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Treatment Options for Adult Obesity

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Learning Objectives

After completing this continuing education program, the pharmacist will be able to:

1. Identify those factors that contribute to the development of obesity in adults.
2. Describe the medical and social consequences of adult obesity.
3. Describe effective lifestyle and medical treatment options for obese and overweight adults.
4. Evaluate and prioritize treatment options based upon patient history and risk factors.
5. Identify risk factors associated with each treatment.

Abstract: Obesity is a complex, chronic disorder with a multifactorial etiology. Numerous genetic and environmental factors have been found to contribute to the recent epidemic of obesity. Over half of all United States (U.S.) adults are overweight or obese and between 12%-14% of U.S. children and adolescents are overweight. Obesity-related comorbidities include type 2 diabetes, coronary heart disease, hypertension, and sleep apnea. Obese individuals also experience emotional, social, educational, and economic discrimination. Weight management efforts must be directed at the community as a whole and the individual client. Treatment options include lifestyle interventions, such as dietary, physical activity, and behavioral modifications, and medical interventions, such as pharmacotherapy and surgery. Lifestyle modifications are very low in cost and carry few, if any, potential for risk. Diets with a modest (300-500 kcal/d) reduction in energy intake will result in a gradual loss of ½ to 1 lb/wk with good prospects for long-term weight maintenance. Low fat, high fiber diets further enhance the weight loss and maintenance processes. Physical activity, while inadequate as the sole intervention for weight loss, appears to be a key factor for long-term maintenance of initial weight loss. There are very few drugs approved by the Food and Drug Administration (FDA) for short- or long-term use for weight control, and those with

FDA approval often are associated with harmful side effects. Surgical intervention should be reserved as the treatment option of last choice, appropriate only for the morbidly obese client who has failed to achieve or sustain appropriate weight loss through other less intensive approaches. The treatment of obesity must address improvement of health, implementation and continuation of lifestyle change, and enhancement of body composition, rather than focusing solely on the loss of body weight. Treatment plans must be individualized and offered within a multidisciplinary plan of care.



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INTRODUCTION

Obesity is a highly complex, chronic disorder with a multifactorial etiology. The derivation and continuation of this condition stems from a web of genetic, social, cultural, behavioral, physiologic, and metabolic factors. At its core, obesity represents a long-term imbalance between energy intake and energy expenditure. In reality, obesity is a disorder that differs in the amount of excess adiposity, the regional distribution of that excess adipose tissue, and its concomitant physiological consequences.

Definition of Obesity

Overweight and obesity have been defined or classified through a number of different systems.¹ The clinical guidelines of the National Institutes of Health (NIH) and The National Heart, Lung, and Blood Institutes (NHLBI) are based on a Body Mass Index (BMI) classification system.² BMI is calculated by dividing body weight (kg) by height (m) squared. The formula for BMI = $[Wt_{kg} \div Ht_m^2]$. BMI is closely correlated with body fatness across a population and is now used to define obesity and overweight.

Table 1: Classification of Overweight and Obesity

	Obesity Class	BMI (kg/m ²)
Underweight		<18.5
Normal		18.5-24.9
Overweight		25.0-29.9
Obesity	I	30.0-34.9
	II	35.0-39.9
Extreme Obesity	III	≥40

Source: NHLBI Obesity Education Initiative Expert Panel, 1998²

Although it is assumed that persons with a BMI of 30 kg/m² or above have excessive body fat, BMI does not distinguish between body fat and lean body mass for a given individual.³ Various measures of body composition, such as hydrostatic (underwater) weighing, air displacement plethysmograph measures (“bod pod”), bioelectrical impedance, skinfold measures, dual-energy X-ray absorptiometry (DXA), and computed tomography (CT), provide accurate estimates of body fat for the individual client. Many of these measures are too expensive for practical clinical use, although some health care providers do make use of skinfold measures, bioimpedance, bod pod, and/or underwater weighing. Researchers have determined that, among most young adults, a body fat in excess of 22% (males) or 32% (females) increases chronic disease risk.²

Waist circumference has been used to further classify an individual’s risk for obesity-related complications, such as type 2 diabetes, hypertension, and coronary heart disease (CHD).² Excessive abdominal or visceral fat has been linked to metabolic abnormalities in both lipid and glucose metabolism. Chronic disease risk increases when waist circumference exceeds 40 inches (102 cm) in males and 35 inches (88 cm) in females. Use of waist-to-hip ratio (WHR) is less common than in the past; WHR that exceeds 1.0 in males and 0.85 in females reflects a central or abdominal distribution of body fat, and has been associated with an increased risk of chronic disease.⁴

Practitioners often use standard weight-for-height tables, such as the Metropolitan Life Insurance Table⁵ or the 1995 Healthy Weights for Healthy Adults reference table.⁶ Such tables are not,

however, viewed as accurate tools for the assessment of obesity or overweight, and their use is not recommended as an evaluation measure. In addition, most weight-for-height tables are not based on an ethnically diverse sample nor do they reflect weight for height patterns of the elderly and very elderly.

Prevalence of Obesity

An estimated 97 million adults in the U.S. are overweight or obese.² Recent data suggest that over half of all U.S. adults are overweight (BMI ≥ 25 kg/m²) or obese (BMI ≥ 30 kg/m²), and the rate of obesity continues to climb.^{7,8} According to 1998 data, 37 states had rates of obesity that exceeded 15%, while the remaining states had obesity rates within the 10%-15% range. The number of overweight and obese adults has increased every decade since 1960; Blacks, Hispanics, Native American Indians, women, and low income adults have rates of overweight and obesity that exceed the national average.⁸ There has also been an alarming increase in the incidence of obesity among children and adolescents, with children becoming obese at younger ages. According to NHANES III data, 10%-11% of children (6-11 years old) and adolescents (12-17 years old) were overweight.⁹ In response to this virtual epidemic of obesity, "Overweight and Obesity" was named as one of 10 Leading Health Indicators by Healthy People 2010;¹⁰ several related objectives were established:

- Increase the proportion of adults who are at a healthy weight.
- Reduce the proportion of adults who are obese.
- Reduce the proportion of children and adolescents who are overweight or obese.
- Increase the proportion of work sites that offer nutrition or weight management classes or counseling.
- Increase the proportion of physician office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia, which include counseling or education related to diet and nutrition.

Etiology of Obesity

Most researchers categorize the causes of obesity into environmental and genetic clusters. A critical

environmental factor is lack of adequate physical activity. Modern technology has minimized the physical work requirements of most jobs. Occupational work is less physically demanding than in the past, thus significantly fewer calories are expended during the workday. Household and related chores are also less physically taxing. The widespread availability of cars and public transportation has dramatically reduced the number of people who walk or bike even short distances. Movies, TV, video games, and computer activities have replaced more physically active pursuits, such as bicycle riding, team sports, and outdoor games; increased reliance on sedentary activities has been shown to be positively associated with body fatness in children.¹¹ A low level of leisure time physical activity in adults is associated with future weight gain. Persons who remain physically active throughout their life experience a much lower rate of overweight and obesity than the population as a whole.¹²

In addition to a highly sedentary lifestyle, modern societies have been impacted by industrialized food systems, which have triggered a basic shift in food acquisition and consumption patterns. The term "toxic food environment" refers to the continuously available supply of high fat, high calorie, low fiber foods, often served in huge portions.¹³ Persons who chronically consume high fat diets are at greater risk for obesity than those on chronically low fat diets.¹⁴ A wide variety of appealing food is available around the clock: food can be bought at school, work, and play; people eat while driving, walking, and sitting; food is served at bookstores, gas stations, places of worship, and virtually any location imaginable. Clearly, Americans must exert a great deal of self-control in order to withstand the constant onslaught of food.

Genetics appear to play a major role in determining the susceptibility to obesity.¹⁵⁻¹⁷ The offspring of obese parents are more than twice as likely to be obese as adults compared with children of lean parents.¹⁸ Individuals respond differently to overeating; some will gain up to three times as much weight as others when purposefully overfed.¹⁹ It has been estimated that the heritability for BMI is between 25%-40%.² While a person's genetic profile may not cause obesity, researchers have identified a number of genetic factors that influence risk for obesity. It has been suggested that genetic

susceptibility may be expressed through low resting metabolic rate,²⁰ decreased rate of lipid oxidation, impaired appetite regulation (short- and long-term controls), altered patterns of hormone release and/or sensitivity, or response to overfeeding.¹⁹ Not only are these factors linked to an increased risk of overweight and obesity, they may also help explain why so few people are able to successfully maintain their weight loss.

Consequences of Obesity

There are numerous health, economic, and psychologic risks associated with chronic obesity. Researchers estimated almost \$52 billion of the 1995 National Health Expenditure budget went toward obesity-related comorbidities.²¹ Obesity increases the risk for type 2 diabetes, hypertension, coronary heart disease, stroke, certain cancers, sleep apnea, gout, gallstones, osteoarthritis, and reproductive abnormalities.^{2,22,23} Severe obesity [BMI ≥ 40 kg/m²] is associated with a 12-fold increase in mortality in 25-35 year olds over that of lean adults of the same age range.² Persons with BMI values ≥ 30 kg/m² have mortality rates 50%-100% greater than those of individuals with BMI values of 20-25 kg/m².² In addition, obese individuals are at greater risk for social, emotional, and psychologic disorders such as depression, poor self-esteem, and social isolation.²⁴ Rates of anxiety and depression are 300%-400% greater among obese adults compared with lean peers.²⁴ Obese persons are often subjected to subtle forms of economic discrimination, often earning less than normal weight individuals of the same employment status.²⁴ Virtually all of these consequences can be minimized or reversed with successful, and often modest, weight loss and maintenance of weight loss.²⁵

TREATMENT OF OBESITY

The effective treatment of obesity must address weight loss and weight maintenance.²⁶ Rather than focusing solely on the reduction of body weight, intervention goals should emphasize the improvement of health, initiation and retention of lifestyle changes, and enhancement of body composition. Many overweight and obese adults exhibit clinically significant improvements in blood pressure, blood glucose control, and serum lipid profile with only modest (10-15 lb) loss of weight.²⁵ Physical, metabolic, and hormonal complications improve or reverse with modest weight loss.

Emotional and psychologic parameters also improve with weight loss.

Public Health Approaches to Weight Management

Recently, the World Health Organization developed a series of strategies for addressing the epidemic of obesity and overweight.⁴ Prevention interventions were classified as follows:

- Universal/public health prevention: programs are directed at the community as a whole. The goals are to minimize the development of obesity in previously normal weight persons, to stabilize the prevalence of obesity across the population, and, over time, lower the incidence of obesity.
- Selective prevention: interventions are specifically designed for and targeted at high-risk populations within the community. High-risk subgroups in the U.S. include African Americans, Native Americans, Pacific Islanders, persons with low levels of physical activity, and persons in "vulnerable" stages of the life cycle (adolescence, young adulthood, postmenopause). The goals are to improve the knowledge and behaviors of high-risk groups of people and, it is hoped, to reduce the incidence and/or severity of overweight and obesity within the specified populations.
- Targeted prevention: interventions are aimed at individuals who are already overweight or obese. The goals are to prevent further weight gain and reduce or reverse obesity-related comorbidities. Ideally, these interventions would also facilitate weight maintenance in previously overweight or obese persons.

Coordination of these efforts at a national level will require collaborative efforts among public health agencies, primary care providers, and allied health professionals. Additional policy and environmental interventions have been suggested as a means of reversing the current problem of obesity. The restaurant and food industries can review marketing and advertising policies to minimize any contributions to the nationwide epidemic of obesity. Legislators might consider the implementation of a

“sin tax,” which increases the consumer cost of high fat, high calorie foods of low nutrient quality. Federal food assistance programs should be reassessed to determine if they have, in any way, contributed to the extreme rates of obesity among low-income populations. Urban planners can incorporate additional safe and convenient options for daily leisure time activities and promote walking and bicycle riding as routine transportation within communities. Insurance companies and employers can expand policies that reimburse for health club membership fees and exercise equipment purchases. Only with the development and implementation of a comprehensive national policy can the problem of obesity be successfully addressed at a societal level.

Weight Management for the Individual

The medical community now recognizes obesity as a serious, chronic disease in need of and deserving its own focused treatment and management protocols.²⁷ In the past, many physicians treated obesity only as it impacted other chronic disease states, such as diabetes, hypertension, and coronary heart disease. Client goals and outcomes must be personalized; for some obese individuals, the best outcome is simply stabilization of body weight or prevention of future weight gain.² Obese or overweight clients with the presence of comorbid risk factors will need a more aggressive treatment plan than overweight or obese persons with no medical risk factors. The presence of 3 or more concomitant risk factors, such as hypertension, dyslipidemia, impaired glucose tolerance, smoking, or family history of premature heart disease places the overweight/obese client at high risk for obesity related comorbidities. Clients with pre-existing heart disease, type 2 diabetes, or sleep apnea are at very high risk and require aggressive intervention.²

Each client must be evaluated for his/her readiness to initiate and maintain a weight control program.²⁸ Bray²⁹ has devised a series of questions to determine if a given individual is ready to commit to the weight loss process. If not ready to make a sustained and concerted effort, even severely overweight or obese clients should be counseled against “going on a diet.” With each treatment failure, the likelihood of future success declines.

Once the decision has been made to initiate a treatment plan, many clinicians routinely establish both initial and subsequent goals. The NHLBI

Obesity Education Initiative Expert Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults suggests, at the very least, prevention of further weight gain.² Ideally, the client should be encouraged to seek and achieve an initial weight loss goal of a 10% reduction from baseline weight over a 6-month period. Once that initial weight loss has been achieved, future efforts should focus on weight maintenance or, if appropriate, additional weight reduction efforts. Clients often express the desire to achieve their “ideal” body weight; however, that is often an unrealistic goal. Clinical studies confirm that even a modest loss of body weight (5%-10% of baseline weight) can significantly improve blood pressure, blood lipid profile, blood glucose control, and quality of life.²⁵

Weight loss and maintenance efforts can be classified as lifestyle modifications (dietary, physical activity, and behavioral modifications) or medical interventions (pharmacotherapy and surgery). Lifestyle modification should always constitute the initial treatment of choice; this approach involves no risk, minimal cost, and the potential for long-term success.^{30,31}

Dietary Therapy

All overweight and obese individuals may benefit from nutrition education; information on food choices, portion sizes, meal frequency and timing, and nutrient profile can facilitate weight loss and maintenance. Various dietary interventions have been promoted; however, many are effective only in the short term, with very poor long-term efficacy.³² Most of the weight lost during the initial 4 to 5 months of dieting is regained within a 2- to 5-year span. Despite this poor prognosis, diet therapy remains the intervention of first choice in the treatment of overweight and obesity.

Modest Energy Deficit Diets

A modest (300-500 kcal/d) reduction in energy intake, generally with no fewer than 1200 kcal/d, will result in a projected weight loss of ½ to 1 lb/wk in overweight (BMI of 27-35 kg/m²) persons.² Severely obese clients (BMI ≥35 kg/m²) will typically lose 1-2 lb/wk with a caloric restriction of 500-1000 kcal/d. This approach is usually well accepted by clients, and often results in greater long-term weight losses than more extreme dietary restrictions. A combination of modest caloric

reductions and lower fat intakes (20%-25% of kcal or less) appears most effective.^{2,31}

Severe Energy Deficit Diets

Intakes of 1000-1200 kcal/d are characteristic of some commercial diet programs, such as those that rely on program foods and popular consumer weight loss diets printed in monthly magazines. While such diets may promote an initial weight loss of up to 15%, they may be deficient in several key nutrients, have high dropout rates, and rarely sustain the weight loss over time. Use of a single, standard caloric goal for all persons is inappropriate, as initial body weights and patterns of physical activity may vary greatly. If food intake is kept below 1200 kcal/d, use of a multivitamin/mineral supplement is advisable.

Very Low Calorie Diets

Very low calorie diets (VLCDs) may provide as few as 400-500 kcal/d, although many liquid diet plans maintain an intake of 800 kcal/d. Some are ketogenic (very little or no carbohydrates) while others are nonketogenic. These diets produce a rapid, substantial loss of weight over the short term but have very poor long-term (over one year) outcomes.³³ Use of a VLCD should be reserved for medically supervised, high-risk obese adults. Even under medical supervision, clients may experience large losses of lean body mass, gallstones, fluid and electrolyte imbalance, hyperuricemia, and cardiac arrhythmia.³⁴ Some VLCDs have been described as “protein-sparing modified fasts,” although their ability to spare body protein (muscle mass) is limited. These programs are often expensive, highly structured, and may not provide adequate support for the client’s transition off the liquid VLCD back to a food-based diet.

Ketogenic Diets

A very low carbohydrate diet limits the body’s access to glucose (the primary fuel for the brain and central nervous system) and triggers the formation of ketones as an alternative source of energy. These diets are high in both protein and fat and severely restrict intakes of breads, grains, cereals, fruits, certain vegetables, and milk/dairy foods. Proponents of ketogenic diets promote the high satiety value of dietary protein³⁵ as well as the ability of a high protein diet to blunt the postprandial insulin response. Critics of ketogenic diets cite the hazards of high fat diets, particularly

those high in saturated fat.³⁶ Others have described a lack of adequate fiber, Vitamins A and C, phytochemicals, and calcium. While persons on ketogenic diets often lose dramatic amounts of weight in a very short period of time, much of that weight represents an acute loss of body water attributed to the depletion of glycogen stores.³⁶ This represents a temporary loss of weight that returns as soon as the client reintroduces dietary carbohydrate and replenishes normal glycogen stores.

High Fiber Diets

High fiber foods are typically low in fat and calories, high in satiety value, and often blunt subsequent hunger.³⁷ A daily intake of at least 25-30 g of fiber per day has been shown to facilitate weight loss and control. Because of their low energy density, high fiber meals often provide a feeling of fullness and satiation on a lower caloric intake. Soluble fibers absorb large amounts of fluid, increasing gastric distention, and delaying gastric emptying. Postprandial elevations in blood glucose and insulin are blunted by soluble fiber, which may improve blood glucose control and delay the onset of hunger. High fiber diets may also reduce fat and protein digestibility, lowering the net absorption of energy.³⁸ Most research confirms that consumption of a high fiber diet lowers caloric intake over the short term and contributes to weight loss and weight maintenance.³⁷ Foods such as legumes, whole grain breads and cereals, fresh and dried fruits, and raw vegetables are beneficial sources of dietary fiber. It is important for clients to make a gradual transition from a low to a high fiber diet and to maintain an adequate fluid intake.

Fad Diets

There is a continuous parade of “miracle” weight loss diets, each promising guaranteed weight loss.³⁹ Some focus on one or a few foods (Grapefruit Diet, Cabbage Soup Diet), promote specific food combinations (Food Combining diets), or greatly restrict one or more dietary components (very low fat diets, very low carbohydrate diets). Consumers should be alert to the following “red flags:”⁴⁰

- Claims of a recent scientific discovery, known only to the diet promoters
- Promises of dramatic, rapid, effortless weight loss
- Emphasis on “miracle foods” or specific food combinations
- Wholesale elimination of one or more food groups
- Promotion of company-specific dietary supplements or other weight loss aids
- Use of sales or marketing personnel to assess, diagnose, or counsel clients
- Lack of long-term or maintenance programs

One popular food-combining plan claims that obesity is the result of foods being consumed in the wrong combination. For example, this plan forbids the simultaneous consumption of protein foods and starchy foods based on the (false) premise that the protein-induced secretion of gastric acid impairs starch digestion. The starch digesting enzyme salivary amylase acts in the oral cavity, thus is unaffected by gastric secretions, and pancreatic amylase is released into the duodenum where pancreatic bicarbonate rapidly buffers the gastric acid irrespective of protein intake. Other food prohibitions are equally illogical and unnecessary.

A popular and recurring fad diet is the very low carbohydrate diet. Initially promoted in the 1970s, this diet resurfaces every decade or so, typically with a “new twist.”⁴¹ Under this approach, dietary carbohydrate is kept to less than 30% of calories; in some cases (the “Induction Diet” of Dr. Atkins’ New Diet Revolution), dietary carbohydrate is limited to as little as 20 g/day. By default, very low carbohydrate diets are very high in dietary protein and fat. While these diets do produce dramatic short-term weight loss and may temporarily lower serum glucose, serum insulin, and serum triglycerides, these benefits will not be retained if body weight gain occurs as dietary carbohydrate intake is liberalized (see “Ketogenic Diet” section above). Data from the National Weight Control Registry indicate less than 1% of registry participants consumed a low carbohydrate diet (less than 24% of calories from carbohydrates).⁴² Compared with those dieters with higher carbohydrate intakes, registry participants following a low carbohydrate diet maintained their weight loss for a shorter time span.⁴² As previously noted, very

low carbohydrate diets strictly limit the amounts of fruits, vegetables, and grain products that can be consumed. As a result, there are inadequate levels of certain dietary vitamins (Vitamins A and C, folate), phytochemicals, and fiber. A low carbohydrate intake may limit endurance and athletic performance, while an elevated protein intake can increase risk for hyperuricemia, gout, kidney stones, and hypercalciuria.⁴³

While these and other fad diets may not be harmful to most healthy adults if used for a short time, most fad diets are nutritionally unbalanced, provide no transitional or maintenance programs, and are inappropriate for long-term use.

Physical Activity

Physical activity increases daily energy expenditure, contributes to initial weight loss, and, most importantly, helps sustain weight loss over time.^{44,45} Over 90% of “successful dieters” report using physical activity as a means of maintaining their initial weight loss.³¹ In addition to the energy expended during the activity itself, exercise can indirectly increase total energy expenditure (TEE) by boosting post-activity basal metabolic rate (BMR).⁴⁶ After intense exercise, BMR remains slightly elevated for an undefined period of time, thus extending the period of energy expenditure. Adults who exercise while restricting caloric intake are able to preserve lean body mass to a greater extent than with dieting alone, thus blunting the normal diet-induced reduction in BMR.⁴⁷ Most people experience a short-term suppression of appetite after an intense workout and, for some, activity can curb the inappropriate use of food to counter stress, anxiety, boredom, or depression.

Low- to moderate-intensity activities such as bicycling, walking, swimming, and jogging will promote fat oxidation as skeletal muscles use free fatty acids as a primary source of energy. While intense exercise results in a higher total energy expenditure over a given period of time, most overweight and obese adults are unable to sustain that degree of activity for very long. The American College of Sports Medicine recommends an activity level equivalent to the expenditure of at least 1000 kcal/wk for weight loss.⁴⁸ Regular participation in low- to moderate-intensity activity conducted over a 30-45 minute period of time for 5-7 days of the week will enhance weight loss and maintenance

efforts.² Resistance training also provides long-term benefits. It preserves or increases lean body mass during periods of caloric restriction, improves muscle tone and body appearance, and blunts the age-related loss of bone mineral density. Resistance training might also prevent the decline in resting metabolic rate that occurs with severe caloric restriction.^{49,50}

Programmed exercise is not the only way to successfully increase total daily activity. Most overweight and obese adults benefit from lifestyle changes that are modest, yet effective, in increasing daily energy expenditure. Using the stairs instead of elevators, walking during breaks and lunch hours, parking at the far end of the lot instead of close to the entryway, and replacing TV watching with more active pursuits, such as gardening or dancing, can gradually increase energy expenditure and contribute to weight control efforts.⁵¹ A recent study concluded that non-exercise activity, including fidgeting, could account for some resistance to weight gain in adults.

In addition to its effect on energy balance, regular physical activity improves cardiovascular and respiratory functions and decreases body fat, specifically abdominal fat. Serum lipid profiles normalize and blood glucose control improves, as does emotional well-being. While there is some debate whether exercise alone is sufficient for significant and long-term weight reduction, physical activity does appear critical for the long-term maintenance of weight loss after dieting.^{31,44,52-55}

Behavior Modification

Many overweight and obese persons have accumulated a lifetime of specific behaviors that have led to their current state. Reversing or replacing these habits with ones that will promote weight loss and maintenance require a sustained commitment. Brownell and Kramer⁵⁶ have identified several key components of an effective behavior modification program:

- **Self-monitoring**: completing food records to identify stressors and triggers to inappropriate food consumption; tracking eating and exercise behaviors; documenting behavioral improvements over time

- **Goal Setting**: establishing primary and secondary goals; identifying one critical behavior to focus on first (e.g., not stopping for pastry every morning on the way to work), then moving on to other behaviors after the first success
- **Stimulus control**: eliminating environmental cues to eat; keeping food off the countertop, away from the desk, and out of the car; not buying problematic foods to begin with; substituting physical activity for “mindless eating” after dinner or in the late afternoon
- **Reinforcement**: practicing successful problem solving skills and identifying meaningful non-food rewards; avoiding friends and relatives who may undermine newly acquired healthy habits
- **Social support**: maintaining a network of family, friends, and diet/exercise partners; joining weight control groups through work site wellness programs, community centers, or places of worship; signing up for exercise classes or online health/weight control chat rooms
- **Cognitive change**: establishing and maintaining a positive outlook on life; developing acceptance of one’s weight, body image, and personal attributes; focusing on successful weight loss and maintenance over the long term; emphasizing health goals over weight goals

Stress management, problem solving, contingency management, relapse management, and cognitive restructuring are additional behavioral strategies that can facilitate the weight loss and weight maintenance processes.⁵⁷

Some overweight/obese individuals benefit from group-based interventions. Programs such as Weight Watchers, Take Off Pounds Sensibly (TOPS), and Overeaters Anonymous (OA) can be effective behavioral adjuncts to dietary and exercise-based interventions. More than half of adults successful at long-term weight maintenance reported using a commercial weight loss program, such as those mentioned, or a health professional to lose weight.³¹

Overweight and obese adults must realize that they should not initiate weight loss efforts if they are distracted by other major life stressors. While there is never a “perfect” time to lose weight, it is unrealistic to begin a structured diet and exercise program shortly after losing a job, experiencing a family death, or facing some other similar life crisis.²⁸

Surgical Intervention

Surgical interventions are recommended only for adults with morbid obesity (BMI >40 kg/m²), those who have been unable to achieve or sustain adequate weight loss through other less drastic means, and obese adults (BMI >35 kg/m²) who are suffering from concurrent obesity-related comorbidities, such as hypertension, hyperlipidemia, type 2 diabetes, and sleep apnea.² By their very nature, surgical treatments are inherently effective for long-term weight loss and maintenance. As with all obesity treatments, the risks of surgical intervention must be weighed against the potential benefits of the anticipated weight loss. Obese adults are high-risk surgical candidates, and must be fully informed of the risks associated with surgery. In addition, candidates for surgical intervention must understand the extent to which their lifestyle and quality of life may be impacted.

Previous surgical interventions, such as intestinal or jejunoileal bypass surgery, have been replaced by safer, more effective procedures designed to reduce food intake.⁵⁸ Surgical gastroplasty and vertical banded gastroplasty create a small (≈30-50 mL) pouch that severely limits the amount of food that can be consumed in a single setting. Once food passes out of the small reservoir into the stomach proper, normal digestion and absorption ensues. Gastric bypass surgery (Roux-en-Y) has also been used with considerable success, although there is a higher risk of malabsorption and nutrient deficiencies. Resultant weight loss can be as great as 50-100 kg (110-220 lb) over 6-12 months, with a high rate of weight maintenance.² Most clients show significant post-surgical improvements in blood lipid profile, blood glucose control, and blood pressure.⁵⁹

Surgical treatment of obesity has been associated with certain long-term complications.⁵⁸ Post-

surgical vomiting is a common side effect, and will persist if food intake is too rapid or too great. Loss of absorptive capability can increase risk for iron, folate, and Vitamin B-12 deficiencies. Some patients may develop “dumping syndrome” or, secondary to the rapid weight loss, gallstones. Postoperative depression is another potential complication. Patient education and compliance to dietary guidelines is critical to the long-term success of the surgery, since the consumption of calorically dense liquids and semisolid foods can override the limitations of the surgically minimized gastric capacity. Surgical intervention to treat patients should be followed by appropriate medical, nutritional, and behavioral practitioners to optimize long-term outcomes.² Lipectomy, commonly referred to as “liposuction,” is the surgical removal of modest amounts of adipose tissue. This is a form of cosmetic surgery and, although some medical providers are offering “serial” lipectomy, should not be viewed as appropriate intervention for long-term weight control.

Pharmacologic Treatment

Weight loss drugs can reduce food intake, alter specific appetites, inhibit nutrient digestion or absorption, alter nutrient metabolism, and increase energy expenditure.^{30,60} Generally, pharmacologic therapy should not be introduced until the client has devoted at least 6 months of “honest effort” to a lifestyle program of dieting, physical activity, and behavior modification. As an adjunct to these lifestyle changes, weight loss drugs may be appropriate for obese adults (BMI ≥30 kg/m²) or overweight adults (BMI ≥27 kg/m²) with concurrent risk factors, such as hypertension, type 2 diabetes, hyperlipidemia, coronary heart disease, or sleep apnea.² Because of the known adverse effects of many Food and Drug Administration (FDA) approved weight loss drugs, only those clients at increased medical risk should be considered for pharmacotherapy.

If used as the sole form of therapy, without concurrent lifestyle or behavioral changes, many clients do not respond to pharmacotherapy, even with increased drug dosages.² Those who do respond to drug therapy may experience only a modest weight loss (2-10 kg, most during the first 6 months of treatment).² As noted previously, however, even a modest loss of excess body weight

can result in clinically significant improvements in blood pressure, blood glucose control, serum lipid profile, and quality of life; thus pharmacologic treatment of obesity can enhance the health status of overweight or obese adults. Pharmacologic therapy for weight loss is effective only during the period of administration. If diet, activity patterns, and other lifestyle factors have not been modified during the period of pharmacotherapy, its effectiveness will cease when the medication is discontinued.³⁰ As with other chronic diseases, most physicians view drug therapy as a long-term treatment strategy for obesity.

Herbal Products and Plant Extracts

A number of commercially available herbal and botanical products have been marketed as promoting or facilitating weight loss. Some of these claims have been investigated through placebo-controlled studies, but many remain untested and unproven.

Bottlebrush, also known as Horsetail Herb or Shave Grass, has been used as an adjuvant in weight reduction diets, possibly related to its diuretic effect.⁶¹ In the U.S., bottlebrush is available as an ingredient in dietary supplements, typically as capsules or tablets. There are no known side effects or contraindications.

Glucomannan is a polysaccharide plant derivative that human enzymes do not digest, thus is classified as a dietary fiber.⁶² Glucomannan absorbs as much as 60 times its weight in water, so it suppresses appetite through gastric distention. It is available in capsule form, and may be found in “diet pills” of various compositions. Several cases of esophageal and lower gastrointestinal obstruction have been reported with glucomannan use. In addition, diabetics who use glucomannan may alter their blood glucose levels and/or insulin requirements. All persons using glucomannan must consume liberal amounts of fluid each day.

Maté, also known as yerba maté, Jesuit tea, or St. Bartholomew’s tea, is a caffeine-containing brew promoted as an appetite suppressant and “slimming” agent.⁶² These weight-control traits may simply be related to the diuretic effect of caffeine. In the U.S., consumers can purchase this product as a liquid extract or tea or find it as an ingredient in commercial sodas or beverages. German

researchers cite no known side effects or adverse reactions, and the FDA has classified maté as “Generally Recognized as Safe” (GRAS) for use as a food additive.

Bladderwrack, also known as seawrack, kelpware, bladder focus, and cutweed, has been promoted for obesity and overweight, although there are few data to support its effectiveness.⁶³ Medical practitioners no longer recommend this compound because of its high iodide content (up to 1% by weight) and potential for allergic reactions.

Yohimbine is an alkaloid compound extracted from the bark of a West African tree; it is classified as an alpha 2-adrenergic antagonist, and has been shown to stimulate norepinephrine release.⁶⁴ Yohimbine has been marketed as an aid to weight loss, although placebo-controlled studies have produced conflicting results regarding its effect on lipolysis.^{65,66} Its use has been associated with side effects including hypertension, tremors, dizziness, tachycardia, nausea and vomiting, insomnia, and anxiety. Yohimbine is contraindicated in persons with hypertension, hypotension, hepatic or renal disease, bipolar conditions, or on tricyclic antidepressants.^{61,67} Germany, a country with an extensive history of herbal product regulation, has not approved yohimbine for humans.⁶¹

Ma huang is a popular herbal supplement, often promoted for weight and fat loss.⁶⁴ It contains ephedrine, a nervous system stimulant. Ma huang is contraindicated in persons with hypertension, glaucoma, seizure disorders, thyroid disease, depression, or recurring headaches. Persons taking monoamine oxidase inhibitors (MAOI), methyl dopa, certain asthma medications, or certain cough/cold products should not take ma huang. Inappropriate use of ma huang has been associated with side effects such as dizziness, severe headache, rapid or irregular heartbeat, shortness of breath, and nausea. Severe side effects include stroke and heart attack. Over the past few years, the FDA has received several reports of deaths among users of products containing ephedrine and caffeine.

The National Heart, Lung, and Blood Institute does not recommend the use of herbal products as an effective means of weight control.² The Dietary Supplement Health and Education Act (DSHEA) of 1994 governs the sale and marketing of herbal and

botanical products.⁶⁸ The FDA does not evaluate supplements, including herbal products, for safety or efficacy prior to their sale and marketing. The FDA is allowed to remove a supplement from the market only after receiving reports of harm and proving harm was done. Manufacturers are allowed to make “structure-function” claims on product labels, but must include the FDA disclaimer, “*This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, mitigate, cure, or prevent any disease.*” Many consumers, however, fail to fully comprehend the minimal regulatory oversight directed toward dietary supplements compared with the comprehensive oversight of food products and drugs. Health care providers should specifically address the issue of herbal and botanical supplement use by their clients or patients in order to minimize the potential of adverse effects.

Appetite Suppressants

Centrally acting anorectic drugs typically alter brain neurotransmitter metabolism, functioning as centrally acting noradrenergic or serotonergic compounds. They may increase the secretion of neurotransmitters, such as norepinephrine or serotonin, inhibit the reuptake of these neurotransmitters, or both.

Phentermine, a noradrenergic agent, stimulates the release of norepinephrine and inhibits food intake by delaying the onset of the subsequent meal or inducing early satiety.³⁰ The FDA has approved phentermine for short-term use only (i.e., few weeks). Phentermine was previously used in combination with fenfluramine; since the withdrawal of fenfluramine from the market, phentermine is now used as a sole weight loss agent.⁶⁹ The most commonly reported side effects include headache, dry mouth, constipation, insomnia, irritability, palpitations, and tachycardia.^{69,70} It is contraindicated in patients with moderate to severe hypertension, advanced arteriosclerosis, symptomatic cardiovascular disease, hyperthyroidism, or glaucoma.^{70,71} Patients with a history of addictive behavior should not be placed on phentermine therapy.⁷⁰ It should not be taken with, or within two weeks of, monoamine oxidase inhibitors. Pulmonary hypertension and cardiac valve abnormalities have been reported in patients taking phentermine, although most were also taking fenfluramine or dexfenfluramine in

combination.⁷² It has been suggested that patients using phentermine should discontinue the drug if angina, syncope, decreased exercise tolerance, or dyspnea occurs.⁷⁰

Sibutramine (Meridia®), recently approved by the FDA for long-term use, inhibits the neural reuptake of norepinephrine, dopamine, and serotonin.⁷³ It results in an increase in satiation, thus reduces food intake. The most commonly reported side effects include headache, dry mouth, constipation, nausea, and insomnia. Standing tachycardia, increased heart rate, and increased blood pressure have been noted with repeated doses.⁷⁴ Sibutramine is contraindicated in patients with a history of congestive heart failure, dysrhythmia, coronary heart disease, stroke, poorly controlled hypertension, or severe renal or hepatic impairment. Patients should not take sibutramine if they receive other centrally acting appetite suppressants. Sibutramine is contraindicated in patients receiving MAO inhibitor therapy.⁷⁴ Several clinical trials have shown sibutramine to effectively promote weight loss in a dose-dependent manner.^{75,76} Sibutramine has also been shown to effectively maintain and improve weight loss over a 1-year period in patients who had previously lost weight on a very low calorie diet.⁷³ The addition of lifestyle modifications to a 1-year trial of sibutramine significantly increased weight loss and improved self-rated health, energy level, appearance, and self-esteem compared with drug treatment alone.⁷⁷ Triglyceride and LDL-cholesterol levels decreased significantly in all treatment groups, although systolic and diastolic blood pressure increased significantly.⁷⁷

Fenfluramine and dexfenfluramine are serotonergic agents; they increase the release of serotonin and block its reuptake. Both compounds were withdrawn from the market several years ago, which was attributed to their link to valvular heart disease.⁷⁸ Fluoxetine (Prozac®) and sertraline (Zoloft®) are selective serotonin reuptake inhibitors; however neither is approved by the FDA for weight loss.

Phenylpropanolamine (PPA), previously available in over-the-counter (OTC) products, such as Dexatrim® and Acutrim®, are noradrenergic drugs, which had been approved for short-term use in weight control. In November 2000, the FDA

requested the voluntary withdrawal of all products containing PPA; this withdrawal has been completed, thus, this compound is no longer available on the consumer market. PPA has been linked to elevations in blood pressure and increased risk of hemorrhagic stroke in adult women.⁷⁹ Amphetamines, while also functioning as noradrenergics, have not been approved for clinical treatment of obesity because of their addictive nature.

Several neuropeptides are currently under clinical investigation as potential peripheral anorectic agents. Leptin, cholecystokinin, glucagon-like peptide (GLP-1), neuropeptide Y (NPY) antagonists, and bombesin are among those substances known to promote or prolong the sense of satiety.³⁰ The regulation of appetite and food intake is, however, complex and it is difficult to isolate a single metabolic control point. A case in point is the hormone leptin. Leptin is secreted primarily from white adipocytes, and acts on the brain to decrease food intake and increase thermogenesis. In animal models, a deficiency of leptin results in increased food intake and increased adiposity. Soon after its initial discovery, leptin was touted as a “cure” for obesity. In most obese individuals, however, leptin secretion and plasma leptin levels are paradoxically elevated.⁸⁰ There is a strong positive correlation between body fatness and plasma leptin levels;⁸¹ thus, most obese individuals typically have high circulating levels of leptin. It has been hypothesized that some obese persons are leptin resistant⁸² and/or exhibit abnormal transport of leptin across the blood-brain barrier.⁸³ Clearly, leptin therapy would be ineffective for this population. In contrast, a very small number of humans exhibit a congenital defect in or absence of leptin, resulting in significant and early onset obesity.⁸⁴ One child with congenital leptin deficiency has been successfully treated with recombinant leptin.⁸⁵ Although leptin and other neuropeptides may eventually come to play an important role in the prevention and/or treatment of obesity, researchers do not yet fully understand the regulation and metabolism of these compounds.

Malabsorptive Agents

Orlistat (Xenical®), recently approved by the FDA for long-term use in the treatment of obesity, inhibits the absorption of dietary fat by decreasing the activity of pancreatic lipase. Fecal fat increases

by as much as 30%, although the drug has little effect on persons consuming a moderately low fat diet (a diet with less than 30% of kcal from fat). Since the drug acts locally rather than systemically (less than 1% of the drug is absorbed from the gastrointestinal tract), metabolic or systemic side effects are minimal. However, clients who fail to adhere to a modest dietary fat restriction (30% of total kcal or less) frequently experience gastrointestinal (GI) distress, such as fecal urgency, oily spotting, frequent defecation, or fecal incontinence.⁸⁶ Recent research found concomitant use of the soluble fiber psyllium reduced the frequency and severity of GI complications.⁸⁷ Plasma levels of fat-soluble vitamins A, D, and E, as well as lipid soluble phytochemicals, such as beta-carotene, may decrease with long-term use of orlistat; thus use of a multivitamin supplement is recommended. Orlistat is contraindicated in patients with chronic malabsorption and cholestasis; it should not be used by lactating women, and is not recommended during pregnancy.⁸⁸ Long-term clinical trials have shown that use of orlistat by obese adults results in a greater loss of weight compared with placebo.^{89,90} Research also suggests use of orlistat may delay or prevent the onset of type 2 diabetes in obese clients,⁹¹ and can reduce serum LDL-cholesterol beyond that expected from weight loss alone.⁹²

Persons with eating disorders have inappropriately used over-the-counter (OTC) laxatives to facilitate weight loss. They have no role in the long-term treatment of obesity or overweight. Chronic laxative abuse can result in electrolyte imbalance leading to cardiac arrhythmia, muscle weakness, and other complications.

Thermogenic Substances

Ephedrine, a derivative of phenylpropanolamine, stimulates thermogenesis in humans and is promoted to the general public as an “energy-burning” compound. It is derived from an herbal product known as *ma huang* and is often sold in combination with caffeine. Consumers using ephedra-based herbal products have submitted more than 800 reports of adverse effects, including cardiac arrhythmias and death, to the FDA. The FDA has not approved caffeine or ephedrine for use in the treatment of obesity.

CONCLUSION

The prevention of obesity is more desirable than the treatment of the condition after it has become entrenched.⁹³ Prevention efforts have not been very effective, however, particularly at the societal level. If the U.S. is to successfully manage the current epidemic of obesity, then a coordinated and expansive effort must be mounted. The economic and health consequences of obesity are staggering. The total cost of obesity in the U.S. is estimated at over \$100 billion per year. Until public health officials can develop and implement an effective societal strategic plan for the prevention and management of obesity, primary health care providers must assume principal responsibility for its treatment. Obesity has long been viewed as a sign of gluttony, lack of self-control, or poor moral character. Health care practitioners must recognize obesity for what it is: a multifaceted, chronic medical condition that is both preventable and treatable. Interventions must be individualized, treatments offered within a multidisciplinary plan of care, and medical follow-up and education provided over an extended period of time.

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