category and miss an opportunity to guide the family toward healthier behaviors. To document BMI consistently and accurately, offices need reliable scales for infants and children, recumbent infant length boards, and wall-mounted stadiometers. This equipment needs regular calibration. Staff members must know how to measure weight and height accurately, how to calculate BMI, and how to plot the measures on the growth curves;
2. establishment of procedures to deliver obesity prevention messages to all children. When the patient's individual risk of obesity is low, these messages can promote appropriate general health or wellness, rather than weight control. One example from collaborative efforts in Maine and Massachusetts is the 5 2 1 0 message, which reminds families to eat ≥5 fruits and vegetables, spend no more than 2 hours on screen time, include 1 hour of physical activity or active play, and consume little or no sugar-sweetened beverages. Clinicians remind families of these goals at all health supervision visits and have posters in the office and handouts that reinforce these recommendations. Although the specific content of such messages may vary until research establishes the best approach, simple memorable guidelines, presented early and repeated regularly, can be delivered efficiently in the office and are likely to be effective teaching tools;
3. establishment of procedures to address children who are overweight (85th–94th percentile BMI) and obese (≥95th percentile BMI). For instance, when a child is overweight, a practice may plan to review the family history, child's blood pressure, child's cholesterol level, and BMI percentile over time and then assess health risks on the basis of that information. Offices should flag charts of overweight and obese children, so that all providers at all visits are aware and can monitor growth, risk factors, and social/emotional issues;
4. involvement and training of interdisciplinary teams, including nurses, physicians, and administrative staff members, regarding their respective responsibilities and skills;
5. chart audits to establish baseline practices, to help set goals for practice improvement, and then to measure the improvement over time. Offices can use the techniques for continuous quality improvement from the rapid-cycle improvement method described above.

The Roles of the School and the Community

These recommendations focus on the office visit and the opportunity to influence the family routine and home environment, but the child's school and community environments can either support or impede obesity prevention behaviors. Clinicians can support school and community programs that help prevent obesity through local, state, or national advocacy, and they can encourage patients' families to voice their preference to their schools through parent-teacher organizations or school board meetings or directly to principals, teachers, and after-care program directors. The Institute of Medicine report on obesity prevention provides a model for school policies.[19] It recommends adequate physical education and recess periods and the establishment of nutritional standards for all foods served at school, including foods from vending machines and other competitive foods.[19] To improve the community environment, providers can advocate for the establishment and maintenance of safe parks and recreation centers, and they can urge local grocery stores to offer healthy, low-cost food that is

consistent with the most common cultures of the community members.

ASSESSMENT

Risks

When a child's BMI is above the 85th percentile, the clinician should assess medical and behavioral risks before initiating any intervention. Medical risks include risk of future or persistent obesity, risk of future obesity-related medical conditions, and identification of current obesity-related medical conditions. Behavioral risks include current eating habits, physical activity, and sedentary behaviors that promote energy imbalance. These evaluations must precede behavior-based treatment.

Medical Assessment

Responsibility

Screening children for obesity-related medical problems falls squarely in the purview of health care providers, especially primary care providers. Providers are responsible for considering any current obesity-associated medical conditions, such as hyperlipidemia, risks of future conditions associated with obesity and ameliorated by weight control, and rare conditions that cause obesity, such as primary Cushing syndrome or Prader-Willi syndrome. Because weight control alone may not treat many conditions adequately, diagnosis must be followed by appropriate treatment.

Body Fat Assessment

The BMI percentile, although imperfect, is the recommended screen for body fat in routine office practice. Offices should use the 2000 CDC BMI charts, rather than the International Obesity Task Force standards, because the CDC charts provide the full array of percentile levels (which makes them more appropriate for assessment of individual children), whereas the International Obesity Task Force charts provide only overweight and obesity categories.[5,48]

Skinfold thickness measurements are not recommended. Although these measurements provide information about body fat and risks of medical conditions,[49] they are not feasible in routine clinical care, because they are difficult to perform accurately without careful training and experience and reference data are not readily available.

Similarly, waist circumference measurements are not recommended currently. Waist circumference measurements can provide indirect information about visceral adiposity, which tracks with cardiovascular and metabolic risk factors, and are more easily performed than skinfold thickness measurements,[50–52] but reference values for children that identify risk over and above the risk from BMI category are not available. In the future, cutoff points that provide additional information and can influence evaluation or treatment may make waist circumference measurement a useful clinical tool.

TABLE 5 **Findings on Review of Systems in Obesity Assessment and Possible Causes**

Symptom	Possible Causes
Anxiety, school avoidance, social isolation	Depression
Severe recurrent headaches	Pseudotumor cerebri
Shortness of breath, exercise intolerance	Asthma, lack of physical conditioning
Snoring, apnea, daytime sleepiness	Obstructive sleep apnea, obesity hypoventilation syndrome
Sleepiness or wakefulness	Depression
Abdominal pain	Gastroesophageal reflux disease, constipation, gallbladder disease, NAFLD[a]
Hip pain, knee pain, walking pain	Slipped capital femoral epiphysis, musculoskeletal stress from weight (may be barrier to physical activity)
Foot pain	Musculoskeletal stress from weight (may be barrier to physical activity)
Irregular menses (<9 cycles per y)	Polycystic ovary syndrome; may be normal if recent menarche
Primary amenorrhea	Polycystic ovary syndrome, Prader-Willi syndrome
Polyuria, polydipsia	Type 2 diabetes mellitus[a]
Unexpected weight loss	Type 2 diabetes mellitus[a]
Nocturnal enuresis	Obstructive sleep apnea
Tobacco use	Increased cardiovascular risk; may be used as form of weight control

[a] These conditions are often asymptomatic.

BMI percentile categories guide assessment of medical risk; 5th to 85th percentile is healthy weight, 85th to 94th percentile is overweight, and ≥95th percentile is obese, with >99th percentile being an emerging category that indicates a high likelihood of immediate medical problems. Because no objective assessment to distinguish high body fat from high lean body mass is clinically practical, clinicians must also consider the family history of obesity and medical problems, the child's past BMI pattern, and the child's current medical conditions and current health behaviors as they decide whether to recommend intervention.

Parental Obesity

Parental obesity is a strong risk factor for a child's obesity persisting into adulthood, especially for young children.[37] Genetic vulnerability plays an important role in the development of obesity. Although it is currently not possible to test for specific genotypes or to adapt therapy on the basis of genetic information, knowledge of strong familial risks for obesity, especially parental obesity, should lead to greater efforts to establish or to improve healthy behaviors.

Family Medical History

Several obesity-related medical conditions are familial. Family history predicts type 2 diabetes mellitus or insu-

TABLE 6 **Physical Examination Findings in Obesity Assessment and Possible Causes**

System	Findings	Possible Explanations
Anthropometric features	High BMI percentile	Overweight or obesity
	Short stature	Underlying endocrine or genetic condition
Vital signs	Elevated blood pressure	Hypertension if systolic or diastolic blood pressure >95th percentile for age, gender, and height on ≥3 occasions
Skin	Acanthosis nigricans	Common in obese children, especially when skin is dark; increased risk of insulin resistance
	Excessive acne, hirsutism	Polycystic ovary syndrome
	Irritation, inflammation	Consequence of severe obesity
	Violaceous striae	Cushing syndrome
Eyes	Papilledema, cranial nerve VI paralysis	Pseudotumor cerebri
Throat	Tonsillar hypertrophy	Obstructive sleep apnea
Neck	Goiter	Hypothyroidism
Chest	Wheezing	Asthma (may explain or contribute to exercise intolerance)
Abdomen	Tenderness	Gastroesophageal reflux disorder, gallbladder disease, NAFLD[a]
	Hepatomegaly	NAFLD[a]
Reproductive system	Tanner stage	Premature puberty in <7-y-old white girls, <6-y-old black girls, and <9-y-old boys
	Apparent micropenis	May be normal penis that is buried in fat
	Undescended testes	Prader-Willi syndrome
Extremities	Abnormal gait, limited hip range of motion	Slipped capital femoral epiphysis
	Bowing of tibia	Blount disease
	Small hands and feet, polydactyly	Some genetic syndromes

[a] These conditions are usually without signs.

lin resistance, and the prevalence of childhood diabetes is especially high among several ethnic and racial backgrounds common in the United States, including Hispanic, black, and North American Indian.[53] Cardiovascular disease and cardiovascular disease risk factors (hyperlipidemia and hypertension) are also more common when family history is positive.[54] Offices should review and regularly update the family history regarding first- and second-degree relatives.

Evaluation of Weight-Related Problems

Screening

Obesity-related medical conditions affect almost every organ system in the body. A review of systems and a physical examination represent an inexpensive way to screen for many of these conditions, although some conditions are without symptoms or signs. Summarized below are important weight-related medical conditions, with their common symptoms and appropriate screening tests. Tables 5 and 6 present a review of systems and physical examination findings in the order typically followed in an office visit.

Sleep Problems

Obstructive sleep apnea can lead to right ventricular hypertrophy and pulmonary hypertension. In addition, the disturbed sleep leads to poor attention, poor academic performance, and enuresis. This condition is one of the most serious problems that can occur and is more common among children who are severely obese. Prevalence is higher among obese children[55,56] and may be ≥50% among adolescents with severe obesity.[57] Symptoms that parents may notice are loud snoring with pauses in breathing, restless sleep, and daytime somnolence. On physical examination, children may have tonsillar hypertrophy, although obstructive sleep apnea can occur in the absence of tonsillar hypertrophy or after removal of tonsils and adenoids. Diagnosis is made through polysomnography. Treatment should include removal of tonsils and adenoids if they are enlarged. If this approach is ineffective or not indicated, then a pulmonologist should evaluate the patient for continuous positive airway pressure therapy during sleep.

In obesity hypoventilation syndrome, the weight of fat on the chest and abdomen impairs ventilation; these patients are severely obese. Symptoms are similar to those of obstructive sleep apnea, and diagnosis is made through polysomnography, which demonstrates elevated carbon dioxide levels. These patients may have elevated hemoglobin and hematocrit levels. They require continuous positive airway pressure therapy until substantial weight loss relieves the condition.

Respiratory Problems

Asthma may occur more frequently among obese children.[58] Shortness of breath and exercise intolerance may be symptoms of asthma, rather than signs of poor physical conditioning. Diagnosis is made in the usual way.

Obese patients with asthma may need guidance about asthma management during physical activity or outdoor play, to minimize the limitations on exercise.

Gastrointestinal Problems

Nonalcoholic fatty liver disease (NAFLD) is a condition of increasing concern because of the increasing prevalence of obesity and diabetes, which are important risk factors. The term NAFLD includes simple steatosis, steatohepatitis, fibrosis, and cirrhosis resulting from fatty liver. Knowledge of prevalence, natural history, and effective management is incomplete, although studies are ongoing. NAFLD generally causes no symptoms, although some patients have right upper quadrant abdominal pain or tenderness or mild hepatomegaly. Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels, which are usually elevated, are reasonably good screens. Ultrasonography and other imaging methods can demonstrate changes consistent with nonalcoholic steatohepatitis but cannot indicate the degree of inflammation or fibrosis. Liver biopsy is the standard method for diagnosis. Weight loss leads to improved liver test results and histologic features, and studies of medications are ongoing.[59] When and how often to perform ALT and AST testing have not been determined; pending evidence-based recommendations, the expert committee suggests biannual screening starting at 10 years of age for children with BMI of ≥95th percentile and those with BMI of 85th to 94th percentile who have other risk factors. This schedule coincides with diabetes screening recommendations.[60] ALT or AST results 2 times normal levels should prompt consultation with a pediatric hepatologist.

Gallstones are more prevalent among overweight and obese children.[61] In addition, rapid weight loss increases the risk of gallstones.[62] Intermittent episodes of intense colicky pain in the right upper quadrant of the abdomen are classic symptoms, but milder pain and epigastric pain can occur. On physical examination, the right upper quadrant may be tender. Ultrasonography can identify gallstones and cholecystitis.

Several common pediatric gastrointestinal problems, including gastroesophageal reflux disease and constipation, are exacerbated by obesity.[63,64] Symptoms, signs, and management are the same as for children of normal weight, but clinicians should be aware of the increased likelihood of these conditions and should provide appropriate medical and behavioral treatment in addition to weight control.

Endocrine Disorders

Type 2 diabetes mellitus is one of the most serious complications of childhood obesity. As many as 45% of children with newly diagnosed diabetes mellitus have type 2 rather than type 1 disease.[53] Patients may not have symptoms such as polyuria and polydipsia; consequently, identification requires laboratory screening for children at risk. Risk factors are BMI of ≥85th percentile; family history of diabetes; black, Hispanic, or Native American background; and other related conditions, such as polycystic ovary syndrome, acanthosis nigricans, or cardiovascular risk factors. The American Diabetes Association currently recommends screening with a fasting glucose test when a child is overweight and has 2 additional risk factors. Screening should begin at puberty or 10 years of age and should be performed every 2 years. A fasting glucose level of ≥126 mg/dL or a casual glucose level of ≥200 mg/dL indicates diabetes and requires referral to a pediatric endocrinologist. Fasting glucose levels of ≥100 mg/dL are considered prediabetes, indicating future risk for diabetes.[60]

Polycystic ovary syndrome occurs in ≥8% of young women 18 to 25 years of age, with prevalence depending on the definition used. Women with polycystic ovary syndrome are more likely to be obese.[65] Infrequent menses (<9 cycles per year) is the most important finding that should lead to additional evaluation. Physical examination findings that are common but not diagnostic for polycystic ovary syndrome are hirsutism, excessive acne, and acanthosis nigricans. Women with polycystic ovary syndrome often have insulin resistance or type 2 diabetes and may have metabolic syndrome. Reproductive hormone laboratory tests can diagnose the condition but generally require interpretation by a subspecialist, such as an endocrinologist, gynecologist, or adolescent physician (see the assessment report[2]); these specialists can initiate and monitor treatment to protect fertility.

Hypothyroidism is a frequent concern of parents, but this condition does not usually cause severe obesity. The prevalence is ~1 case per 1000.[66] Symptoms include fatigue and decline in academic performance. Cessation of linear growth is an important sign, and a goiter may be present. Thyroid function tests are generally unnecessary when a child has normal linear growth velocity and no other symptoms of hypothyroidism.

Primary Cushing syndrome is extremely rare. The population incidence is probably ~2 cases per 1 000 000 annually, with onset in adulthood being more common than onset in childhood.[67] Because the condition is treatable, clinicians should be aware of the physical examination findings, which include "moon facies" and "buffalo hump," although exogenous obesity can also lead to this distribution of adipose tissue. Primary Cushing syndrome generally leads to short stature and therefore is extremely unlikely in a tall obese child. The striae found in Cushing syndrome are violaceous in color and thus differ from the commonly seen striae resulting from rapid weight gain. If Cushing syndrome is suspected, then the child should be referred to an endocrinologist for appropriate testing.

Evaluation of puberty in obese children requires careful attention to physical examination findings and

knowledge of the normal range of puberty onset. Adipose tissue in the breast area must be distinguished from true breast development, which is generally discernible through pigmented erectile areolae. A suprapubic fat pad, which can hide the penis and give it the appearance of a micropenis, must be manually reflected away. Obese children tend to begin puberty earlier than children of normal weight but, when onset is truly premature, these children require an endocrinologic evaluation just as do children of normal weight. Children at risk for endocrine disorders are white girls <7 years of age and black girls <6 years of age with breast tissue or pubic hair and boys <9 years of age with pubic hair or enlargement of the penis.

Nervous System Disorders

Pseudotumor cerebri is an extremely rare condition (incidence estimates for children are 1 case per 100 000 annually[68]), but obesity is one of several risk factors[69] and, untreated, the condition can lead to vision loss. Patients describe severe headaches with photophobia. Patients may have double vision if they have impairment of cranial nerve VI. Optic disks are blurred. When suspected, this condition requires urgent referral to the neurology service.

Cardiovascular Risk Factors

Approximately 13% of overweight children have elevated systolic blood pressure, and ~9% have elevated diastolic blood pressure.[15] Blood pressure should be assessed at all health supervision visits, and offices should have large cuffs, including thigh cuffs, which allow accurate assessment of blood pressure for severely obese youths. The National Heart, Lung, and Blood Institute has updated tables defining elevated blood pressure levels according to age, gender, and height percentile, which offices should have available for easy reference.[70] Three or more readings above the 95th percentile for either systolic or diastolic blood pressure indicate hypertension. Information on the National Heart, Lung, and Blood Institute Web site (www.nhlbi.nih.gov/health/prof/heart/hbp/hbp_ped.htm) includes recommendations for evaluation, which may include ambulatory blood pressure monitoring to identify "white coat" hypertension or abnormal diurnal blood pressure patterns. Primary care providers can follow these detailed recommendations for evaluation and treatment or can refer patients to a specialist.

Lipid level abnormalities are among the most common obesity-related medical conditions.[15] Because of the high prevalence, a fasting lipid profile should be obtained when BMI is ≥85th percentile, even in the absence of other risk factors. Total cholesterol levels of <170 mg/dL are acceptable, levels of 170 to 199 mg/dL are in the borderline category, and levels of ≥200 mg/dL are high. Low-density lipoprotein levels of <110 mg/dL are acceptable, levels of 110 to 129 mg/dL are borderline, and levels of ≥130 mg/dL are high. Dietitians can guide patients and families regarding the reduced-fat and reduced-cholesterol diets recommended by the National Cholesterol Education Panel.[71] If levels are highly elevated and do not respond to diet changes, then a pediatric cardiologist or lipid specialist can assess the benefits and risks of medication use. Abnormal triglyceride levels, defined by the National Cholesterol Education Panel as ≥110 mg/dL for adolescents, and abnormal high-density lipoprotein levels, defined as ≤40 mg/dL, respond to increased physical activity.

Psychiatric Disorders

The effects of obesity on quality of life can be severe.[72] Depression, an important comorbidity of obesity, may precede or result from obesity. Clinicians should look for flat affect, anxiety, body dissatisfaction, excess eating, fatigue, and difficulty sleeping. Sexual and physical abuse may increase the risk of severe obesity.[73,74] Youths with binge eating or purging behavior should be evaluated for eating disorders.

Orthopedic Disorders

Blount disease (tibia vara) occurs more often among obese children, and onset generally occurs after 8 years of age.[75] Often painless, Blount disease presents as visible bowing of the lower extremity and is diagnosed with anteroposterior radiographic views of the affected knee obtained while the patient is standing. An orthopedic surgeon can determine how to treat this condition, to correct bowing and to prevent progression.

Slipped capital femoral epiphysis occurs between 9 and 16 years of age, affects boys more often than girls, and has an incidence estimated at ~11 cases per 100 000 children.[76] It occurs more frequently when a child is obese.[77] These children have hip or knee pain and pain with walking. On examination, hip range of motion is impaired. Bilateral frog-leg radiographic views of the hips should be obtained, and the child should be referred to the orthopedic surgery service.

A recent study revealed that overweight children and adolescents reported more fractures and musculoskeletal discomfort.[78] Because injury and pain interfere with physical activity, early intervention (including physical therapy, when indicated) may reduce weight gain in these children.

Skin Conditions

Acanthosis nigricans is present in ~10% of obese white children and 50% of obese black children.[79] Although it is associated with hyperinsulinemia, acanthosis nigricans is associated more strongly with high BMI. The prominence of acanthosis nigricans diminishes with weight loss.

Severely obese children can have chronic irritation and infection in the folds of the skin, especially in the lower abdomen and axilla. This intertrigo and furunculosis requires good hygiene, use of topical antibiotic and anticandidal ointments, and sometimes systemic antibiotic therapy.

Genetic Syndromes

Well-defined genetic syndromes that cause obesity, such as Prader-Willi syndrome, are very rare. The assessment report lists some of these syndromes and their presentations. Clinicians should consider referral for genetic testing, especially when the obese child is short and has developmental delay. Unfortunately, diagnosis of these genetic syndromes does not modify treatment options.

Laboratory Testing

History and physical examination cannot effectively screen for abnormal cholesterol levels, NAFLD, and type 2 diabetes mellitus. Therefore, these conditions must be identified with laboratory tests. The expert committee recommends that children with BMI of 85th to 94th percentile should undergo lipid panel testing and, if risk factors are present, then fasting glucose, ALT, and AST levels should be measured every 2 years for individuals ≥10 years of age. For children with BMI of ≥95th percentile, the committee suggests that fasting glucose, ALT, and AST levels be measured every 2 years starting at 10 years of age, regardless of other risk factors. Elevation of ALT or AST levels above 60 U/L on 2 occasions may indicate the need for additional evaluation, probably with guidance from pediatric gastroenterology/hepatology experts.

The results of the primary care provider's history, physical examination, and screening laboratory tests may indicate the need for additional diagnostic tests. A table of more-specialized diagnostic testing to be performed after initial positive screening is presented in the assessment report.[2] Table 7 summarizes the medical assessment according to BMI category.

Implementation of Medical Assessment

Many practices develop checklists of symptoms and family history for patients or parents to complete. Clinicians can include weight-related symptoms and conditions on the list and then review these with families. Forms in the chart may help trigger the recommended evaluation once the BMI category of the child is flagged.

Behavior Assessment

Goals

The purpose of the behavior assessment is twofold. The first goal is to identify the child's dietary and physical activity behaviors that may promote energy imbalance and that are modifiable. The second goal is to assess the capacity of the patient and/or the patient's family to change some or all of these behaviors. Families must have both the means and the motivation to make changes. For instance, a child may benefit from increased outdoor play but, if no safe play area exists or if the parents do not perceive the benefit of this behavior change, then no change will occur and the child will "fail treatment." The clinician should work with the family to target behavior changes that are appropriate and possible.

Dietary and Physical Activity Assessments

Because comprehensive dietary and physical activity assessments, such as diet or physical activity diaries, are impractical in a typical office setting, the expert committee recommends a focused assessment of behaviors that have the strongest evidence for association with energy balance and that are modifiable. It should be noted that current evidence generally reveals an association between specific behaviors and energy consumption or expenditure or between a behavior and weight status, leaving the direction of the relationship unknown.

For eating behavior assessment, the following behaviors should be addressed:

- frequency of eating food prepared outside the home, including food in restaurants, school and work cafeterias, and fast food establishments and food purchased for "take out";
- ounces, cups, or cans of sugar-sweetened beverages consumed each day;
- portions that are large for age (qualitative assessment);
- ounces or cups of 100% fruit juice consumed each day;
- frequency and quality of breakfast;
- consumption of foods that are high in energy density, such as high-fat foods;
- number of fruit and vegetable servings consumed each day; and
- number of meals and snacks consumed each day and quality of snacks.

For physical activity assessment, the following behaviors should be addressed:

- time spent in moderate physical activity each day (including organized physical activity and unstructured activity, including play), to estimate whether the goal of 60 minutes of moderately vigorous activity each day is achieved;
- routine activity patterns, such as walking to school or performing yard work;
- sedentary behavior, including hours of television, videotape/DVD, and video game viewing and computer

TABLE 7 **Medical Screening According to BMI Category**

BMI Percentile	Recent History	Medication Use	Review of Symptoms	Family History (First- and Second-Degree Relatives)	Physical Examination	Laboratory Tests
5th–84th	BMI percentile change	Medications that may affect weight gain (eg, neuropsychiatric medications)		Obesity, type 2 diabetes, hypertension, lipid level abnormalities, heart disease	Blood pressure (correct cuff)	
85th–94th	BMI percentile change	Medications that may affect weight gain (eg, neuropsychiatric medications)	Snoring/sleep, abdominal pain, menstrual irregularities, hip, knee, or leg pain, polyuria, thirst, depression	Obesity, type 2 diabetes, hypertension, lipid level abnormalities, heart disease	Blood pressure (correct cuff), acanthosis nigricans, tonsils, goiter, tender abdomen, liver, bowing of legs, limited hip range of motion, optic discs if headaches, acne and hirsutism	Fasting lipid profile; if age 10 y and other risk factors, fasting glucose level biannually; ALT and AST levels biannually
95th–99th	BMI percentile change	Medications that may affect weight gain (eg, neuropsychiatric medications)	Snoring/sleep, abdominal pain, menstrual irregularities, hip, knee, or leg pain, urination, thirst, depression	Obesity, type 2 diabetes, hypertension, lipid level abnormalities, heart disease	Blood pressure (correct cuff), acanthosis nigricans, tonsils, goiter, tender abdomen, liver, bowing of legs, limited hip range of motion, optic discs if headaches, acne and hirsutism	Fasting lipid profile; if age 10 y and other risk factors, fasting glucose level biannually; ALT and AST levels biannually
>99th	BMI change	Medications that may affect weight gain (eg, neuropsychiatric medications)	Snoring/sleep, abdominal pain, menstrual irregularities, hip, knee, or leg pain, urination, thirst, depression	Obesity, type 2 diabetes, hypertension, lipid levels abnormalities, heart disease	Blood pressure (correct cuff), acanthosis nigricans, tonsils, goiter, tender abdomen, liver, bowing of legs, limp, limited hip range of motion, optic discs if headaches, acne and hirsutism, skin inflammation	Fasting lipid profile; if age 10 y and other risk factors, fasting glucose level biannually; ALT and AST levels biannually

use, to determine whether viewing is >2 hours per day.

Implementation of Behavior Assessment

Standardized instruments simplify assessment of usual diet and activity behaviors, and several are available (see the assessment report[2]). None assesses all of the targeted behaviors comprehensively, and none has been tested for reliability and validity in a clinical setting. Additional research in this area is urgently needed.

Targeting of realistic behavior changes requires an assessment of practical resources and barriers. Neighborhood parks, grocery stores, recreation centers, and neighborhood children with whom to play can all support a healthier lifestyle. Clinical offices can maintain a list of nearby community resources. Within the household, finances, time, and caregivers other than parents may affect behavior changes. A family's cultural values, which are influenced by ethnicity, religion, educational background, and many other factors, often affect the family's perception of appropriate physical activity or customary food and eating practices. Clinicians who become familiar with attitudes common among the patients they serve and who pay attention to the specific values of individual families will be able to tailor recommendations. For example, if a family prefers a traditional Mexican diet, then the clinician might suggest that the family members learn to prepare the foods with less fat and more whole grains; if a family places a high priority on religious worship and family time on Sundays, then the clinician might suggest that the family members develop a tradition of walking, biking, or bowling together. Offices should provide educational material appropriate for the particular patient population. For example, an office that serves Cambodian patients should offer information about a healthy Cambodian diet, in the appropriate language.

Because behavior change requires sustained commitment by the patient and family members, their motivation is the most important but most challenging aspect of obesity care. Motivational interviewing, as discussed above, is a technique that merges assessment and intervention and provides a framework for communicating physical and laboratory findings. The clinician helps the patient and family members determine their priorities, consider how current behaviors support or undermine those priorities, and assess the resources and barriers in their family and environment that may influence their capacity to improve behaviors. For example, a family may decide to improve portion sizes but not to add fruits and vegetables, or a family may want to explore other possible resources before choosing a behavior change. Through the process of behavior assessment, the clinician and family members together identify treatment goals.

Whether the child or the parent is the target of behavior changes depends on the age of the child. When the child is young, the parents and caregivers should take responsibility for providing a healthy diet, limiting the amount of television and screen time, and creating opportunities for active play. Parents should not expect the child to choose between soda and water or to turn off the television at the end of 2 hours. Therefore, clinicians should address concerns and motivation with parents when children are young. However, adolescents generally have many opportunities away from home to make eating and physical activity choices. Although parents can support an adolescent's efforts by making the home environment healthy, the adolescent's own concerns and motivation are paramount in any weight control efforts and should be the focus of the clinician's assessment.

TREATMENT

Goals

The primary goal of obesity treatment is improvement of long-term physical health through permanent healthy lifestyle habits. Implementation of these habits alone will lead to improved weight (weight loss or weight maintenance during linear growth) for some children, but other children and youths may need additional focused efforts to achieve negative energy balance. Others may need additional help with behavior modification strategies to develop and to sustain healthy habits. Emotional health (good self-esteem and appropriate attitudes toward food and body) is also an important outcome. To achieve these goals, the treatment writing group recommended that providers present a staged approach, with 4 treatment stages of increasing intensity. Patients can begin at the least-intensive stage and advance depending on responses to treatment, age, degree of obesity, health risks, and motivation. Providers may identify some obese youths who are motivated to begin behavior change at a more-intensive stage. This approach may lead to greater success when obesity is more severe, as long as the patient is motivated.

Outcomes

The establishment of permanent healthy lifestyle habits is a good outcome, regardless of weight change, because of the long-term health benefits of these behaviors. Improvement in medical conditions is also an important sign of long-term health benefits. The metric for improved weight is BMI percentile, generally to <85th percentile, although some children are healthy in the overweight category (85th–94th percentile). Although improvement in BMI percentile is the goal, monitoring this metric in the short-term with BMI curves may be difficult. Serial weight measurements can reflect energy balance in the short-term. Weight maintenance leads to reductions in absolute BMI because of ongoing linear

growth, and even slow weight gain can result in lower BMI percentiles because the BMI for a given percentile curve increases with age. In general, younger and more mildly obese children should change weight more gradually than older and severely obese youths. When a patient's weight or BMI percentile does not improve as desired over 3 to 6 months of planned treatment, the provider and family should consider advancing to the next, more-intensive stage of treatment.

Staged Treatment

The expert committee's proposed systematic approach integrates aspects of treatment that have evidence to support them, although the approach as a whole is untested. This approach promotes brief, office-based intervention for the greatest number of overweight and obese children and then a systematic intensification of efforts, tailored to the capacity of the clinical office, the motivation of the family, and the degree of obesity, with the most aggressive treatment stage being considered only for those who have not responded to other interventions.

Providers' offices need to prepare by implementing a system for evaluation; by identifying resources, such as pediatric dietitians or behavioralists, or training staff members for diet and activity assessments; and by identifying community resources and referral centers, if available. Referral centers may emerge in response to the needs of area practices. For each stage of obesity treatment, the expert committee has recommended a process for implementation, suggesting how the primary care provider can provide this care or identify support beyond the office.

Stages of Obesity Treatment

Stage 1: Prevention Plus

As a first step, overweight and obese patients and their families could focus on basic healthy lifestyle eating and activity habits that form the obesity prevention strategies. However, the outcome would be improved BMI status rather than maintained healthy BMI, and the provider would offer more-frequent monitoring to motivated patients and families.

Specific healthy eating and activity habits are as follows.

1. consume ≥5 servings of fruits and vegetables every day (ME). Families may subsequently increase to 9 servings per day, as recommended by the USDA. The USDA Web site (www.mypyramid.gov) recommends the number of cups of fruits and vegetables per day according to age, ranging from 2 cups per day for 2-year-old children to 4.5 cups per day for 17- and 18-year-old youths;
2. minimize sugar-sweetened beverages, such as soda, sports drinks, and punches (ME). Ideally, these beverages will be eliminated from a child's diet, although children who consume large amounts will benefit from reduction to 1 serving per day;
3. decrease television viewing (and other forms of screen time) to ≤2 hours per day (CE). If the child is <2 years of age, then no television viewing should be the goal. To assist with this change, the television should be removed from the room where the child sleeps;
4. be physically active ≥1 hour each day (ME). Unstructured play is most appropriate for young children. Older children should find physical activities that they enjoy, which may include sports, dance, martial arts, bike riding, and walking. Activity can be structured, such as a dance class, or unstructured, such as dancing to music at home, and children can perform several shorter periods of activity over the day;
5. prepare more meals at home rather than purchasing restaurant food (ME);
6. eat at the table as a family at least 5 or 6 times per week (ME);
7. consume a healthy breakfast every day (ME);
8. involve the whole family in lifestyle changes (CE);
9. allow the child to self-regulate his or her meals and avoid overly restrictive feeding behaviors (CE for children <12 years of age);
10. help families tailor behavior recommendations to their cultural values (suggest).

For implementation of Prevention Plus, the following points should be noted.

1. families and providers can work together to identify the behaviors that are appropriate to target. Considerations include current behaviors that most contribute to energy imbalance, the family's cultural values and preferences, the family's specific financial situation, neighborhood, and schedule, and the motivation of the child and family to make particular changes. By using motivational interviewing techniques, the provider allows the child and family to determine the priority behaviors, which naturally integrates the family situation and values;
2. patients may need to achieve the target behaviors in steps. For example, obese children may need to begin with 15 minutes of physical activity per day and work up to 60 minutes, or a family may choose 3 goals at the beginning and expand the number of targeted behaviors over time;

3. follow-up visit frequency should be tailored to the individual family, and motivational interviewing techniques may be useful to set the frequency;
4. the Prevention Plus stage of obesity treatment can take place in the office setting;
5. physicians, advanced practice nurses, physician assistants, and office nurses, with appropriate training, can provide this level of treatment;
6. after 3 to 6 months, if the child has not made appropriate improvement, the provider can offer the next level of obesity care, that is, structured weight management.

Stage 2: Structured Weight Management

This level of obesity treatment is distinguished from Prevention Plus less by differences in the targeted behaviors and more by the support and structure provided to the child to achieve those behaviors. Specific eating and activity goals in addition to the goals in Prevention Plus are as follows:

1. a planned diet or daily eating plan with balanced macronutrients, in proportions consistent with Dietary Reference Intake recommendations,[40] emphasizing foods low in energy density (such as those with high fiber or water content) (suggest);
2. structured daily meals and planned snacks (breakfast, lunch, dinner, and 1 or 2 scheduled snacks, with no food or calorie-containing beverages at other times, may reduce excess intake) (suggest);
3. additional reduction of television and other screen time to ≤1 hour per day (suggest);
4. planned, supervised, physical activity or active play for 60 minutes per day (ME);
5. monitoring of these behaviors through use of logs (for example, the patient or family members can record the minutes spent watching television and can keep a 3-day recording of food and beverages consumed) (CE); and
6. planned reinforcement for achieving targeted behaviors (suggest).

For implementation of structured weight management, the following points should be noted.

1. the eating plan requires a dietitian or a clinician who has received additional training in creating this kind of eating plan for children;
2. office staff members who have some training in motivational interviewing and in teaching of monitoring and reinforcement techniques can establish initial goals with families and see them for follow-up care;
3. some families need a counselor for help with parenting skills, resolution of family conflict, or motivation;
4. depending on the child and family, referral to a physical therapist or exercise therapist can help the child and family develop physical activity habits;
5. monthly office visits are probably most appropriate at this level;
6. a provider's office staff can provide much of this treatment, with some additional training;
7. some practices may find group sessions to be effective and efficient.

Stage 3: Comprehensive Multidisciplinary Intervention

This approach increases the intensity of behavior changes, the frequency of visits, and the specialists involved, to maximize support for behavior changes. Generally, this type of program would exceed the capacity of a primary care office to offer within the typical visit structure. However, an office or several offices could organize specialists to offer this kind of a program. Eating and activity goals are generally those of the structured weight management stage.

For implementation of comprehensive multidisciplinary intervention, the following points should be noted.

1. a structured program in behavior modification should include, at a minimum, food monitoring, short-term diet and physical activity goal setting, and contingency management[43] (CE);
2. negative energy balance resulting from structured dietary and physical activity changes is planned (ME);
3. parental participation in behavior modification techniques is needed for children <12 years of age (CE). Parental involvement would be progressively less with older youths;
4. parents should be trained regarding improvement of the home environment (suggest);
5. systematic evaluation of body measurements, diet, and physical activity should be performed at baseline and at specified intervals throughout the program (suggest);
6. a multidisciplinary team with experience in childhood obesity, including a behavioral counselor (for example, social worker, psychologist, other mental health care provider, or trained nurse practitioner), registered dietitian, exercise specialist (physical therapist or other team member with training or a community program prepared to assist obese children), and primary care provider who continues to monitor medical issues and maintains a supportive alliance with the families, should be involved;
7. frequent office visits should be scheduled; weekly visits for a minimum of 8 to 12 weeks seem to be

TABLE 8 **Weight Goals and Intervention Stages, According to Age and BMI Categories**

Age	BMI Category	Weight Goal to Improve BMI Percentile[a]	Initial Intervention Stage	Highest Intervention Stage
<2 y	Weight for height	NA	Prevention counseling	Prevention counseling
2–5 y	5th–84th percentile or 85th–94th percentile with no health risks	Weight velocity maintenance	Prevention counseling	Prevention counseling
	85th–94th percentile with health risks	Weight maintenance or slow weight gain	Prevention Plus (stage 1)	SWM (stage 2)
	≥95th percentile	Weight maintenance (weight loss of up to 1 lb/mo may be acceptable if BMI is >21 or 22 kg/m^2)	Prevention Plus (stage 1)	CMI (stage 3)
6–11 y	5th–84th percentile or 85th–94th percentile with no health risks	Weight velocity maintenance	Prevention counseling	Prevention counseling
	85th–94th percentile with health risks	Weight maintenance	Prevention Plus (stage 1)	SWM (stage 2)
	95th–99th percentile	Gradual weight loss (1 lb/mo or 0.5 kg/mo)	Prevention Plus (stage 1)	CMI (stage 3)
	>99th percentile	Weight loss (maximum is 2 lb/wk)	Prevention Plus (stage 1) or stage 2 or 3 if family is motivated	TCI (stage 4), if appropriate
12–18 y	5th–84th percentile or 85th–94th percentile with no health risks	Weight velocity maintenance; after linear growth is complete, weight maintenance	Prevention counseling	Prevention counseling
	85th–94th percentile with health risks	Weight maintenance or gradual weight loss	Prevention Plus (stage 1)	SWM (stage 2)
	95th–99th percentile	Weight loss (maximum is 2 lb/wk)	Prevention Plus (stage 1)	TCI (stage 4), if appropriate
	>99th percentile	Weight loss (maximum is 2 lb/wk)	Prevention Plus (stage 1) or stage 2 or 3 if patient and family are motivated	TCI (stage 4), if appropriate

SWM indicates structured weight management; CMI, comprehensive multidisciplinary intervention; TCI, tertiary care intervention; NA, not applicable.
[a] If a child has obesity-related health risks, then the target outcome is a downward shift of the child's BMI curve. Serial weights, with the goals described here, are more easily assessed over weeks and months. In growing children, weight maintenance or even slow weight gain results in lower BMI.

most efficacious[80] (CE). Subsequently, monthly visits can help maintain new behaviors;

8. group visits may be more cost-effective and have therapeutic benefit[80,81] (ME);
9. an established pediatric weight management program may be best suited to provide this type of intervention, although such programs are sparse and often are not covered by insurance plans;
10. commercial weight management programs can be considered, but the primary care provider's office needs to screen the programs to ensure that the approach is healthy and appropriate for the age of the child. Information to guide this evaluation is included in the treatment report.[3]

Stage 4: Tertiary Care Intervention

Interventions

The intensive interventions in this category may be offered to some severely obese youths. These interventions move beyond the goal of balanced healthy eating and activity habits that are the core of the other stages. Candidates for consideration should have attempted weight control in the comprehensive multidisciplinary intervention stage, should have the maturity to understand possible risks, and should be willing to maintain physical activity and, if consistent with the additional intervention, a healthy diet with appropriate behavior monitoring. However, lack of success with the comprehensive multidisciplinary intervention is not by itself an indication to move to this level of treatment.

The interventions listed below have been used for adolescents, and some patients may be candidates for one of these interventions. Consideration of each of these interventions depends on the patient and the resources in the geographic area.

Medications

Two medications have been used for adolescents.[82] Sibutramine is a serotonin reuptake inhibitor that increased weight loss for adolescents who were in a diet and exercise program, compared with diet and exercise alone. Adolescents who received medication lost ~3 kg more than did those in the control group.[83,84] In 1 study, use of orlistat, which causes fat malabsorption through inhibition of enteric lipase, led to less weight gain, compared with diet and exercise alone, among adolescents.[85] The effect of these medications (always studied in conjunction with diet and exercise) has been modest. The Food and Drug Administration has approved sibutramine for patients ≥16 years of age and orlistat for patients ≥12 years of age.

Very Low-Calorie Diet

There are few reports on the use of highly restrictive diets for children or adolescents. A restrictive diet was used as the first step in a childhood weight management

program, followed by a mildly restrictive diet.[86] Long-term outcome data have not been reported.

Weight Control Surgery

Because of the increasing number of youths with severe obesity that is not responsive to behavioral intervention, a few centers offer bariatric surgery, either gastric bypass or gastric banding. This treatment generally leads to substantial weight loss and improvement in medical conditions.[87] However, perioperative risks, postprocedure nutritional risks, and the necessity of lifelong commitment to altered eating make this approach unattractive or inappropriate for many. Selection criteria proposed by Inge et al[88] include BMI of ≥40 kg/m^2 with a medical condition or ≥50 kg/m^2; physical maturity (generally 13 years of age for girls and ≥15 years of age for boys); emotional and cognitive maturity; and weight loss efforts for ≥6 months in a behavior-based treatment program. Those investigators also recommended strongly that bariatric surgery centers maintain databases, so that these criteria can be modified as appropriate on the basis of outcomes.[88] Furthermore, adolescents who undergo such procedures need careful evaluation before surgery and prolonged nutritional and psychological support after surgery, and many youths who might otherwise qualify live too far from an adolescent bariatric center.

Implementation

For implementation of tertiary care intervention, the following points should be noted.

1. these interventions should occur in pediatric weight management centers with comprehensive services;
2. the multidisciplinary team should have expertise in childhood obesity and its comorbidities, with patient care provided by a physician or nurse practitioner, registered dietitian, behavioral counselor, and exercise specialist. Standard clinical protocols for patient selection should evaluate patient age, degree of obesity, motivation and emotional readiness, previous efforts to control weight, and family support. Standard clinical protocols should be in place for evaluation before, during, and after intervention. These evaluations should focus on the physical and emotional effects of the treatment. These protocols should be established by a physician, dietitian, and behaviorist;
3. some patients who are appropriate candidates for one of these interventions may not have access because programs are not available in their geographic area or insurance does not cover the treatment.

Staged Approach for Individual Patients

When a clinician identifies health risks resulting from excess fat (most patients with BMI of ≥95th percentile and many patients with BMI of 85th–94th percentile), the provider can first offer Prevention Plus. If the child and family are already attempting these behaviors as part of prevention efforts or if 3 to 6 months of Prevention Plus do not lead to expected improvement, then the patient can move on to structured weight management. Similarly, after 3 to 6 months in a structured weight management program, some patients who have not achieved goals can move on to a comprehensive multidisciplinary intervention. The timing of these stages should be adapted to individual families and the availability of programs. For instance, providers may suggest a comprehensive program immediately when youths are motivated to begin such treatment, especially if they have urgent medical issues. If families must wait for an opening in a comprehensive program, then clinicians could provide Prevention Plus or structured weight management in the interim. Suggested weight goals and highest treatment stage recommended according to age and BMI category are presented in Table 8.

Patients <2 years of age require different evaluation and intervention approaches. Measurement and plotting of weight and height are unchanged but, because the growth curves do not include BMI percentiles, weight-for-height values should be plotted; children with weight-for-height values above the 95th percentile are classified as overweight. Risk of excess body fat increases as weight-for-height values increase above the 95th percentile, although no cutoff points currently define obesity. At this age, parental weight status is very important in assessing future obesity risk and predicts obesity in young adulthood more accurately than does the toddler's current weight status.[37] Therefore, an 18-month-old child with 2 obese parents is at very high risk, even if the toddler's weight-for-height value is <95th percentile.

Until normative values for individual longitudinal growth are well established, energy restrictions designed to reduce weight are not recommended for this age group. However, providers should discuss the potential long-term risks and should encourage parents to establish obesity prevention strategies. For infants 0 to 12 months of age, pediatric providers can encourage exclusive breastfeeding until 6 months of age and continued breastfeeding to 12 months of age and beyond, after introduction of solid foods. Parents can be encouraged to offer new foods repeatedly and to avoid sugar-sweetened beverages (such as soda) and snack foods (such as French fries and potato chips). Providers can recommend that televisions not be in the infant's sleeping room. Caregivers other than the parents should follow the same "parenting" strategies. When providers identify overweight toddlers 12 to 24 months of age, the providers should recommend age-appropriate obesity prevention strategies, such as avoidance of sugar-sweetened beverages and excessive juice intake and avoidance of excessive milk intake (>16–24 oz of milk per day may

add extra energy or displace other nutrients). Providers can encourage establishment of 3 meals per day eaten at the table with other family members, with the television off. Families should not restrict how much their children eat at meals and snacks but should be sure that all of the food available is healthy, with plenty of fruits and vegetables. At this age, children frequently consume 2 snacks in addition to their meals but, between meals and snacks, parents can offer water when children are thirsty, rather than providing constant access to caloric beverages such as juice. Children should have ample opportunity for active play, with limitation of television and DVD viewing and no televisions in their bedrooms. When weight is extremely high, the infant or toddler may have a genetic condition, especially if height is low or development is delayed.

Severe obesity combined with low motivation or lack of concern creates a distressing situation for clinicians, especially when the child has urgent medical conditions such as sleep apnea or diabetes. Particularly challenging are situations in which the child is young and the parents, on whom the child relies for healthy eating and physical activity structure, are unwilling to make changes. Providers can use empathy and persistence; they should maintain their relationship with the family and encourage change without scolding. Scolding or a sense of failure may lead the family to seek care elsewhere. If providers search for the source of resistance, then they may find ways to address it. A social worker could help address financial limitations, an adult psychiatrist could help a parent who is depressed, family therapy could help a family cope with a divorce, and Big Brother/Big Sister programs could offer a weekly outing that is physically active. Offices should actively keep these families engaged (eg, encouraging follow-up appointments to evaluate weight, rather than waiting for the next well-child check). Office staff members can check with the family by telephone after missed appointments. When families agree to meet with a specialist, such as a dietitian, office staff members can inform the specialist of the situation, to ensure that the appointment goes smoothly, and also can address practical problems, such as transportation issues. These strategies communicate the clinician's concern about the child's health but also the desire to support the family.

Although providers often feel overwhelmed by obesity care in the face of the environmental forces that promote it, increasing public concern, increasing attention directed at school and community policies, and refined understanding of the most-effective interventions will eventually come together to meet this challenge successfully. Meanwhile, health care providers have the potential to improve outcomes by performing early identification, by helping individual families create the best possible home environment, and by providing more-structured guidance to overweight and obese children and their families.

APPENDIX: EXPERT COMMITTEE RECOMMENDATIONS ON THE ASSESSMENT, PREVENTION, AND TREATMENT OF CHILD AND ADOLESCENT OVERWEIGHT AND OBESITY

Assessment Recommendations

1. The expert committee recommends that physicians and allied health care providers perform, at a minimum, a yearly assessment of weight status for all children and that this assessment include calculation of height, weight (measured appropriately), and BMI for age and plotting of those measures on standard growth charts.
2. With regard to classification, the expert committee recommends that individuals 2 to 18 years of age with BMI of ≥95th percentile for age and gender or BMI of >30 (whichever is smaller) should be considered obese and individuals with BMI of ≥85th percentile but <95th percentile for age and gender should be considered overweight; this term replaces "at risk of overweight."
3. The expert committee recommends the use of 99th percentile BMI values for age as cutoff points (indicated by using a table with cutoff points for the 99th percentile BMI according to age and gender), to allow for improved accessibility of the data in the clinical setting and for additional study.
4. The expert committee recommends against the routine clinical use of skinfold thickness measurements in the assessment of obesity in children.
5. The expert committee was unable to recommend waist circumference measurements for routine clinical use at the present time, because of incomplete information and the lack of specific guidance for clinical application.
6. The expert committee recommends that qualitative assessment of dietary patterns for all pediatric patients be conducted, at a minimum, at each well-child visit for anticipatory guidance and that assessment include self-efficacy and readiness to change and identification of the following specific dietary practices, which may be targets for change: frequency of eating outside the home at restaurants or fast food establishments, excessive consumption of sweetened beverages, and consumption of excessive portion sizes for age. Additional practices to be considered for evaluation during the qualitative dietary assessment include excessive consumption of 100% fruit juices, breakfast consumption (frequency and quality), excessive consumption of foods that are high in energy density, low consumption of fruits

and vegetables, and meal frequency and snacking patterns (including quality).

7. The expert committee recommends that assessment of levels of physical activity and sedentary behaviors should be performed for all pediatric patients, at a minimum, at each well-child visit for anticipatory guidance and should include the general areas of (*a*) self-efficacy and readiness to change, (*b*) environment and social support and barriers to physical activity, (*c*) whether the child is meeting recommendations of 60 minutes of at least moderate physical activity per day, and (*d*) levels of sedentary behavior (including hours of behaviors such as watching television and/or DVDs, playing video games, and using the computer, in comparison with a baseline value of <2 hours per day).
8. The expert committee recommends that physicians and allied health care providers obtain a focused family history for obesity, type 2 diabetes mellitus, cardiovascular disease (particularly hypertension), and early deaths resulting from heart disease or stroke, to assess the risks of current or future comorbidities associated with a child's overweight or obese status.
9. The expert committee recommends that a thorough physical examination be performed and that, for a child identified as overweight or obese, the following measurements be included, in addition to the aforementioned recommendations on BMI: (*a*) pulse, measured in the standard pediatric manner; (*b*) blood pressure, measured with a cuff large enough that 80% of the arm is covered by the bladder of the cuff; and (*c*) signs associated with comorbidities of overweight and obesity (see the assessment report).[2] Waist circumference is not recommended for routine use. Although high waist circumference can indicate insulin resistance and other comorbidities of obesity and may be useful to characterize risks for obese children, measurement is difficult and appropriate cutoff values are uncertain.
10. The expert committee recommends that the following laboratory tests be considered in the evaluation of a child identified as overweight or obese. If the BMI is 85th to 94th percentile for age and gender with no risk factors, then a fasting lipid profile should be obtained. If the BMI is 85th to 94th percentile for age and gender with risk factors in the history or physical examination, then AST, ALT, and fasting glucose levels should also be measured. If the BMI is >95th percentile for age and gender, even in the absence of risk factors, then all of the tests listed for 85th to 94th percentile BMI with risk factors should be performed. Guidelines for laboratory assessment and testing for more-detailed evaluation, typically performed and interpreted by subspecialists, are also provided (see assessment report).[2]

Treatment Recommendations

1. The expert committee recommends that all physicians and health care providers address weight management and lifestyle issues with all patients, regardless of presenting weight, at least each year.
2. The expert committee recommends that all children between 2 and 18 years of age with BMI values between the 5th and 84th percentile follow the recommendations for prevention outlined in the prevention report.[3]
3. The expert committee recommends that the treatment of overweight children be approached with a staged method based on the child's age, BMI, related comorbidities, parents' weight status, and progress in treatment and that the child's primary caregivers and family be involved in the process.
4. The expert committee recommends the following staged approach for children between the ages of 2 and 19 years whose BMI is >85th percentile. Stage 1 is the Prevention Plus protocol. These recommendations can be implemented by the primary care physician or an allied health care provider who has some training in pediatric weight management or behavioral counseling. Stage 1 recommendations include the following. (*a*) Consume ≥5 servings of fruits and vegetables per day (ME). (*b*) Minimize or eliminate sugar-sweetened beverages (ME). (*c*) Limit screen time to ≤2 hours per day, with no television in the room where the child sleeps (CE). (*d*) Engage in ≥1 hour of daily physical activity (ME). The patient and the family of the patient should be counseled to facilitate the following eating behaviors: (*a*) eating a daily breakfast (ME); (*b*) limiting meals outside the home (ME); (*c*) eating family meals at least 5 or 6 times per week (ME); and (*d*) allowing the child to self-regulate his or her meals and avoiding overly restrictive behaviors (CE for children <12 years of age and suggested for children >12 years of age). Providers should acknowledge cultural differences and help families to adapt recommendations to meet these differences (suggest). Within this category, the goal should be weight maintenance, with growth resulting in decreasing BMI as age increases. Monthly follow-up assessment should be performed. After 3 to 6 months, if no improvement in BMI or weight status has been noted, then advancement to stage 2 is indicated, on the basis of patient/family readiness to change. Stage 2 is a structured weight management protocol. These recommendations can be implemented by a primary care physician or an allied

health care provider who is highly trained in weight management. Stage 2 recommendations include the following: (*a*) development of a plan for use of a balanced macronutrient diet, emphasizing small amounts of energy-dense foods (suggest); (*b*) provision of structured daily meals and snacks (breakfast, lunch, dinner, and 1 or 2 snacks per day) (suggest); (*c*) supervised active play of ≥60 minutes per day (ME); (*d*) screen time of ≤1 hour per day (suggest; CE for ≤2 hours); (*e*) increased monitoring (eg, screen time, physical activity, dietary intake, and restaurant logs) by provider, patient, and/or family (CE); and (*f*) reinforcement for achieving targeted behavior goals (not weight goals) (suggest). Within this category, the goal should be weight maintenance that results in decreasing BMI as age and height increase; however, weight loss should not exceed 1 lb/month for children 2 to 11 years of age or an average of 2 lb/week for older overweight/obese children and adolescents. If there is no improvement in BMI or weight status after 3 to 6 months, then the patient should advance to stage 3. Stage 3 is a comprehensive multidisciplinary intervention. At this level of intervention, optimally the patient should be referred to a multidisciplinary obesity care team. Eating and activity goals are the same as in stage 2. Activities within this category should also include the following: (*a*) planned negative energy balance achieved through structured diet and physical activity (ME); (*b*) structured behavioral modification program, including food and activity monitoring and development of short-term diet and physical activity goals (CE); (*c*) involvement of primary caregivers/family members for behavioral modification for children <12 years of age (CE); (*d*) provision of training for all families to improve the home environment (suggest); and (*e*) frequent office visits. Weekly visits for a minimum of 8 to 12 weeks seem to be most efficacious (CE), and subsequent monthly visits help maintain new behaviors. Group visits may be more cost-effective and have therapeutic benefit (ME). Systematic evaluation of body measurements, dietary intake, and physical activity should be conducted at baseline and at specific intervals throughout the program. Within this category, the goal should be weight maintenance or gradual weight loss until BMI is <85th percentile. Weight loss should not exceed 1 lb/month for children 2 to 5 years of age or 2 lb/week for older obese children and adolescents.

5. The expert committee recommends stage 4 for children >11 years of age with BMI of >95th percentile who have significant comorbidities and who have not been successful in stages 1 to 3 or children with BMI of >99th percentile who have shown no improvement in stage 3 (comprehensive multidisciplinary intervention). Stage 4 is a tertiary care protocol, that is, referral to a pediatric tertiary weight management center with access to a multidisciplinary team with expertise in childhood obesity, operating under a designed protocol. This protocol should include continued diet and activity counseling and the consideration of such additions as meal replacement, very low-calorie diet, medication, and surgery (suggest).

6. The expert committee recommends that the following weight loss targets be considered when the staged treatment plan is implemented; the recommendations are based on clinical recommendations and judgment because of the limited amount of evidence: age 2 to 5 years: BMI of 85th to 94th percentile: weight maintenance until BMI is <85th percentile or slowing of weight gain is indicated by a downward deflection in the BMI curve; BMI of ≥95th percentile: weight maintenance until BMI is <85th percentile; however, if weight loss occurs with a healthy adequate diet, then it should not exceed 1 lb/month (if greater loss is noted, then the patient should be monitored for causes of excessive weight loss); BMI of >21 or 22 kg/m^2 (rare, very high): gradual weight loss, not to exceed 1 lb/month (if greater loss occurs, then the patient should be monitored for causes of excessive weight loss); age 6 to 11 years: BMI of 85th to 94th percentile: weight maintenance until BMI is <85th percentile or slowing of weight gain is indicated by a downward deflection in the BMI curve; BMI of 95th to 98th percentile: weight maintenance until BMI is <85th or gradual weight loss of ~1 lb/month (if greater loss is noted, then the patient should be monitored for causes of excessive weight loss); BMI of ≥99th percentile: weight loss not to exceed an average of 2 lb/week (if greater loss is noted, then the patient should be monitored for causes of excessive weight loss); age 12 to 18 years: BMI of 85th to 94th percentile: weight maintenance until BMI is <85th percentile or slowing of weight gain is indicated by a downward deflection in the BMI curve; BMI of 95th to 98th percentile: weight loss until BMI is <85th percentile, with no more than an average of 2 lb/week (if greater loss is noted, then the patient should be monitored for causes of excessive weight loss); BMI of ≥99th percentile: weight loss not to exceed an average of 2 lb/week (if greater loss is noted, the patient should be monitored for causes of excessive weight loss).

7. The expert committee recommends that, for children 12 to 18 years of age with BMI of >99th percentile, primary care physicians and allied health care providers may begin treatment at stage 1, 2, or 3, as indicated by the patient's and family's readiness to change.

Prevention Recommendations

Patient-Level Interventions

1. The expert committee recommends that physicians and allied health care providers counsel the following for children 2 to 18 years of age whose BMI is 5th to 84th percentile: (*a*) limiting consumption of sugar-sweetened beverages (CE); (*b*) encouraging diets with recommended quantities of fruits and vegetables (ME); (*c*) limiting television and other screen time by allowing no more than 2 hours per day, as advised by the American Academy of Pediatrics (CE), and removing television and computer screens from children's primary sleeping areas (CE); (*d*) eating breakfast daily (CE); (*e*) limiting eating at restaurants, particularly fast food restaurants (CE); (*f*) encouraging family meals in which parents and children eat together (CE); and (*g*) limiting portion sizes (CE).
2. The expert committee also suggests that providers counsel families to engage in the following behaviors: (*a*) eating a diet rich in calcium; (*b*) eating a diet high in fiber; (*c*) eating a diet with balanced macronutrients (energy from fat, carbohydrates, and protein in proportions appropriate for age, as recommended by Dietary Reference Intakes); (*d*) initiating and maintaining breastfeeding; (*e*) participating in 60 minutes of moderate to vigorous physical activity per day for children of healthy weight (the 60 minutes can be accumulated throughout the day, rather than in single or long bouts; ideally, such activity should be enjoyable to the child); and (*f*) limiting consumption of energy-dense foods.

Practice- and Community-Level Interventions

1. The expert committee recommends that physicians, allied health care professionals, and professional organizations (*a*) advocate for the federal government to increase physical activity at schools through intervention programs from grade 1 through the end of high school and college and through the creation of school environments that support physical activity in general and (*b*) support efforts to preserve and to enhance parks as areas for physical activity, inform local development initiatives regarding the inclusion of walking and bicycle paths, and promote families' use of local physical options by making information and suggestions about physical activity alternatives available in doctors' offices.
2. The expert committee recommends the use of the following techniques to aid physicians and allied health care providers who may wish to support obesity prevention in clinical, school, and community settings: (*a*) actively engaging families with parental obesity or maternal diabetes, because these children are at increased risk for developing obesity even if they currently have normal BMI; (*b*) encouraging an authoritative parenting style in support of increased physical activity and reduced sedentary behavior (authoritative parents are both demanding and responsive, providing tangible and motivational support for children); (*c*) discouraging a restrictive parenting style (restrictive parenting involves heavy monitoring and controlling of a child's behavior) regarding child eating; (*d*) encouraging parents to model healthy diets and portions sizes, physical activity, and limited television time; and (*e*) promoting physical activity at school and in child care settings (including after-school programs) by asking children and parents about activity in these settings during routine office visits.

ACKNOWLEDGMENTS

Expert committee member organizations and representatives were as follows: Heather Walter, MD (American Academy of Child and Adolescent Psychiatry), Goutham Rao, MD, MPH (American Academy of Family Physicians); Caroline R. Richardson, MD (American Academy of Family Practice); Reginald Washington, MD (American Academy of Pediatrics); Jim Guillory, DO, MPH, FACPM (American College of Preventive Medicine); Steven Stovitz, MD (American College of Sports Medicine); Susan H. Laramee, MS, RD, LDN, FADA (American Dietetic Association); Keith Oldham, MD (American Pediatric Surgical Association); James Sallis, PhD (American Psychological Association); Susan Sloan, MD (Association of American Indian Physicians); Phyllis Speiser, MD (The Endocrine Society); Margaret Grey, DrPH, FAAN, CPNP (National Association of Pediatric Nurse Practitioners); Shirley Schantz, EdD, ARNP (National Association of School Nurses); Flavia Mercado, MD (National Hispanic Medical Association); Winston Price, MD, FAAP (National Medical Association); Jeffrey B. Schwimmer, MD (North American Association for the Study of Obesity). The writing groups were as follows: Prevention: Ken Resnicow, PhD; Matthew Davis, MD, MAPP; Bonnie Gance-Cleveland, PhD, RNC, PNP; Sandra Hassink, MD, FAAP; Rachel K. Johnson, PhD, RD; Gilles Paradis, MD, MSc, FRCPC, FACPM, FAHA; Assessment: Nancy F. Krebs, MD, MS; Patricia Guilday, RN, MSN, NCSN; John H. Himes, MD, PhD; Dawn Jacobson, MD, MPH; Theresa Nicklas, DrPH; Dennis Styne, MD; Treatment: Bonnie Spear, PhD, RD; Sarah E. Barlow, MD, MPH; Chris Ervin, MD, FACEP; David S. Ludwig, MD, PhD; Brian E. Saelens, PhD; Karen E. Schetzina, MD, MPH; Elsie M. Taveras, MD, MPH.

Special thanks go to the National Association of Pediatric Nurse Practitioners for allowing use of its reference lists, which were used to develop the National Association of Pediatric Nurse Practitioners clinical practice guideline on identifying and preventing overweight

in children. Those documents expedited preparation of this report.

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Pediatrics 2007;120;S164
DOI: 10.1542/peds.2007-2329C