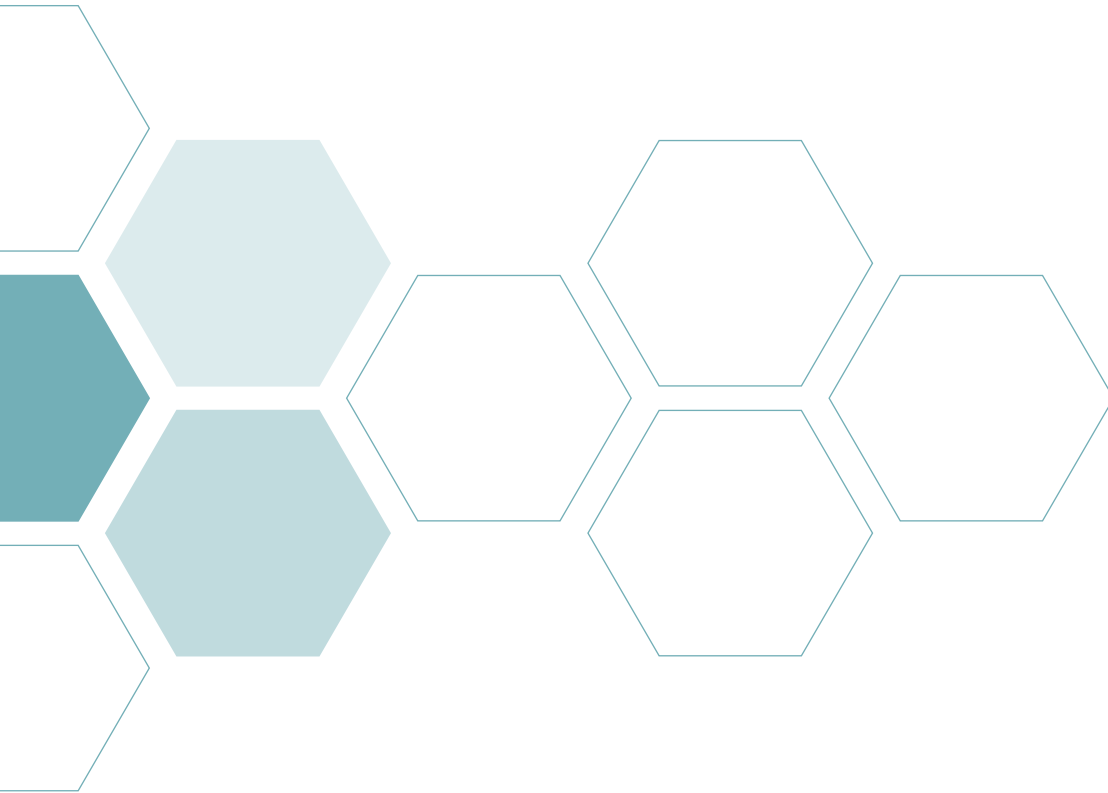


JOURNAL of MANAGED CARE MEDICINE

Educating Medical Directors of Employers, Health Plans and Provider Systems



Medical Directors Guide on Obesity

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Medical Directors Guide on Obesity

Geneva Briggs PharmD, BCPS and Tirissa J. Reid, MD

Introduction

During the past 20 years, there has been a dramatic increase in obesity in the United States (U.S.) and rates remain high. More than one-third of U.S. adults (35.7 percent) and approximately 17 percent (or 12.5 million) of children and adolescents aged 2 to 19 years are obese.¹

This document provides an overview of the current state of overweight and obesity in the U.S. and strategies for managing this medical issue. The goal is to provide managed care medical directors the latest information regarding weight issues and their treatment to help improve patient outcomes. This document also serves as a resource for medical directors to use to manage a population of patients with weight issues.

Disease State Information

Defining Overweight and Obesity

Overweight and obesity are both terms describing ranges of weight that are greater than what is generally considered healthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems.

Adults

For adults, overweight and obesity ranges are determined by using weight/(height)² to calculate body mass index (BMI). BMI is used because, for most people, it correlates with their amount of body fat.

- An adult who has a BMI below 18.5 is considered underweight.
- An adult who has a BMI between 18.5 and 24.9 is considered normal weight.
- An adult who has a BMI between 25 and 29.9 is considered overweight.
- An adult who has a BMI of 30 or higher is considered obese.
- A BMI > 40 is considered extreme obesity.²
- Obesity can be further broken down into three groups:
 - Class 1 (BMI 30–34.9)
 - Class 2 (BMI 35–39.9)
 - Class 3 (BMI > 40)

A BMI table can be found in Appendix A.³ Numerous BMI calculators can be found online. One is at <http://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm>. It is important to remember that although BMI correlates with the amount of body fat, BMI does not directly measure body fat. As a result, some people, such as muscular athletes, may have a BMI that identifies them as overweight even though they do not have excess body fat; therefore, clinical judgment is an important part of patient management as well.

Adolescents

A child's weight status is determined using an age- and sex-specific percentile for BMI rather than the BMI categories used for adults because the body composition of children varies as they age and varies between boys and girls.

CDC Growth Charts (http://www.cdc.gov/growthcharts/clinical_charts.htm) are used to determine the corresponding BMI-for-age and gender percentile. For children and adolescents (aged 2 to 19 years):

- Overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and gender.
- Obesity is defined as a BMI at or above the 95th percentile for children of the same age and gender.⁴

Prevalence

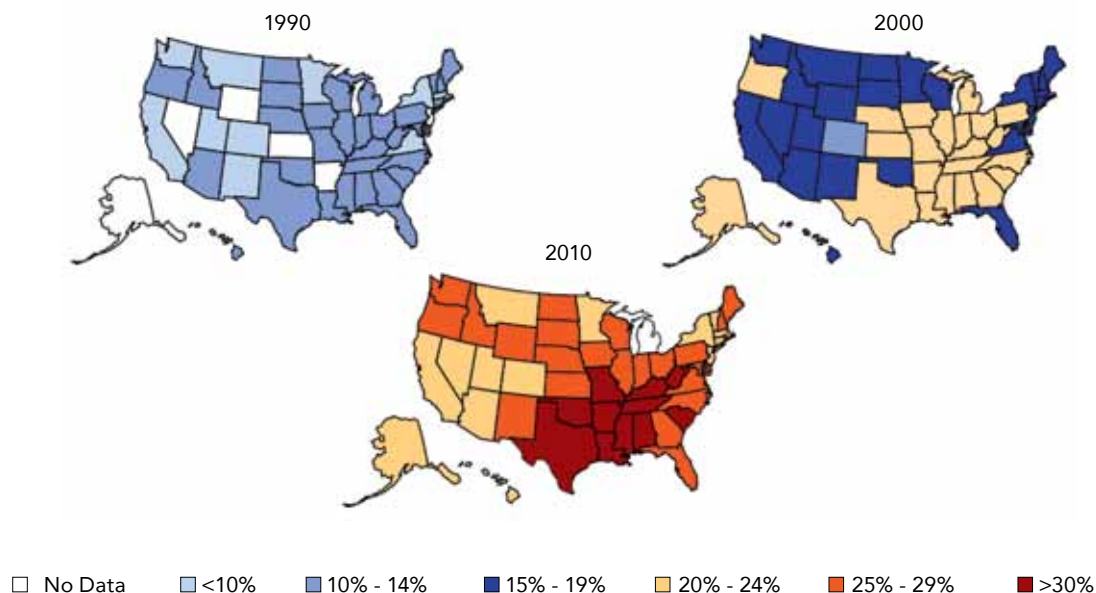
Unfortunately, almost 70 percent of adults aged 20 years and over are overweight (69.2 percent, NHANES 2009 to 2010).⁵ More than one-third of adults and almost 17 percent of youth are obese.⁶

As shown in Exhibit 1, the prevalence of obesity in the United States increased significantly during the last decades of the 20th century. More recently there appears to have been a slowing of the rate of increase or even a leveling off.⁶ There was no change in the prevalence of obesity among adults or children from 2007–2008 to 2009–2010.

Causes

Exhibit 1: Obesity Trends* Among U.S. Adults⁶

BRFSS, 1990, 2000, 2010
(*BMI ≥ 30 , or about 30 lbs. overweight for 5'4" person)



Obesity is the result of long-term mismatches in energy balance, in which daily energy intake exceeds daily energy expenditure. The pathogenesis of obesity is complex, involving multiple interactions among behavioral, environmental, and genetic factors.

Genes play a central role in the determination of BMI and, consequently, in the pathogenesis of obesity. However, it has generally proven challenging to identify the specific underlying genetic cause of obesity, and this is due to the complex interactions involved in the regulation of adiposity.⁷ What is now considered a disease could well have been an advantage in more primitive times when food was less available, and when high energy expenditure through physical activity was a way of life. Those with a so-called thrifty phenotype had a survival advantage due to a more efficient use of calories.⁸

Although weight is influenced by genetic traits, the increase in obesity prevalence in the past few decades cannot be explained by changes in the human gene pool alone, and a more substantial contribution is often attributed to environmental changes that promote excessive food intake and discourage physical activity. Environmental factors that have contributed to the rising weight of our population include the increased availability of highly palatable food, inexpensive readily available food, reduced physical activity both during school, work and lei-

sure time, and improved transportation (walking versus car use).⁹

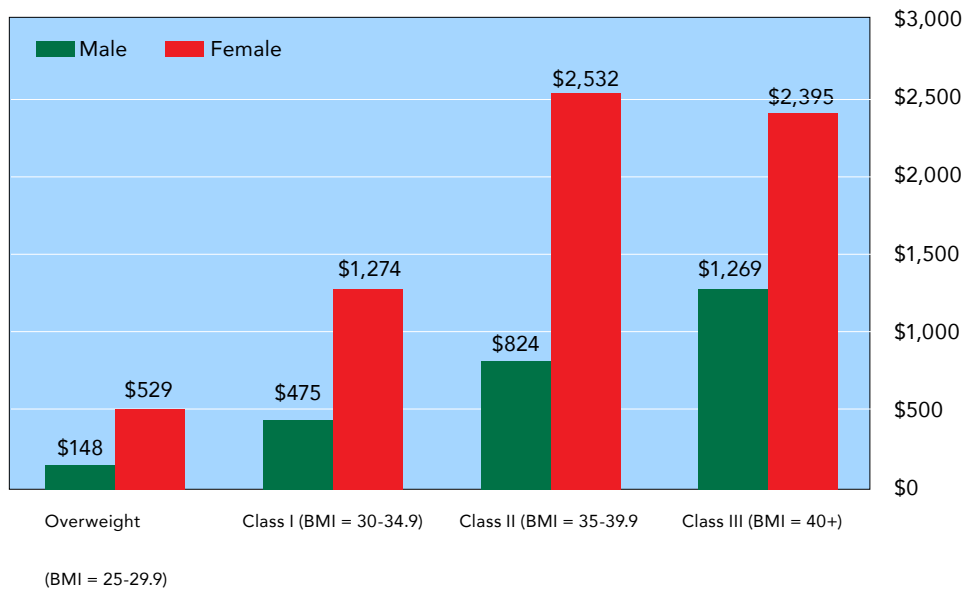
In addition to changes in the food market, changes in the built environment, in schools and child care settings have all impacted the rate of childhood obesity.¹⁰ An increase in dual-career or single-parent working families may also have increased demand for food away from home or pre-prepared foods. A host of factors have also contributed to reductions in energy expenditure. In particular, children today seem less likely to walk to school and to be traveling more in cars than they were during the early 1970s. Finally, children today spend more time viewing television and using computers rather than they do playing outside.

Additionally, obesity may be induced or worsened by medications (e.g., glucocorticoids, antipsychotics, antidepressants, insulin, oral hypoglycemics, antiepileptics) or be secondary to various endocrine disorders, such as Cushing's syndrome, hypothyroidism or polycystic ovary syndrome.¹¹

Obesity as a Disease

In June 2013, the American Medical Association House of Delegates approved by vote the policy "that our AMA recognize that obesity is a disease with multiple pathophysiologic aspects requiring a range of interventions to advance obesity treatment and prevention". The policy garnered significant

Exhibit 2: Additional Annual Medical Expenses Per Adult to Normal Weight (dollars)²¹



publicity. The American Society for Metabolic and Bariatric Surgery (ASMBS), The Obesity Society (TOS), The American Society of Bariatric Physicians (ASBP), and the American Association of Clinical Endocrinologists (AACE) agreed with the AMA's decision to classify obesity as a disease.¹² The overall impact of this decision on managed care is unknown. Treatment guidelines for obesity issued by the National Heart, Lung, and Blood Institute declared in 1995 that "obesity is a complex, multifactorial chronic disease developing from multiple interactive influences of numerous factors."¹³ Moreover, a decade earlier (1985), an NIH Consensus Development Conference was held on the health implications of obesity. This conference provided important national recognition that obesity is a serious health condition that leads to increased morbidity and mortality.¹³

Many have predicted that the labeling of obesity as a disease is a step toward increased insurance reimbursement for nutrition counseling, behavior management programs, and weight loss medications. Although large insurance companies typically cover weight-loss surgery for selected patients, obesity counseling and medication for those who don't qualify for surgery typically are not covered.

Health Impact of Excess Weight

The primary concern of overweight and obesity is one of health and not appearance. Following are some of the health impacts of excess weight. In 2003, obesity was the second leading cause of pre-

ventable death in the United States, and it is projected to overtake smoking as the leading cause if current trends continue.¹⁴ In fact, a recent study estimates that one in six deaths in the U.S. are related to obesity.¹⁵

Premature Death¹⁶

- An estimated 300,000 deaths per year may be attributable to obesity.
- The risk of death rises with increasing weight.
- Even moderate weight excess (10 to 20 pounds for a person of average height) increases the risk of death, particularly among adults aged 30 to 64 years.
- Individuals who are obese have a 50 to 100 percent increased risk of premature death from all causes, compared to individuals with a healthy weight.

Heart Disease¹⁶

- The incidence of heart disease (myocardial infarction, heart failure, sudden cardiac death, angina, and arrhythmia) is increased in persons who are overweight or obese.
- Hypertension is twice as common in adults who are obese than in those who are at a healthy weight.
- Obesity is associated with elevated triglycerides and decreased HDL cholesterol, both of which increase the risk for heart disease, particularly if insulin resistance is present.

Diabetes¹⁶

- A weight gain of 11 to 18 pounds increases a person's risk of developing type 2 diabetes to twice that of individuals who have not gained weight.
- More than 80 percent of people with type 2 diabetes are overweight or obese.

Cancer¹⁶

- Overweight and obesity are associated with an increased risk for some types of cancer including endometrial, colon, gall bladder, prostate, kidney, and postmenopausal breast cancer.
- Women gaining more than 20 pounds from age 18 to midlife double their risk of postmenopausal breast cancer, compared to women whose weight remains stable.

Respiratory¹⁶

- Sleep apnea is more common in obese persons.
- Obesity is associated with a higher prevalence of asthma.

Skeletal¹⁶

- For every two-pound increase in weight, the risk of developing osteoarthritis is increased by 9 to 13 percent.
- Symptoms of osteoarthritis can improve significantly with weight loss.

Reproductive Complications¹⁶

- Obesity during pregnancy is associated with increased risk of death in both fetus and mother and increases the risk of maternal hypertension by 10 times.
- In addition to many other complications, women who are obese during pregnancy are more likely to have gestational diabetes and problems with labor and delivery.
- Infants born to women who are obese during pregnancy are more likely to be high birth weight and, therefore, may face a higher rate of Cesarean section delivery and low blood glucose (which can be associated with brain damage and seizures).
- Obesity during pregnancy is associated with an increased risk of birth defects, particularly heart defects and neural tube defects, such as spina bifida.¹⁷
- Obesity in premenopausal women is associated with polycystic ovary syndrome and infertility.

Gastrointestinal¹⁶

- Overweight and obesity are associated with an

increased risk of gall bladder disease, gastroesophageal reflux disease, pancreatitis and nonalcoholic fatty liver disease. Nonalcoholic steatohepatitis (NASH) is expected to become the number one indication for liver transplantation within the next decade.¹⁸

Additional Consequences¹⁶

- Overweight and obesity are associated with increased risks of incontinence, depression, and complications after surgery.
- Obesity can affect quality of life through limited mobility and decreased physical endurance as well as in the social, academic, and employment spheres, with job discrimination against obese individuals having been documented.¹⁹

Children¹⁶

- Risk factors for heart disease, such as dyslipidemia and hypertension, occur with increased frequency in overweight children and adolescents compared to those with a healthy weight.
- Type 2 diabetes, previously considered an adult disease, has increased dramatically in children and adolescents, mirroring the steep increase in obesity rates.
- Overweight adolescents have a 70 percent chance of becoming overweight or obese adults, which increases to 80 percent if one or more parent is overweight or obese.
- The most immediate consequence of overweight, as perceived by children themselves, is social discrimination.

Cost Impact of Obesity

There is no doubt that obesity is an expensive medical condition.

- Obesity adds 9.1 percent to the nation's personal health spending. This varies by payer, with obesity accounting for 8.5 percent of Medicare spending, 11.8 percent of Medicaid spending and 12.9 percent of private health insurance spending.²⁰
- In 2008, the annual health care cost of obesity in the U.S. was estimated to be as high as \$147 billion a year.²⁰
- Medical expenses for obese employees are estimated to be 42 percent higher than for a person with a healthy weight.²⁰
- On a per capita basis, the most severely obese individuals have medical expenses that may be thousands of dollars more a year than their counterparts of normal weight (Exhibit 2).²¹
- Absenteeism related to weight is also an issue for employers. In one study, the average three-year

Exhibit 3: Selected Healthy People 2020 Goals²⁷

Goal	Baseline	2020 Target
Increase the proportion of primary care physicians who regularly measure the BMI of their adult patients	48.7%	53.6%
Increase the proportion of primary care physicians who regularly assess BMI for age and sex in their child or adolescent patients	49.7%	54.7%
Increase the proportion of physician office visits of adult patients who are obese which include counseling or education related to weight reduction, nutrition, or physical activity	28.9%	31.8%
Increase the proportion of persons aged 20 years and older at a healthy weight.	30.8%	33.9%
Reduce the proportion of adults who are obese	33.9%	30.5%
Reduce the proportion of children and adolescents who are obese	10.7% (2-5 years) 17.4% (6-11 years) 17.9% (12-19 years)	9.6% 15.7% 16.1%

absenteeism cost for obese employees was \$863 (1998 dollars) greater than that of lean employees.²²

Between 1997 and 2005, the prevalence of 11 chronic conditions associated with overweight and obesity grew 180 percent.²³ Obesity alone contributed nearly 29 million additional chronic condition cases in 2005 over the 1997 level. The burden of obesity is most marked in heart disease and diabetes, accounting for more than 70 percent of the growth in prevalence for these two conditions. Obesity accounted for 60 percent of the growth in hypertension and nearly 50 percent of the rise in osteoarthritis. Spending on obesity-related conditions increased significantly during this period of time. Overall, obesity accounted for 27 percent of the increase in inflation-adjusted health expenditures among working-age adults.²⁴

Calculating the Impact of Obesity for Employers

Many employers realize the need to assess the costs of obesity as it relates to their bottom line. Forward thinking organizations are looking for ways to quantify the magnitude of this challenge and to assess the options and benefits of providing interventions and incentives to better manage the health of their employees. The CDC website has an Obesity Cost Calculator (<http://www.cdc.gov/leanworks/costcalculator/>), which uses input data provided by human resources or benefits personnel to calculate an estimate of the costs to an organization that are obesity related. More specifically, the Obesity Cost Calculator estimates the costs of obesity based on characteristics of a company. These include costs

for medical expenditures and the dollar value of increased absenteeism resulting from obesity.

Screening Guidelines

- The U.S. Preventive Services Task Force (USPSTF) recommends screening all adults for obesity.²⁵ Clinicians should offer or refer patients with a BMI of 30 kg/m² or higher to intensive, multicomponent behavioral interventions. Grade: B recommendation.
- The USPSTF recommends that clinicians screen children aged 6 years and older for obesity and offer them or refer them to comprehensive, intensive behavioral interventions to promote improvement in weight status.²⁶ Grade: B recommendation.

Healthy People 2020 Goals

Selected Healthy People 2020 goals for nutrition status and weight specifically targeted at obesity are listed in Exhibit 3.²⁷ The complete listing of goals and how baseline and target values are determined can be found at www.healthypeople.gov/2020.

Prevention of Overweight and Obesity

Although the primary focus of this document is managing a population of patients with obesity, prevention of weight gain over the lifespan is an important public health issue. For the reader who wishes to know more about community-based obesity prevention, there are some good resources. The National Center for Chronic Disease Prevention and Health Promotion has developed a list of recommended community-based strategies for obesity prevention

Exhibit 4: Treatment Options by BMI Category for Adults^{3,33-35}

BMI Category	Health Risk	Dietary Changes	Physical Activity	Behavioral Management	Medications	Bariatric Surgery
Overweight (25-29.9)	Low	X	X	X	X ¹	-
Obese Class I (30-34.9)	Moderate	X	X	X	X	? ²
Obese Class II (35-39.9)	High	X	X	X	X	X ³
Obese Class III (>40)	Severe	X	X	X	X	X

¹May be initiated for BMI ≥ 27 and comorbidities
²Gastric banding - Lapband is FDA approved for BMI of at least 30 kg/m² with one or more obesity-related comorbid conditions. It is not covered by most insurances and it is not approved for use in non-adults. Realize bands are only FDA approved for BMI ≥ 35 .
³May be considered if obesity related comorbidities are present.

and a suggested measurement for each strategy that communities can use to assess performance and track progress over time.²⁸ The 24 strategies are divided into six categories: (1) strategies to promote the availability of affordable healthy food and beverages, (2) strategies to support healthy food and beverage choices, (3) a strategy to encourage breastfeeding, (4) strategies to encourage physical activity or limit sedentary activity among children and youth, (5) strategies to create safe communities that support physical activity, and (6) a strategy to encourage communities to organize for change. In addition to this resource, The Agency for Healthcare Research and Quality (AHRQ) has published comparative effectiveness analyses of interventions to prevent childhood and adult obesity.^{29,30} Both of these reviews focus on community-based programs including school, work, and other community settings.

On an individual basis, there are some recommendations that can be made. As noted in the previous screening guidelines section, everyone over the age of six should be screened for weight issues at primary care visits. If a patient is noted to be gaining weight or already overweight, several interventions can be recommended to reduce the risk of continued weight gain. Below is a simple list of recommendations for maintaining a healthy weight for life from the National Institutes of Health We Can program.³¹

- Follow a healthy eating plan with a focus on the balance of energy in and energy out.
- Focus on food portion size.
- Be physically active (additional information below)
- Reduce screen time to two hours or less a day of screen time that's not work- or homework-

related.

- Keep track of weight, body mass index, and waist circumference over time.

Physical Activity

The U.S. Department of Health and Human Services 2008 Physical Activity Guidelines for Americans recommend that children and adolescents be physically active for at least 60 minutes on most, if not all, days.³²

- **Aerobic:** Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least three days a week.
- **Muscle-strengthening:** As part of the 60 or more minutes of daily physical activity, muscle-strengthening physical activity should be included on at least three days of the week.
- **Bone-strengthening:** As part of their 60 or more minutes of daily physical activity, bone-strengthening physical activity should be included on at least three days of the week.

The 60 minutes of activity can be done in smaller chunks of time over the day. Some of that time for children may come from physical education (PE) and gym classes in schools.

All adults should avoid inactivity. Some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.

- For substantial health benefits, adults should do at least 150 minutes (two hours and 30 minutes) a week of moderate-intensity, or 75 minutes (one hour and 15 minutes) a week of vigorous-inten

Exhibit 5: Treatment Options by BMI Category for Youths³⁶

BMI Category	Health Risk	Dietary Changes	Physical Activity	Behavioral Management	Medications	Bariatric Surgery
Overweight (85 th - 94 th percentile)	Low	X	X	X	-	-
Obese (>95 th)	High	X	X	X	X ¹	X ²
Severely Obese (>99 th)	Severe	X	X	X	X ¹	X ³

¹May be considered if obesity related comorbidities are present. Only Orlistat is FDA approved for use in those 12 and older. No medications are approved for less than 12.
²May be considered if obesity related comorbidities are present. Many caveats - see later section for discussion on surgery.
³May be considered. See later section for discussion on surgery.

sity aerobic physical activity, or an equivalent combination of moderate- and vigorous intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.³²

- For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes (five hours) a week of moderate intensity, or 150 minutes a week of vigorous intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity.³² Additional health benefits are gained by engaging in physical activity beyond this amount.
- Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on two or more days a week, as these activities provide additional health benefits.³²

Physical activity recommendations do have to be adapted to the patient’s current physical condition and concomitant medical conditions such as diabetes or asthma that can impact the ability to exercise.

Management of Obesity

Physical activity, dietary changes, behavioral interventions, medications, and surgery are all possible treatments for obesity. Physical activity, dietary changes, and behavioral interventions are typically considered together and referred to as lifestyle interventions or behavioral-based interventions. Each of these areas is reviewed briefly in subsequent sections. The guidelines for applying each of these treatments are discussed briefly within each section.

An overview of the indication for each treatment

in adults is shown in Exhibit 4.^{3,33-35} Everyone who is overweight or obese should be prescribed dietary changes, physical activity, and behavioral management. Weight loss medications can be used as an adjunct to lifestyle changes in those with BMI > 27 kg/m² with comorbidities and those ≥ 30 kg/m². Bariatric surgeries are an option for those with lower levels of obesity and comorbidities and those with severe obesity.

Because there is less data on using weight loss medications and surgery in overweight youth, the mainstays of therapy are lifestyle changes. Exhibit 5 lists the various treatment options by weight category.³⁶

Lifestyle Changes

Lifestyle changes for weight loss are similar to those for preventing weight gain but require a higher intensity. These include dietary changes, physical activity, and behavioral interventions.

Efficacy

A review of studies in adults conducted for the USPSTF found that multicomponent weight management interventions resulted in 3-kg (6.6-lb) greater weight loss in intervention than control participants after 12 to 18 months; this was a mean of 4 percent weight reduction.³⁷ This conclusion only applied to those in the overweight to Class 2 obesity groups. No trials were included in the analysis that included Class 3 obesity. A health technology review reached a similar conclusion that multicomponent weight management interventions promote weight loss in overweight or obese adults.³⁸ However, weight changes were small and weight regain was common in those studies that measured it. In those studies that measured weight regain, most groups began to regain weight at further follow-up, although a statistically significant difference

in weight loss in favor of the intervention group was maintained in some studies at up to 36 months' follow-up.³⁸ Because there were few similarities between included studies, identifying the most effective strategies for weight loss was not possible in either review.

As noted in the two reviews, lifestyle modification alone has limited long-term efficacy. Most patients experience rebounds in body weight after achieving an initial success.³⁹

In an evaluation of the treatment options for children, comprehensive lifestyle interventions of medium-to-high intensity were the most effective behavioral approach. There was a weight difference of 1.9 to 3.3 kg/m² favoring intervention groups at 12 months.⁴⁰

Health Outcomes

A systematic review of the long-term outcomes of treating obesity with lifestyle changes concluded that weight loss for people suffering from obesity was associated with decreased risk of development of type 2 diabetes, and a reduction in low-density lipoprotein cholesterol, total cholesterol and blood pressure, in the long term.⁴¹

In terms of mortality, intentional weight loss using lifestyle changes has a small benefit for individuals classified as unhealthy (with obesity-related risk factors) (RR 0.87 (95 % CI 0.77, 0.99); P = 0.028), especially unhealthy obese (RR 0.84 (95 % CI 0.73, 0.97); P = 0.018), but appears to be associated with slightly increased mortality for those who are overweight but not obese (RR 1.09 (95 % CI 1.02, 1.17); P = 0.008).⁴² There was no evidence for weight loss conferring either benefit or risk among healthy obese people.

When mortality data are examined by gender, there may be some differences. Intentional weight loss appears to significantly reduce all types of mortality for women if they have obesity-related illness.⁴¹ However, the same is not found for men; in one analysis, weight loss did not appear to be associated with a reduction in mortality due to cardiovascular disease and was associated with an increased risk of mortality due to cancer.⁴¹ Weight loss is associated with a reduction in diabetes-related mortality in both men and women whether overweight, obese or morbidly-obese.⁴³ The reason for some gender differences is unclear, but has been postulated to be fewer health care visits by men.⁴¹

Cost Effectiveness

The cost effectiveness of multicomponent weight management interventions (focused on lifestyle changes) has been assessed in numerous studies. For the health technology review, only two eco-

nomics evaluations met the majority of the core criteria of the review and a pragmatic decision was taken to describe only those two studies.^{38,44}

⁴⁵ One study used prescription antiobesity drugs in some participants, and the other had a follow-up of less than 18 months. Each study used a lifetime chronic disease model to evaluate the effect of changes in an individual's weight. The models included the costs and benefits from avoiding chronic illnesses such as coronary heart disease and diabetes. Both studies found the interventions to be cost-effective. In an economic simulation trial, a three-component intervention of diet, exercise, and behavior modification cost \$12,600 per quality-adjusted life-year gained compared with routine care.⁴⁴

Physical Activity

Physical activity is recommended as part of a comprehensive weight loss and weight maintenance program because it: (1) modestly contributes to weight loss in overweight and obese adults (Evidence Category A), (2) may decrease abdominal fat (Evidence Category B), (3) increases cardiorespiratory fitness (Evidence Category A), and (4) may help with maintenance of weight loss (Evidence Category C).³

The physical activity guidelines given earlier under prevention can be applied to losing weight. Ideally, 30 to 60 minutes of moderate physical activity on most days of the week is recommended (> 150 minutes a week). However, for those who have lost a considerable amount of weight, higher amounts of physical activity may be required for weight maintenance (> 275 minutes a week).³³

Dietary Changes

Weight loss is directly related to calorie content and the ability to maintain caloric restriction; the proportions of nutrients in the diet have thus far been shown to be irrelevant to weight loss itself. The ability of patients to maintain the dietary changes over the long-term appears to be most important.⁴⁶ Some diets may provide higher levels of satiety and thus be easier to maintain. Exhibit 6 provides some comparison information on various diets.

Low-Carbohydrate Diets

Because of their higher protein and fat content and lower fiber content, concerns have been raised about the potential health consequences of low-carbohydrate diets. Published long-term data are lacking. Short-term studies comparing traditional low-fat diets with low-carbohydrate diets found lower triglyceride levels, higher high-density lipoprotein cholesterol levels, similar low-density

Exhibit 6: Comparing Various Example Diets

Diet	Total Calories per Day ¹	Carbohydrate (% of calories)	Protein (% of calories)	Fat (% of calories)	Weight Loss Difference ²	References
Typical U.S.	2,200	50%	15%	35%	-	47
Recommended (not weight loss)	Varies by age, gender and activity level	45 - 65%	10 - 35%	20 - 35%	-	48, 49
Low-carbohydrate diet (Atkins)	1,152/1,627/1,990 (induction/ongoing/maintenance)	5% / 9% / 19%	35% / 33% / 25%	59% / 58% / 52%	2.5 ± 1.8 kg at 12 weeks; 4.0 ± 0.4 kg at 24 weeks At 1 year - no significant difference in maintained weight loss compared with other diets	47, 50, 51, 55, 56
Moderate carbohydrate diet (carbohydrate Addict's Diet, Zone, South Beach)	1,476	24%	23%	54%	Equals Weight Watchers and Ornish, < Atkins at 1 year	47, 50, 55, 56
Low-glycemic index diet (Sugar Busters!)	1,521	45%	23%	26%	1.1 kg at 6 months	52, 53
Low-fat/calorie restricted diet (Weight Watchers, LEARN, Nutrisystem, Jenny Craig)	1,200 to 1,500	56 - 59%	20 - 24%	20 - 26%	5.6 kg vs 6.5 kg for other diets at 1 year	54, 55, 56
Very low calorie diet (Ornish)	1,273	81%	15%	9%	Equals Zone, Weight Watchers, LEARN, < Atkins at 1 year	55, 56
Very low calorie diet (Medifast/Op-tifast)	800 to 1,000	40%	40%	20%	5.4% of starting weight over 3 months 3.7 kg at 6 months	57, 58
Mediterranean diet (moderate fat/restricted calorie)	1,500	50%	18%	35%	1.75 kg over 6 months 2.69 kg over 12 months	59

¹Calories per day may vary based on starting weight, current activity and gender. General values for women were used in this table.

²Weight loss is difference compared to other diets except were noted.

lipoprotein cholesterol levels, and lower A1C levels in persons on low-carbohydrate diets.⁴⁶ These diets induce greater weight loss at three and six months than traditional low-fat diets; however, by one year there is no significant difference in maintained weight loss. Low-carbohydrate diets had lower dropout rates than low-fat diets in several studies, possibly because of the high pro-

tein content and low glycemic index, which can help induce satiety. Data indicate that low-carbohydrate diets are a safe, reasonable alternative to low-fat diets for weight loss. Additional studies are needed to investigate the long-term safety and effectiveness of these and other approaches to weight loss.

Low-Glycemic Index Diets

In short-term trials, low glycemic index diets have been shown to be more effective than low-calorie or higher glycemic index diets.^{52,53} There have been at least seven randomized controlled trials (N = 278) lasting at least five weeks. The longest studies had a six-month intervention with a six-month follow-up. No studies reported on adverse effects, mortality, or quality of life. Compared with other diets, low-glycemic index diets resulted in statistically significant reductions in BMI, LDL cholesterol, and total fat mass. There was a reduction in insulin resistance, but not fasting insulin.

Low-Fat Diets

A Cochrane review suggests that fat-restricted diets are no better than calorie restricted diets in achieving long-term weight loss in overweight or obese people.⁵⁴ Overall, participants lost slightly more weight on the control diets, but this was not significantly different from the weight loss achieved through dietary fat restriction.

The Ornish diet is a very low-fat diet used for reversing cardiovascular disease. It has been compared in two trials to several other popular diets (Zone, Weight Watchers, Atkins, and LEARN).⁵⁵ Each popular diet modestly reduced body weight and several cardiac risk factors at one year. In one trial, mean (SD) weight loss at one year was 2.1 (4.8) kg for Atkins, 3.2 (6.0) kg for Zone, 3.0 (4.9) kg for Weight Watchers, and 3.3 (7.3) kg for Ornish. Overall dietary adherence rates were low in this trial (Atkins 53% of 40 participants completed, Zone 65 percent of 40, Weight Watchers 65 percent of 40 completed and Ornish 50 percent of 40 completed), although increased adherence was associated with greater weight loss and cardiac risk factor reductions for each diet group.⁵⁵ In another trial in overweight/obese, nondiabetic, postmenopausal women, mean 12-month weight loss was as follows: Atkins, -4.7 kg (95% confidence interval [CI], -6.3 to -3.1 kg), Zone, -1.6 kg (95% CI, -2.8 to -0.4 kg), LEARN, -2.6 kg (-3.8 to -1.3 kg), and Ornish, -2.2 kg (-3.6 to -0.8 kg).⁵⁶ Weight loss was significantly greater for the Atkins group, but not statistically different among the Zone, LEARN, and Ornish groups.

Very Low-Calorie Diets

Medifast is an example of a portion-controlled, low-fat, low-calorie weight-loss plan that uses meal replacements. The primary Medifast weight loss program, “5 plus 1,” calls for five daily Medifast meal-replacement drinks or foods (all available only through the company) plus one “lean and green” meal, consisting of lean meat or fish plus salad or green vegetables. One trial compared this diet with

a restricted calorie diet in 120 men and women with BMI greater than 35.⁵⁷ At one year, there was greater weight loss (4.7 vs. 1.9 kg), reduction in waist circumference, and fat mass loss in the Medifast group, which was statistically significant. Another trial in those with BMI greater than 30 found similar results at 16 weeks (4.9 kg greater mean weight loss).⁵⁸ In this trial, patients were followed for an additional 24 weeks of maintenance; patients who had been on the meal replacement plan regained more weight (mean 4.0 kg) than the control group. This illustrates the difficulties people can have transitioning back to normal foods.

Behavioral

Behavioral interventions for weight loss and maintenance often include cognitive and behavioral management techniques to help participants initiate and sustain needed lifestyle changes. According to the USPSTF, effective weight-loss programs involve 12 to 26 group or individual sessions over the course of a year that cover multiple behavioral management techniques.²⁵ These may include setting weight-loss goals, strategizing about how to maintain lifestyle changes, incorporating exercise, eating a more healthful diet, stress-reducing activities, and learning to address the psychological, social and other barriers that may be roadblocks to weight loss. The task force found that people in these programs generally lost nine to 15 pounds in the first year.

Behavioral interventions may be delivered in many different health care, commercial, and community settings. Examples of commercial-based programs that offer these types of interventions as part of an overall weight-loss program are Weight Watchers, TOPS (Take Off Pounds Sensibly), and Jenny Craig. An example of a community-setting based program is the CDC led National Diabetes Prevention Program.

Although specifically geared toward preventing type 2 diabetes, the National Diabetes Prevention Program (www.cdc.gov/diabetes/prevention/about.htm) is at its core a weight-loss program that emphasizes incorporating physical activity and healthy eating into one's daily life. In the National Diabetes Prevention Program, the YMCA and United HealthCare partnered with the CDC to deliver an evidence-based lifestyle program. Participants work with a lifestyle coach in a group setting to receive a one-year lifestyle change program that includes 16 core sessions (usually one per week) and six post-core sessions (one per month). Lifestyle coaches work with participants to identify emotions and situations that can sabotage their success, and the group process encourages participants to share

strategies for dealing with challenging situations.

For those patients who struggle with emotional eating or have been diagnosed with an eating disorder that is contributing to their obesity, referral to psychotherapists or specialized eating disorder programs may be necessary. Community support groups such as Overeaters Anonymous are another resource.

Pharmacologic Therapy

Antiobesity medications primarily work by suppressing appetite or inhibiting fat absorption. Overall, these agents have had low utilization. In a National Health and Nutrition Examination Survey (NHANES) in 2007 to 2008, although 45.9 percent of men and 45.0 percent of women were candidates for obesity treatment, only 3.7 percent took nonprescription weight-loss medications and 2.2 percent took prescription agents to control weight during the preceding year.⁶⁰ Overall, 0.5 percent and 0.1 percent of participants were taking phentermine and orlistat, respectively.

One reason for underutilization has been concerns about adverse effects. Numerous once-promising weight-loss drugs have been abandoned because of serious toxic effects: aminorex (which caused pulmonary hypertension, 1972), fenfluramine and dexfenfluramine (valvulopathy, 1997), phenylpropylamine (stroke, 2000), rimonabant (suicidal ideation and behavior, 2010), and sibutramine (myocardial infarction and stroke, 2010). The removal of sibutramine from the market left orlistat as the only prescription drug approved for the long-term treatment of obesity until this past year. In 2012, two new products – phentermine/topiramate (Qsymia[®]) and Lorcaserin (Belviq[®]) were FDA approved for long-term use. Exhibit 7 provides basic information about each of the currently approved antiobesity agents.

Sympathomimetics

The sympathomimetic agents such as phentermine, phendimetrazine, and diethylpropion, when given as monotherapy, are approved for short-term therapy of obesity and effective in helping patients achieve a mean weight loss of 3.6 to 7.5 kg at six months; however, discontinuation of the medication results in weight regain. These agents can have significant adverse effects and have many contraindications (Exhibit 7).

Orlistat

Orlistat results in better weight loss than placebo, which it does by blocking the absorption of 30 percent of dietary fat.^{63,74} The prescription dose (120

mg three times daily) is the optimum regimen in terms of weight loss, but the OTC dose still results in greater weight loss than placebo. Most trials showed significant improvement in at least some lipid concentration parameters, and, in three RCTs, orlistat produced statistically significant reductions in blood pressure relative to placebo. In obese patients with type 2 diabetes, orlistat resulted in a significantly greater weight loss at one year compared with placebo, and some parameters of glycemic control and lipid concentrations also showed significantly greater improvements compared with placebo. The incidence of gastrointestinal adverse events was consistently higher in orlistat groups compared with placebo, and orlistat use was associated with lower serum levels of fat-soluble vitamins. In a cost-effectiveness analysis, the cost per quality-adjusted life-year for orlistat was £45,881 (U.S. equivalent not given).⁷⁴

Phentermine/Topiramate

Long-term success of single-drug therapies for obesity is often limited by the counter-regulatory adaptive mechanisms of the human body, especially the processes in the central nervous system that regulate energy intake and homeostasis. Thus, there is growing interest in combination drug therapies, which may more effectively overcome compensatory mechanisms than treatments working via a single mechanism, to achieve more favorable long-term weight-loss outcomes than monotherapy.

Sympathomimetics like phentermine have been used for many years for weight loss but have limitations because of the adverse effects of doses required to suppress appetite. In searching for potential weight-loss medications, it was noted that unintentional weight loss was seen when patients were treated with topiramate for epilepsy and migraine prophylaxis. Because of this, topiramate began to be used off-label for weight loss.

When used at recommended doses for epilepsy and migraine prophylaxis and as off-label monotherapy for obesity, topiramate causes a high rate of cognition-related adverse events. In particular, patients have psychomotor slowing, difficulty with concentration and attention, memory impairment, and language difficulties. Alone, it results in about a 4 kg weight loss over one year.^{78,79}

A newly approved combination combines immediate-release phentermine and delayed-release topiramate beads in a timed-release capsule form. This combination drug therapy is available in four fixed-dose strengths: 3.75/23 mg (low dose), 7.5/46 mg (mid-dose), 11.25/69 mg (three-quarter dose), and 15/92 mg (full-dose). In order to minimize adverse

Exhibit 7: FDA Approved Prescription and Over the Counter Weight Loss Medications⁶¹⁻⁷⁶

Drug	Mechanism of Action	Effectiveness Compared to Placebo	Common Adverse Effects	Contraindications	Comments
Diethylpropion (Tenuate, Tenuate Dospan), Phentermine (Adipex), Benzphetamine (Didrex [®]), Mazindol (Mazanor, Sanorex), Phendimetrazine (Bontril [®])	Sympathomimetic - Enhancement of norepinephrine release and possibly blockade of norepinephrine reuptake	3.6 - 7.5 kg at 6 months (phentermine) ⁶¹ , 3.0 kg at 6 months (diethylpropion) ⁶²	Dry mouth, headache, insomnia, nervousness, irritability, and constipation. More clinically significant side effects include: palpitations, tachycardia, hypertension	Pulmonary hypertension Advanced arteriosclerosis, Cardiovascular disease, Moderate to severe hypertension, Hyperthyroidism, Known hypersensitivity or idiosyncrasy to the sympathomimetic amines, Glaucoma Stroke, Arrhythmias Pregnancy Nursing Agitated states. History of drug abuse during or within 14 days of taking monoamine oxidase inhibitors.	DEA Class IV, FDA approved for short term use (Package inserts say a few weeks, ~12 weeks)
Phentermine/topiramate (Qsymia [®])	See above and unknown for topiramate; May be AMPA/KA receptor antagonism	75% with ≥5% weight loss versus 30% on placebo at 2 yrs ⁶³ ; 50% with ≥10% weight loss at 1 yr; 7.5 kg greater weight loss than placebo at 2 years (all studies 3.5-9 kg over 1 yr) ⁶⁵⁻⁶⁸	Constipation Dry mouth Paresthesias Dysgeusia Insomnia [most common from clinical trials of combination, see above for possible AE of phentermine, other AE of topiramate include difficulty concentrating, menstrual spotting, hair loss, palpitations.	Same as above and Use with caution in patients with a history of kidney stones.	DEA Class IV; REMS – teratogenic potential of topiramate (cleft palate) – Limited distribution Monitor for depression, suicidal ideation, cognitive impairment.
Lorcaserin (Belviq)	Serotonin 2C agonist	47.5% with ≥5% weight loss versus 20.3% on placebo at 1 yr; 3.6 kg greater weight loss than placebo at 1 yr ^{70,71}	Headache Dizziness Fatigue Nausea Dry mouth Constipation	Pregnancy	DEA Class IV, Potential for serotonin syndrome when combined with other serotonergic or anti-dopaminergic (e.g, antipsychotic) agents; cognitive impairment, euphoria, dissociation
Orlistat (Xenical, Alli)	Inhibits absorption of dietary fat through gastrointestinal tract	RX dose (120 mg tid): Mean weight reduction of 3 kg at 1 year; increased absolute percentage of participants achieving 5% and 10% weight loss thresholds by 21% and 12% ^{74,75} OTC dose (60 mg tid): 1-2 kg over 4 months ⁷⁷	Oily discharge Gas with discharge Urgent need to have a bowel movement Oily or fatty stools Increased number of bowel movements Inability to control bowel movements Note: frequency and severity of adverse effects increase with increased dietary fat intake.	Pregnancy Chronic malabsorption syndrome Cholestasis	Rare reports of serious hepatic and renal adverse effects (cholelithiasis, cholestatic hepatitis, subacute liver failure, acute renal failure); FDA approved for ages 12 and older (Rx).

effects, it is recommended that the lowest dosage be started and titrated to mid-dose after two weeks.⁶⁴ Discontinuation or dose escalation should be considered for nonresponders (not achieving 3 percent weight loss after three months on the mid-dose). Discontinuation is recommended if at least 5 percent weight loss is not achieved after three months on the full-dose. For patients on the full-dose, if a decision is made to stop, gradual discontinuation is recommended. Doses higher than 7.5/46 mg are not recommended for patients with moderate or severe hepatic or renal disease. At one year, 50 percent of patients were able to achieve 10 percent or greater weight loss and 75 percent were able to achieve 5 percent or greater weight loss at one year. Exhibit 7 lists the most common adverse effects and contraindications to use.

Because of teratogenic potential with topiramate, the combination was approved with a Risk Evaluation and Mitigation Strategy (REMS). The purpose of the REMS is to inform prescribers and females of reproductive potential about the:

- Increased risk of congenital malformation, specifically orofacial clefts, in infants exposed to Qsymia during the first trimester of pregnancy
- Importance of pregnancy prevention for females of reproductive potential receiving Qsymia
- Need to discontinue Qsymia immediately if pregnancy occurs.⁸⁰
- In compliance with the REMS, the combination is currently only available through certified pharmacies.

Lorcaserin

Lorcaserin is a selective serotonin 2C receptor agonist. Serotonin 2C (5-HT_{2C}) receptors are located almost exclusively in the CNS and participate in the process of controlling caloric balance.⁸¹ While it is generally thought that 5-HT_{2C} receptors help to regulate appetite as well as mood, and endocrine secretion, the exact mechanism of appetite regulation is not yet known.

Concerns about the possible effects of lorcaserin on cardiac values have been raised. Fenfluramine and dexfenfluramine most likely caused cardiac valvulopathy by activation of serotonin 2B (5-HT_{2B}) receptors on cardiac interstitial cells.⁸² From echocardiographic data from more than 5200 participants who received lorcaserin or placebo for up to one year, the relative risk of FDA-defined valvulopathy in lorcaserin-treated participants, as compared with those who received placebo, was 1.16 (95% confidence interval, 0.81 to 1.67).⁸³ Lorcaserin has much greater selectivity for the 5-HT_{2C} receptor

than for the 5-HT_{2B} receptor and would not, at the clinically recommended dose, be expected to activate the 5-HT_{2B} receptor. Therefore, on the basis of these and other data, the FDA concluded that it is unlikely that lorcaserin increases the risk of valvulopathy in humans.⁸³

Placebo-subtracted mean differences in weight loss associated with lorcaserin treatment were 3.7 percent for one pivotal trial and 3.0 percent for another pivotal trial.⁸⁴ It should be noted however, that a small proportion of patients may achieve impressive and probably quite important weight loss. “Unfortunately, this will not be the experience of the majority of users.”⁸⁴ This agent is given as 10 mg twice daily and should be discontinued if 5 percent weight loss is not achieved by week 12. Exhibit 7 lists the most common adverse effects and contraindications to use.

Comparing Agents

Although there are no head-to-head comparisons of the new agents with each other or older agents, in examining the trials of each, some general statements can be made. Based only on trial data, it appears that lorcaserin was better tolerated than the phentermine/topiramate combination or orlistat. Orlistat, while difficult to tolerate from a gastrointestinal perspective, is the most widely available and is not a DEA scheduled substance like all of the other agents. The issue of teratogenicity and the accompanying REMS requirements make phentermine/topiramate more cumbersome to prescribe. Again based on trial data for each agent compared with placebo, the mean weight loss with phentermine/topiramate was slightly higher than that seen in the lorcaserin or orlistat trials compared with placebo; but the relative efficacy of these medications compared to each other can only be truly determined through a head-to-head trial. Also of note is that phentermine/topiramate has a more extensive adverse effect and contraindication profile than lorcaserin or orlistat, which is a result of being composed of two medications, each with its own adverse effects, particularly the sympathomimetic component.

Importance of Combining Lifestyle Changes and Medication

The effects of lifestyle modifications on body weight are so important that, without changes in these, drug therapy alone is bound to fail.⁸⁵ Almost every trial of a weight-loss medication is done on the background of diet or exercise, or both. Thus, to achieve the amount of weight loss seen in the trials and to help the individual transition from a weight-loss phase to long-term weight maintenance, lifestyle changes must be initiated and sustained.

Off Label Use For Weight Loss

Numerous medications have been and are being used off label for weight loss. The major ones include the use of phentermine or diethylpropion for longer than three months, topiramate (Topamax®), glucagon-like peptide-1 (GLP-1) receptor agonists (liraglutide [Victoza®] and exenatide [Byetta®]), metformin (Glucophage®), and bupropion (Wellbutrin®). With the exception of the noradrenergic agents, unintentional weight loss was noted when these agents were used for their FDA approved indications of treating seizures, migraines, type 2 diabetes and depression.

Although approved for managing type 2 diabetes, GLP-1 agonists induce weight loss by suppressing appetite and slowing gastric emptying, resulting in a more rapid onset of satiety, lasting for a longer period of time. In a meta-analysis of 25 trials, GLP-1 agonist groups achieved a greater weight loss than control groups (weighted mean difference -2.9 kg, 95% confidence interval -3.6 to -2.2; 21 trials, 6411 participants).⁸⁶ The duration of individual trials ranged from 20 to 52 weeks. Patients with and without diabetes lost similar amounts of weight in the trials. Exenatide has been studied for treating obesity in youth with similar amounts of weight lost and metabolic benefits.^{87,88}

Liraglutide has been compared to orlistat in one trial in obese adults.⁸⁹ From randomization to year one, liraglutide 3.0mg recipients lost 5.8kg (95% confidence interval 3.7-8.0) more weight than those on placebo and 3.8kg (1.6-6.0) more than those on orlistat (p=0.0001; intention-to-treat, last-observation-carried-forward). At year two, participants on liraglutide 2.4/3.0mg for the full two years (pooled group, n=184) lost 3.0kg (1.3-4.7) more weight than those on orlistat (n=95; P<0.001). Completers on liraglutide 2.4/3.0mg (n=92) maintained a two-year weight loss of 7.8kg from screening. With liraglutide 2.4/3.0mg, the two-year prevalence of pre-diabetes and metabolic syndrome decreased by 52 and 59 percent, with improvements in blood pressure and lipids.

In addition to modest weight loss, GLP-1 agonists have beneficial effects on systolic and diastolic blood pressure, plasma concentrations of cholesterol, and glycemic control. The most common adverse effects with GLP-1 agonists are nausea, diarrhea, and vomiting. Importantly, these agents are only available by subcutaneous injection.

Metformin, another antidiabetic agent, has also been studied for weight management in nondiabetic individuals, including adolescents.^{90,91} In adolescents, metformin was administered for 6-12 months at a dosage of 1,000 to 2,000 mg/daily, decreasing

BMI by 1.1 to 2.7 kg/m² compared with placebo or lifestyle intervention alone.⁹¹ Concomitantly, fasting insulin resistance improved after metformin therapy. Post-treatment follow-up was performed in one study, showing that after one year of discontinuation of therapy the decrease in BMI disappears.

Metformin has also been used to reduce weight gain from chronic antipsychotic therapy.⁹²⁻⁹⁴ Overall, patients on antipsychotics treated with metformin can lose 5 kg over a short period of time (12 weeks).⁹⁴ Like all other medications used for weight loss, patients regain weight when metformin is stopped.

Alternative Medications

Numerous dietary supplements and herbals are promoted for weight loss and are available for purchase over the counter, in health food stores, and on the Internet. It is important to know that these products exist because they are frequently used by consumers to attempt weight loss. In one survey, 33.9 percent of U.S. adults reported using a dietary supplement for weight loss.⁹⁵ Use was most common among women, 25 to 34 age group, and African Americans and Hispanics. Many believed these products are evaluated by the FDA and safer than over the counter and prescription medications because they are “natural”. Another survey found a disturbing trend of long-term use of these supplements; 10.2 percent reported greater than 12 month use.⁹⁶ Less frequent long-term use in women (7.7 percent) than men (15.0 percent). Almost 74 percent used a supplement containing a stimulant including ephedra, caffeine, and/or bitter orange (synephrine).

The two most commonly used dietary supplements in various combination products for weight loss are ephedrine like derivatives (synephrine) and caffeine sources (caffeine, green tea, guarana, yerba mate). Ephedra and ephedrine have been banned from dietary supplements by the FDA but can still be found in products imported from other countries. Because these agents do not need to undergo the usual drug approval process, their effectiveness and safety when used for weight loss are not well documented. There are a few small, short-term trials that suggest that ephedrine derivatives (being sympathomimetics), caffeine, green tea extract, chitosan and conjugated linoleic acid may be modestly effective in helping people lose 1 to 2 kg of weight more than placebo.^{97,98}

Pharmacotherapy Overall

When used with calorie restricted diets and physical activity, weight-loss medications, FDA approved and some used off label, result in more weight loss than

lifestyle changes alone. Weight-loss medications are generally associated with favorable changes in cardiometabolic and anthropometric parameters (e.g., blood pressure, high-density lipoprotein cholesterol levels, and waist circumference). Weight-loss medications also improve glycated hemoglobin levels in overweight and obese participants with type 2 diabetes. No weight loss medication has been shown to alter mortality from obesity complications. Weight-loss medications must be used longterm or any weight that is lost will typically be regained when the medication is discontinued.

Bariatric Surgery

There are several types of weight-loss surgeries, the most common being adjustable gastric banding, gastric bypass, and sleeve gastrectomy (Exhibit 8).^{33, 99-101} Bariatric surgical procedures are either restrictive (reducing the amount of food someone can consume in a single sitting), malabsorptive (reducing nutrient absorption by bypassing parts of the gut), or a combination.

Less commonly performed is the biliopancreatic diversion with duodenal switch (BPD/DS). The duodenal switch procedure is a combination of the sleeve gastrectomy and a long intestinal bypass.³³ The common channel, which is the length of the bowel exposed to both food and biliopancreatic fluid, is between 50 and 150 cm. The pylorus and most proximal portion of the duodenum are left intact. This allows for improved food processing by the stomach and thus little if any dumping syndrome. The small segment of duodenum, 1 to 4 cm, is quite resistant to the development of marginal ulceration, a common problem associated with the gastric bypass. The presence of a large sleeve facilitates more food intake over time than the gastric bypass. These patients tend to suffer from diarrhea in comparison to patients with the gastric bypass, who have constipation.

Gastric plication is a newer minimally invasive weight-loss surgery technique being performed at some centers.¹⁰² This procedure involves folding and sewing the stomach to reduce its capacity to approximately three ounces. The procedure does not involve the use of an implant (such as gastric banding). Also, unlike the gastric sleeve procedure, gastric plication may be reversible because a portion of the stomach is not removed. In addition, unlike gastric bypass, the gastric plication procedure does not involve rerouting and reconnecting the intestines; however, it is a relatively new procedure and there is limited data regarding its efficacy and safety at this time.

Indications

Adults

Consensus guidelines suggest that the surgical

treatment of obesity should be reserved for patients with a body-mass index (BMI) ≥ 40 kg/m² or with a BMI ≥ 35 kg/m² and one or more significant comorbid conditions, when less invasive methods of weight loss have failed and the patient is at high risk for obesity-associated morbidity and mortality (strength of recommendation: C, based on consensus guidelines).^{3,33} There is interest in performing bariatric procedures in those who are Class I obesity (30–35 kg/m²) who have comorbid conditions such as diabetes. In a review of the three published studies of this patient population, the authors concluded that current evidence suggests that, when compared with nonsurgical treatments, bariatric surgical procedures in patients with a BMI of 30 to 35 and diabetes are associated with greater short-term weight loss and better intermediate glucose outcomes.¹⁰³ The review also concluded that evidence is insufficient to reach conclusions about the appropriate use of bariatric surgery in this population until more data are available about long-term outcomes and complications of surgery.

Youth

It is important to note that there are no universally agreed on BMI criteria for bariatric surgery in youth.³⁶ Candidates should meet the following criteria:

- Have significant obesity, defined as either:
 - BMI ≥ 50 kg/m² or BMI above 40 kg/m² with significant, severe comorbidities.^{36,104}
 - or
 - BMI ≥ 40 kg/m² or BMI ≥ 35 kg/m² and one or more significant comorbid conditions.¹⁰⁵
- Be their adult height (usually at age 13 or older for girls and 15 or older for boys).
- Have serious health problems linked to weight, such as type 2 diabetes or sleep apnea, that may improve with bariatric surgery.
- Lifestyle modifications and/or pharmacotherapy for at least six months have failed.
- Candidates for surgery and their families must be psychologically stable and capable of adhering to lifestyle modifications.
- Access to experienced surgeons and sophisticated multidisciplinary teams who assess the benefits and risks of surgery is obligatory.

Health care providers should refer young patients to special youth bariatric surgery centers that focus on meeting the unique needs of youth.

Efficacy

Adults

Bariatric surgery appears to be a clinically effective and cost-effective intervention for moderately to se-

Exhibit 8: Comparison of Common Bariatric Procedures^{33, 99-101}

Roux-en-Y Gastric Bypass	Sleeve Gastrectomy	Adjustable Gastric Banding (Lapband, Realize Band-C)
Procedure/Anatomy		
Creation of a 20-30 cc gastric pouch, which is connected to a more distal portion of the small intestines. Food and digestive juices are separated for 3-5 ft.	Removal of the greater curvature of the stomach including the fundus while preserving the antrum resulting in a long narrow vertical pouch measuring 60-100 cc. Can be a first step for weight loss before a gastric bypass in patients with extreme obesity.	An adjustable silicone band is placed around the top part of the stomach creating a 15-30 cc pouch; adjustable and reversible
Speed of Weight Loss		
Rapid	Moderate pace	Gradual
Estimated Weight Loss		
At 1 year, 62 - 68% loss of excess weight At 2 years, 50 - 75% At 14 years, 49%	At 1 year, 33 - 45% At 2 years, 66%	At 1 year, 40 - 53% At 2 years, 45 - 78%
Effect on Comorbid Conditions		
Diabetes +++	++	+
Hypertension +++	++	++
Sleep Apnea ++	++	++
GERD ++++	-	+
Complications		
Dumping Syndrome Stricture Ulcers Bowel Obstruction Anemia Vitamin/Mineral deficiencies (Iron, Vitamin B12, folate) Leak Infection Internal bleeding	Heartburn Leak Stricture Significant nausea and vomiting Infection	Slippage Erosion Concentric dilatation Port problems Infection Inadequate weight loss
0.2 - 0.5% mortality rate	0.2 mortality rate	0.2 - 0.5% mortality rate
6% readmission rate	5% readmission rate	1% readmission rate
Other Comparisons		
Longest surgical procedure, hospital stay, and recovery.		Shortest surgical procedure, hospital stay, and recovery. Can be done outpatient. Best short term safety profile
Dietary Restrictions		
Patients must consume less than 800 calories per day in first 12-18 months; 1000-1200 thereafter; 3 small high protein meals per day Must avoid sugar and fats to prevent "dumping syndrome" Must take multivitamin to prevent deficiencies No drinking with meals	Patients must consume less than 600 -800 calories per day in first 24 months; 1000-1200 thereafter Must take multivitamin to prevent deficiencies No drinking with meals	Must consume less than 800 calories per day for 18-36 months; 1000-1200 thereafter Certain foods can get "stuck" if eaten (rice, bread, dense meats, nuts, popcorn) causing pain and vomiting No drinking with meals
Lifetime Nutritional Supplements		
Multivitamin Vitamin B12 Calcium Iron	Multivitamin Calcium Iron	Multivitamin Calcium

verely obese people compared with nonsurgical interventions.⁴¹ See Exhibit 8 for average weight loss with the various procedures.

The various bariatric procedures have also been compared with each other. On measures of weight

change, gastric bypass, which combines restrictive and malabsorptive components, was superior to the purely restrictive procedures of vertical banded gastroplasty, and laparoscopic adjustable gastric banding.^{41,99} In studies comparing the restrictive

	Normal						Overweight					Obese					
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Height (inches)	Body Weight (pounds)																
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204
65	114	120	126	132	138	144	150	158	162	168	174	180	186	192	198	204	210
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287

Source: Adapted from Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: The Evidence Report Appendix A

procedures, all studies found greater initial weight loss following vertical banded gastroplasty. Long-term studies have had conflicting results with some showing no difference at two to three years follow-up, greater weight loss with adjustable gastric banding at three to five years, and greater loss with gastroplasty at seven years.⁹⁹ Studies comparing open versus laparoscopic surgical approaches found no significant differences in weight loss outcomes between open and laparoscopic; both groups lost similar amounts of weight. Laparoscopic procedures are associated with fewer early postoperative complications. An in-depth review of these studies (through 2009) can be found in the health technology assessment publication.⁹⁹

Youth

Mounting evidence suggests that bariatric surgery can favorably change both the weight and health of youth with extreme obesity.¹⁰⁶ Over the years, gastric bypass surgery has been the main operation

used to treat extreme obesity in youth. An estimated 2,700 youth bariatric surgeries were performed between 1996 and 2003; more recent statistics are not available.¹⁰⁷

A review of short-term data from the largest inpatient database in the United States suggests that these surgeries are at least as safe for youth as adults.¹⁰⁷ A similar in-hospital complication rate but a significantly shorter length of stay among adolescents was seen. While the adult in-hospital mortality rate in that year was 0.2 percent, there were no in-hospital deaths among the teenage bariatric surgery patients. Despite the apparent safety of teen weight loss surgery when compared with adults, there are still risks that should be seriously considered and understood by prospective patients. As yet, gastric banding has not been approved for use in the United States for people younger than age 18. However, favorable weight-loss outcomes after gastric banding for youth have been reported.¹⁰⁸

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Cost Effectiveness

Surgical management with gastric bypass or banding of morbid obesity (BMI > 40) was more costly than nonsurgical management, but results in improved outcomes (in terms of quality of life) over a modeled 20-year time horizon.⁴¹ The incremental cost-effectiveness ratios (ICERs) ranged between £2000 and £4000 per QALY gained (U.S. dollars not available). Surgical management (with gastric banding) of moderate to severe obesity (BMI ≥ 30 and < 40) in patients with type 2 diabetes was more costly than nonsurgical management, but resulted in improved outcomes. The ICER reduced with a longer time horizon from £18,930 at two years to £1367 at 20 years.

In a U.S. based analysis of data from several Blue Cross Blue Shield plans, bariatric surgery was found to not reduce overall health care costs over a six-year period post-surgery.¹⁰⁹ This analysis found no evidence that any one type of surgery is more likely to reduce long-term health care costs. An analysis

of Swedish data over 20 years found that, compared with controls, surgically treated patients used more inpatient and nonprimary outpatient care during the first six-year period after undergoing bariatric surgery but not thereafter.¹¹⁰ Medication costs from years seven through 20 were lower for surgery patients (mean per year, \$920) than for control patients (\$1123, adjusted difference -\$228; 95% CI, -\$335 to -\$121; P < .001).¹¹⁰

Surgical Failure

Excessive food intake will defeat any of the bariatric procedures. Failed bariatric surgery is when less than 25 percent excess weight loss is achieved. At 10 years it is estimated that 23 percent of patients who started with a BMI less than 50 fail bariatric surgery.¹¹¹ Also at 10 years, it is estimated that 58 percent of patients with a BMI greater than 50 fail bariatric surgery.¹¹¹ Besides starting BMI, there are no other good indicators for prediction of weight-loss success or failure.

Safety

Complications do occur after bariatric surgery. Exhibit 8 includes complications which can occur with the various procedures. The peri-surgical mortality rate is low with all the procedures and is lowest for gastric banding procedures. Hospital readmissions related to complications are lowest for gastric banding.

Dumping syndrome occurs most often with gastric bypass. The patient may have nausea, shaking, sweating, diarrhea, and other symptoms soon after eating foods with a high simple sugar content. Patients with dumping syndrome and other food intolerances may need to be referred to a bariatric dietitian for education on adjusting food intake.

Medications used for treating associated comorbidities will typically need to be reduced as the patient loses weight. Medications for diabetes and hypertension will both require frequent monitoring and dosage adjustments during the first three months after surgery to prevent adverse effects.¹¹² The use of diuretic agents should be reduced or discontinued in the first month to avoid dehydration and electrolyte abnormalities. Lipid profile improvements will be seen during the first year and thus medication adjustments may be needed.¹¹³

Medications for all bariatric surgery patients need to be in crushed, liquid, or chewable forms during the first six months and can then be converted back to solid form for gastric banding patients, but some sleeve gastrectomy or gastric bypass patients may occasionally be required to have these special formulations for life after surgery; however, most patients are able to resume solid dosage forms after the surgical sites have healed.¹¹⁴ The use of whole medications may lead to ulceration as they sit in the stomach pouch or pouch enlargement. Nonsteroidal anti-inflammatory drugs are contraindicated after gastric bypass because of the incidence of ulcers. Pharmacists may need to be consulted to seek alternative formulations that are acceptable because some medication dosage forms cannot be altered.

Psychological issues such as adjusting to a new body image and social interactions may need to be addressed through counseling. Patients who lose a significant amount of weight will have large amounts of loose skin. This can be surgically removed after weight stabilization.

Long Term

Long term, those who maintain the lifestyle changes for the rest of their lives after bariatric surgery will maintain the weight loss. These changes include following a healthy well-balanced diet, taking the recommended vitamin supplementation, and exer-

cising regularly. In some patients with severe physical disabilities, physical therapy is often used to help them become mobile and to incorporate the appropriate amount of exercise. Vitamin and mineral supplements are required to prevent deficiencies of calcium, vitamin D, iron, B12, B1, and folate.¹¹²

Long-Term Weight Maintenance

When a successful weight-loss intervention is stopped, the benefits of treatment are often lost; this is true for lifestyle interventions as well as medications.^{115, 116} Weight recidivism can also occur after bariatric surgery.

Given that most people who lose weight with dietary restriction and exercise will regain most of it, several researchers have looked into the role of metabolic factors as contributors to body weight regulation and weight regain. The set-point theory holds that the body has a homeostatic feedback system for controlling its fat stores. The notion that weight regain may be due to an adaptive down-regulation in resting metabolic rate (RMR) after weight loss has prompted controversy and different interpretations of the same data.¹¹⁷ One small study found that energy restriction produced a transient hypothyroid-hypometabolic state that normalizes on return to energy-balanced conditions. The authors of this trial concluded that failure to establish energy balance after weight loss gives the misleading impression that weight-reduced persons are energy conservative and predisposed to weight regain.¹¹⁷ In contrast, studies by Rosenbaum and Leibel found that a greater than 10 percent weight loss caused a significantly decreased energy expenditure, compared with non-weight reduced individuals, which persisted long term and favored weight regain.¹¹⁸

In the absence of a continuing intervention at some level, long-term weight control is unlikely in most cases; hence, long-term treatment is imperative. The National Weight Control Registry (NWCR) prospectively works to identify and investigate the characteristics of individuals who have succeeded at long-term weight loss. Forty-five percent of registry participants lost the weight on their own and the other 55 percent lost weight with the help of some type of program.¹¹⁹ Ninety-eight percent of registry participants report that they modified their food intake in some way to lose weight. Ninety-four percent increased their physical activity, with the most frequently reported form of activity being walking.

There is variety in how NWCR members keep the weight off. Most participants report continuing to maintain a low-calorie, low-fat diet and maintaining high levels of physical activity. Seventy-

eight percent eat breakfast every day, 75 percent weigh themselves at least once a week, 62 percent watch less than 10 hours of television per week, and 90 percent exercise, on average, about one hour per day.¹¹⁹

Overall Impact of Weight Loss

Long-term weight loss in epidemiological studies is associated with reduced risk of type 2 diabetes, and may be beneficial for reducing cardiovascular disease.³⁸ As noted earlier under lifestyle changes, intentional weight loss using lifestyle changes results in a small all-cause mortality benefit in those who are obese with obesity-related risk factors.⁴² Disease-specific mortality benefits of weight loss have not been found.

Although cost effectiveness was addressed under each treatment section, there have been assessments examining the overall cost effectiveness of obesity treatment. A 2004 systematic literature review on the long-term effects and economic consequences of treatments for obesity found that while a very small number of studies show that obesity treatment can reduce health spending, most studies instead show that obesity treatment is cost-effective rather than cost-saving.⁴¹ This review encompassed lifestyle changes, medications (as of 2004), and bariatric surgery.

A 2010 analysis of TRICARE's Prime plan data found that among overweight and obese beneficiaries, lifetime medical expenditures declined \$440 (3 percent discount rate) for each permanent 1 percent reduction in body weight.¹²⁰ This includes \$590 in savings from improved health, offset by \$150 in additional expenditures from prolonged life. Estimates range from a \$660 reduction for grossly obese adults aged <45 years to a \$40 increase from grossly obese adults aged 55 to 64 years (where expenditures from increased longevity exceed savings from improved health). This cost analysis was the only one found that measured benefits from temporary weight loss. If weight loss is temporary and regained after 24 months, lifetime expenditures decline by \$40 per 1 percent reduction in body weight.¹²⁰

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Resources

This section lists the many available resources for additional information on overweight and obesity along with contact information. At the end is a listing of practice guidelines.

Centers for Disease Control, CDC's Division of Nutrition, Physical Activity, and Obesity (DNPAO)

Website: www.cdc.gov/obesity

DNPAO is working to implement policy and environmental strategies to make healthy eating and active living accessible and affordable for everyone. Website has links to overweight and obesity statistics, BMI calculators, educational resources, and much more.

Weight Control Information Network

Website: www.win.niddk.nih.gov

The Weight-control Information Network (WIN) is an information service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), part of the National Institutes of Health (NIH). Established in 1994, WIN provides the general public, health professionals, and the media with up-to-date, science-based information on obesity, weight control, physical activity, and related nutritional issues. WIN also developed Sisters Together: Move More, Eat Better, a national program to encourage black women to maintain a healthy weight by becoming more physically active and eating healthier foods. WIN provides fact sheets and brochures for a range of audiences, including parents, men, African American women, children, and many others. Some of WIN's materials are available in both English and Spanish, like the series Healthy Eating and Physical Activity Across Your Lifespan. WIN also operates a toll-free telephone line to respond to requests from the public

Obesity Society

Website: www.obesity.org

The Obesity Society is a professional organization dedicated to advancing the science-based understanding of the causes, consequences, prevention and treatment of obesity in order to improve the lives of those affected. The society publishes the Obesity Journal, a Childhood Obesity Resource Guide (only available to members), and various position statements. The website has sections for scientists, clinicians, consumers, and reporters.

American Society for Metabolic and Bariatric Surgery (ASMBS)

Website: www.asmb.org

The vision of the Society is to improve public health and well-being by lessening the burden of the disease of obesity and related diseases throughout the world. Founded in 1983, the purpose of the society is to advance the art and science of metabolic and bariatric surgery by continually improving the quality and safety of care and treatment of people with obesity and related diseases by:

- Advancing the science of metabolic and bariatric surgery and increase public understanding of obesity.
- Fostering collaboration between health professionals on obesity and related diseases.
- Providing leadership in metabolic and bariatric surgery the multi-disciplinary management of obesity.
- Advocating for health care policy that ensures patient access to prevention and treatment of obesity.
- Serving the educational needs of our members, the public and other professionals.

National Weight Control Registry

Website: www.nwcr.ws

The National Weight Control Registry (NWCR) is the largest prospective investigation of long-term successful weight loss maintenance. Given the prevailing belief that few individuals succeed at long-term weight loss, the NWCR was developed to identify and investigate the characteristics of individuals who have succeeded at long-term weight loss. The NWCR is tracking over 10,000 individuals who have lost significant amounts of weight and kept it off for long periods of time. Detailed questionnaires and annual follow-up surveys are used to examine the behavioral and psychological characteristics of weight maintainers, as well as the strategies they use to maintaining their weight losses.

The Academy for Eating Disorders

Website: www.aedweb.org

The Academy for Eating Disorders is a global professional association committed to leadership in eating disorders research, education, treatment and prevention.

The Academy of Nutrition and Dietetics

Website: www.eatright.org/public

The Academy of Nutrition and Dietetics is the world's largest organization of food and nutrition professionals. The Academy is committed to improving the nation's health and advancing the profession of dietetics through research, education and advocacy.

America on the Move

Website: aom3.americaonthemove.org

America on the Move is an evidence-based nonprofit organization located in Denver, CO. The mission is to improve health and quality of life by promoting healthful eating and active living among individuals, families, communities, and society

American Academy of Pediatrics (AAP) - Obesity

Website: www2.aap.org/obesity

The AAP obesity website is dedicated to the prevention of childhood overweight and obesity. The purpose of this site is to bring awareness to the serious health problem of childhood overweight and obesity; empower pediatricians and families to take action in their homes, offices and communities to prevent childhood obesity; and to support pediatricians, families and community advocates in improving the health status of those children who are already overweight and obese.

American Society of Bariatric Physicians

Website: www.asbp.org

The Society was founded in 1950 and is the oldest medical association focused on the education and training of medical professionals treating and managing patients affected by obesity and associated conditions. The Society is a medical professional association for physicians, nurse practitioners and physician assistants focused on the treatment and management of overweight and obese patients and their related conditions. The Society provides clinical education and training for the medical management of obesity.

Harvard School of Public Health - The Obesity Prevention Source

Website: www.hsph.harvard.edu/obesity-prevention-source

The Obesity Prevention Source is an in-depth resource for all who seek to understand the causes of obesity—and to reverse the epidemic of obesity in children and adults. Policy and environmental changes are the foundation of obesity prevention. Their goal is to inform and empower people with science-based information about what can and must be done to prevent adult and childhood obesity; to help those who are overweight achieve a healthier weight; and ultimately, to turn back the obesity epidemic's global spread.

Healthy People 2020

Website: www.healthypeople.gov

Healthy People provides science-based, 10-year national objectives for improving the health of all Americans. For three decades, Healthy People has established benchmarks and monitored progress over time in order to: encourage collaborations across communities and sectors, empower individuals toward making informed health decisions, and measure the impact of prevention activities.

International Association for the Study of Obesity

Website: www.iaso.org

The International Association for the Study of Obesity (IASO) is a not-for-profit organization linking over 50 regional and national associations with over 30,000 professional members in scientific, medical and research organizations. It is an umbrella organization for 53 national obesity associations, representing 55 countries. The International Obesity Task Force is part of this organization.

International Obesity Task Force

Website: www.iaso.org/iotf

The IOTF is a global network of expertise, a research-led think tank and advocacy arm of the International Association for the Study of Obesity.

Let's Move

Website: www.letsmove.gov

Let's Move! is a comprehensive initiative, launched by the First Lady, dedicated to solving the problem of obesity within a generation, so that children born today will grow up healthier and able to pursue their dreams.

Partnership for A Healthier America

Website: www.ahealthieramerica.org

The Partnership for a Healthier America (PHA) is devoted to working with the private sector to ensure the health of our nation's youth by solving the childhood obesity crisis. PHA brings together public, private and nonprofit leaders to broker meaningful commitments and develop strategies to end childhood obesity. Most importantly, PHA ensures that commitments made are commitments kept by working with unbiased, third parties to monitor and publicly report on the progress our partners are making to show everyone what can be achieved when we all work together. Founded in 2010 in conjunction with – but independent from – Let's Move!, PHA is a nonpartisan, nonprofit that is led by some of the nation's most respected health and childhood obesity advocates.

Obesity Action Coalition

Website: www.obesityaction.org

The Obesity Action Coalition is a nonprofit organization whose sole focus is helping individuals affected by obesity through education, advocacy and support. The OAC is made up of individuals directly affected by obesity who fight prevention, awareness, increasing education, expanding access to treatment and putting an end to the stigma and weight bias.

Shaping America's Youth

Website: www.shapingamericasyouth.org

Shaping America's Youth is a nonprofit organization steering a nationwide initiative to identify and centralize information on the widespread efforts underway throughout all sectors of American society to reverse the rapidly increasing prevalence of overweight and inactivity among children and adolescents. SAY's mission is to assure that the voices of families and communities are integrated into local and national policy to improve the nutrition, physical activity, and health of children and youth.

S.T.O.P Obesity Alliance

Website: www.stopobesityalliance.org

The Strategies to Overcome and Prevent (STOP) Obesity Alliance is a collaboration of consumer, provider, government, labor, business, health insurers and quality-of-care organizations united to drive innovative and practical strategies that combat obesity.

Yale Rudd Center for Food Policy & Obesity

Website: www.yaleruddcenter.org

The Rudd Center for Food Policy & Obesity is a nonprofit research and public policy organization devoted to improving the world's diet, preventing obesity, and reducing weight stigma. The Rudd Center serves as a leader in building broad-based consensus to change diet and activity patterns, while holding industry and government agencies responsible for safeguarding public health. The Center serves as a leading research institution and clearinghouse for resources that add to our understanding of the complex forces affecting how we eat, how we stigmatize overweight and obese people, and how we can change

Toolkits

Dietary Guidelines for Americans 2010 Tools

Website: www.health.gov/dietaryguidelines/2010.asp#tools

A compilation of resources that may assist health education experts in offering the latest science-based nutrition and physical activity recommendations to the public.

My Pyramid for Professionals

Website: www.mypyramid.gov/professionals/

My Pyramid is an education campaign about the USDA food guidelines. This page provides resources designed for health professionals.

California Medical Association Foundation's Obesity Prevention Project Toolkits

Website: www.calmedfoundation.org/projects/obesityProject.aspx

The California Association of Health Plans (CAHP) and the California Medical Association Foundation (CMAF) released three toolkits devel-

oped to address obesity and overweight and to encourage physicians to discuss healthier lifestyles with their patients. These three toolkits are designed for adults, children and adolescents, and pre/post bariatric surgery patients. The toolkits are the result of collaboration of health plans, academia, and public health entities to address California's obesity epidemic.

Eat Smart Move More, North Carolina - Pediatric Clinical Obesity Tools

Website: www.eatsmartmovemorenc.com/programs_tools/Pediatric-ObesityTools.html

This package of clinical tools is the result of a collaborative effort among health care professionals, public health professionals, and researchers. The Pediatric Obesity Clinician Reference Guide was developed by a committee of North Carolina physicians, with input from a larger expert panel of North Carolina clinicians, and was reviewed by health care professionals, public health professionals and researchers. It is based on the recommendations of the Expert Committee convened by the American Medical Association, in collaboration with the Health Resources and Service Administration and the Centers for Disease Control and Prevention (CDC), released in Pediatrics in December 2007. To complement the Pediatric Obesity Clinician Reference Guide, several other tools are provided: color-coded BMI charts, blood pressure tables, and prescription pads for promoting simple healthy messages for patients and their families.

National Initiative For Healthcare Quality (NICHQ) - The Childhood Obesity Action Network (COAN)

Website: www.nichq.org/NICHQ/Programs/ConferencesAndTraining/ChildhoodObesityActionNetwork.htm

The Childhood Obesity Action Network is a Web-based national network aimed at rapidly sharing knowledge, successful practices and innovation by: mobilizing and inspiring health care providers to accelerate improvements in care and advocate for change; partnering with a broad constituency of health professionals, quality improvement leaders, childhood obesity experts and child health advocates; designing and disseminating policy interventions that will enhance the ability of the healthcare system to address the obesity challenge, providing tools and technical assistance to improve clinical care, focusing on strategies to reduce health disparities and provide culturally effective care for all families; and committing to evaluating, learning and sharing evidence-informed strategies.

Ounce of Prevention is Worth a Pound

Website: www.healthyohioprogram.org/healthylife/nutri2/nutrikids2/ounce.aspx

The Ounce of Prevention is Worth a Pound toolkit was introduced in 2007. In 2010, the birth to 6 years materials were revised and the kit was expanded to include ages 7 to 18 years. The Ounce of Prevention is Worth a Pound toolkit was developed to address the growing epidemic of childhood obesity through prevention. By providing the nutrition and physical activity messages and routinely reviewing the child's height and weight, it is hoped that many cases of childhood obesity will be prevented. It is important for this messaging to begin at birth during well-child visits or other health-care provider appoint-

ments, i.e., WIC Program, Child and Family Health Services, HeadStart, daycare, after-school programs, etc., since a child's eating habits are formed by the time they are 2 years old.

CDC LeanWorks Obesity Cost Calculator

Website: www.cdc.gov/leanworks/costcalculator/

Uses input data provided by human resources or benefits personnel to calculate an estimate of the costs to an organization that are obesity related. More specifically, the Obesity Cost Calculator estimates the costs of obesity based on characteristics of a company. These include costs for medical expenditures and the dollar value of increased absenteeism resulting from obesity. Costs are estimated separately for four groups based on BMI (Overweight, Obese 1, Obese 2, and Obese 3)

Practice Guidelines

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