8. Obesity and Weight Management for the Prevention and Treatment of Diabetes: Standards of Care in Diabetes–2026

*American Diabetes Association Professional Practice Committee for Diabetes**

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The American Diabetes Association (ADA) "Standards of Care in Diabetes" includes the ADA's current clinical practice recommendations and is intended to provide the components of diabetes care, general treatment goals and guidelines, and tools to evaluate quality of care. Members of the ADA Professional Practice Committee for Diabetes, an interprofessional expert committee, are responsible for updating the Standards of Care annually, or more frequently as warranted. For a detailed description of ADA standards, statements, and reports, as well as the evidence-grading system for ADA's clinical practice recommendations and a full list of Professional Practice Committee members, please refer to Introduction and Methodology. Readers who wish to comment on the Standards of Care are invited to do so at professional.diabetes.org/SOC.

Obesity is a chronic, often relapsing disease with numerous metabolic, physical, and psychosocial complications, including a substantially increased risk for the development and progression of type 2 diabetes (1). There is strong and consistent evidence that obesity management can delay the progression from prediabetes to type 2 diabetes (2–6) and is highly beneficial in treating type 2 diabetes (7–15). In people with type 2 diabetes and overweight or obesity, modest weight loss improves glycemia and reduces the need for glucose-lowering medications, particularly insulin (7,16,17), and greater weight loss substantially reduces A1C and fasting glucose and may promote sustained diabetes remission (9,18–21). Metabolic surgery, which results in an average >20% body weight loss, greatly improving glycemia and often leading to remission of diabetes, improved quality of life, improved cardiovascular outcomes, and reduced mortality (22,23). Several therapeutic modalities, including intensive behavioral and lifestyle counseling, obesity pharmacotherapy, and metabolic surgery, may aid in achieving and maintaining meaningful weight loss and reducing obesity-associated health risks. This section aims to provide evidence-based recommendations for obesity and weight management, including behavioral, pharmacologic, and surgical interventions, in people with, or at high risk of, diabetes. Additional considerations regarding weight management in older individuals and children and adolescents can be found in section 13, "Older Adults," and section 14, "Children and Adolescents."

ASSESSMENT AND MONITORING OF THE INDIVIDUAL WITH OVERWEIGHT OR OBESITY

Recommendations

8.1 Use person-centered, nonjudgmental language that fosters collaboration between individuals and health care professionals, including person-first language

**A complete list of members of the American Diabetes Association Professional Practice Committee for Diabetes can be found at https://doi.org/10.2337/dc26-SINT.*

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(e.g., "person with obesity" rather than "obese person" and "person with diabetes" rather than "diabetic person"). **E**

8.2a Screen for overweight and obesity using BMI annually. To confirm excess adiposity, additional assessments of body fat using anthropometric assessments (e.g., waist-to-hip ratio) or direct measurements (e.g., dual-energy X-ray absorptiometry, bioelectrical impedance analysis) could be considered where available/feasible. **E**

8.2b Monitor obesity-related anthropometric measurements at least annually to inform treatment considerations. During active weight management treatment, increase monitoring to at least every 3 months. **E**

8.3 Accommodations should be made to provide privacy during anthropometric measurements. **E**

8.4 In people with type 2 diabetes and overweight or obesity, weight management should represent a primary goal of treatment along with glycemic management. **A**

8.5 Provide weight management treatment, aiming for any magnitude of weight loss. Weight loss of 5–7% of baseline weight improves glycemia and other intermediate cardiovascular risk factors. **A** Sustained loss of >10% of body weight usually confers greater benefits, including disease-modifying effects and possible remission of type 2 diabetes **A** and may improve long-term cardiovascular outcomes and mortality. **B**

8.6 Individualize initial treatment approaches for obesity (i.e., lifestyle and nutritional therapy, pharmacologic therapy, or metabolic surgery) **A** based on the person's medical history, life circumstances, and preferences. **C** Consider combining treatment approaches if appropriate. **C**

Obesity is defined by the World Health Organization as an abnormal or excessive fat accumulation that presents a risk to health (24). BMI (calculated as weight in kilograms divided by the square of height in meters [kg/m^2]) has been used widely to diagnose and stage obesity (overweight: BMI 25–29.9 kg/m^2; obesity class 1: BMI 30–34.9 kg/m^2; obesity class 2: BMI 35–39.9 kg/m^2; obesity class 3: BMI ≥40 kg/m^2). Despite its ease of measurement, BMI is not a perfect measure of adipose tissue mass and does not measure adipose tissue distribution or function, and it does not factor in the presence of weight-related health or well-being consequences (25,26). BMI is especially prone to misclassification in individuals who are very muscular (athletes) or in those with low muscle mass and in populations with different body composition and cardiometabolic risk (27). It is recommended that excess adiposity be confirmed by either direct measurement of body fat, where available, or at least one anthropometric criterion (e.g., waist circumference, waist-to-hip ratio, or waist-to-height ratio) in addition to BMI, using validated methods and cutoff points appropriate to age, sex, and ethnicity and particularly in individuals with BMI 25–34.9 kg/m^2 and in certain populations (South Asian individuals), as these measurements better reflect metabolic disease (28). However, confirming excess adiposity in routine clinical practice may be both challenging and unnecessary in the U.S. adult population aged 20–59 years, in whom the prevalence of obesity by BMI is nearly identical to the obesity prevalence after confirmation of excess adiposity in the vast majority (29). Thus, although BMI is not a perfect measure of adiposity, it remains an acceptable measure for use by clinicians who may not have the resources to obtain additional measures of adiposity on all individuals.

Obesity is a key pathophysiologic driver of diabetes, other cardiovascular risk factors (e.g., hypertension, hyperlipidemia, metabolic dysfunction–associated steatotic liver disease [MASLD], and inflammatory state), and ultimately cardiovascular and kidney disease (30). Diabetes can further exacerbate obesity, including through the use of glucose-lowering therapies that lead to weight gain (e.g., insulin, sulfonylurea, and pioglitazone), and obesity can exacerbate hyperglycemia and diabetes, thereby setting up a vicious cycle that contributes to disease progression and occurrence of microvascular and macrovascular complications. As such, treatment goals for both glycemia and weight are recommended in people with diabetes to address both hyperglycemia and its underlying pathophysiologic driver (obesity) and therefore benefit the person holistically.

Weight stigma, fat bias, and antifat bias are ways to describe the bias toward people living in larger bodies. Fat bias is prevalent among health care professionals and the general public. Health care professionals are strongly encouraged to increase their awareness of implicit and explicit weight-biased attitudes (31,32). Increasing empathy and understanding about the complexity of weight management among health care professionals is a useful avenue to help reduce weight bias (33). The Obesity Association, a subdivision of the American Diabetes Association, has recently developed guidelines on recognizing and addressing weight bias and stigma (32) and encourages adopting these guidelines to reduce weight bias and stigma.

A person-centered communication style that uses inclusive and nonjudgmental language and active listening to elicit individual preferences and beliefs and assesses potential barriers to care should be used to optimize health outcomes and health-related quality of life. Use person-first language (e.g., "person with obesity" rather than "obese person") to avoid defining people by their condition (25,32,34,35). Measurement of weight and height (to calculate BMI) and other anthropometric measurements should be performed at least annually to aid the diagnosis of obesity. More frequent assessments (at least every 3 months) should be undertaken to monitor response to treatment during active weight management (36). Clinical considerations, such as the presence of comorbid heart failure or unexplained weight change, may warrant more frequent evaluation (37,38). If such measurements are questioned or declined by the individual, the health care professional should be mindful of possible prior stigmatizing experiences and query for concerns, and the value of monitoring should be explained as a part of the medical evaluation process that helps to inform treatment decisions (39,40). Accommodations should be made to ensure privacy during weighing and other anthropometric measurements, particularly for those individuals who report or exhibit a high level of disease-related distress or dissatisfaction. Anthropometric measurements should be performed and reported nonjudgmentally; such information should be regarded as sensitive health information.

Health care professionals should advise individuals with overweight or obesity and those with increasing weight trajectories that, in general, greater fat accumulation increases the risk of diabetes, cardiovascular disease, and all-cause mortality and has multiple adverse health and quality of life consequences. Health care professionals should also assess readiness to engage in

behavioral changes for weight loss and jointly determine behavioral and weight loss goals and individualized intervention strategies using shared decision-making (41). Strategies may include nutrition and eating pattern changes, physical activity and exercise, behavioral counseling, pharmacotherapy, medical devices, and metabolic surgery. The initial and subsequent therapeutic choices should be individualized based on the person's medical history, life circumstances, and preferences (42).

Among people with type 2 diabetes and overweight or obesity who have inadequate glycemic, blood pressure, and lipid management and/or other obesity-related metabolic complications, modest and sustained weight loss (5–7% of body weight) improves glycemia, blood pressure, and lipids and may reduce the need for disease-specific medications (7,16,17,43). In people with prediabetes, 5–7% weight loss reduces progression to diabetes (2,17,44–47). Greater weight loss produces additional benefits, including a reduction in all-cause mortality and cardiovascular mortality (20,21,48,49). Mounting data have shown that >10% body weight loss usually confers greater benefits on glycemia and improves other metabolic comorbidities, including cardiovascular outcomes, metabolic dysfunction–associated steatohepatitis (MASH), MASLD, adipose tissue inflammation, and sleep apnea, as well as physical comorbidities and quality of life (6,20,21,30,45,49–58). In addition, some studies showed diabetes remission can be maintained for 2–5 years depending on the duration of diabetes (with responders having better β-cell function at baseline) (59).

With the increasing availability of more effective treatments, individuals with diabetes and overweight or obesity should be informed of the potential benefits of both modest and more substantial weight loss and guided in the range of available treatment options, as discussed in the sections below. Shared decision-making should be used when counseling on behavioral changes, intervention choices, and weight management goals.

NUTRITION, PHYSICAL ACTIVITY, AND BEHAVIORAL THERAPY INTERVENTIONS

Recommendations

8.7 Nutrition, physical activity, and behavioral therapy are recommended for people with type 2 diabetes and overweight or obesity to achieve both weight and health outcome goals. **B**

8.8a Interventions including high frequency of counseling (≥16 sessions in 6 months) with focus on nutrition changes, physical activity, and behavioral strategies to achieve a 500–750 kcal/day energy deficit (irrespective of macronutrient composition) should be recommended for weight loss when available. **A**

8.8b If access to such interventions is limited, consider alternative structured programs delivering nutrition changes, physical activity, and behavioral counseling (e.g., remote, telehealth, mobile app). **E**

8.9 Nutrition recommendations should be individualized to the person's preferences and nutritional needs. Use nutritional plans that create an energy deficit, while still following general nutritional guidance, to achieve weight loss. **A**

8.10 When developing a plan of care, consider systemic, structural, cultural, and socioeconomic factors that may impact nutrition patterns and food choices, such as food insecurity and hunger, access to healthful food options, and other social determinants of health. **C**

8.11 For those who achieve weight loss goals, continue to monitor progress, provide ongoing support, and recommend continuing interventions to maintain weight goals long term. **E** Effective long-term (≥1 year) weight maintenance programs provide monthly contact and support, include frequent self-monitoring of body weight (weekly or more frequently) and other self-monitoring strategies (e.g., food diaries or wearables), and encourage regular physical activity (200–300 min/week). **A**

8.12 Short-term nutrition intervention using structured, very-low-calorie meals (800–1,000 kcal/day) should be prescribed only to carefully selected individuals by trained practitioners in medical settings with close monitoring. Long-term, comprehensive weight maintenance strategies and counseling should be integrated to maintain weight loss. **B**

8.13 Nutritional supplements are not recommended, as they have not been shown to be effective for weight loss. **A**

8.14 Counsel and regularly monitor individuals pursuing intentional weight loss to ensure adequate nutritional intake, with particular attention to preventing protein insufficiency and micronutrient deficiencies. **E**

For a more detailed discussion of lifestyle management approaches and recommendations, see section 5, "Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes." For a detailed discussion of nutrition-specific interventions, please refer to "Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report" (60).

Behavioral Interventions

Numerous behavioral interventions have demonstrated positive effects from reducing energy intake, increasing physical activity, or some combination of these key lifestyle behaviors (61). The Look AHEAD (Action for Health in Diabetes) randomized controlled trial (RCT) demonstrated that people with obesity and type 2 diabetes could achieve and maintain long-term (up to 8 years after trial conclusion) weight loss by participating in a prospective intensive lifestyle intervention (ILI). Approximately half of ILI participants lost and maintained ≥5% of their initial body weight (46). Additionally, compared with the diabetes support and education group, ILI participants who lost ≥10% at 1 year had a 21% reduced risk of mortality (hazard ratio 0.79 [95% CI 0.67, 0.94]; P = 0.007) (62). Culturally tailoring behavioral interventions could be an additional useful tool for improving the impact of interventions (63–65).

To achieve significant weight loss with lifestyle behavior change programs, creating a 500–750 kcal/day energy deficit is recommended. For most women, this is equal to consuming approximately 1,200–1,500 kcal/day, and for most men, this is equal to consuming approximately 1,500–1,800 kcal/day, with adjustment for the individual's baseline body weight. Some RCTs report less than 5% weight loss in adults with diabetes and overweight or obesity following a lifestyle behavioral intervention, but this limited amount of weight loss has not been shown to improve glycemia, lipids, or blood pressure – rather, a minimum weight loss of 5% or more seems necessary to achieve metabolic improvements (66). Weight loss benefits are progressive; more intensive

weight loss goals (>7%, >10%, >15%) can achieve further health improvements if these goals can be feasibly and safely attained. Almost one-third of the Look AHEAD intensive lifestyle group participants lost and maintained ≥10% of their initial body weight at 8 years and required fewer glucose-, blood pressure-, and lipid-lowering medications than those randomly assigned to standard care (46).

Nutrition interventions can create the necessary energy deficit to promote weight loss in many ways, and no single way is best (19,67–69). Altering macronutrient content and using meal replacement plans prescribed by trained professionals are two commonly used approaches (70). Reducing processed and ultraprocessed food intake is also an encouraging area of ongoing weight loss research. The Preventing Overweight Using Novel Dietary Strategies (POUNDS) Lost trial reported small but significant improvements when ultraprocessed foods were replaced isocalorically by less processed foods, with improved trunk fat loss (β = 3.9 [95% CI −7.01 to −0.70]; *P* = 0.02) (71). The specific nutrition and lifestyle choices should be based on the individual's health status, maintaining or improving nutrition status and overall wellness, clinical considerations, social determinants of health, overall preferences, and other cultural and personal circumstances that affect eating and activity patterns (72) (see section 5, "Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes," for more discussion on processed and ultraprocessed foods).

There continues to be debate on the physiological basis of obesity (73,74), and low carbohydrate eating patterns continue to be of interest for people with diabetes and health care professionals. A 2022 meta-analysis of RCTs 12 weeks to 2 years in duration was conducted in people with overweight or obesity and with or without diabetes. Low carbohydrate diets were defined as nonketogenic, >50 g to 150 g carbohydrate per day, or <45% of total energy intake. Both at 3–12 months and up to 2 years after randomization, there were no greater benefits for those consuming low carbohydrate over balanced carbohydrate (defined as carbohydrate intake of 45–65% of total energy) in people with or without diabetes. Additionally, the authors concluded change in A1C was not meaningfully different among the groups (mean difference −0.14%) (75).

Based on two of the largest RCTs completed in the U.S. investigating lifestyle behavior change—the Diabetes Prevention Program (DPP) and Look AHEAD—proven intensive behavioral interventions generally include ≥16 sessions during an initial 6 months and focus on durable nutritional changes, physical activity, and behavioral strategies to achieve a ∼500–750 kcal/day energy deficit. Such interventions should be provided by trained individuals and can be conducted face-to-face or remotely and on an individual or group basis (66,76). Assessing a person's motivation level, life circumstances, cultural considerations, socioeconomic factors, and ability to implement behavioral changes to achieve weight loss should be considered along with medical status when such interventions are recommended and initiated (41,77).

Very-low-calorie interventions (usually 800–1,000 kcal/day) are another approach that might be appropriate in some people with diabetes and obesity. As evidenced by findings from the U.K.-based DiRECT (Diabetes Remission Clinical Trial), structured, very-low-calorie eating patterns, using high-protein foods and meal replacement products, may increase the pace and/or magnitude of initial weight loss and glycemic improvements compared with standard behavioral interventions (20,21,78). However, such intensive nutritional interventions should be provided only by trained and experienced professionals in medical settings with close ongoing monitoring and integration with behavioral support and counseling, and only for a short term (generally up to 3 months). Furthermore, due to the high risk of complications (electrolyte abnormalities, severe fatigue, cardiac arrhythmias, etc.), very-low-calorie intensive interventions should be prescribed only to carefully selected individuals, such as those requiring weight loss and/or glycemic management before surgery, if benefits exceed potential risks (79,80). As weight recurrence is common, such interventions should include long-term, comprehensive weight maintenance strategies and counseling to maintain weight loss and behavioral changes (81).

Despite widespread marketing and exorbitant claims, there is no clear evidence that nutrition supplements (e.g., herbs, vitamins and minerals, amino acids, enzymes, and antioxidants) are effective for obesity management or weight loss (82–84). Several large systematic reviews show that most trials evaluating nutrition supplements for weight loss are of low quality and at high risk of bias. High-quality published studies show little or no weight loss benefits.

It is important to monitor nutrition intake in individuals with diabetes undergoing treatment for obesity to prevent or mitigate nutrition deficiencies (85,86). Multivitamin mineral supplements can be considered for individuals who consume less than 1,200 kcal/day, exclude micronutrient nutrient-rich food groups from their usual intake (e.g., fruits and vegetables, whole grains, proteins, nuts, and seeds), are strict vegetarians, have underlying health conditions that impair nutrient absorption, are older (aged >50 years), or experience excessive weight loss (87). Those experiencing significant (>20%) or rapid (>4% per month) weight loss should be screened for micronutrient deficiencies (88). Screening for micronutrient deficiencies should be guided by general clinical judgment, as there are no universal recommendations for how often to screen. Some micronutrients of concern include iron, calcium, magnesium, zinc, and vitamins A, D, E, K, B1, B12, and C (89).

Monitoring protein and fiber intake is also important for people undergoing weight loss treatment. To preserve lean mass, health care professionals should emphasize the importance of optimizing protein intake alongside resistance training and encourage protein supplementation as needed (90). Also encouraging adequate fiber and water intake to prevent and manage constipation for people consuming very-low-calorie eating patterns can be useful. Referral to a registered dietitian nutritionist can streamline this education.

For a more detailed discussion of nutrition and physical activity in the context of diabetes and weight loss, see section 5, "Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes."

For people undergoing metabolic surgery, it is advised to provide corrective supplementation in cases of documented deficiency (91) and prophylactically (92). See METABOLIC SURGERY, below, for more details on nutrition guidance for people who have undergone metabolic surgery.

Physical activity is beneficial to people with diabetes and overweight or obesity for numerous reasons, primarily for maintaining and improving overall health, and

should be encouraged not only for weight loss. Rather, physical activity should be encouraged because it can improve quality of life, cardiorespiratory fitness, and glycemic management efforts and reduce mortality (93–96). Like all adults, people with overweight and obesity should be encouraged to do activities they enjoy, with an eventual goal of getting 150 min of physical activity per week. For a more detailed discussion of physical activity and exercise, see section 5, "Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes."

Health disparities adversely affect people who have systematically experienced greater obstacles to health based on their race or ethnicity, socioeconomic status, gender identity, disability, or other factors. Overwhelming research shows that these disparities can significantly affect health outcomes, including increasing the risk for obesity, diabetes, and diabetes-related complications. Health care professionals should evaluate systemic, structural, and socioeconomic factors that may impact food choices, access to healthful foods, and nutrition patterns; behavioral patterns, such as neighborhood safety and availability of safe outdoor spaces for physical activity; environmental exposures; access to health care; social contexts; and, ultimately, diabetes risk and outcomes. For a detailed discussion of social determinants of health, refer to "Social Determinants of Health: A Scientific Review" (97).

Maintaining weight loss is of paramount importance, and people with type 2 diabetes and overweight or obesity who have lost weight should be offered long-term (≥1 year) comprehensive weight loss maintenance programs. Weight loss maintenance programs should be delivered by an interprofessional team with appropriate training and experience in implementing long-term weight maintenance programs. While we acknowledge that most insurers, Medicare, and Medicaid are not currently covering many long-term weight maintenance programs, there is evidence to support their effectiveness and benefits (46,66,98) on both personal and population levels. Weight maintenance programs should include at least monthly contact with trained individuals and focus on ongoing monitoring of body weight (weekly or more frequently) and/or other self-monitoring strategies such as tracking food and beverage intake and steps, continued focus on nutrition and behavioral changes, and participation in high volume of physical activity (200–300 min/week) (99, 100). Some commercial and proprietary weight loss programs have shown promising weight loss results; however, results vary across programs, most lack evidence of effectiveness, many do not satisfy guideline recommendations, and some promote unscientific and possibly dangerous practices (101,102). Along with routine medical management visits, people with obesity and diabetes or prediabetes should be screened during diabetes self-management education and support and medical nutrition therapy encounters for a history of dieting and past or current disordered eating behaviors. See section 5, "Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes," for more information on disordered eating and the role of behavioral health counseling in obesity management.

PHARMACOTHERAPY

Recommendations

8.15 Whenever clinically appropriate, engage other care team members to minimize use of weight-promoting medications for treatment of other conditions among adults with diabetes and obesity. **E**

8.16 When choosing glucose-lowering medications for people with type 2 diabetes and overweight or obesity, prioritize medications with beneficial effect on weight. **B**

8.17 Obesity pharmacotherapy should be considered for people with diabetes and overweight or obesity along with lifestyle changes. Potential benefits and risks must be considered. **A**

8.18 In people with diabetes and overweight or obesity, the preferred pharmacotherapy should be a glucagon-like peptide 1 receptor agonist or dual glucose-dependent insulinotropic polypeptide and glucagon-like peptide 1 receptor agonist with greater weight loss efficacy (i.e., semaglutide or tirzepatide), especially considering their added weight-independent benefits. **A**

8.19 Obesity pharmacotherapy indicated for chronic therapy should be continued beyond reaching weight loss goals to maintain the health benefits, as discontinuation often results in recurrence of weight gain and worsening or reemergence of cardiometabolic risk factors. **B**

8.20 Individualize the dose and the dose titration approach of obesity pharmacotherapy to balance effectiveness, health benefits, and tolerability; the optimal treatment dose may not be the maximum approved dose. **B**

8.21 In people with diabetes not reaching weight treatment goals, modify or intensify treatment with additional approaches, including structured lifestyle management programs, metabolic surgery, **A** and additional or alternative pharmacologic agents. **B**

Glucose-Lowering Therapy

Numerous effective glucose-lowering medications are currently available. However, to achieve both glycemic and weight management goals for diabetes treatment, health care professionals should prioritize the use of glucose-lowering medications with a beneficial effect on weight. Agents associated with clinically meaningful weight loss include glucagon-like peptide 1 (GLP-1) receptor agonists (RAs) and a dual glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 RA (tirzepatide), and they are the preferred agents in individuals with stable insurance coverage. Sodium–glucose cotransporter 2 inhibitors, metformin, and amylin mimetics are also associated with weight loss, although the magnitude of weight loss is much smaller (<5% body weight loss). Dipeptidyl peptidase 4 inhibitors, centrally acting dopamine agonist (bromocriptine), α-glucosidase inhibitors, and bile acid sequestrants (colesevelam) are considered weight neutral. In contrast, insulin secretagogues (sulfonylureas and meglitinides), thiazolidinediones, and insulin are often associated with weight gain (see section 9, "Pharmacologic Approaches to Glycemic Treatment").

Concomitant Medications

Health care professionals should carefully review the individual's concomitant medications and, whenever clinically appropriate, engage other care team members to minimize or provide alternatives for medications that promote weight gain (103–106). Examples of medications associated with weight gain include antipsychotics (e.g., clozapine, olanzapine, and risperidone), some antidepressants (e.g., tricyclic antidepressants, some selective

serotonin reuptake inhibitors, and monoamine oxidase inhibitors), glucocorticoids, injectable progestins, some anticonvulsants (e.g., gabapentin and pregabalin), β-blockers (e.g., atenolol, metoprolol, and propranolol), and possibly sedating antihistamines and anticholinergics (103). The use of weight promoting medication can hinder the effectiveness of lifestyle interventions for weight loss in people with diabetes. Notably, a post hoc analysis of the Look AHEAD study showed a negative association between the use of weight-promoting or obesogenic medications and weight loss outcomes. The association was dose-dependent—participants using two or more obesogenic medications were less likely to achieve the 5% and 10% weight loss benchmarks than those using one medication (106).

Approved Obesity Pharmacotherapy

The U.S. Food and Drug Administration (FDA) has approved several medications for obesity as adjuncts to a reduced-calorie eating pattern and increased physical activity in individuals with BMI ≥30 kg/m^2 or ≥27 kg/m^2 with one or more obesity-associated comorbid conditions (e.g., type 2 diabetes, hypertension, and/or dyslipidemia). Nearly all FDA-approved obesity pharmacotherapies have been shown to improve glycemia in people with type 2 diabetes and delay progression to type 2 diabetes in at-risk individuals (4,5,11–14,54,107–111) and some of these agents (e.g., liraglutide, semaglutide, and tirzepatide) have a dual indication for glucose lowering as well as weight management. Phentermine and other older adrenergic agents are approved for short-term treatment (112), while all others are approved for long-term treatment (**Tables 8.1** and **8.2**). Refer to section 14, "Children and Adolescents," for medications approved for adolescents with obesity. In addition, setmelanotide, a melanocortin 4 receptor agonist, is approved for use in cases of rare genetic mutations resulting in severe hyperphagia and extreme obesity, such as leptin receptor deficiency and proopiomelanocortin deficiency.

In people with type 2 diabetes and overweight or obesity, agents with both glucose-lowering and weight loss effects are preferred (refer to section 9, "Pharmacologic Approaches to Diabetes Treatment") and include agents from the GLP-1 RA class and the dual GIP and GLP-1 RA class (collectively referred to as nutrient-stimulated hormone-based therapeutics, a class that also includes other investigational agents that act on various nutrient-stimulated hormonal pathways, like glucagon and amylin). Should use of these medications not result in achievement of weight management goals, or if they are not tolerated or are contraindicated, other obesity treatment approaches should be considered. In the Effect and Safety of Semaglutide 2.4 mg Once-Weekly in Subjects With Overweight or Obesity and Type 2 Diabetes (STEP 2) trial, semaglutide 2.4 mg resulted in a body weight loss of 6.2% more than placebo and A1C lowering of 1.2% more than placebo after 68 weeks (54). In the Efficacy and Safety of Tirzepatide Once Weekly in Participants With Type 2 Diabetes Who Have Obesity or Are Overweight: A Randomized, Double-Blind, Placebo-Controlled Trial (SURMOUNT-2), tirzepatide resulted in body weight loss of 9.6% and 11.6% more than placebo and A1C lowering of 1.55% and 1.57% more than placebo after 72 weeks of treatment with the 10 mg and 15 mg doses, respectively, with adverse effects similar to those seen with the GLP-1 RA class (109). The observed weight loss with obesity pharmacotherapy is lower in people with diabetes than in those of similar baseline weight without diabetes; therefore, it is important to appropriately manage expectations of individuals with diabetes and health care professionals. Success should be framed as weight loss plus glycemic improvement, lower insulin needs and cardiovascular benefit. Obesity pharmacotherapy has demonstrated multiple additional benefits beyond weight loss and improvement in glucose management. Some such examples include improvements in cardiovascular risk factors (e.g., blood pressure and lipids), inflammation, obstructive sleep apnea, MASLD and MASH, and symptoms related to heart failure with preserved ejection fraction (113–116). Liraglutide 1.8 mg and semaglutide 1 mg (doses approved for type 2 diabetes, which are lower than those approved for the treatment of obesity) demonstrated reduction in cardiovascular events in people with type 2 diabetes who are either at high risk for cardiovascular disease or have established cardiovascular disease (55,117). Additionally, semaglutide 2.4 mg (dose approved for the treatment of obesity) also demonstrated reduction in cardiovascular events in people with overweight or obesity and preexistent cardiovascular disease but without diabetes (118).

Health care professionals should be knowledgeable about the dosing, benefits, and risks for each treatment option to balance the potential benefits of successful weight loss against the potential risks for each individual. The high risk and prevalence of cardiovascular disease in people with diabetes must be balanced against the lack of long-term cardiovascular outcomes trial data for agents like combination naltrexone and bupropion and combination phentermine and topiramate. The response to all obesity pharmacotherapies is highly heterogeneous; therefore, their weight loss effectiveness should be reevaluated after initiation and therapy adjustments should be considered, if needed. All these medications are contraindicated in individuals who are pregnant or actively trying to conceive and are not recommended for use in individuals who are nursing. Individuals of childbearing potential should receive counseling regarding the use of reliable methods of contraception while using weight loss medications. Tirzepatide in particular may reduce the efficacy of oral hormonal contraceptives due to delayed gastric emptying, an effect that is largest after the first dose and diminishes over time. Individuals using oral hormonal contraceptives should switch to a nonoral contraceptive method or add a barrier method of contraception for 4 weeks after initiation and for 4 weeks after each dose escalation.

Nutrition deficiencies might be more of a concern in people receiving pharmacotherapy for obesity management. A recent retrospective cohort study quantified nutritional deficiencies among a large cohort of people—461,382 U.S. adults prescribed GLP-1 RAs between 2017 and 2022, in which more than half had obesity or overweight and more than 80% had type 2 diabetes. The analysis showed that nearly 13% of those in the cohort were diagnosed with nutritional deficiencies after 6 months and over 22% after 12 months. Vitamin D deficiency was the most frequently diagnosed subtype (6-month incidence was 7.5%; 12-month incidence was 13.6%) (85). Thus, choice of therapy should be guided by person-centered treatment factors, including comorbidities, considerations of adverse effects and treatment burden, treatment cost and accessibility,

Table 8.1—Obesity pharmacotherapy in individuals with type 2 diabetes

Medication name	Treatment arm; weight loss from baseline	Time frame for weight loss (weeks)*	Common side effects	Possible safety concerns and considerations
Sympathomimetic amine anorectic: approved for short-term use only				
Phentermine (183,184)†	• 15 mg q.d.; 7.4% • 7.5 mg q.d.; 6.6% • Placebo; 2.3%	28	Dry mouth, insomnia, dizziness, irritability, increased blood pressure, elevated heart rate	• Contraindicated for use in combination with monoamine oxidase inhibitors • Contraindicated with a history of cardiovascular disease • Do not use if at high risk for glaucoma due to risk of acute angle-closure glaucoma
Lipase inhibitor				
Orlistat (4,185)‡	• 120 mg t.i.d.; 9.6% • Placebo; 5.6%	52	Abdominal pain, flatulence, fecal urgency	• Contraindicated in cholestasis • Potential malabsorption of fat-soluble vitamins (A, D, E, K) and of certain medications (e.g., cyclosporine, thyroid hormone, anticonvulsants) • Rare cases of severe liver injury reported • Cholelithiasis reported • Nephrolithiasis reported. Monitor renal function and discontinue if oxalate nephropathy occurs
Sympathomimetic amine anorectic/ antiepileptic combination				
Phentermine/topiramate ER (54,116)§	• 15 mg/92 mg q.d.; 9.8% • 7.5 mg/46 mg q.d.; 7.8% • Placebo; 1.2%	56	Constipation, paresthesia, insomnia, nasopharyngitis, xerostomia, increased blood pressure, nephrolithiasis	• Contraindicated for use in combination with monoamine oxidase inhibitors • Contraindicated during pregnancy due to risk of fetal harm with topiramate • Cognitive impairment associated with rapid dose titration or high initial doses • Caution with cardiovascular disease • Do not use if at high risk for glaucoma due to risk of acute angle-closure glaucoma
Opioid antagonist/antidepressant combination				
Naltrexone/bupropion ER (13,186)	• 16 mg/180 mg b.i.d.; 5% • Placebo; 1.8%	56	Constipation, nausea, headache, xerostomia, insomnia, elevated heart rate and blood pressure	• Contraindicated in people with unmanaged hypertension and/or seizure disorders • Contraindicated for use with chronic opioid therapy • Acute angle-closure glaucoma may occur • Increased blood pressure and heart rate may occur; monitor in people with cardiovascular and cerebrovascular disease **Boxed warning:** • Risk of suicidal behavior/ideation in people younger than 24 years old who have depression
GLP-1 receptor agonist				
Liraglutide (14,55,187)‖	• 3.0 mg q.d.; 6% • 1.8 mg q.d.; 4.7% • Placebo; 2%	56	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux, constipation)	The following apply to both GLP-1 receptor agonists: • Provide guidance on discontinuation prior to surgical procedures to mitigate potential for pulmonary aspiration with general anesthesia or deep sedation

Continued on p. S173

Table 8.1—Continued

Medication name	Treatment arm; weight loss from baseline	Time frame for weight loss (weeks)*	Common side effects	Possible safety concerns and considerations
Semaglutide (54,117,188)	• 2.4 mg weekly; 9.6% • 1.0 mg weekly; 7% • Placebo; 3.4%			• Pancreatitis: acute pancreatitis has been reported, but causality has not been established. Do not initiate if at high risk for pancreatitis and discontinue if pancreatitis is suspected • Biliary disease: evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected; avoid use in at-risk individuals • Gastrointestinal disorders (severe constipation and small-bowel obstruction/ileus progression) • Diabetic retinopathy: close monitoring of retinopathy in those at high risk (older individuals and those with longer duration of type 2 diabetes [≥10 years]) • Nonarteritic anterior ischemic optic neuropathy reported; rare incidence. Monitor for this during eye examinations • Impact on drug absorption: orally administered drug absorption may be impaired during dose titration (including oral contraceptives) • Gastrointestinal side effects: counsel on potential for gastrointestinal side effects; provide guidance on dietary modifications to mitigate gastrointestinal side effects (reduction in meal size, mindful eating practices [e.g., stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for those experiencing gastrointestinal challenges. Not recommended for individuals with gastroparesis • Hypoglycemia (with concomitant use of insulin or sulfonylurea) **Boxed warning:** • Risk of thyroid C-cell tumors in rodents; human relevance not determined; do not use in individuals with personal or family history of medullary thyroid cancer or multiple endocrine neoplasia type 2
Dual GIP and GLP-1 receptor agonist				
Tirzepatide (109,189)	• 15 mg weekly; 14.7% • 10 mg weekly; 12.8% • Placebo; 3.2%	72	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux, constipation)	Same as for GLP-1 receptor agonists, with addition of the following: • Monitor effects of oral medications with narrow therapeutic index (warfarin) or whose efficacy is dependent on threshold concentration • Advise individuals using oral contraceptives to switch to a nonoral contraceptive method or add a barrier method of contraception for 4 weeks after initiation and for 4 weeks after each dose escalation

Select safety and side effect information is provided; for a comprehensive discussion of safety considerations, please refer to the prescribing information for each agent, b.i.d., twice daily; ER, extended release; GIP, glucose-dependent insulinotropic polypeptide; GLP-1, glucagon-like peptide 1; q.d., every day; Rx, prescription; t.i.d., three times daily, p.o., by mouth. *Time frames used in clinical trials. Medications approved for long-term use should be continued as indicated beyond reaching weight loss goals. †Phentermine was evaluated in a general adult population with obesity. As monotherapy, phentermine is only approved for short-term use. Use lowest effective dose; maximum appropriate dose is 37.5 mg. ‡Enrolled participants had normal (79%) or impaired (21%) glucose tolerance. §Maximum dose, depending on response, is 15 mg/92 mg q.d. Approximately 68% of enrolled participants had type 2 diabetes or impaired glucose tolerance. ||Agent has indication for reduction of cardiovascular events (55,117).

Table 8.2—Median monthly (30-day) AWP and NADAC of maximum or maintenance dose of obesity pharmacotherapies

Medication name	Typical adult maintenance dose	AWP (median and range for 30-day supply)	NADAC (median and range for 30-day supply)
Sympathomimetic amine anorectic: approved for short-term use only			
Phentermine	8–37.5 mg daily	$43 ($3–$58)*	$2 ($2–$3)*
Lipase inhibitor			
Orlistat	60 mg t.i.d. (OTC) 120 mg t.i.d. (Rx)	$58 ($41–$90) $675 ($520–$781)	NA $514 ($416–$611)
Sympathomimetic amine anorectic/antiepileptic combination			
Phentermine/topiramate ER	7.5 mg/46 mg daily	$238 ($238–$251)	NA
Opioid antagonist/antidepressant combination			
Naltrexone/bupropion ER	16 mg/180 mg b.i.d.	$750	NA
GLP-1 receptor agonist			
Liraglutide	3 mg daily	$1,619	$1,303
Semaglutide	2.4 mg once weekly	$1,619	$1,302
Dual GIP and GLP-1 receptor agonist			
Tirzepatide	5, 10, or 15 mg once weekly	$1,304**	$1,022

The costs listed in this table are representative of costs at a national level. These costs may not be representative of an individual's cost and do not account for medication coverage or available discounts. AWP, average wholesale price; b.i.d., twice daily; ER, extended release; GIP, glucose-dependent insulinotropic polypeptide; GLP-1, glucagon-like peptide 1; NA, data not available; NADAC, National Average Drug Acquisition Cost; OTC, over the counter; Rx, prescription; t.i.d., three times daily. AWP and NADAC prices are for a 30-day supply of maximum or maintenance dose as of 15 July 2025 (190,191). *Data are for 37.5 mg q.d. dose. **Pricing listed for tirzepatide is for the pens only, not the cost of vials available from the manufacturer.

and the individual's therapeutic goals and preferences. Medication cost and insurance coverage considerations often influence treatment decisions, and payors should cover evidence-based obesity treatments for people with diabetes and prediabetes to reduce barriers to treatment access. It is also essential that health care teams are knowledgeable about insurance coverage requirements and establish systems to support clinicians in prescribing evidence-based obesity pharmacotherapies and to reduce financial hardship of treatment for individuals, including formulary and medication coverage requirements, eligibility for medication assistance programs, and availability of copayment reduction cards (see section 1, "Improving Care and Promoting Health in Populations").

Assessing and Optimizing Efficacy and Safety of Obesity Pharmacotherapy

Obesity pharmacotherapy should be initiated at the lowest dose and the dose titration based on tolerability and response. Clinicians should evaluate other type 2 diabetes pharmacotherapies to mitigate risk of hypoglycemia and counsel people with diabetes appropriately. When adding a GLP-1 RA or a dual GIP and GLP-1 RA, sulfonylureas should be discontinued or the dose reduced and insulin dosing should be adjusted to avoid hypoglycemia (e.g., reduce bolus by 10–20%, basal ~10% if A1C <7.5% [58 mmol/mol]). The treatment dose should be individualized to balance achievement of weight loss goals, health benefits, and tolerability and may be less than the maximum approved dose (119). Gradual stepwise uptitration of obesity medications is a well-supported clinical strategy used in clinical trials for enhancing drug tolerability, reducing adverse effects, and optimizing medication-taking behavior. In some individuals, dose titration at a slower rate or in smaller dose increments than those recommended by the manufacturer may be needed. A recent open-label RCT of 104 people with type 2 diabetes demonstrated that slower, flexible titration of semaglutide improved medication-taking behavior and reduced adverse events without compromising efficacy as compared with the label-recommended titration protocol (119).

Upon initiating medications for obesity, assess their effectiveness and safety at least monthly for the first 3 months and at least quarterly thereafter. Modeling from published clinical trials consistently shows that early responders have improved long-term outcomes (120,121); however, it is notable that the response rate with the latest generation of obesity pharmacotherapies is much higher (54,109). Unless clinical circumstances (such as poor tolerability) or other considerations (such as financial expense or individual preference) suggest otherwise, those who achieve sufficient early weight loss upon starting a chronic obesity pharmacotherapy (typically defined as >5% weight loss after 3 months of use) should continue the medication long-term. When early weight loss results are modest (typically <5% weight loss after 3 months of use), the benefits of ongoing treatment need to be examined in the context of the glycemic response, the availability of other potential treatment options, treatment tolerance, and overall treatment burden. Ongoing monitoring of the achievement and maintenance of weight management goals is recommended. Obesity is a chronic, relapsing disease, similar to hypertension, and typically requires continuation of pharmacotherapy after weight reduction goals are achieved to sustain weight loss and health benefits. Clinical trials have shown that sudden discontinuation of semaglutide and tirzepatide results in weight recurrence of one-half to two-thirds of the weight loss within 1 year with reversal of cardiometabolic improvements (122–124). Shared decision-making should be used to

determine the best long-term weight management approach, such as continuing pharmacotherapy on the lowest effective dose for weight loss maintenance using intermittent therapy, or stopping medication followed by close weight monitoring. For individuals stopping GLP-1 RA therapies, regular physical activity (≥60 min/day), self-monitoring, and dietary patterns emphasizing minimally processed, nutrient-dense foods are strategies reported by individuals in the National Weight Control Registry who were successful in maintaining long-term weight loss (125) that could potentially mitigate weight recurrence. Notably, these have not been validated in the post–GLP-1 RA therapy setting.

For those not reaching or maintaining weight-related treatment goals, avoid treatment inertia by reevaluating ongoing weight management therapies and intensify treatment with additional approaches (e.g., metabolic surgery, additional or alternative pharmacologic agents, and structured lifestyle management programs).

MEDICAL DEVICES FOR WEIGHT LOSS

While gastric banding devices have fallen out of favor due to their limited long-term efficacy and high rate of complications, several minimally invasive medical devices have been approved by the FDA for short-term weight loss, including implanted gastric balloons, a vagus nerve stimulator, and gastric aspiration therapy (126). High cost, limited insurance coverage, and limited data supporting the efficacy of these devices in the treatment of individuals with diabetes has created uncertainty for their current use and led to the voluntary removal of several of these medical devices from the U.S. market (127).

METABOLIC SURGERY

Recommendations

8.22 Consider metabolic surgery as a weight and glycemic management approach in people with type 2 diabetes with BMI ≥30.0 kg/m^2 (or ≥27.5 kg/m^2 in Asian American individuals) who are otherwise good surgical candidates. **A**

8.23 Metabolic surgery should be performed in high-volume centers with interprofessional teams knowledgeable about and experienced in managing obesity, diabetes, and gastrointestinal surgery. **E**

8.24 People being considered for metabolic surgery should be evaluated for comorbid psychological conditions and social and situational circumstances that have the potential to interfere with surgery outcomes. **B**

8.25 People who undergo metabolic surgery should receive long-term medical and behavioral support and routine micronutrient, nutritional, and metabolic status monitoring. **B**

8.26 If post–metabolic surgery hypoglycemia is suspected, clinical evaluation should exclude other potential disorders contributing to hypoglycemia, and management should include education, medical nutrition therapy with a registered dietitian nutritionist experienced in post–metabolic surgery hypoglycemia, and medication treatment, as needed. **A** In individuals with post–metabolic surgery hypoglycemia, use continuous glucose monitoring to improve safety. **C**

8.27 In people who undergo metabolic surgery, routinely screen for psychosocial and behavioral health changes and refer to a qualified behavioral health professional as needed. **C**

8.28 Monitor individuals who have undergone metabolic surgery for insufficient weight loss or weight recurrence at least every 6–12 months. **E** In those who have insufficient weight loss or experience weight recurrence, assess for potential predisposing factors and, if appropriate, consider additional weight loss interventions (e.g., obesity pharmacotherapy). **C**

Surgical procedures for obesity treatment—often referred to interchangeably as bariatric surgery, weight loss surgery, metabolic surgery, or metabolic/bariatric surgery—can promote significant and durable weight loss and improve glycemic management and long-term outcomes in those with type 2 diabetes. Given the magnitude and rapidity of improvement of hyperglycemia and glucose homeostasis, these procedures have been suggested as treatments for type 2 diabetes even in the absence of severe obesity, hence the current preferred terminology of "metabolic surgery" (128).

A substantial body of evidence, including data from large cohort studies and randomized controlled (nonblinded) clinical trials, demonstrates that metabolic surgery achieves superior glycemic management and reduction of cardiovascular risk in people with type 2 diabetes and obesity compared with nonsurgical intervention (51). In addition to improving glycemia, metabolic surgery reduces the incidence of microvascular disease (129), improves quality of life (51,130,131), decreases cancer risk, improves cardiovascular disease risk factors and long-term cardiovascular events (131–137), and decreases all-cause mortality (138). Cohort studies that match surgical and nonsurgical subjects strongly suggest that metabolic surgery reduces all-cause mortality (139). Studies have also shown that metabolic surgery can improve liver outcomes among individuals with MASH, including biopsy-proven disease (140,141).

The overwhelming majority of procedures performed in the U.S. are vertical sleeve gastrectomy (VSG) and Roux-en-Y gastric bypass (RYGB). Both procedures result in a smaller stomach pouch and often robust changes in enteroendocrine hormones. In VSG, ∼80% of the stomach is removed, leaving behind a long, thin sleeve-shaped pouch. RYGB creates a much smaller stomach pouch (roughly the size of a walnut), which is then attached to the distal small intestine, thereby bypassing the duodenum and jejunum.

Metabolic surgery has been demonstrated to have beneficial effects on type 2 diabetes irrespective of the presurgical BMI (142). The American Society for Metabolic and Bariatric Surgery recommends metabolic surgery for people with type 2 diabetes and a BMI ≥30 kg/m^2 (or ≥27.5 kg/m^{2}for Asian American individuals) in surgically eligible individuals. A real-world data analysis through the National Patient-Centered Outcomes Research Network (PCORnet) in the U.S. compared surgical outcomes between 6,233 individuals with type 2 diabetes who underwent RYGB and 3,477 who underwent VSG. At 1 year after surgery, those who had RYGB lost on average 29.1% of their total body weight, while those who had VSG lost on average 22.8% of their total body weight. At 5 years after surgery, the total body weight loss was 24.1% for those who had RYGB and 16.1% for those who had VSG, with 86.1% of individuals experiencing type 2 diabetes remission after RYGB and 83.5% of individuals experiencing type 2 diabetes remission after VSG. Among the 6,141 individuals who experienced type 2 diabetes remission,

the subsequent type 2 diabetes relapse rate was lower for those who had RYGB than for those who had VSG (hazard ratio 0.75 [95% CI 0.67–0.84]). Estimated relapse rates for those who had RYGB and VSG were 33.1% and 41.6%, respectively, at 5 years after surgery. At 5 years, compared with baseline, A1C was reduced, on average, 0.4 percentage points more for individuals who had RYGB than for individuals who had VSG (143). Most notably, the Surgical Treatment and Medications Potentially Eradicate Diabetes Efficiently (STAMPEDE) trial, which randomized 150 participants with type 2 diabetes, A1C >7.0%, and BMI 27–43 kg/m^2 to receive either metabolic surgery or medical treatment for type 2 diabetes using glucose-lowering agents, found that 29% of those treated with RYGB and 23% of those treated with VSG achieved A1C of ≤6.0% after 5 years (51). In the Alliance of Randomized Trials of Medicine vs. Metabolic Surgery in Type 2 Diabetes (ARMSS-T2D) study, a pooled analysis of four single-center RCTs, the rates of remission at 7 years were 18% in the bariatric surgery group and 6% in the medical/lifestyle group (144). Available data suggest an erosion of diabetes remission over time (52,144); 35–50% of individuals who initially achieve remission of diabetes eventually experience recurrence. Still, the median disease-free period among such individuals following RYGB is 8.3 years (144,145), and the majority of those who undergo surgery maintain substantial improvement of glycemia from baseline for at least 5–15 years (51,130,131,133).

Exceedingly few presurgical predictors of diabetes remission have been identified. However, younger age, shorter duration of diabetes (e.g., <8 years) (120), and lesser severity of diabetes (better glycemic management, not using insulin) are associated with higher rates of diabetes remission (51,131,146). Greater baseline visceral fat area may also predict diabetes remission, especially among Asian American people with type 2 diabetes (147).

Whereas metabolic surgery has greater initial costs than nonsurgical obesity treatments, retrospective analyses and modeling studies suggest that surgery may be cost-effective or even cost-saving for individuals with type 2 diabetes. However, these results largely depend on assumptions about the long-term effectiveness and safety of the procedures, the specific medications being compared, the time horizon for cost-effectiveness assessments, and the population examined (e.g., duration and severity of diabetes) (148).

The safety of metabolic surgery has improved significantly with continued refinement of minimally invasive (laparoscopic) approaches, enhanced training and credentialing, and involvement of interprofessional teams. Perioperative mortality rates are typically 0.1–0.5%, similar to those for common abdominal procedures such as cholecystectomy and hysterectomy (149,150). Major complications occur in 2–6% of those undergoing metabolic surgery, which compares favorably with the rates for other commonly performed elective operations (150). Postsurgical recovery times and morbidity have also dramatically declined. Minor complications and need for operative reintervention occur in up to 15% (149,151–153). Empirical data suggest that the proficiency of the operating surgeon and surgical team is a key determinant of mortality, complications, reoperations, and readmissions (154). Accordingly, metabolic surgery should be performed in high-volume centers with interprofessional teams experienced in managing diabetes, obesity, and gastrointestinal surgery. Refer to the American College of Surgeons website for information on accreditation and locations of accredited programs (https://www.facs.org/quality-programs/accreditation-and-verification/metabolic-and-bariatric-surgery-accreditation-and-quality-improvement-program/).

Beyond the perioperative period, longer-term risks include vitamin and mineral deficiencies, anemia, osteoporosis, dumping syndrome (or rapid gastric emptying), and severe hypoglycemia (92). Nutritional and micronutrient deficiencies and related complications occur with variable frequency depending on the type of surgical procedure and require routine monitoring of micronutrient and nutritional status and lifelong vitamin/nutritional supplementation (92). Dumping syndrome usually occurs shortly (10–30 min) after a meal and may present with diarrhea, nausea, vomiting, palpitations, and fatigue; hypoglycemia is usually not present at the time of symptoms but, in some cases, may develop several hours later. Post–metabolic surgery hypoglycemia can occur with RYGB, VSG, and other gastrointestinal procedures and may severely impact quality of life (155–157). Post–metabolic surgery hypoglycemia is driven in part by altered gastric emptying of ingested nutrients, leading to rapid intestinal glucose absorption and excessive postprandial secretion of GLP-1 and other gastrointestinal peptides. As a result, overstimulation of insulin release and a sharp drop in plasma glucose occur, most commonly 1–3 h after a high-carbohydrate meal. Symptoms range from sweating, tremor, tachycardia, and increased hunger to impaired cognition, loss of consciousness, and seizures. In contrast to dumping syndrome, which often occurs soon after surgery and improves over time, post–metabolic surgery hypoglycemia typically presents >1 year after surgery. Diagnosis is primarily made by a thorough examination of history, detailed records of food intake, physical activity, and symptom patterns, and exclusion of other potential causes of hypoglycemia (e.g., malnutrition, side effects of medications or supplements, dumping syndrome, and insulinoma). Initial management includes education to facilitate reduced intake of rapidly digested carbohydrates while ensuring adequate intake of protein, healthy fats, and vitamin and nutrient supplements. When available, individuals should be offered medical nutrition therapy with a registered dietitian nutritionist experienced in post–metabolic surgery hypoglycemia and the use of continuous glucose monitoring (ideally real-time continuous glucose monitoring, which can detect dropping glucose levels before severe hypoglycemia occurs), especially for those with impaired hypoglycemia awareness. Medication treatment, if needed, is primarily aimed at slowing carbohydrate absorption (e.g., acarbose) or reducing GLP-1 and insulin secretion (e.g., diazoxide, octreotide) (158).

People who undergo metabolic surgery may be at increased risk for substance use, worsening or new-onset depression and/or anxiety disorders, and suicidal ideation (159–162). Candidates for metabolic surgery should be assessed by a behavioral health professional with expertise in obesity management prior to consideration for surgery (163). Surgery should be postponed in individuals with alcohol or substance use disorders, severe depression, suicidal ideation, or other significant behavioral health conditions until these conditions have been appropriately addressed. Individuals with preoperative or new-onset psychopathology should be assessed regularly following surgery to

optimize behavioral health and post-surgical outcomes.

Finally, no definitive evidence supports the pre– and post–metabolic surgery use of nutrient-stimulated hormone-based therapeutics for chronic obesity. Existing studies suggest that among individuals with a BMI >50 kg/m^2, GLP-1 RAs are associated with significant weight loss prior to surgery with no increase in complications or time to surgery (164). Nutrient-stimulated hormone-based therapeutics can be considered as adjuvants after metabolic surgery to augment initial weight loss either shortly after surgery or when weight loss has plateaued (165). Studies have also shown that GLP-1 RAs can effectively treat weight recurrence after metabolic surgery and therefore could be considered as an alternative to revisional surgery (166). Long-term outcomes, however, are lacking in terms of durability of weight loss, effect on weight recurrence when medications are stopped, and long-term side effects with use and after discontinuation (167).

TREATMENT OF OBESITY IN TYPE 1 DIABETES

Recommendation

8.29 Apply obesity management strategies used in the general adult population, including GLP-1 RA–based therapy **B** and metabolic surgery, **C** to adults with type 1 diabetes who have obesity (BMI ≥30.0 kg/m^2, or ≥27.5 kg/m^2 in Asian American individuals). Shared decision-making should inform individualized care.

The prevalence of overweight (30–40%) and obesity (15–30%) for people with type 1 diabetes is comparable to that for the general adult population (168–170). In people with type 1 diabetes, obesity portends a higher burden of cardiovascular disease and microvascular complications, when compared with people without obesity (170). In this context, establishing evidence-based interventions for obesity management specifically in type 1 diabetes remains an unmet need. Though preliminary, cross-sectional work and trials (171–178) thus far have shown positive results for people with type 1 diabetes and obesity who are treated with GLP-1 RA–based therapy or metabolic surgery.

A large electronic health record–based cross-sectional study showed a significant increase in the prescription pattern of GLP-1 RAs and dual GIP and GLP-1 RAs over time, which were prescribed in approximately 6.5% of people with type 1 diabetes in 2023 (179). While people with type 1 diabetes were excluded in most large RCTs testing the efficacy of GLP-1 RA–based therapy on weight loss in people with obesity or type 2 diabetes, real-world data suggest benefits for weight reduction and improvement in A1C in association with lower insulin requirements (172). The ADJUNCT ONE and ADJUNCT TWO randomized placebo-controlled trials investigated safety and efficacy of varying doses of liraglutide for 52 and 26 weeks, respectively, in people with longstanding type 1 diabetes (173,174). While the highest dose of liraglutide (1.8 mg daily) was associated with a ∼6% weight reduction in both RCTs, the rates of hypoglycemia increased by 20–30% at all doses and the risk of hyperglycemia with ketosis doubled with liraglutide 1.8 mg when compared with placebo. The appetite suppression and reduction in caloric intake combined with lower insulin requirements appear to be key factors underlying the risk of ketosis associated with GLP-1 RA–based therapy.

For treatment of obesity in people with type 1 diabetes, initiation of GLP-1 RA or dual GIP and GLP-1 RA should follow a detailed review of the drug side effect profiles and a person-centered dialogue about goals and expectations. Thus, it is essential to counsel people with type 1 diabetes who start treatment with a GLP-1 RA or a dual GIP and GLP-1 RA on anticipating an increased risk of hypoglycemia and a reduction in insulin requirements, on maintaining a critical carbohydrate intake, and on testing for excess ketone body production. Notably, dose escalation protocols validated in people with type 2 diabetes should not be extrapolated to people with type 1 diabetes, for whom titration of GLP-1 RA–based therapy should be particularly cautious and accompanied by close monitoring of changes in insulin requirements and in the frequency of episodes of hypoglycemia. In the absence of robust data specific to people with type 1 diabetes regarding therapy discontinuation, the paradigm of maintaining long-term treatment should be applied to prevent weight recurrence. Also, people with type 1 diabetes who discontinue GLP-1 RA-based treatment, which occurs in >50% of people with obesity at 1 year (180), should expect a variable increase in insulin requirements.

In this context, the presence of comorbidities such as obstructive sleep apnea, MASH, or coronary artery disease may further guide the selection of people with type 1 diabetes and obesity who would particularly benefit from GLP-1 RA or dual GIP and GLP-1 RA treatment for obesity. Conversely, preexisting gastroparesis, hypoglycemia unawareness, or a recent episode of diabetic ketoacidosis or euglycemic ketoacidosis should generally dissuade from initiating treatment with these medications.

Adjunctive therapy with a GLP-1 RA or a dual GIP and GLP-1 RA in people with type 1 diabetes using automated insulin delivery (AID) systems requires periodic assessment of AID settings, primarily to reduce the risk of hypoglycemia and avoid prolonged insulin delivery suspensions that may predispose to ketosis. As suggested in a recent consensus report (175), deintensification of insulin-to-carbohydrate ratios and sensitivity factor should be expected through the titration process of GLP-1 RA–based therapy. In addition, delayed gastric emptying may require a modification of mealtime insulin dosing to the beginning of or just after the meal to optimally match insulin delivery with food absorption.

In summary, the decision to initiate GLP-1 RA–based therapy in type 1 diabetes should be informed by a detailed conversation of risks and benefits, including the anticipated reduction in insulin requirements, the importance of ketone monitoring and implementation of sick-day rules, and modifications of AID settings, if applicable.

Metabolic surgery represents a highly individualized option for management of obesity in people with type 1 diabetes. In a retrospective analysis of 17 bariatric surgery studies that included 107 individuals with type 1 diabetes (176), 65% of whom underwent RYGB, the average achieved postoperative BMI was 31 kg/m^2 (reduced from an average preoperative BMI of 41 kg/m^2) over the observation period of 1.5–5 years. Other cohort studies have shown similar BMI reductions (177). In contrast, the effects of metabolic surgery on A1C have been inconsistent (177), with

one study noting an increase at 5 years postoperatively (178).

Also, a frequency of diabetic ketoacidosis ranging between 15% and 20% (181,182)—often in the first days after surgery and concomitantly with reduced carbohydrate intake and insulin doses—and enhanced risk of hypoglycemia (182) are key safety issues that should be discussed in detail with people with type 1 diabetes considering metabolic surgery. In addition, long-term surgical complications like dumping syndrome are particularly challenging to manage in people with type 1 diabetes. In conclusion, using a multidisciplinary approach a careful evaluation and extensive counseling is required to select people with type 1 diabetes who would benefit the most from metabolic surgery while individualizing goals and setting realistic expectations.

References

1. Narayan KMV, Boyle JP, Thompson TJ, Gregg EW, Williamson DF. Effect of BMI on lifetime risk for diabetes in the U.S. Diabetes Care 2007;30:1562–1566
2. Knowler WC, Barrett-Connor E, Fowler SE, et al.; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002;346:393–403
3. Garvey WT, Ryan DH, Henry R, et al. Prevention of type 2 diabetes in subjects with prediabetes and metabolic syndrome treated with phentermine and topiramate extended release. Diabetes Care 2014;37:912–921
4. Torgerson JS, Hauptman J, Boldrin MN, Sjöström L. XENical in the prevention of diabetes in obese subjects (XENDOS) study: a randomized study of orlistat as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients. Diabetes Care 2004;27:155–161
5. Le Roux CW, Astrup A, Fujioka K, et al.; SCALE Obesity Prediabetes NN8022-1839 Study Group. 3 years of liraglutide versus placebo for type 2 diabetes risk reduction and weight management in individuals with prediabetes: a randomised, double-blind trial. Lancet 2017;389:1399–1409
6. Booth H, Khan O, Prevost T, et al. Incidence of type 2 diabetes after bariatric surgery: population-based matched cohort study. Lancet Diabetes Endocrinol 2014;2:963–968
7. Pastors JG, Warshaw H, Daly A, Franz M, Kulkarni K. The evidence for the effectiveness of medical nutrition therapy in diabetes management. Diabetes Care 2002;25:608–613
8. Galaviz KI, Weber MB, Suvada K, et al. Interventions for reversing prediabetes: a systematic review and meta-analysis. Am J Prev Med 2022;62:614–625
9. Jackness C, Karmally W, Febres G, et al. Very low-calorie diet mimics the early beneficial effect of Roux-en-Y gastric bypass on insulin sensitivity and β-cell function in type 2 diabetic patients. Diabetes 2013;62:3027–3032
10. Rothberg AE, McEwen LN, Kraftson AT, Fowler CE, Herman WH. Very-low-energy diet for type 2 diabetes: an underutilized therapy? J Diabetes Complications 2014;28:506–510
11. Hollander PA, Elbein SC, Hirsch IB, et al. Role of orlistat in the treatment of obese patients with type 2 diabetes. A 1-year randomized double-blind study. Diabetes Care 1998;21:1288–1294
12. Garvey WT, Ryan DH, Bohannon NJV, et al. Weight-loss therapy in type 2 diabetes: effects of phentermine and topiramate extended release. Diabetes Care 2014;37:3309–3316
13. Hollander P, Gupta AK, Plodkowski R, et al.; COR-Diabetes Study Group. Effects of naltrexone sustained-release/bupropion sustained-release combination therapy on body weight and glycemic parameters in overweight and obese patients with type 2 diabetes. Diabetes Care 2013;36:4022–4029
14. Davies MJ, Bergenstal R, Bode B, et al.; NN8022-1922 Study Group. Efficacy of liraglutide for weight loss among patients with type 2 diabetes: the SCALE diabetes randomized clinical trial. JAMA 2015;314:687–699
15. Rubino F, Nathan DM, Eckel RH, et al.; Delegates of the 2nd Diabetes Surgery Summit. Metabolic surgery in the treatment algorithm for type 2 diabetes: a joint statement by international diabetes organizations. Obes Surg 2017;27:2–21
16. Pi-Sunyer X, Blackburn G, Brancati FL, et al.; Look AHEAD Research Group. Reduction in weight and cardiovascular disease risk factors in individuals with type 2 diabetes: one-year results of the look AHEAD trial. Diabetes Care 2007;30:1374–1383
17. Goldstein DJ. Beneficial health effects of modest weight loss. Int J Obes Relat Metab Disord 1992;16:397–415
18. Steven S, Hollingsworth KG, Al-Mrabeh A, et al. Very low-calorie diet and 6 months of weight stability in type 2 diabetes: pathophysiological changes in responders and nonresponders. Diabetes Care 2016;39:808-815
19. Jensen MD, Ryan DH, Apovian CM, et al.; Obesity Society. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. J Am Coll Cardiol 2014;2014;63:2985–3023
20. Lean ME, Leslie WS, Barnes AC, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. Lancet 2018;391:541–551
21. Lean MEJ, Leslie WS, Barnes AC, et al. Durability of a primary care-led weight-management intervention for remission of type 2 diabetes: 2-year results of the DiRECT open-label, cluster-randomised trial. Lancet Diabetes Endocrinol 2019;7:344–355
22. Wiggins T, Guidozzi N, Welbourn R, Ahmed AR, Markar SR. Association of bariatric surgery with all-cause mortality and incidence of obesity-related disease at a population level: a systematic review and meta-analysis. PLoS Med 2020;17:e1003206
23. Aminian A, Wilson R, Zajichek A, et al. Cardiovascular outcomes in patients with type 2 diabetes and obesity: comparison of gastric bypass, sleeve gastrectomy, and usual care. Diabetes Care 2021;44:2552–2563
24. World Health Organization. Obesity. Accessed 25 September 2025. Available from https://www.who.int/health-topics/obesity#tab=tab_1
25. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004;363:157–163
26. Araneta MRG, Kanaya AM, Hsu WC, et al. Optimum BMI cut points to screen Asian Americans for type 2 diabetes. Diabetes Care 2015;38:814–820
27. Aggarwal R, Bibbins-Domingo K, Yeh RW, et al. Diabetes screening by race and ethnicity in the United States: equivalent body mass index and age thresholds. Ann Intern Med 2022;175:765–773
28. Rubino F, Cummings DE, Eckel RH, et al. Definition and diagnostic criteria of clinical obesity. Lancet Diabetes Endocrinol 2025;13:221–262
29. Aryee EK, Zhang S, Selvin E, Fang M. Prevalence of obesity with and without confirmation of excess adiposity among US adults. JAMA 2025;333:1726–1728
30. Klein S, Gastaldelli A, Yki-Järvinen H, Scherer PE. Why does obesity cause diabetes? Cell Metab 2022;34:11–20
31. Lawrence BJ, Kerr D, Pollard CM, et al. Weight bias among health care professionals: a systematic review and meta-analysis. Obesity (Silver Spring) 2021;29:1802–1812
32. Bannuru RR; Professional Practice Committee. Weight stigma and bias: standards of care in overweight and obesity—2025. BMJ Open Diabetes Res Care 2025;13:e004962
33. Moore CH, Oliver TL, Randolph J, Dowdell EB. Interventions for reducing weight bias in healthcare providers: an interprofessional systematic review and meta-analysis. Clin Obes 2022;12:e12545
34. American Medical Association. *AMA Manual of Style: A Guide for Authors and Editors.* Oxford University Press, 2019
35. American Medical Association. Person-First Language for Obesity H-440.821. Accessed 25 September 2025. Available from https://policysearch.ama-assn.org/policyfinder/detail/obesity?uri=%2FAMADoc%2FHOD.xml-H-440.821.xml
36. Kushner RF, Batsis JA, Butsch WS, et al. Weight history in clinical practice: the state of the science and future directions. Obesity (Silver Spring) 2020;28:9–17
37. Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA focused update of the 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. J Am Coll Cardiol 2017;70:776–803
38. Bosch X, Monclús E, Escoda O, et al. Unintentional weight loss: clinical characteristics and outcomes in a prospective cohort of 2677 patients. PLoS One 2017;12:e0175125
39. Wilding JPH. The importance of weight management in type 2 diabetes mellitus. Int J Clin Pract 2014;68:682–691
40. Van Gaal L, Scheen A. Weight management in type 2 diabetes: current and emerging approaches to treatment. Diabetes Care 2015;38:1161–1172
41. Warren J, Smalley B, Barefoot N. Higher motivation for weight loss in African American

than Caucasian rural patients with hypertension and/or diabetes. Ethn Dis 2016;26:77–84
42. Stoops H, Dar M. Equity and Obesity Treatment - Expanding Medicaid-Covered Interventions. N Engl J Med 2023;388:2309–2311
43. Rothberg AE, McEwen LN, Kraftson AT, et al. Impact of weight loss on waist circumference and the components of the metabolic syndrome. BMJ Open Diabetes Res Care 2017;5:e000341
44. UKPDS Group. UK Prospective Diabetes Study 7: response of fasting plasma glucose to diet therapy in newly presenting type II diabetic patients. Metabolism 1990;39:905–912
45. Wing RR, Bolin P, Brancati FL, et al.; Look AHEAD Research Group. Cardiovascular effects of intensive lifestyle intervention in type 2 diabetes. N Engl J Med 2013;369:145–154
46. Look AHEAD Research Group. Eight-year weight losses with an intensive lifestyle intervention: the look AHEAD study. Obesity (Silver Spring) 2014; 22:5–13
47. Sandforth A, von Schwartzenberg RJ, Arreola EV, et al. Mechanisms of weight loss-induced remission in people with prediabetes: a post-hoc analysis of the randomised, controlled, multicentre Prediabetes Lifestyle Intervention Study (PLIS). Lancet Diabetes Endocrinol 2023;11:798–810
48. Doumouras AG, Wong JA, Paterson JM, et al. Bariatric Surgery and Cardiovascular Outcomes in Patients With Obesity and Cardiovascular Disease: a Population-Based Retrospective Cohort Study. Circulation 2021;143:1468–1480
49. Gregg E, Jakicic J, Blackburn G, et al.; Look AHEAD Research Group. Association of the magnitude of weight loss and changes in physical fitness with long-term cardiovascular disease outcomes in overweight or obese people with type 2 diabetes: a post-hoc analysis of the Look AHEAD randomised clinical trial. Lancet Diabetes Endocrinol 2016;4:913–921
50. Baum A, Scarpa J, Bruzelius E, Tamler R, Basu S, Faghmous J. Targeting weight loss interventions to reduce cardiovascular complications of type 2 diabetes: a machine learning-based post-hoc analysis of heterogeneous treatment effects in the Look AHEAD trial. Lancet Diabetes Endocrinol 2017;5:808–815
51. Schauer PR, Bhatt DL, Kirwan JP, et al.; STAMPEDE Investigators. Bariatric surgery versus intensive medical therapy for diabetes - 5-year outcomes. N Engl J Med 2017;376:641–651
52. Ikramuddin S, Korner J, Lee W-J, et al. Durability of addition of Roux-en-Y gastric bypass to lifestyle intervention and medical management in achieving primary treatment goals for uncontrolled type 2 diabetes in mild to moderate obesity: a randomized control trial. Diabetes Care 2016;39:1510–1518
53. Gadde KM, Allison DB, Ryan DH, et al. Effects of low-dose, controlled-release, phentermine plus topiramate combination on weight and associated comorbidities in overweight and obese adults (CONQUER): a randomised, placebo-controlled, phase 3 trial. Lancet 2011;377:1341–1352
54. Davies M, Færch L, Jeppesen OK, et al.; STEP 2 Study Group. Semaglutide 2·4 mg once a week in adults with overweight or obesity, and type 2 diabetes (STEP 2): a randomised, double-blind, double-dummy, placebo-controlled, phase 3 trial. Lancet 2021;397:971–984
55. Marso SP, Daniels GH, Brown-Frandsen K, et al.; LEADER Trial Investigators. Liraglutide and cardiovascular outcomes in type 2 diabetes. N Engl J Med 2016;375:311–322
56. Rosenstock J, Wysham C, Frías JP, et al. Efficacy and safety of a novel dual GIP and GLP-1 receptor agonist tirzepatide in patients with type 2 diabetes (SURPASS-1): a double-blind, randomised, phase 3 trial. Lancet 2021;398:143–155
57. Frías JP, Davies MJ, Rosenstock J, et al.; SURPASS-2 Investigators. Tirzepatide versus semaglutide once weekly in patients with type 2 diabetes. N Engl J Med 2021;385:503–515
58. Magkos F, Fraterrigo G, Yoshino J, et al. Effects of moderate and subsequent progressive weight loss on metabolic function and adipose tissue biology in humans with obesity. Cell Metab 2016;23:591–601
59. Taylor R. Type 2 diabetes and remission: practical management guided by pathophysiology. J Intern Med 2021;289:754–770
60. Evert AB, Dennison M, Gardner CD, et al. Nutrition therapy for adults with diabetes or prediabetes: a consensus report. Diabetes Care 2019;42:731–754
61. Olateju IV, Opaleye-Enakhimion T, Udeogu JE, et al. A systematic review on the effectiveness of diet and exercise in the management of obesity. Diabetes Metab Syndr 2023;17:102759
62. Look AHEAD Research Group. Effects of intensive lifestyle intervention on all-cause mortality in older adults with type 2 diabetes and overweight/obesity: results from the Look AHEAD study. Diabetes Care 2022;45:1252–1259
63. Wadi NM, Asantewa-Ampaduh S, Rivas C, Goff LM. Culturally tailored lifestyle interventions for the prevention and management of type 2 diabetes in adults of Black African ancestry: a systematic review of tailoring methods and their effectiveness. Public Health Nutr 2022;25:422–436
64. McCurley JL, Gutierrez AP, Gallo LC. Diabetes prevention in U.S. Hispanic adults: a systematic review of culturally tailored interventions. Am J Prev Med 2017;52:519–529
65. Ali SH, Misra S, Parekh N, Murphy B, DiClemente RJ. Preventing type 2 diabetes among South Asian Americans through community-based lifestyle interventions: a systematic review. Prev Med Rep 2020;20:101182
66. Franz MJ, Boucher JL, Rutten-Ramos S, VanWormer JJ. Lifestyle weight-loss intervention outcomes in overweight and obese adults with type 2 diabetes: a systematic review and meta-analysis of randomized clinical trials. J Acad Nutr Diet 2015;115:1447–1463
67. Sacks FM, Bray GA, Carey VJ, et al. Comparison of weight-loss diets with different compositions of fat, protein, and carbohydrates. N Engl J Med 2009;360:859–873
68. de Souza RJ, Bray GA, Carey VJ, et al. Effects of 4 weight-loss diets differing in fat, protein, and carbohydrate on fat mass, lean mass, visceral adipose tissue, and hepatic fat: results from the POUNDS LOST trial. Am J Clin Nutr 2012;95: 614–625
69. Johnston BC, Kanters S, Bandayrel K, et al. Comparison of weight loss among named diet programs in overweight and obese adults: a meta-analysis. JAMA 2014;312:923–933
70. Ye W, Xu L, Ye Y, et al. The efficacy and safety of meal replacement in patients with type 2 diabetes: a systematic review and meta-analysis. J Clin Endocrinol Metab 2023;108:3041–3049
71. Yao Q, de Araujo CD, Juul F, et al. Isocaloric replacement of ultraprocessed foods was associated with greater weight loss in the POUNDS Lost trial. Obesity (Silver Spring) 2024;32:1281–1289
72. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. J Acad Nutr Diet 2014;114:1943–1953.e2
73. Hall KD, Farooqi IS, Friedman JM, et al. The energy balance model of obesity: beyond calories in, calories out. Am J Clin Nutr 2022;115:1243–1254
74. Ludwig DS, Apovian CM, Aronne LJ, et al. Competing paradigms of obesity pathogenesis: energy balance versus carbohydrate-insulin models. Eur J Clin Nutr 2022;76:1209–1221
75. Naude CE, Brand A, Schoonees A, Nguyen KA, Chaplin M, Volmink J. Low-carbohydrate versus balanced-carbohydrate diets for reducing weight and cardiovascular risk. Cochrane Database Syst Rev 2022;1:CD013334
76. Hoerster KD, Hunter-Merrill R, Nguyen T, et al. Effect of a remotely delivered self-directed behavioral intervention on body weight and physical health status among adults with obesity: the D-ELITE randomized clinical trial. JAMA 2022; 328:2230–2241
77. Kahan S, Manson JE. Obesity treatment, beyond the guidelines: practical suggestions for clinical practice. JAMA 2019;321:1349–1350
78. Lean ME, Leslie WS, Barnes AC, et al. 5-year follow-up of the randomised diabetes remission clinical trial (DiRECT) of continued support for weight loss maintenance in the UK: an extension study. Lancet Diabetes Endocrinol 2024;12:233–246
79. Muscogiuri G, Barrea L, Laudisio D, et al. The management of very low-calorie ketogenic diet in obesity outpatient clinic: a practical guide. J Transl Med 2019;17:356
80. Malik N, Tonstad S, Paalani M, Dos Santos H, Luiz do Prado W. Are long-term FAD diets restricting micronutrient intake? A randomized controlled trial. Food Sci Nutr 2020;8:6047–6060
81. Johansson K, Neovius M, Hemmingsson E. Effects of anti-obesity drugs, diet, and exercise on weight-loss maintenance after a very-low-calorie diet or low-calorie diet: a systematic review and meta-analysis of randomized controlled trials. Am J Clin Nutr 2014;99:14–23
82. Batsis JA, Apolzan JW, Bagley PJ, et al. A systematic review of dietary supplements and alternative therapies for weight loss. Obesity (Silver Spring) 2021;29:1102–1113
83. Bessell E, Maunder A, Lauche R, Adams J, Sainsbury A, Fuller NR. Efficacy of dietary supplements containing isolated organic compounds for weight loss: a systematic review and meta-analysis of randomised placebo-controlled trials. Int J Obes (Lond) 2021;45:1631–1643
84. Maunder A, Bessell E, Lauche R, Adams J, Sainsbury A, Fuller NR. Effectiveness of herbal medicines for weight loss: a systematic review and meta-analysis of randomized controlled trials. Diabetes Obes Metab 2020;22:891–903
85. Scott Butsch W, Sulo S, Chang AT, et al. Nutritional deficiencies and muscle loss in adults with type 2 diabetes using GLP-1 receptor agonists: a retrospective observational study. Obes Pillars 2025;15:100186
86. Neeland IJ, Linge J, Birkenfeld AL. Changes in lean body mass with glucagon-like peptide-1-based therapies and mitigation strategies. Diabetes Obes Metab 2024;26(Suppl. 4):16–27

87. Marra MV, Bailey RL. Position of the Academy of Nutrition and Dietetics: micronutrient supplementation. J Acad Nutr Diet 2018;118:2162–2173
88. Donini LM, Busetto L, Bischoff SC, et al. Definition and diagnostic criteria for sarcopenic obesity: ESPEN and EASO consensus statement. Obes Facts 2022;15:321–335
89. Almandoz JP, Wadden TA, Tewksbury C, et al. Nutritional considerations with antiobesity medications. Obesity (Silver Spring) 2024;32:1613–1631
90. Locatelli JC, Costa JG, Haynes A, et al. Incretin-based weight loss pharmacotherapy: can resistance exercise optimize changes in body composition? Diabetes Care 2024;47:1718–1730
91. Mallard SR, Howe AS, Houghton LA. Vitamin D status and weight loss: a systematic review and meta-analysis of randomized and nonrandomized controlled weight-loss trials. Am J Clin Nutr 2016;104:1151–1159
92. Benson-Davies S, Frederiksen K, Patel R. Bariatric nutrition and evaluation of the metabolic surgical patient: update to the 2022 Obesity Medicine Association (OMA) bariatric surgery, gastrointestinal hormones, and the microbiome clinical practice statement (CPS). Obes Pillars 2025;13:100154
93. Chen Y, Jin X, Chen G, Wang R, Tian H. Dose-response relationship between physical activity and the morbidity and mortality of cardiovascular disease among individuals with diabetes: meta-analysis of prospective cohort studies. JMIR Public Health Surveill 2024;10:e54318
94. Sabag A, Chang CR, Francois ME, et al. The effect of exercise on quality of life in type 2 diabetes: a systematic review and meta-analysis. Med Sci Sports Exerc 2023;55:1353–1365
95. O'Donoghue G, Blake C, Cunningham C, Lennon O, Perrotta C. What exercise prescription is optimal to improve body composition and cardiorespiratory fitness in adults living with obesity? A network meta-analysis. Obes Rev 2021;22:e13137
96. Al-Mhanna SB, Batrakoulis A, Wan Ghazali WS, et al. Effects of combined aerobic and resistance training on glycemic control, blood pressure, inflammation, cardiorespiratory fitness and quality of life in patients with type 2 diabetes and overweight/obesity: a systematic review and meta-analysis. PeerJ 2024;12:e17525
97. Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social determinants of health and diabetes: a scientific review. Diabetes Care 2020;44:258–279
98. Thorpe K, Toles A, Shah B, Schneider J, Bravata DM. Weight loss-associated decreases in medical care expenditures for commercially insured patients with chronic conditions. J Occup Environ Med 2021;63:847–851
99. Wadden TA, Tronieri JS, Butryn ML. Lifestyle modification approaches for the treatment of obesity in adults. Am Psychol 2020;75:235–251
100. Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK, American College of Sports Medicine. American College of Sports Medicine Position Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. Med Sci Sports Exerc 2009;41:459–471
101. Gudzune KA, Doshi RS, Mehta AK, et al. Efficacy of commercial weight-loss programs: an updated systematic review. Ann Intern Med 2015;162:501–512
102. Bloom B, Mehta AK, Clark JM, Gudzune KA. Guideline-concordant weight-loss programs in an urban area are uncommon and difficult to identify through the internet. Obesity (Silver Spring) 2016;24:583–588
103. Domecq JP, Prutsky G, Leppin A, et al. Clinical review: drugs commonly associated with weight change: a systematic review and meta-analysis. J Clin Endocrinol Metab 2015;100:363–370
104. Stanford FC, Cena H, Biino G, et al. The association between weight-promoting medication use and weight gain in postmenopausal women: findings from the Women's Health Initiative. Menopause 2020;27:1117–1125
105. Hales CM, Gu Q, Ogden CL, Yanovski SZ. Use of prescription medications associated with weight gain among US adults, 1999-2018: a nationally representative survey. Obesity (Silver Spring) 2022;30:229–239
106. Moon RC, Almuwaqqat Z. Effect of obesogenic medication on weight- and fitness-change outcomes: evidence from the Look AHEAD Study. Obesity (Silver Spring) 2020;28:2003–2009
107. Garvey WT, Ryan DH, Look M, et al. Two-year sustained weight loss and metabolic benefits with controlled-release phentermine/topiramate in obese and overweight adults (SEQUEL): a randomized, placebo-controlled, phase 3 extension study. Am J Clin Nutr 2012;95:297–308
108. Jastreboff AM, Le Roux CW, Stefanski A, et al.; SURMOUNT-1 Investigators. Tirzepatide for obesity treatment and diabetes prevention. N Engl J Med 2025;392:958–971
109. Garvey WT, Frias JP, Jastreboff AM, et al.; SURMOUNT-2 investigators. Tirzepatide once weekly for the treatment of obesity in people with type 2 diabetes (SURMOUNT-2): a double-blind, randomised, multicentre, placebo-controlled, phase 3 trial. Lancet 2023;402:613–626
110. Garvey WT, Batterham RL, Bhatta M, et al.; STEP 5 Study Group. Two-year effects of semaglutide in adults with overweight or obesity: the STEP 5 trial. Nat Med 2022;28:2083–2091
111. Kahn SE, Deanfield JE, Jeppesen OK, et al.; SELECT Trial Investigators. Effect of semaglutide on regression and progression of glycemia in people with overweight or obesity but without diabetes in the SELECT trial. Diabetes Care 2024;47:1350–1359
112. Drugs.com. Phentermine: package insert/prescribing info. Accessed 25 September 2025. Available from https://www.drugs.com/pro/phentermine.html
113. Kosiborod MN, Petrie MC, Borlaug BA, et al.; STEP-HFpEF DM Trial Committees and Investigators. Semaglutide in patients with obesity-related heart failure and type 2 diabetes. N Engl J Med 2024;390:1394–1407
114. Malhotra A, Grunstein RR, Fietze I, et al.; SURMOUNT-OSA Investigators. Tirzepatide for the treatment of obstructive sleep apnea and obesity. N Engl J Med 2024;391:1193–1205
115. Loomba R, Hartman ML, Lawitz EJ, et al.; SYNERGY-NASH Investigators. Tirzepatide for metabolic dysfunction-associated steatohepatitis with liver fibrosis. N Engl J Med 2024;391:299–310
116. Sanyal AJ, Newsome PN, Kliers I, et al.; ESSENCE Study Group. Phase 3 trial of semaglutide in metabolic dysfunction-associated steatohepatitis. N Engl J Med 2025;392:2089–2099
117. Marso SP, Bain SC, Consoli A, et al.; SUSTAIN-6 Investigators. Semaglutide and cardiovascular outcomes in patients with type 2 diabetes. N Engl J Med 2016;375:1834–1844
118. Lincoff AM, Brown-Frandsen K, Colhoun HM, et al.; SELECT Trial Investigators. Semaglutide and cardiovascular outcomes in obesity without diabetes. N Engl J Med 2023;389:2221–2232
119. Eldor R, Avraham N, Rosenberg O, et al. Gradual titration of semaglutide results in better treatment adherence and fewer adverse events: a randomized controlled open-label pilot study examining a 16-week flexible titration regimen versus label-recommended 8-week semaglutide titration regimen. Diabetes Care 2025;48:1607–1611
120. Fujioka K, O'Neil PM, Davies M, et al. Early weight loss with liraglutide 3.0 mg predicts 1-year weight loss and is associated with improvements in clinical markers. Obesity (Silver Spring) 2016;24:2278–2288
121. Fujioka K, Plodkowski R, O'Neil PM, Gilder K, Walsh B, Greenway FL. The relationship between early weight loss and weight loss at 1 year with naltrexone ER/bupropion ER combination therapy. Int J Obes (Lond) 2016;40:1369–1375
122. Wilding JPH, Batterham RL, Davies M, et al.; STEP 1 Study Group. Weight regain and cardiometabolic effects after withdrawal of semaglutide: the STEP 1 trial extension. Diabetes Obes Metab 2022;24:1553–1564
123. Rubino D, Abrahamsson N, Davies M, et al.; STEP 4 Investigators. Effect of continued weekly subcutaneous semaglutide vs placebo on weight loss maintenance in adults with overweight or obesity: the STEP 4 randomized clinical trial. JAMA 2021;325:1414–1425
124. Aronne LJ, Sattar N, Horn DB, et al.; SURMOUNT-4 Investigators. Continued treatment with tirzepatide for maintenance of weight reduction in adults with obesity: the SURMOUNT-4 randomized clinical trial. JAMA 2024;331:38–48
125. Catenacci VA, Odgen L, Phelan S, et al. Dietary habits and weight maintenance success in high versus low exercisers in the National Weight Control Registry. J Phys Act Health 2014;11:1540–1548
126. Sullivan S. Endoscopic medical devices for primary obesity treatment in patients with diabetes. Diabetes Spectr 2017;30:258–264
127. Kahan S, Saunders KH, Kaplan LM. Combining obesity pharmacotherapy with endoscopic bariatric and metabolic therapies. Tech Innov Gastrointest Endosc 2020;22:154–158
128. Eisenberg D, Shikora SA, Aarts E, et al. 2022 American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): indications for metabolic and bariatric surgery. Surg Obes Relat Dis 2022;18:1345–1356
129. O'Brien R, Johnson E, Haneuse S, et al. Microvascular outcomes in patients with diabetes after bariatric surgery versus usual care: a matched cohort study. Ann Intern Med 2018;169:300–310
130. Mingrone G, Panunzi S, De Gaetano A, et al. Bariatric-metabolic surgery versus conventional medical treatment in obese patients with type 2 diabetes: 5 year follow-up of an open-label, single-centre, randomised controlled trial. Lancet 2015;386:964–973

131. Sjöström L, Peltonen M, Jacobson P, et al. Association of bariatric surgery with long-term remission of type 2 diabetes and with microvascular and macrovascular complications. JAMA 2014;311:2297–2304
132. Sjöström L, Lindroos A-K, Peltonen M, et al.; Swedish Obese Subjects Study Scientific Group. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. N Engl J Med 2004;351:2683–2693
133. Adams TD, Davidson LE, Litwin SE, et al. Health benefits of gastric bypass surgery after 6 years. JAMA 2012;308:1122–1131
134. Sjöström L, Gummesson A, Sjöström CD, et al.; Swedish Obese Subjects Study. Effects of bariatric surgery on cancer incidence in obese patients in Sweden (Swedish Obese Subjects Study): a prospective, controlled intervention trial. Lancet Oncol 2009;10:653–662
135. Sjöström L, Peltonen M, Jacobson P, et al. Bariatric surgery and long-term cardiovascular events. JAMA 2012;307:56–65
136. Arterburn DE, Olsen MK, Smith VA, et al. Association between bariatric surgery and long-term survival. JAMA 2015;313:62–70
137. Fisher DP, Johnson E, Haneuse S, et al. Association between bariatric surgery and macrovascular disease outcomes in patients with type 2 diabetes and severe obesity. JAMA 2018;320:1570–1582
138. Sjöström L, Narbro K, Sjöström CD, et al.; Swedish Obese Subjects Study. Effects of bariatric surgery on mortality in Swedish obese subjects. N Engl J Med 2007;357:741–752
139. Syn NL, Cummings DE, Wang LZ, et al. Association of metabolic-bariatric surgery with long-term survival in adults with and without diabetes: a one-stage meta-analysis of matched cohort and prospective controlled studies with 174 772 participants. Lancet 2021;397:1830–1841
140. Verrastro O, Panunzi S, Castagneto-Gissey L, et al. Bariatric-metabolic surgery versus lifestyle intervention plus best medical care in non-alcoholic steatohepatitis (BRAVES): a multicentre, open-label, randomised trial. Lancet 2023;401:1786–1797
141. Aminian A, Al-Kurd A, Wilson R, et al. Association of bariatric surgery with major adverse liver and cardiovascular outcomes in patients with biopsy-proven nonalcoholic steatohepatitis. JAMA 2021;326:2031–2042
142. Li Y, Gu Y, Jin Y, Mao Z. Is bariatric surgery effective for chinese patients with type 2 diabetes mellitus and body mass index < 35 kg/m^2? A systematic review and meta-analysis. Obes Surg 2021;31:4083–4092
143. McTigue KM, Wellman R, Nauman E, et al.; PCORnet Bariatric Study Collaborative. Comparing the 5-year diabetes outcomes of sleeve gastrectomy and gastric bypass: the National Patient-Centered Clinical Research Network (PCORNet) bariatric study. JAMA Surg 2020;155:e200087
144. Courcoulas AP, Patti ME, Hu B, et al. Long-term outcomes of medical management vs bariatric surgery in type 2 diabetes. JAMA 2024;331:654–664
145. Sjöholm K, Pajunen P, Jacobson P, et al. Incidence and remission of type 2 diabetes in relation to degree of obesity at baseline and 2 year weight change: the Swedish Obese Subjects (SOS) study. Diabetologia 2015;58:1448–1453
146. Hariri K, Guevara D, Jayaram A, Kini SU, Herron DM, Fernandez-Ranvier G. Preoperative insulin therapy as a marker for type 2 diabetes remission in obese patients after bariatric surgery. Surg Obes Relat Dis 2018;14:332–337
147. Yu H, Di J, Bao Y, et al. Visceral fat area as a new predictor of short-term diabetes remission after Roux-en-Y gastric bypass surgery in Chinese patients with a body mass index less than 35 kg/m^2. Surg Obes Relat Dis 2015;11:6–11
148. Lauren BN, Lim F, Krikhely A, et al. Estimated cost-effectiveness of medical therapy, sleeve gastrectomy, and gastric bypass in patients with severe obesity and type 2 diabetes. JAMA Netw Open 2022;5:e2148317
149. Young MT, Gebhart A, Phelan MJ, Nguyen NT. Use and outcomes of laparoscopic sleeve gastrectomy vs laparoscopic gastric bypass: analysis of the American College of Surgeons NSQIP. J Am Coll Surg 2015;220:880–885
150. Aminian A, Brethauer SA, Kirwan JP, Kashyap SR, Burguera B, Schauer PR. How safe is metabolic/diabetes surgery? Diabetes Obes Metab 2015;17:198–201
151. Birkmeyer NJO, Dimick JB, Share D, et al.; Michigan Bariatric Surgery Collaborative. Hospital complication rates with bariatric surgery in Michigan. JAMA 2010;304:435–442
152. Altieri MS, Yang J, Telem DA, et al. Lap band outcomes from 19,221 patients across centers and over a decade within the state of New York. Surg Endosc 2016;30:1725–1732
153. Courcoulas AP, King WC, Belle SH, et al. seven-year weight trajectories and health outcomes in the Longitudinal Assessment of Bariatric Surgery (LABS) study. JAMA Surg 2018;153:427–434
154. Birkmeyer JD, Finks JF, O'Reilly A, et al.; Michigan Bariatric Surgery Collaborative. Surgical skill and complication rates after bariatric surgery. N Engl J Med 2013;369:1434–1442
155. Service GJ, Thompson GB, Service FJ, Andrews JC, Collazo-Clavell ML, Lloyd RV. Hyperinsulinemic hypoglycemia with nesidioblastosis after gastric-bypass surgery. N Engl J Med 2005;353:249–254
156. Sheehan A, Patti ME. Hypoglycemia after upper gastrointestinal surgery: clinical approach to assessment, diagnosis, and treatment. Diabetes Metab Syndr Obes 2020;13:4469–4482
157. Lee D, Dreyfuss JM, Sheehan A, Puleio A, Mulla CM, Patti ME. Glycemic patterns are distinct in post-bariatric hypoglycemia after gastric bypass (PBH-RYGB). J Clin Endocrinol Metab 2021;106:2291–2303
158. Salehi M, Vella A, McLaughlin T, Patti M-E. Hypoglycemia after gastric bypass surgery: current concepts and controversies. J Clin Endocrinol Metab 2018;103:2815–2826
159. Conason A, Teixeira J, Hsu C-H, Puma L, Knafo D, Geliebter A. Substance use following bariatric weight loss surgery. JAMA Surg 2013;148:145–150
160. Bhatti JA, Nathens AB, Thiruchelvam D, Grantcharov T, Goldstein BI, Redelmeier DA. Self-harm emergencies after bariatric surgery: a population-based cohort study. JAMA Surg 2016;151:226–232
161. Jakobsen GS, Småstuen MC, Sandbu R, et al. Association of bariatric surgery vs medical obesity treatment with long-term medical complications and obesity-related comorbidities. JAMA 2018;319:291–301
162. King WC, Chen J-Y, Mitchell JE, et al. Prevalence of alcohol use disorders before and after bariatric surgery. JAMA 2012;307:2516–2525
163. Greenberg I, Sogg S, M Perna F. Behavioral and psychological care in weight loss surgery: best practice update. Obesity (Silver Spring) 2009;17:880–884
164. Ilanga M, Heard JC, McClintic J, et al. Use of GLP-1 agonists in high risk patients prior to bariatric surgery: a cohort study. Surg Endosc 2023;37:9509–9513
165. Thakur U, Bhansali A, Gupta R, Rastogi A. Liraglutide augments weight loss after laparoscopic sleeve gastrectomy: a randomised, double-blind, placebo-control study. Obes Surg 2021;31:84–92
166. Jensen AB, Renström F, Aczél S, et al. Efficacy of the glucagon-like peptide-1 receptor agonists liraglutide and semaglutide for the treatment of weight regain after bariatric surgery: a retrospective observational study. Obes Surg 2023;33:1017–1025
167. Vosburg RW, El Chaar M, El Djouzi S, et al.; Clinical Issues Committee of the American Society for Metabolic and Bariatric Surgery. Literature review on antiobesity medication use for metabolic and bariatric surgery patients from the American Society for Metabolic and Bariatric Surgery Clinical Issues Committee. Surg Obes Relat Dis 2022;18:1109–1119
168. Fang M, Jeon Y, Echouffo-Tcheugui JB, Selvin E. Prevalence and management of obesity in U.S. adults with type 1 diabetes. Ann Intern Med 2023;176:427–429
169. Van der Schueren B, Ellis D, Faradji RN, Al-Ozairi E, Rosen J, Mathieu C. Obesity in people living with type 1 diabetes. Lancet Diabetes Endocrinol 2021;9:776–785
170. Giandalia A, Russo GT, Ruggeri P, et al. The burden of obesity in type 1 diabetic subjects: a sex-specific analysis from the AMD Annals Initiative. J Clin Endocrinol Metab 2023;108:e1224–e1235
171. Shah VN, Akturk HK, Kruger D, et al. Semaglutide in adults with type 1 diabetes and obesity. NEJM Evid 2025;4:EVIDoa2500173
172. Edwards K, Li X, Lingvay I. Clinical and safety outcomes with GLP-1 receptor agonists and SGLT2 inhibitors in type 1 diabetes: a real-world study. J Clin Endocrinol Metab 2023;108:920–930
173. Mathieu C, Zinman B, Hemmingsson JU, et al.; ADJUNCT ONE Investigators. Efficacy and safety of liraglutide added to insulin treatment in type 1 diabetes: the ADJUNCT ONE treat-to-target randomized trial. Diabetes Care 2016;39:1702–1710
174. Ahrén B, Hirsch IB, Pieber TR, et al.; ADJUNCT TWO Investigators. Efficacy and safety of liraglutide added to capped insulin treatment in subjects with type 1 diabetes: the ADJUNCT TWO randomized trial. Diabetes Care 2016;39:1693–1701
175. Shah VN, Peters AL, Umpierrez GE, et al. Consensus report on glucagon-like peptide-1 receptor agonists as adjunctive treatment for individuals with type 1 diabetes using an automated insulin delivery system. J Diabetes Sci Technol 2025;19:191–216
176. Kirwan JP, Aminian A, Kashyap SR, Burguera B, Brethauer SA, Schauer PR. Bariatric surgery in obese patients with type 1 diabetes. Diabetes Care 2016;39:941–948

177. Ashrafian H, Harling L, Toma T, et al. Type 1 diabetes mellitus and bariatric surgery: a systematic review and meta-analysis. Obes Surg 2016;26:1697–1704
178. Middelbeek RJW, James-Todd T, Cavallerano JD, Schlossman DK, Patti ME, Brown FM. Gastric bypass surgery in severely obese women with type 1 diabetes: anthropometric and cardiometabolic effects at 1 and 5 years postsurgery. Diabetes Care 2015;38:e104–e105
179. Li P, Li Z, Staton E, et al. GLP-1 receptor agonist and SGLT2 inhibitor prescribing in people with type 1 diabetes. JAMA 2024;332:1667–1669
180. Rodriguez PJ, Zhang V, Gratzl S, et al. Discontinuation and reinitiation of dual-labeled GLP-1 receptor agonists among US adults with overweight or obesity. JAMA Netw Open 2025;8:e2457349
181. Maraka S, Kudva YC, Kellogg TA, Collazo-Clavell ML, Mundi MS. Bariatric surgery and diabetes: implications of type 1 versus insulin-requiring type 2. Obesity (Silver Spring) 2015;23:552–557
182. Rottenstreich A, Keidar A, Yuval JB, Abu-Gazala M, Khalaileh A, Elazary Ram. Outcome of bariatric surgery in patients with type 1 diabetes mellitus: our experience and review of the literature. Surg Endosc 2016;30:5428–5433
183. U.S. National Library of Medicine. Phentermine-phentermine hydrochloride capsule. 25 September 2025. Available from https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=737eef3b-9a6b-4ab3-a25c-49d84d2a0197
184. Aronne LJ, Wadden TA, Peterson C, Winslow D, Odeh S, Gadde KM. Evaluation of phentermine and topiramate versus phentermine/topiramate extended-release in obese adults. Obesity (Silver Spring) 2013;21:2163–2171
185. CHEPLAPHARM and H^2 Pharma. Xenical (orlistat). Accessed 25 September 2025. Available from https://xenical.com
186. Currax Pharmaceuticals. Contrave (naltrexone HCl/bupropion HCl) extended-release tablets. Accessed 25 September 2025. Available from https://contrave.com
187. Novo Nordisk. Saxenda (liraglutide injection 3 mg). Accessed 25 September 2025. Available from https://www.saxenda.com
188. Novo Nordisk. Wegovy semaglutide injection 2.4 mg. Accessed 25 September 2025. Available from https://www.novo-pi.com/wegovy.pdf
189. Eli Lilly and Company. Zepbound (tirzepatide). Accessed 25 September 2025. Available from https://pi.lilly.com/us/zepbound-uspi.pdf
190. Merative. Redbook (electronic version). Accessed 15 July 2025. Available from https://www.micromedexsolutions.com
191. Data.Medicaid.gov. NADAC (National Average Drug Acquisition Cost). Accessed 15 July 2025. Available from https://healthdata.gov/dataset/NADAC-National-Average-Drug-Acquisition-Cost-2024/3tha-57c6/about_data