

Obesity Evaluation and Treatment: Expert Committee Recommendations

Sarah E. Barlow, MD, MPH, and William H. Dietz, MD, PhD

ABSTRACT. *Objectives.* The development of recommendations for physicians, nurse practitioners, and nutritionists to guide the evaluation and treatment of overweight children and adolescents.

Methods. The Maternal and Child Health Bureau, Health Resources and Services Administration, the Department of Health and Human Services convened a committee of pediatric obesity experts to develop the recommendations.

Results. The Committee recommended that children with a body mass index (BMI) greater than or equal to the 85th percentile with complications of obesity or with a BMI greater than or equal to the 95th percentile, with or without complications, undergo evaluation and possible treatment. Clinicians should be aware of signs of the rare exogenous causes of obesity, including genetic syndromes, endocrinologic diseases, and psychological disorders. They should screen for complications of obesity, including hypertension, dyslipidemias, orthopedic disorders, sleep disorders, gall bladder disease, and insulin resistance. Conditions that indicate consultation with a pediatric obesity specialist include pseudotumor cerebri, obesity-related sleep disorders, orthopedic problems, massive obesity, and obesity in children younger than 2 years of age. Recommendations for treatment evaluation included an assessment of patient and family readiness to engage in a weight-management program and a focused assessment of diet and physical activity habits. The primary goal of obesity therapy should be healthy eating and activity. The use of weight maintenance versus weight loss to achieve weight goals depends on each patient's age, baseline BMI percentile, and presence of medical complications. The Committee recommended treatment that begins early, involves the family, and institutes permanent changes in a stepwise manner. Parenting skills are the foundation for successful intervention that puts in place gradual, targeted increases in activity and targeted reductions in high-fat, high-calorie foods. Ongoing support for families after the initial weight-management program will help families maintain their new behaviors.

Conclusions. These recommendations provide practical guidance to pediatric clinicians who evaluate and treat overweight children. *Pediatrics* 1998;102(3). URL:

<http://www.pediatrics.org/cgi/content/full/102/3/e29>; *obesity, weight control, diet, activity, assessment, treatment, children, adolescents.*

ABBREVIATIONS. BMI, body mass index; NCHS, National Center for Health Statistics; NIDDM, noninsulin-dependent diabetes mellitus; WIN, Weight-control Information Network.

Obesity in children and adolescents represents one of the most frustrating and difficult diseases to treat. Furthermore, as recent data from the National Center for Health Statistics (NCHS) indicate, approximately one in five children in the United States is now overweight.¹ To develop guidance for physicians, nurse practitioners, dietitians/nutritionists, and others who care for overweight^a children, the Maternal and Child Health Bureau, Health Resources and Services Administration, the Department of Health and Human Services convened a conference in Washington, DC, on March 18–19, 1997. The Expert Committee members were chosen for their clinical and research experience in the field of pediatric obesity. Those who attended the conference were professionals from the American Academy of Pediatrics, the American Dietetic Association, the American Heart Association, the National Association of Pediatric Nurse Associates and Practitioners, the Maternal and Child Health Bureau, the National Institutes of Health, the Centers for Disease Control and Prevention, the Food and Drug Administration, and the US Department of Agriculture. The Committee reached consensus on the evaluation and treatment of childhood obesity. Subsequently, a group of nurse practitioners, pediatricians, and nutritionists reviewed these recommendations for content and usefulness and approved their appropriateness for practitioners.

The management recommendations presented here represent an important attempt to provide those who care for children with practical directions on how to assess and treat overweight children. Many of the approaches also apply to obesity prevention. Because so few studies of this problem have been performed, the approaches to evaluation and therapy presented here rarely are evidence-based. Nonetheless, they represent the consensus of a group of professionals who treat obese children and adolescents.

Several general considerations apply to these rec-

^aAlthough the word *overweight* may connote a milder degree of excess fat than does *obesity*, no defined criteria exist to make this distinction. In this report, the terms are used interchangeably.

From the Division of Pediatric Gastroenterology and Nutrition, New England Medical Center, Boston, Massachusetts.

Expert Committee Members: William H. Dietz, MD, PhD; Leonard H. Epstein, PhD; Samuel S. Gidding, MD; John H. Himes, PhD, MPH; Linda Jonides, RN, CPNP; William J. Klish, MD; Thomas N. Robinson, MD, MPH; and Mary Story, PhD, RD.

Dr Dietz's present affiliation: Division of Nutrition and Physical Activity, Centers for Disease Control and Prevention, Atlanta, Georgia.

Received for publication Nov 14, 1997; accepted May 12, 1998.

Reprint requests to the National Maternal and Child Health Clearinghouse, 2070 Chain Bridge Road, Suite 450, Vienna, VA 22182-2536. e-mail: nmhc@circsol.com

PEDIATRICS (ISSN 0031 4005). Copyright © 1998 by the American Academy of Pediatrics.

ommendations. Obesity represents a chronic disease. Therefore, frequent visits, continuous monitoring, and reinforcement will be required for success, but will not ensure it. Providers who lack the time required to implement the suggestions outlined below or who find themselves annoyed or easily frustrated by obese children or the parents of obese children should refer these patients elsewhere for care because of the potential adverse effect the providers' response may have on the child and family.

IDENTIFICATION OF CHILDREN FOR EVALUATION AND TREATMENT OF OBESITY

Assessment of Obesity

A clinically useful assessment of obesity must reflect excess body fat and still be simple to use. Body mass index (BMI), expressed as body weight in kilograms divided by the square of height in meters (kg/m^2), is a weight-for-height index that meets these criteria.² BMI is the standard obesity assessment in adults, and its use in children provides a consistent measure across age groups. International support for BMI use in children exists; participants at a recent workshop on childhood obesity, convened by the International Task Force on Obesity, agreed that BMI provides a reasonable index of adiposity.³

BMI correlates with measures of body fatness in children and adolescents. The correlation coefficient ranges from 0.39 to 0.90, depending on the method of fatness measurement and the age and sex of the subjects.³⁻⁵ BMI also correlates with markers of secondary complications of obesity, including current blood pressures,⁶⁻⁸ blood lipids, and blood lipoproteins,^{6,9-11} and with long-term mortality.¹²

BMI is calculated easily from weight and height. Revised reference growth curves that will be released soon by the NCHS will facilitate these calculations and interpretations by displaying BMI percentile curves by age and sex.

Choice of Appropriate Cutoff Values

In general, the appropriate cutoff value to diagnose obesity should minimize false-positive results; that is, only a few children who are *not* obese will be above the cutoff. Although this approach misclassifies some obese children who fall below the cutoff, it avoids the potential psychologic and physical harm of misclassifying and treating children who are not obese.

Until more definitive recommendations are established, the Committee recommends that children and adolescents with BMI greater than or equal to the 95th percentile for age and sex should undergo an in-depth medical assessment (Fig 1). Use of the 95th percentile identifies children with a significant likelihood of persistence of obesity into adulthood.¹³⁻¹⁶ In older adolescents, BMI above the 95th percentile is associated with elevated blood pressure and lipid profiles that increase the risk of obesity-related disease and mortality.^{8,17-19} Children who fit this criteria should be evaluated carefully, as described below, and treated unless some contraindication is found.

A child whose BMI falls between the 85th and 95th

percentile for age and sex should be evaluated carefully with particular attention to secondary complications of obesity, including hypertension and dyslipidemias. A recent large change in BMI should also prompt evaluation and possible treatment. Although the degree of change that indicates risk has not been defined, an annual increase of 3 to 4 BMI units probably reflects rapid increase in body fat in most children. This estimate is based on the observation that a BMI in a given percentile channel increases annually by ≤ 1 unit, but for most age groups, the BMI at the 85th percentile is 3 or 4 units higher than the BMI at the 50th percentile.²⁰

LANGUAGE AND Demeanor OF CLINICIANS

Because of the value placed on physical appearance and the common belief that obesity results from laziness or lack of willpower, overweight children and their families often feel embarrassed and ashamed. Clinicians who care for these families must treat them with sensitivity, compassion, and a conviction that obesity is an important, chronic medical problem that can be treated. Questions about food consumption and activity should be framed in objective, nonaccusatory language. The clinician can create an alliance with the family by focusing questions on behaviors rather than on the characteristics of the child or family. For instance, the clinician can ask, "Do you find your eating is out of control sometimes?" rather than "Do you lack willpower?" When clinicians take the time to understand each family's particular living situation, schedule, and values, they can refine treatment recommendations and provide sympathetic support to the family's efforts.

MEDICAL ASSESSMENT

The first step in the assessment of an overweight child is a careful evaluation to identify any underlying syndromes or secondary complications (Table 1).

Exogenous Causes of Obesity

Identifiable exogenous causes of obesity are rare. Genetic syndromes, such as Bardet-Biedl and Cohen, present with dysmorphic features, developmental delay, and sometimes retinal changes and deafness in addition to obesity.^{21,22} Children with Prader-Willi syndrome demonstrate poor linear growth in addition to developmental delay and dysmorphic facial features, and males with Prader-Willi syndrome usually have undescended testicles.²³ A clinical geneticist can evaluate children with any of these findings for additional testing. Endocrinologic causes of overweight include hypothyroidism and Cushing's syndrome. Both conditions lead to poor linear growth,^{24,25} and a history of normal linear growth makes these conditions unlikely. Hirsutism and truncal obesity occur in Cushing's syndrome, and prominent violaceous striae in particular should prompt an evaluation with a urine free-cortisol or dexamethasone suppression test.²⁶

Psychologic disorders may cause or be related to obesity. A child who often feels unable to control consumption of large amounts of food or who reports vomiting or laxative use to avoid a weight gain

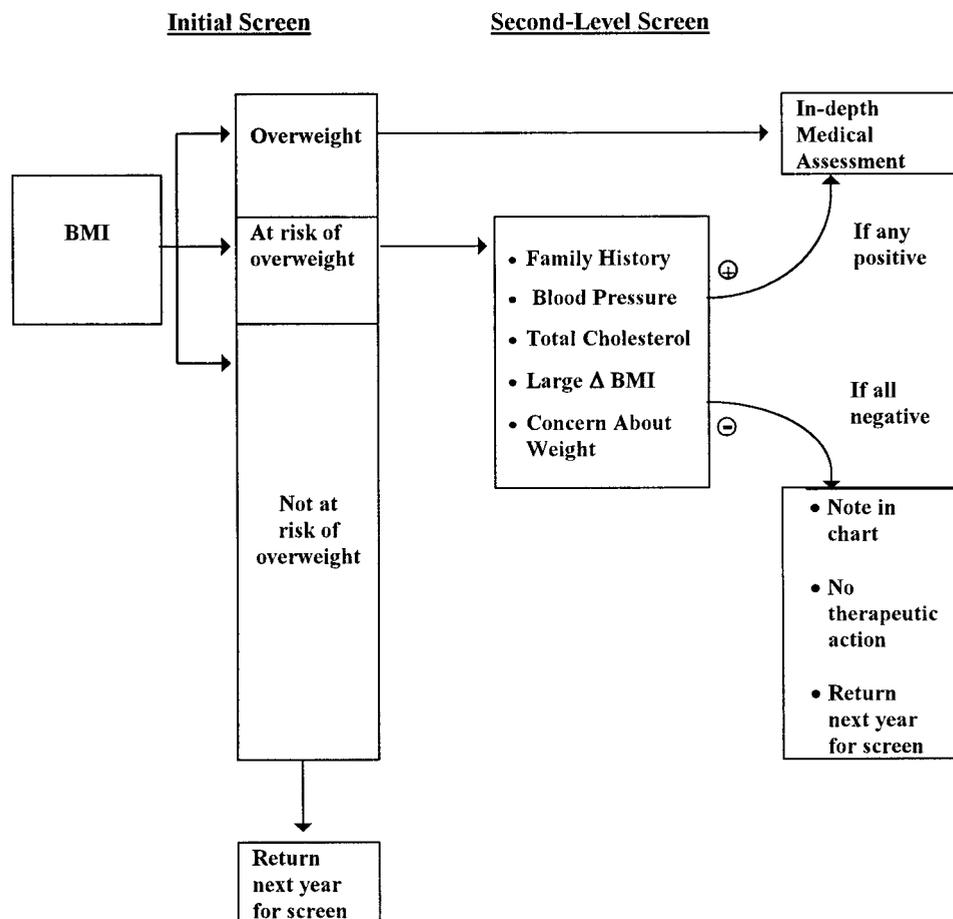


Fig 1. Reproduced with permission. Guidelines for overweight in adolescent preventive services: recommendations from an expert committee. Himes JH, Dietz WH. *Am J Clin Nutr.* 1994;59:307–316.

may have an eating disorder. The Primary Care Evaluation of Mental Disorders questionnaire includes several questions to screen for eating disorders.²⁷ A therapist with experience in eating disorders should evaluate children with suspected eating disorder to confirm the diagnosis. Children with eating disorders require psychologic treatment and should not participate in a weight-control program without the concurrence of the therapist. An overweight child who is depressed may manifest sleep disturbance, hopelessness and sadness, and appetite changes. The Children's Depression Inventory^b may be useful to screen children who seem depressed.²⁸ Depressed children, like those with eating disorders, require psychologic evaluation and treatment. Without such treatment, a weight-control program may be ineffective.

Complications of Obesity

Obesity can cause complications in many organ systems. Orthopedic complications include slipped capital femoral epiphysis, which may manifest as hip or knee pain and limited hip range of motion,^{29–32}

and Blount's disease (tibia vara).³³ If radiography confirms either of these conditions, an orthopedic surgeon should evaluate the child, and the primary clinician should consult a pediatric obesity specialist about an appropriate weight-loss program to prevent recurrence of Blount's disease or contralateral slipped epiphysis. Blurred margins of the optic disks may indicate pseudotumor cerebri, especially when the child reports severe headaches. Pseudotumor cerebri can occur in the absence of blurred disk margins, however, and a neurologist can help make the diagnosis.³⁴ Because this condition may lead to loss of visual fields or visual acuity, clinicians should refer to or consult with a pediatric obesity specialist. If the child experiences daytime somnolence or the family describes breathing difficulty during sleep, a sleep study will identify sleep apnea or obesity hypoventilation syndrome.^{35–38} Enlarged tonsils may interfere with ventilation at night, especially if the child snores heavily. Tonsillectomy may improve quality of sleep and therefore daytime well-being.^{35,36} Sleep apnea and obesity hypoventilation syndrome are potentially fatal disorders that require rapid weight loss and may require continuous positive airway pressure until weight loss decreases intraabdominal pressure, improves chest wall compliance, and restores adequate ventilation. Clinicians should seek guidance from a pediatric obesity treatment

^bChildren's Depression Index contains 27 groups of sentences. Children pick the sentence in each group that best describes their feelings during the previous 2 weeks. They can complete the index by themselves. The index and scoring information can be obtained from Multi-Health Systems, 908 Niagara Falls Blvd, North Tonawanda, NY 14120-2060; (800) 268–6011.

TABLE 1. Assessment of Medical Conditions Related to Obesity

| Findings | Potential Conditions |
|--------------------------------|---|
| History | |
| Developmental delay | Genetic disorders |
| Poor linear growth | Hypothyroidism, Cushing's syndrome, Prader-Willi syndrome |
| Headaches | Pseudotumor cerebri |
| Nighttime breathing difficulty | Sleep apnea, obesity hypoventilation syndrome |
| Daytime somnolence | Sleep apnea, obesity hypoventilation syndrome |
| Abdominal pain | Gall bladder disease |
| Hip or knee pain | Slipped capital femoral epiphysis |
| Oligomenorrhea or amenorrhea | Polycystic ovary syndrome |
| Family history | |
| Obesity | |
| NIDDM | |
| Cardiovascular disease | |
| Hypertension | |
| Dyslipidemia | |
| Gall bladder disease | |
| Social/psychologic history | |
| Tobacco use | |
| Depression | |
| Eating disorder | |
| Physical examination | |
| Height, weight, and BMI | |
| Triceps skinfold thickness | |
| Truncal obesity | Risk of cardiovascular disease; Cushing's syndrome |
| Blood pressure | |
| Dysmorphic features | Genetic disorders, including Prader-Willi syndrome |
| Acanthosis nigricans | NIDDM, insulin resistance |
| Hirsutism | Polycystic ovary syndrome; Cushing's syndrome |
| Violaceous striae | Cushing's syndrome |
| Optic disks | Pseudotumor cerebri |
| Tonsils | Sleep apnea |
| Abdominal tenderness | Gall bladder disease |
| Undescended testicle | Prader-Willi syndrome |
| Limited hip range of motion | Slipped capital femoral epiphysis |
| Lower leg bowing | Blount's disease |

center or specialist. Abdominal pain or tenderness may reflect gall bladder disease, for which obesity is a risk factor in adults,³⁹ although the risk in obese children may be much lower.⁴⁰ Blood tests and ultrasonography may be needed to evaluate further these signs and symptoms.^{41,42} Endocrinologic disorders related to obesity include polycystic ovary disease, which commonly presents with oligomenorrhea or amenorrhea and hirsutism,⁴³⁻⁴⁵ and noninsulin-dependent diabetes mellitus (NIDDM), an increasingly common condition in children.^{46,47} Acanthosis nigricans, the coarse, hyperpigmented areas in the neck folds or axilla that are associated with insulin resistance in obese adults,⁴⁸ occurs frequently but not exclusively in children with noninsulin-dependent diabetes mellitus and in insulin-resistant children.⁴⁷⁻⁴⁹ Fasting blood insulin and glucose will screen for insulin resistance. A pediatric endocrinologist should evaluate children with suspected diabetes.

Clinicians should identify hypertension, dyslipidemias, and tobacco use, conditions that add to the long-term cardiovascular risks conferred by obesity.^{50,51} Cardiovascular disease, hypertension, or dyslipidemias in siblings, parents, aunts, uncles, and grandparents indicate increased risk for the child. Blood pressure should be measured with a cuff of an appropriate size to avoid overestimation of hypertension. Lipoprotein profile will uncover dyslipidemias. Hypertension and dyslipidemias may respond to successful weight control.

Assessment of Degree of Overweight

Height and weight plotted on standard NCHS growth curves and BMI plotted on the revised NCHS curves, when they become available, will register the degree of the child's overweight. Although measurement of skinfold thickness can be unreliable and inaccurate,⁵²⁻⁵⁴ a triceps skinfold thickness higher than the 95th percentile, measured by an experienced observer, provides evidence that the child has excess fat rather than increased lean body mass or large frame size. Table 2 includes instructions on triceps skinfold measurement and 95th percentile values. Visceral obesity, measured directly by computerized tomography or magnetic resonance imaging, is associated with increased risk of cardiovascular disease.¹⁹ However, because the anthropometric quantification of fat distribution has not been established for children, the Committee made no recommendations regarding the use of waist or skinfold measures to assess regional fat distribution.

Indications for Referral to a Pediatric Obesity Treatment Specialist (Table 3)

When children present with complications of obesity that require certain, rapid weight loss, pediatric obesity treatment centers, staffed by providers experienced in the management of these unusual disorders, are best able to help these children. Such centers will be able to prescribe and monitor restrictive diets, administer pharmacologic therapy when ap-

TABLE 2. Smoothed 95th Percentiles of Triceps Skinfold Thickness for NHANES I Subjects adapted with permission²⁰

| Males | 95th Percentile | Females | 95th Percentile |
|---------|-----------------|---------|-----------------|
| Years | mm | Years | mm |
| 6-6.9 | 14 | 6-6.9 | 16 |
| 7-7.9 | 16 | 7-7.9 | 18 |
| 8-8.9 | 17 | 8-8.9 | 20 |
| 9-9.9 | 19 | 9-9.9 | 22 |
| 10-10.9 | 21 | 10-10.9 | 24 |
| 11-11.9 | 22 | 11-11.9 | 26 |
| 12-12.9 | 23 | 12-12.9 | 28 |
| 13-13.9 | 24 | 13-13.9 | 30 |
| 14-14.9 | 23 | 14-14.9 | 31 |
| 15-15.9 | 22 | 15-15.9 | 32 |
| 16-16.9 | 22 | 16-16.9 | 33 |
| 17-17.9 | 22 | 17-17.9 | 34 |
| 18-18.9 | 22 | 18-18.9 | 34 |
| 19-19.9 | 22 | 19-19.9 | 35 |

* Triceps skinfold measurement: determine the midpoint between the acromion and olecranon process on the posterior surface of the right arm and mark it. With the patient's arm relaxed, grasp the skinfold ~1 cm above the midpoint, taking care to exclude muscle from the grasp. Measure skinfold thickness with calipers at the midpoint. Repeat the measure two to three times.⁷⁶

appropriate, and help determine, in rare cases, whether surgery should be considered. The Weight-control Information Network (WIN)^c can assist clinicians in identification of pediatric weight-control services. Only a few centers exist; however, specialists at these centers may be useful resources for clinicians distant from these centers who care for patients with severe complications of obesity. Complications that indicate referral or consultation include pseudotumor cerebri, sleep apnea, obesity hypoventilation syndrome, and orthopedic problems. All of these conditions lead to serious morbidity, as described above. Children with massive overweight, even without complications, may also benefit from referral to or consultation with a pediatric obesity treatment center for more aggressive therapy than outlined below. Because a definition of massive overweight does not exist for children, providers will need to use their judgment to identify these children. The Committee felt strongly that the rare cases of severely overweight children younger than 2 years of age require evaluation in a pediatric obesity center before treatment is considered.

EVALUATION FOR TREATMENT

Readiness to Make Changes

A weight-management program for a parent or an adolescent who is not ready to change may be not only futile but also harmful because an unsuccessful program may diminish the child's self-esteem and impair future efforts to improve weight. If a younger child is not ready for change, the parent who is ready can modify diet and activity successfully. Families who are not ready to change may express a lack of

^cWeight-control Information Network (WIN) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases. WIN assembles and disseminates information on weight control, obesity, and nutritional disorders to health professionals and the general public. Contact WIN at 1 WIN Way, Bethesda, MD 20892-3665; (800) 946-8098; <http://www.niddk.nih.gov/NutritionDocs.html>.

TABLE 3. Approximate Prevalence of Obesity-associated Conditions

| | |
|-----------------------------------|---|
| Prader-Willi | 1/25 000 Population ⁷⁷ |
| Other genetic disorders | Unknown (often reportable) |
| Hypothyroidism | 1-2/1000 School children ⁷⁸ |
| Cushing's syndrome | 1/140 000 Population in Japan ⁷⁹ |
| Slipped capital femoral epiphysis | 1/3 300 <25 Years and >95th percentile weight ⁸⁰ |
| Blount's disease | Probably equals slipped capital femoral epiphysis ³³ |
| Pseudotumor cerebri | 1-2/8000 Obese adults and adolescents ⁸¹ |
| Sleep apnea | 1/100 In pediatric obesity clinic ³⁶ |
| Obesity hypoventilation | Less frequent than sleep apnea ³⁶ |
| Gall bladder disease | 1-2/100 In women >30 kg/m ² (⁴¹) |
| NIDDM | 1/1400 Children age 10-19 ⁴⁷ |
| Polycystic ovary syndrome | 1-3/4 Adolescent and adult women with oligomenorrhea or amenorrhea ⁸² |
| Hypertension | 1/4 Obese children 5-11 years (blood pressure >90 Percentile) ⁸³ |
| Dyslipidemias | 1-3/30 Young adults with BMI >28 kg/m ² (⁸⁴) |
| | 1-2/5 Children with TSF >85 percentile have total cholesterol in 5th quintile ⁸⁵ |

Case definition, size, and characteristics of the population studied all affect the reported prevalence. The prevalence of these conditions in obese children in a primary pediatric practice may differ markedly.

concern about the child's obesity or believe the obesity is inevitable and cannot be changed, or are not interested in modification of activity or eating. Clinicians may find useful the questions about patient readiness included in an adolescent version, now under development, of the Provider-based Assessment and Counseling for Exercise program, cosponsored by the Centers for Disease Control and Prevention and the Association for Teachers of Preventive Medicine.⁵⁵ Depending on the severity of the obesity, families who are not ready for change may benefit from counseling to improve motivation or from deferral of obesity therapy until they are ready. Motivational interviewing,⁵⁶ a technique used with adults to prepare them to change addictive behavior, may have applications in obesity treatment. A practical way to address readiness is to ask all members of the family how concerned they are about the patient's weight, whether they believe weight loss is possible, and what practices need to be changed.

A parent who has an eating disorder (bulimia, anorexia nervosa, or binge-eating disorder) may find changes in the family's diet and activity difficult. A therapist with experience in eating disorders should evaluate the parent and family before the start of a weight-control program to assess the need for individual counseling or family treatment. Parents with histories of eating disorders also may find present management of the child's eating difficult. If such a parent seems to overregulate the child's food intake or set no limits and indulge the child, a therapist should further evaluate the parent or family before treatment.

Diet History

No studies have targeted the most appropriate assessment of children's dietary intake. The Committee recommended a global assessment of each child's eating habits to identify both foods and patterns of eating that may lead to excessive caloric intake. Families can describe the meals and snacks in a typical day and estimate daily or weekly consumption of high-calorie and high-fat foods, such as chips, granola bars, cookies and desserts, and high-calorie liquids, such as soda, juice, and whole milk. Meals prepared outside the home may be important sources of high-calorie eating, whether they are from "take-out" or "fast food" restaurants, at school or day care facilities, or with grandparents or other caregivers. When families eat at restaurants, parents may exert less control over food choices than they do at home. For younger children, extended family or caregivers other than the parents may be responsible for supervision of some meals or snacks and should be identified and involved in treatment. Periods of unsupervised eating, especially after school, also may be a time of high-calorie consumption. For adolescents, social activities may revolve around meals and snacks consumed outside the home. A clinical dietitian should obtain the diet history when the primary care provider lacks time or has limited skills in dietary assessment.

Physical Activity History

A careful history of physical activity will uncover opportunities to increase energy expenditure. This assessment should quantify not only vigorous activity, such as organized sports and school-based physical education, but also activities in daily living, such as walking to school or to the bus stop, unorganized outdoor play, yard work, and household chores. Time spent in sedentary behavior, such as television-viewing, also should be estimated. Clinicians should recognize deterrents to activity, including unsafe neighborhoods and lack of adult supervision after school. Identification of caregivers other than parents who may be responsible for supervision of the child's activity will allow the development of alliances with them. Such alliances may improve the success of treatment recommendations.

GOALS OF THERAPY

Behavior Goals

The Committee felt strongly that the primary goal of a program to manage uncomplicated obesity is healthy eating and activity, not achievement of ideal body weight. To this end, the program should emphasize the skills necessary to change behavior and to maintain those changes. Skills that families should learn include:

1. development of awareness of current eating habits, activity, and parenting behavior;
2. identification of problem behaviors. Clinicians can help identify specific high-calorie foods or eating patterns and obstacles to activity;
3. modification of current behavior. Specifically, families should learn to make a few small, perma-

nent changes at a time and make additional changes only after the previous changes are firmly in place; and

4. continued awareness of behavior and recognition of problems that arise as the child becomes more independent, as family schedules change, or as other changes occur that alter the initial treatment plan.

Medical Goals

For children with a secondary complication of obesity, improvement or resolution of the complication is an important medical goal. Such an improvement is a concrete benefit of the new behavior that can reinforce psychologically the changes the patient has made. Abnormal blood pressure or lipid profile may improve with weight control, and assessment during follow-up visits of these parameters, if abnormal at baseline, and of weight-related symptoms, such as exercise intolerance, will remind the family that weight control leads to overall well-being even if the child does not approach ideal body weight.

Weight Goals

The Committee felt strongly that the first step in weight control for all overweight children ≥ 2 years of age is maintenance of baseline weight. The experience of the Committee members suggests that a child can achieve this goal through modest changes in diet and activity. Initial success can be the foundation for future change.

Prolonged weight maintenance, which allows a gradual decline in BMI as children grow in height, is a sufficient goal for many children (Fig 2). For children ≤ 7 years of age, prolonged weight maintenance is an appropriate goal in the absence of any secondary complication of obesity, such as mild hypertension or dyslipidemia. However, children in this age group with secondary complications of obesity may benefit from weight loss if their BMI is at the 95th percentile or higher. For children older than 7 years, prolonged weight maintenance is an appropriate goal if their BMI is between the 85th and 95th percentile and if they have no secondary complications of obesity. However, the Committee recommended weight loss for children in this age group with a BMI between the 85th and 95th percentile who have a nonacute secondary complication of obesity and for children in this age group with a BMI at the 95th percentile or above. The families of these children should first demonstrate that they can maintain the child's weight, and then clinicians should recommend additional changes in eating and activity to achieve weight loss of ~ 1 pound per month. An appropriate weight goal for all obese children is a BMI below the 85th percentile, although such a goal should be secondary to the primary goal of healthy eating and activity.

THERAPY

Although few studies of long-term effects of weight control in children exist, childhood obesity programs can lead to sustained weight loss when treatment focuses on behavior changes and is family-

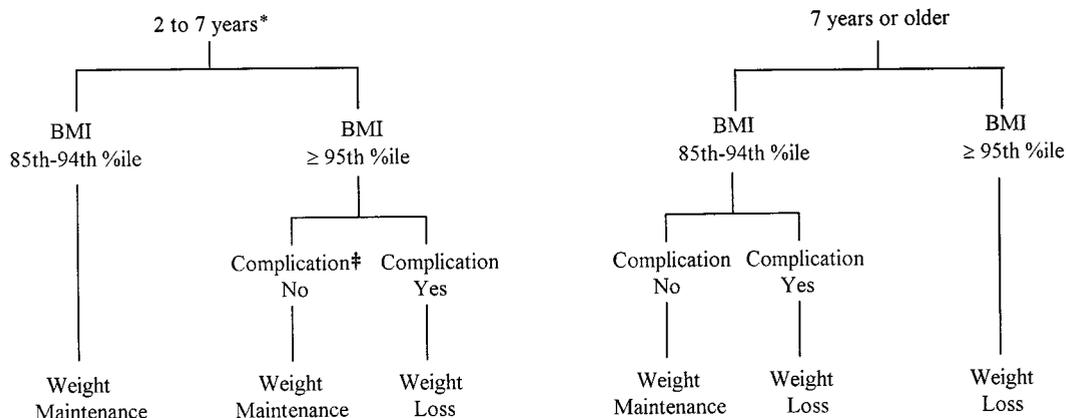


Fig 2. Recommendations for Weight Goals. * Indicates that children younger than 2 years should be referred to a pediatric obesity center for treatment. ‡ Indicates complications such as mild hypertension, dyslipidemias, and insulin resistance. Patients with acute complications, such as pseudotumor cerebri, sleep apnea, obesity hypoventilation syndrome, or orthopedic problems, should be referred to a pediatric obesity center.

based.⁵⁷ The Committee therefore recommends the following general approach (Table 4).

1. Intervention should begin early. Clinicians should initiate the treatment suggestions described below when children ≥ 3 years of age become overweight. The risk of persistent obesity increases with the age of the child.⁵⁸ Furthermore, in the Committee's experience, change in adolescents was much more difficult to facilitate and sustain.
2. The family must be ready for change. The Committee felt that lack of readiness would probably lead to failure, which will frustrate the family and perhaps prevent future weight-control efforts. When the family believes that obesity is inevitable or resists efforts to modify activity or meals, the Committee recommended either deferral of treatment until the family is ready or referral to a therapist who can address the family's readiness.
3. Clinicians should educate families about medical complications of obesity. The child and family should understand the long-term risks of obesity, including hypertension, high cholesterol, heart disease, and diabetes. Family history of these disorders will identify children at particular risk and may help motivate the parents to try to prevent these problems in the child.

TABLE 4. General Approach to Therapy

| |
|---|
| Intervention should begin early |
| The family must be ready for change |
| Clinicians should educate families about medical complications of obesity |
| Clinicians should involve the family and all caregivers in the treatment program |
| Treatment programs should institute permanent changes, not short-term diets or exercise programs aimed at rapid weight loss |
| As part of the treatment program, a family should learn to monitor eating and activity |
| The treatment program should help the family make small, gradual changes |
| Clinicians should encourage and empathize and not criticize |
| A variety of experienced professionals can accomplish many aspects of a weight management program |

4. Clinicians should involve the family and all caregivers in the treatment program. If the child is the only family member who changes eating habits or who must exercise, the child may feel deprived, scapegoated, or resentful, and relapse is more likely. Regular caregivers who do not participate in the changes may undermine the treatment program. Involvement of the entire family and all caregivers will create new family behaviors consistent with the child's new eating and activity goals. Such environmental change will be essential to the long-term success of the treatment.^{59,60} However, clinicians should recognize and respect an adolescent's increasingly independent eating and activity behaviors.
5. Treatment programs should institute permanent changes, not short-term diets or exercise programs aimed at rapid weight loss. Methodic, gradual, long-term changes will be more successful than multiple, frequent changes.
6. As part of the treatment program, a family should learn to monitor eating and activity. Monitoring ensures that change has occurred and is maintained. This skill is the first step in independent problem-solving. Common problems identified by monitoring include "saboteurs" (people who interfere with the changes the family is making), food consumption outside the home, lack of time for physical activity and food preparation, and identification of safe environments for activity. Periodic weight measurements (weekly or less often) at home may help the child maintain awareness of treatment goals and reinforce success, especially if frequent visits are not possible. However, weighing at home can be harmful if weight increases, if lack of weight change leads to punitive attitudes or scapegoating, or if the child and family focus more on body image and less on the more important goals of healthier eating and lifestyle.
7. The treatment program should help the family make small, gradual changes. Clinicians should recommend two or three specific changes in diet

or activity at a time and recommend additional steps only after the child and family have mastered these changes. Visits as frequent as every 2 weeks, even if brief, will allow the clinician to assess progress, evaluate the appropriateness of recommendations, measure weight, emphasize the clinician's involvement and concern, provide positive reinforcement for behavior changes, and convey to the family the importance of the problem and the lack of a "quick fix."

8. Clinicians should encourage and empathize and not criticize. Clinicians promote continued efforts to improve eating and activity when they emphasize successful behavior changes rather than weight changes, and when they empathize with the struggles children and their families experience. Clinicians who are sensitive and not critical about "failure" are in a position to help families try again.
9. A variety of experienced professionals can accomplish many aspects of a weight-management program. Trained nurses, nurse practitioners, nutritionists, physicians, psychologists, and social workers all can effectively help families monitor and change behavior. For many families, the guidance and support of counselors (psychologists, social workers) as they make changes in diet and activity are essential for success. A team approach may make best use of each professional's expertise, and if a clinician is treating many children, group meetings, rather than individual visits, may be efficient and effective.

Parenting Skills (Table 5)

As parents and caregivers institute the changes needed for successful treatment of obesity, they need support and guidance in basic parenting skills. Although clinicians can find complete discussions of parenting techniques in several texts, clinicians should emphasize the following principles in the management of eating and activity behaviors.

1. Find reasons to praise the child's behavior. Remind parents that although children's *behaviors* can be good or bad, *children* are always good. Therefore, praise and correction should focus on the child's behavior, not on the child.
2. Never use food as a reward. Instead, activity and time with parents should reward desired behavior.
3. Parents can ask for "rewards" from children in exchange for the changes in their own behavior,

TABLE 5. Parenting Skills

| |
|--|
| Find reasons to praise the child's behavior |
| Never use food as a reward |
| Parents can ask for "rewards" for children in exchange for the changes in their own behavior |
| Establish daily family meal and snack times |
| Parents or caregivers should determine what food is offered and when, and the child should decide whether to eat |
| Offer only healthy options |
| Remove temptations |
| Be a role model |
| Be consistent |

such as increasing time with child or modifying activity and meals. For example, children could agree to allow parents to sleep late to reward parents for playing basketball with them.

4. Establish daily family meal and snack times.
5. Parents or caregivers should determine what food is offered and when, and the child should decide whether to eat.
6. Offer only healthy options. Parents can ask the child to choose between an apple or popcorn for a snack, not an apple or a cookie, or ask the child to choose between outside play or going to the park rather than to choose between outside play or television. When children can choose, they are less likely to view the alternative they select as unattractive.
7. Remove temptations. Parents can control the food that is purchased and limit or eliminate high-fat or high-sugar foods.
8. Be a role model. Parents should improve their own eating habits and level of activity.
9. Be consistent. As with a Las Vegas slot machine that encourages gambling by unpredictably rewarding it, a parent may perpetuate undesirable behavior by inconsistently "giving in" to it. Inconsistent acquiescence may reinforce undesirable behavior even more than no limits.
10. Clinicians should assess parental mastery of these skills during follow-up visits. Review of these skills with *all* families as part of well-child visits may prevent the development of obesity.

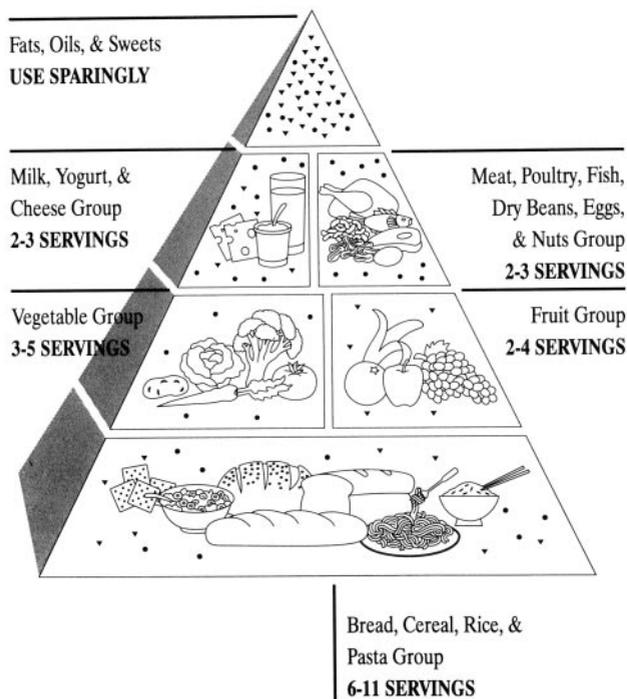
Increase Activity Level

Children and adults should be more active, not only for weight control, but also for general health and well-being. In the Committee's experience, most preadolescent children find periods of defined exercise (aerobics classes or videos, stationary bicycles or treadmills) boring or punitive. Children who are active as part of their daily routine are more likely to continue the activity.

Several approaches may increase activity. The simplest is reduction of inactivity. The American Academy of Pediatrics has recommended limitation of television to 1 or 2 hours per day.⁶¹ Such limitation of television, video games, and computer games will compel children to choose other pastimes, most of which will generate more physical activity and may lead to improved weight.⁶²

Incorporation of activity into usual daily routines is another simple way to increase activity and improve weight.^{63,64} Many children can walk to school instead of ride, or play with a friend in the afternoon instead of talking on the telephone. Clinicians should help families address safety issues. Some solutions to safety problems may have hidden benefits. For instance, when the parent walks the child to school several times a week, the child is safe, the parent benefits from the activity, and the parent and child will enjoy some time together.

The family can add more vigorous activity gradually. At least 30 minutes of activity on most days, the quantity recommended by the Surgeon General's report,⁶⁵ is a goal that most families can achieve. For



Source: U.S. Department of Agriculture/U.S. Department of Health and Human Services

Fig 3. Food Guide Pyramid.

young children, unstructured outdoor play with friends is often vigorous. Some children enjoy organized sports. However, the child must be active in the sport, not sitting on the bench. Parents, especially those of younger children, can seek teams whose coaches emphasize participation over winning. Swimming, dance, and martial arts may appeal to children who dislike team sports. Basketball, walking, and biking with parents or siblings are all enjoyable and inexpensive activities. Providers can consider the purchase of materials like The Kid's Activity Pyramid, a short handout for families that suggests weekly frequency and duration of activities such as outdoor play and aerobic exercise.⁶⁶ Clinicians should advocate for good school-based activity programs in their communities and can urge parents to be advocates as well. Guidelines from the Centers for Disease Control and Prevention for school and community activity programs can help clinicians and parents promote such programs.⁶⁷

Reduce Calorie Intake

The dietary goals for patients and their families are well-balanced, healthy meals and a healthy approach to eating. These changes should be considered permanent rather than a temporary eating plan for rapid weight loss. The Committee felt that the most helpful guide to healthy eating is the Food Guide Pyramid (Fig 3)^d.

Counting calories is tedious, difficult, and inaccurate.

^dThe Food Guide Pyramid. US Department of Agriculture, Center for Nutrition Policy and Promotion, 1120 20th St, NW, Suite 200, North Lobby, Washington, DC, 20036; <http://www.usda.gov/fcs/cnpp.htm>.

rate.⁶⁸ Other strategies are easier and therefore more likely to succeed. Reduction or elimination of specific foods may reduce calories without making patients feel hungry or deprived. For example, the clinician and family can eliminate from the diet one or two high-calorie foods, such as chips, ice cream, or fried foods, or they can replace all but one glass of juice a day with water. A clinical dietitian can work with families both to identify high-calorie eating habits and to guide the families as they make changes. Families may be encouraged by the recognition that modest caloric deficits can lead to significant weight loss over time. A 100-kcal deficit per day could lead to a 10-lb weight loss over 1 year.

Another approach, the "stoplight diet," does not forbid any foods but instead stresses an appropriate balance of high-, medium-, and low-calorie foods. In this diet, "green light" foods contain 20 fewer calories per average serving than standard food in that group, "yellow light" foods contain not >20 calories above the standard for food in that group, and "red light" foods contain >20 calories above the standard for food in that group and should be eaten infrequently.⁶⁹

The Committee did not recommend the use of commercial programs like Weight Watchers or Jenny Craig because comparisons of such programs with other approaches to weight control in children do not exist.

As outlined above, changes in diet are more likely to be achieved if the clinician involves the entire family; recommends one or two small changes at a time; teaches problem-solving, especially how to handle eating outside of the home and saboteurs; and follows the family closely.

Stop Tobacco Use

Adolescents may use tobacco as a form of weight control. In adults, smoking cessation leads to a weight gain of 3 to 5 kg.^{70,71} However, tobacco use increases important risks associated with obesity, like hyperlipidemia^{50,51} and increased central adiposity.⁷² When educating patients about tobacco use, clinicians may want to stress the risk of increased truncal weight, a risk adolescents may feel is a more compelling reason to avoid tobacco than the delayed complications of heart disease.

COMPLICATIONS OF WEIGHT-MANAGEMENT PROGRAMS

Adverse effects of weight loss include gall bladder disease, which can occur in adolescents and adults who lose weight rapidly.^{39,73,74} Another potential problem is inadequate nutrient intake, although reduction of calories by targeting specific high-calorie foods and encouraging consumption of a well-balanced eating plan minimizes this problem. Linear growth may slow during weight loss. However, most overweight children are tall, and impact on adult stature appears to be minimal.⁷⁵ Loss of lean body mass may occur during weight loss. The effects of rapid weight loss (more than 1 pound per month) in children younger than 7 years are unknown.

Weight-loss programs may cause psychological or

emotional harm. Eating disorders may arise, although a supportive, nonjudgmental approach to therapy and attention to the child's emotional state minimize this risk. A child or parent's preoccupation with the child's weight may damage the child's self-esteem. If weight, diet, and activity become areas of conflict, the relationship between the parent and child may deteriorate. When problems such as these occur, clinicians should refer the family to a therapist and should stop the weight-control program until the family can proceed without adverse psychological or emotional effects.

MAINTENANCE

Obesity is a chronic disease requiring lifelong attention to healthy eating and an active lifestyle. After an initial weight-management program, both child and parent must continue to work actively to maintain behaviors that produced weight maintenance, weight loss, or improved BMI percentile. An effective weight-management program includes support for families during this time. Regular contact of parent and child with the clinician is essential to review and reinforce the previous goals of healthy diet and activity as well as the implementation skills. Furthermore, if obesity persists, secondary complications may emerge. Other health professionals such as school nurses, office nurses, pediatric nurse practitioners, and dietitians can help the primary clinician follow these families over time.

ACKNOWLEDGMENTS

This project was funded by Maternal and Child Health Bureau, Health Resources and Services Administration, Public Health Service, US Department of Health and Human Services.

We gratefully acknowledge the contributions of the following individuals who attended the meeting: Donna M. Blum, RD MS; Ann Drum, DDS, MPH; Gilman Grave, MD; David Heppel, MD; Katrina Holt, MPH, MS, RD; Van S. Hubbard, MD, PhD; Vince L. Hutchins, MD, MPH; Robert Kuczumarski, DrPH; Naomi Kulakow, MAT; Gontran Lamberty, DrPH; Barbara Moore, PhD; Audrey H. Nora, MD, MPH; E. Ann Prendergast, MPH RD; Etta Saltos, PhD, RD; Denise Sofka, MPH, RD; Elaine Stone, PhD, MPH; Phyllis E. Stubbs-Wynn, MD, MPH; Carol Jean West Suitor, DSc, RD; Richard Troiano, PhD, RD; and Susan Yanovski, MD.

We also gratefully acknowledge the assistance of the following people in the preliminary reviews of this manuscript: Sunita Bhatnager, RD, MPH; Virginia Buschbacher, RN, MSN, CPNP; Kibbe Conti, RD; Dena Goldberg, RD, MPH, PhD; Jan Kildahl, RD; Shelley Kirk, MS, RD, LD; Melanie Klenk, RN, CPNP; Karen Kopicko, RN, MSN, CPNP; Laura Laine, MEd, RD, LD; Joan MacCracken, MD; Carmen Mikhail, PhD; Dan Palant, MD; Melany Raubolt, RN, MSN, CPNP; Ronald Schneebaum, MD; Ann O. Scheimann, MD; and Toni Toledo, RD.

REFERENCES

1. Troiano RP, Flegal KM, Kuczumarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents. The National Health and Nutrition Examination Surveys, 1963 to 1991. *Arch Pediatr Adolesc Med.* 1995;149:1085-1091
2. Roche AF, Siervogel FM, Chumlea WC, Webb P. Grading body fatness from limited anthropometric data. *Am J Clin Nutr.* 1981;34:2831-2839
3. Dietz WH, Robinson TN. Use of the body mass index as a measure of overweight in children and adolescents. *J Pediatr.* 1998;132:191-193
4. Killeen J, Vanderburg D, Harlan W. Application of weight-height ratios and body indices to juvenile populations—The National Health Examination Survey data. *J Chronic Dis.* 1978;31:529-537
5. Duerenberg P, Weststrate JA, Seidell JC. Body mass index as a measure of body fatness: age- and sex-specific prediction formulas. *Br J Nutr.* 1991;65:105-114

6. Kotchen JM, Kotchen TA, Guthrie GP, Cottrill DM, McKean HE. Correlates of adolescent blood pressure at five-year follow-up. *Hypertension.* 1980;2:124-129
7. Clarke WR, Woolson RF, Lauer RM. Changes in ponderosity and blood pressure in childhood: the Muscatine Study. *Am J Epidemiol.* 1986;124:195-206
8. Johnson AL, Cornoni JC, Cassel JC, Tyroler HA, Heyden S, Hames CG. Influence of race, sex and weight on blood pressure behavior in young adults. *Am J Cardiol.* 1975;35:523-530
9. Gidding SS, Bao W, Srinivasan SR, Berenson GW. Effects of secular trends in obesity on coronary risk factors in children: the Bogalusa Heart Study. *J Pediatr.* 1995;127:868-874
10. Morrison JA, Laskerzewski PM, Rauh JL, et al. Lipids, lipoproteins, and sexual maturation during adolescence: the Princeton Maturation Study. *Metabolism.* 1979;28:641-649
11. Higgins MW, Keller JB, Metzner HL, Moore FE, Ostrander LD Jr. Studies of blood pressure in Tecumseh, Michigan. II. Antecedents in childhood of high blood pressure in young adults. *Hypertension.* 1980;2 (suppl 1):117-123
12. Must A, Jacques PF, Dallal GE, Bajema DJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. *New Engl J Med.* 1992;327:1350-1355
13. Guo SS, Roche AF, Chumlea WC, Gardner JD, Siervogel RM. The predictive value of childhood body mass index values for overweight at age 35 y. *Am J Clin Nutr.* 1994;59:810-819
14. Mossberg H-O. 40-year follow-up of overweight children. *Lancet.* 1989;2:491-493
15. Stark O, Atkins E, Wolff OH, Douglas JWB. Longitudinal study of obesity in the National Survey of Health and Development. *Br Med J.* 1981;283:13-17
16. Braddon FEM, Rodgers B, Wadsworth MEJ, Davies JMC. Onset of obesity in a 36 year birth cohort study. *Br Med J.* 1986;293:299-303
17. Hoffmans MDAF, Kromhout D, de Lezenne Coulander C. The impact of body mass index of 78,612 18-year old Dutch men on 32-year mortality from all causes. *J Clin Epidemiol.* 1988;41:749-756
18. Waaler HT. Height, weight, and mortality: the Norwegian experience. *Acta Med Scand.* 1984;(suppl 679):1-56
19. Caprio S, Hyman LD, McCarthy S, Lange R, Bronson M, Tambolane WV. Fat distribution and cardiovascular risk factors in obese adolescent girls: importance of the intraabdominal fat depot. *Am J Clin Nutr.* 1996;64:12-17
20. Must A, Dallal GE, Dietz WH. Reference data for obesity: 85th and 95th percentiles of body mass index (wt/ht²) and triceps skinfold thickness. *Am J Clin Nutr.* 1991;53:839-846
21. Green JS, Parfery PS, Harnett JD, et al. The cardinal manifestations of Bardet-Biedl syndrome, a form of Laurence-Moon-Biedl syndrome. *New Engl J Med.* 1989;321:1002-1009
22. North C, Patton MA, Baraitser M, Winter RM. The clinical features of Cohen syndrome: further case reports. *J Med Genet.* 1985;22:131-134
23. Greenswag LR, Alexander RC, eds. *Management of Prader-Willi Syndrome.* New York, NY: Springer-Verlag; 1988
24. Dallas JS, Foley TP. Hypothyroidism. In: Lifshitz F, ed. *Pediatric Endocrinology.* New York, NY: Marcel Dekker Inc; 1996: 394
25. Leinung MC, Zimmerman D. Cushing's disease in children. *Endocrinol Metab Clin North Am.* 1994;23:629-639
26. Yanovski JA, Cutler GB. Glucocorticoid action and the clinical features of Cushing's syndrome. *Endocrinol Metab Clin North Am.* 1994;23:487-509
27. Spitzer RL, Williams JBW, Kroenke K, et al. Utility of a new procedure for diagnosing mental disorders in primary care: the PRIME-MD 1000 study. *JAMA.* 1994;272:1749-1756
28. Kovacs M. The Children's Depression Inventory (CDI). *Psychopharmacol Bull.* 1985;21:995-998
29. Richards BS. Slipped capital femoral epiphysis. *Pediatr Rev.* 1996;17:69-70
30. Loder RT, Aronson DD, Greenfield ML. The epidemiology of bilateral slipped capital femoral epiphysis. A study of children in Michigan. *J Bone Joint Surg.* 1993;75:1141-1147
31. Wilcox PG, Weiner DS, Leighley B. Maturation factors in slipped capital femoral epiphysis. *J Pediatr Orthop.* 1988;8:196-200
32. Kelsey JL. Epidemiology of slipped capital femoral epiphysis: a review of the literature. *Pediatrics.* 1973;51:1042-1050
33. Dietz WH, Gross WL, Kirkpatrick JA. Blount disease (tibia vara): another skeletal disorder associated with childhood obesity. *J Pediatr.* 1982;101:735-737
34. Reid AC, Teasdale GM, Matheson MS, Teasdale EM. Serial ventricular volume measurements: further insights into the aetiology and patho-

- genesis of benign intracranial hypertension. *J Neurol Neurosurg Psychiatry*. 1981;44:636-640
35. Silvestri JM, Weese-Mayer DE, Bass MT, Kenny AS, Hauptman SA, Pearsall SM. Polysomnography in obese children with a history of sleep-associated breathing disorders. *Pediatr Pulmonol*. 1993;16:124-129
 36. Mallory GB, Fiser DH, Jackson R. Sleep-associated breathing disorders in obese children and adolescents. *J Pediatr*. 1989;115:892-897
 37. Boxer GH, Bauer AM, Miller BD. Obesity-hypoventilation syndrome in childhood. *J Am Acad Child Psychiatry*. 1988;27:552-558
 38. Riley DJ, Santiago TV, Edelman NH. Complications of obesity-hypoventilation syndrome in childhood. *Am J Dis Child*. 1976;130:671-674
 39. Everhart JE. Contributions of obesity and weight loss to gallstone disease. *Ann Intern Med*. 1993;119:1029-1035
 40. Palasciano G, Portincasa P, Vinciguerra V, et al. Gallstone prevalence and gallbladder volume in children and adolescents: an epidemiological ultrasonographic survey and relationship to body mass index. *Am J Gastroenterol*. 1989;84:1378-1382
 41. Acalivschi MV, Blendea D, Pascu M, Georoceanu A, Badea RI, Preliceanu M. Risk of asymptomatic and symptomatic gallstones in moderately obese women: a longitudinal follow-up study. *Am J Clin Gastroenterol*. 1997;92:127-131
 42. Stampfer MJ, Maclure KM, Colditz GA, Manson JE, Willett WC. Risk of symptomatic gallstones in women with severe obesity. *Am J Clin Nutr*. 1992;55:652-658
 43. Balen AH, Conway GS, Kaltsas G, et al. Polycystic ovary syndrome: the spectrum of the disorder in 1741 patients. *Hum Reprod*. 1995;10:2107-2111
 44. Bringer J, Lefebvre P, Boulet F, et al. Body composition and regional fat distribution in polycystic ovarian syndrome. Relationship to hormonal and metabolic profiles. *Ann NY Acad Sci*. 1993;687:115-123
 45. Wild RA. Hyperandrogenism in the adolescent. *Obstet Gynecol Clin North Am*. 1992;19:71-89
 46. Pinhas-Hamiel O, Dolan LM, Daniels SR, Stanford D, Khoury PR, Zeitler P. Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *J Pediatr*. 1996;128:608-615
 47. Scott CR, Smith JM, Cradock MM, Pihoker C. Characteristics of youth-onset noninsulin-dependent diabetes mellitus and insulin-dependent diabetes mellitus at diagnosis. *Pediatrics*. 1997;100:84-91
 48. Hud JA, Dohen JB, Wagner JM, Cruz PD. Prevalence and significance of acanthosis nigricans in an adult obese population. *Arch Dermatol*. 1992;128:941-944
 49. Richards GE, Cavallo A, Meyer WJ, et al. Obesity, acanthosis nigricans, insulin resistance, and hyperandrogenemia: pediatric perspective and natural history. *J Pediatr*. 1985;107:893-897
 50. Nilsson PM, Lind L, Pollare T, Berne C, Lithell HO. Increased level of hemoglobin A1c, but not impaired insulin sensitivity, found in hypertensive and normotensive smokers. *Metabolism*. 1995;44:557-561
 51. Axelsen M, Eliasson B, Joheim E, Lenner RA, Taskinen MR, Smith U. Lipid intolerance in smokers. *J Intern Med*. 1995;237:449-455
 52. Johnston FE. Validity of triceps skinfold and relative weight as measures of adolescent obesity. *J Adolesc Health Care*. 1985;6:185-190
 53. Kispert CP, Merrifield HH. Interrater reliability of skinfold fat measurements. *Phys Ther*. 1987;67:917-920
 54. Reilly JJ, Wilson J, Durnin JV. Determination of body composition from skinfold thickness: a validation study. *Arch Dis Child*. 1995;73:305-310
 55. Long BJ, Calfas KJ, Wooten W, et al. A multisite field test of the acceptability of physical activity counseling in primary care: project PACE. *Am J Prev Med*. 1996;12:73-81
 56. Rollnick S, Heather N, Bell A. Negotiating behaviour change in medical settings: the development of brief motivational interviewing. *J Mental Health*. 1992;1:25-37
 57. Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year follow-up of behavioral, family-based treatment for obese children. *JAMA*. 1990;264:2519-2523
 58. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *New Engl J Med*. 1997;337:869-873
 59. Brownell KD, Kelman SH, Stunkard AJ. Treatment of obese children with and without their mothers: changes in weight and blood pressure. *Pediatrics*. 1983;71:515-523
 60. Israel AC, Stolmaker L, Andrian CA. The effects of training parents in general child management skills on a behavioral weight loss program for children. *Behav Ther*. 1985;16:169-180
 61. American Academy of Pediatrics, Committee on Communications. Children, adolescents, and television. *Pediatrics*. 1995;96:786-787
 62. Epstein LH, Valoski AM, Vara LS, et al. Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychol*. 1995;14:109-115
 63. Epstein LH, Wing RR, Koeske R, Ossip DJ, Beck S. A comparison of lifestyle change and programmed aerobic exercise on weight and fitness changes in obese children. *Behav Ther*. 1982;13:651-665
 64. Epstein LH, Wing RR, Koeske R, Valoski A. Effects of diet plus exercise on weight change in parents and children. *J Consul Clin Psychol*. 1984;52:429-437
 65. US Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: US Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996
 66. Park Nicollet. *The Kids Activity Pyramid*. HealthSource 1996; Minneapolis, MN
 67. Anonymous. Guidelines for school and community programs to promote lifelong physical activity among young people. Centers for Disease Control and Prevention. *MMWR*. 1997;46:1-36
 68. Bandini LG, Schoeller DA, Cyr HN, Dietz WH. Validity of reported energy intake in obese and nonobese adolescents. *Am J Clin Nutr*. 1990;52:421-425
 69. Epstein LH, Squires S. *The Stoplight Diet for Children*. Boston, MA: Little, Brown and Co; 1988
 70. Flegal KM, Troiano RP, Pamuk ER, Kuczmarski RJ, Campbell SM. The influence of smoking cessation on the prevalence of overweight in the United States. *New Engl J Med*. 1995;333:1165-1170
 71. Williamson DF, Madans J, Anda RF, Kleinman JD, Giovino GA, Byers T. Smoking cessation and severity of weight gain in a national cohort. *New Engl J Med*. 1991;324:739-745
 72. Wareham NJ, Ness EM, Byrne CD, Cox BD, Day NE, Hales CN. Cigarette smoking is not associated with hyperinsulinemia: evidence against a causal relationship between smoking and insulin resistance. *Metabolism*. 1996;45:1551-1556
 73. Heshka S, Spitz A, Nunez D, Fittante AM, Heymsfield SB, Pi-Sunyer FX. Obesity and risk of gallstone development on a 1200 kcal/d(5025Kj/d) regular food diet. *Int J Obes Relat Metab Disord*. 1996;20:450-454
 74. Weinsier RL, Wilson LJ, Lee J. Medically safe rate of weight loss for the treatment of obesity: a guideline based on risk of gallstone formation. *Am J Med*. 1995;98:115-117
 75. Epstein LH, Valoski A, McCurley J. Effect of weight loss by obese children on long-term growth. *Am J Dis Child*. 1993;147:1076-1080
 76. Harrison GG, Buskirk WR, Lindsay Carter JE, et al. Skinfold thicknesses and measurement technique. In: Lohman TG, Roche AF, Martorell R, eds. *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics Books; 1988:67-68a
 77. Burd L, Vesely B, Marsolf J, Kerbeshian J. Prevalence study of Prader-Willi syndrome in North Dakota. *Am J Clin Genet*. 1990;37:97-99
 78. Rallison ML, Dobyns BM, Keating FR, Rall JE, Tyler FH. Occurrence and natural history of chronic lymphocytic thyroiditis in childhood. *J Pediatr*. 1975;86:675-682
 79. Iimura O, Shimamoto K, Nakahashi Y, et al. Actual incidence of adrenal tumors in Hokkaido. In: Takeda R, Miyamori I, eds. *Controversies in Disorders of Adrenal Hormones: Proceedings of the Open Symposium of Disorders of Adrenal Hormones*. February 20, 1988; Tokyo, Japan. New York, NY: Elsevier Science; 1988:37
 80. Kelsey JL, Acheson RM, Keggi KJ. The body build of patients with slipped capital femoral epiphysis. *Am J Dis Child*. 1972;124:276-281
 81. Durcan FJ, Corbett JJ, Wall M. The incidence of pseudotumor cerebri. Population studies in Iowa and Louisiana. *Arch Neurol*. 1988;45:875-877
 82. Adams J, Polson DW, Franks S. Prevalence of polycystic ovaries in women with anovulation and idiopathic hirsutism. *Br Med J*. 1986;293:355-359
 83. Figueroa-Colon R, Franklin FA, Lee JY, Aldridge R, Alexander L. Prevalence of obesity with increased blood pressure in elementary school-aged children. *South Med J*. 1997;90:806-813
 84. Wattigney WA, Webber LS, Srinivasan SR, Berenson GS. The emergence of clinically abnormal levels of cardiovascular disease risk factor variables among young adults: the Bogalusa Heart Study. *Prev Med*. 1985;24:617-626
 85. Williams DP, Going SB, Lohman TG, et al. Body fatness and risk for elevated blood pressure, total cholesterol, and serum lipoprotein ratios in children and adolescents. *Am J Public Health*. 1992;82:358-363

Obesity Evaluation and Treatment: Expert Committee Recommendations

Sarah E. Barlow and William H. Dietz

Pediatrics 1998;102:e29

DOI: 10.1542/peds.102.3.e29

| | |
|---|--|
| Updated Information & Services | including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/102/3/e29.full.html |
| References | This article cites 78 articles, 20 of which can be accessed free at: http://pediatrics.aappublications.org/content/102/3/e29.full.html#ref-list-1 |
| Citations | This article has been cited by 29 HighWire-hosted articles: http://pediatrics.aappublications.org/content/102/3/e29.full.html#related-urls |
| Subspecialty Collections | This article, along with others on similar topics, appears in the following collection(s): Teaching/Curriculum Development http://pediatrics.aappublications.org/cgi/collection/teaching_curriculum_dev_sub Adolescent Health/Medicine http://pediatrics.aappublications.org/cgi/collection/adolescent_health_medicine_sub Obesity http://pediatrics.aappublications.org/cgi/collection/obesity_new_sub |
| Permissions & Licensing | Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://pediatrics.aappublications.org/site/misc/Permissions.xhtml |
| Reprints | Information about ordering reprints can be found online: http://pediatrics.aappublications.org/site/misc/reprints.xhtml |

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 1998 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Obesity Evaluation and Treatment: Expert Committee Recommendations

Sarah E. Barlow and William H. Dietz

Pediatrics 1998;102:e29

DOI: 10.1542/peds.102.3.e29

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/102/3/e29.full.html>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 1998 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

