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Review Article

Lifestyle management approaches for obesity

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BACKGROUND: Lifestyle modification remains the cornerstone of obesity management, serving as an essential component of all treatment plans, even in an era of effective pharmacotherapy.

SOURCES OF MATERIAL: This review examines the key elements of lifestyle interventions, their mechanisms of action, implementation strategies, and challenges in clinical practice. It additionally discusses the evolving role of lifestyle modification when integrated alongside new pharmaceutical advances, particularly glucagon-like peptide-1 receptor agonists, and how these combined approaches may optimize outcomes in obesity treatment.

ABSTRACT OF FINDINGS: Effective implementation of lifestyle modification requires a multidisciplinary approach, incorporating exercise counseling, medical nutrition therapy, and behavioral change strategies to address the complex nature of obesity. Nutritional approaches, including various evidence-based dietary patterns, function by creating energy deficits and altering metabolic pathways that influence weight regulation. Physical activity complements dietary interventions by increasing energy expenditure, improving body composition, and enhancing metabolic health. Studies have demonstrated benefits of physical activity for both weight loss and maintenance. Behavioral change techniques are critical for developing sustainable habits, overcoming psychological barriers, and facilitating long-term adherence to lifestyle modifications.

CONCLUSION: Despite evidence supporting lifestyle modification, challenges limit its use within obesity care, including poor long-term adherence, limited access to specialized facilities and professionals, and inadequate reimbursement for these clinical services.

Introduction

Obesity is a chronic, relapsing, multifactorial, and progressive disease characterized by an increased accumulation of body fat that promotes adipose tissue metabolic dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences.[1,2] This disease is associated with a number of complications and an increased risk of premature mortality.[3,4] The accumulation of body fat results from a complex interplay of genetic, environmental, socioeconomic, and behavioral factors, and cannot be solely attributed to individual lifestyle choices such as diet or physical activity.[5]

While pharmacological approaches to obesity management have advanced considerably in recent years, all com-

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prehensive multidimensional treatment plans should include lifestyle modification as a foundational cornerstone.[6] Effective lifestyle modification involves societal directives within communities, government, and healthcare sectors as well as individual behavior change strategies to develop and sustain long-term adherence to dietary and physical activity interventions.

The most recent (2013) guidelines from the American Heart Association, American College of Cardiology, and The Obesity Society (AHA/ACC/TOS) for the management of overweight and obesity in adults recommend a comprehensive lifestyle intervention alone or with adjunctive therapies (eg, pharmacotherapy) for individuals with a body mass index (BMI) of 30 kg/m^2 or higher or a BMI of 27 kg/m^2 or higher in patients with comorbidities.[6] Similarly, the US Preventive Services Task Force (USPSTF) (2018) recommends that an intensive, multicomponent behavioral intervention has a moderate net benefit for weight management.[7]

For individuals with BMI of $\geq$30, the Centers for Medicare and Medicaid Services (CMS) covers obesity screenings and intensive behavioral counseling to promote sustained weight loss through high-intensity interventions on diet and exercise under Medicare Part B.[8] The National Coverage Determination by CMS for intensive behavioral therapy is restrictive. This counseling must be furnished by a qualified primary care provider and conducted in the primary care setting. For appointments outside of the primary care setting or with other specialists (eg, registered dietitian nutritionists), services are generally not covered by CMS, requiring patients to pay out of pocket. The benefit structure includes 1 face-to-face counseling visit weekly for 1 month, then biweekly visits for an additional 5 months. If an individual loses $\geq$3 kg (6.6 lbs) during the first 6 months, they can receive monthly counseling for an additional 6 months (totaling 12 months of intensive behavioral therapy). If the $\geq$3 kg weight loss is not achieved during the first 6 months, Medicare coverage for intensive behavioral therapy is discontinued. Coverage for gym memberships and subscriptions to fitness programs are not covered by Medicare, except under some Medicare Advantage (Part C) plans. Similarly, there is very limited reimbursement for these lifestyle modification modalities in most state Medicaid programs, despite one-fifth of all people living in the United States enrolled in the program.[9]

Evidence supporting lifestyle modification for obesity management largely comes from 2 large randomized clinical trials—the Look AHEAD trial[10] and the Diabetes Prevention Program.[11] Lifestyle modification involving face-to-face counseling in 14 or more sessions over 6 months[6] has been shown to induce clinically meaningful weight reductions of $\geq$3% to 5% as well as improvements in obesity-related complications.[12,13] In addition to reductions in weight, lifestyle modification can result in clinically significant improvements in blood pressure, lipid profiles (eg, triglycerides, low-density lipoprotein [LDL] cholesterol, high-density lipoprotein [HDL] cholesterol, glycemic control (eg, blood glucose, hemoglobin A1c), and risk of developing type 2 diabetes.[6] Despite strong evidence supporting the effectiveness of lifestyle modifications, the implementation of such approaches faces substantial challenges, including limited adherence to modifications over time, individual variability in response to treatment, inadequate healthcare provider training in behavioral counseling techniques and approaches, lack of reimbursement for these clinical services, systemic barriers to access, and the pervasive influence of environmental factors that promote weight gain.[14–16]

This paper summarizes the components of lifestyle modification for obesity management structured around the Obesity Medicine Association's 4 core pillars of clinical obesity treatment: nutrition therapy, physical activity, behavior modification, and medical interventions.[17] It also describes implementation challenges, the importance of team-based approaches, integration with emerging antiobesity pharmacotherapies, and suggested future directions to enhance the effectiveness and accessibility of lifestyle modification for obesity management.

Dietary approaches for obesity management

There are many pathways to successful weight loss, regardless of which dietary approach is chosen. Weight loss requires inducing and sustaining an energy deficit.[6] The resulting state where energy expenditure is greater than energy intake leads to the use of stored fat as a source of energy. However, this oversimplification of energy expenditure does not account for the dynamic physiological adaptations that occur with weight loss.[18–20] Inducing an energy deficit can be accomplished by reducing portion sizes of meals, altering macronutrient composition of the diet, meal frequency, or choosing more nutrient dense and less energy-dense foods within an eating pattern.[21]

Dietary adherence drives weight loss success

Consistently across studies of different diets, the best predictor of weight loss success is dietary adherence.[6,22,23] A number of factors can contribute to whether or not an individual adheres to a particular dietary pattern, including personal preferences and cultural food norms, social support, access to appropriate foods, and perceived sustainability and flexibility of the diet.[24,25] The ACC/AHA/TOS guidelines identified 18 dietary approaches associated with weight loss.[6] They range from focusing on various macronutrients compositions, including low-fat diets, low-carbohydrate or high-protein diets, low glycemic-index diets, balanced deficit diets, vegetarian, vegan, and various diets based on dietary patterns and eliminating 1 or more major food groups. Across these approaches, no particular dietary pattern or approach demonstrated superiority in terms of inducing or maintaining weight loss.[6] Additionally, there was wide interindividual variation in weight loss between different strategies with weight loss ranging from 4 to 12 kg (9-26 lb) after 6 months for individuals who reduced energy intake $\geq$500 kcal/d.[6] Similar results have also been found in a systematic review and network meta-analysis of randomized trials examining macronutrient patterns of 14 popular dietary patterns.[26]

A 2023 report evaluated prevailing dietary patterns with the 2021 AHA dietary guidance[27] and ranked them from the most to the least alignment.[22] Beyond alignment, the scoring also included an implementation factor with scoring for how easily someone could adhere to dietary guidance wherever food is prepared or consumed. High scoring dietary patterns included the Dietary Approaches to Stop Hypertension (DASH) diet, Mediterranean, pescetarian, and vegetarian (ie, ovo, lacto, ovo/lacto). These 4 dietary patterns are flexible, providing a broad array of healthy foods from which to choose. The Paleo diet, which emphasizes whole, unprocessed foods while restricting or eliminating grains, legumes, dairy, refined sugar, and processed foods, and a very-low-carbohydrate diet (eg, ketogenic diet) earned some of the lowest scores for their restriction of food groups and limited long-term adherence rates. Additionally considerations of individual preferences, cultural or religious traditions, cooking skills and access to cooking equipment, and budgetary requirements is critical to improve adherence to a new dietary pattern and promote successful weight loss.[28]

Initiating dietary interventions for obesity management

An individual with obesity should be provided with evidence-based information about similarities and differences in dietary approaches or patterns to make an informed decision that matches their preferences, values, and health goals.[28] International clinical practice guidelines support that there is no single "most effective" diet for obesity management and a personalized approach to nutrition should be taken.[29–31] Some individuals may also prefer a flexible approach to eating, while others may value more prescriptive or structured eating plans.[32] This might also include how a particular dietary approach or pattern may impact other metrics of health (eg, LDL cholesterol level, blood pressure). Prior to implementing any dietary intervention, clinicians should conduct a comprehensive baseline assessment.[28] This assessment should include a detailed dietary history using validated tools such as 24-hour recalls, food frequency questionnaires, or multiday food records to capture usual eating patterns. The assessment must evaluate meal timing and eating behaviors, identify trigger foods or emotional eating patterns, assess cooking skills and food access, and determine availability of cooking equipment. Additionally, clinicians should consider, when appropriate, screening for food insecurity using validated tools and assessing factors that may contraindicate weight loss interventions (eg, active eating disorders, mental health disorders, pregnancy, chemotherapy treatment).[33–35] The initial assessment should also evaluate the individual's motivation level, readiness to change, and socioeconomic factors that could affect intervention adherence. Relevant laboratory markers (eg, lipid profiles, glucose metabolism indicators, and micronutrient levels) should be documented alongside anthropometric measurements to establish baseline health status. Regular follow-up visits should be scheduled to track progress, monitor adherence, assess tolerance, and modify the dietary prescription based on individual response.

Macronutrient modification dietary approaches

Modifying macronutrients within a dietary pattern has been of great interest over the years in clinical research because proteins, carbohydrates, and lipids each have different impacts on energy metabolism, appetite, and satiety.[21] The European Association for the Study of Obesity (EASO) guidelines rate the evidence for calorie-restricted dietary patterns emphasizing variable macronutrient distribution ranges (lower, moderate, or higher carbohydrate with variable proportions of protein and fat) with a Level 2, Grade B evidence level.[31] The AHA/ACC/TOS guidelines rate the evidence in support of using a low-fat or a low-carbohydrate diet as treatment for obesity as high-grade.[6] Numerous studies have examined low-fat vs low-carbohydrate diets.[36–38] Within well-controlled efficacy trials, such as metabolic ward studies or controlled feeding studies, low-carbohydrate diets are generally associated with greater weight reduction and cardiometabolic improvements (eg, reducing triglyceride and increasing HDL cholesterol concentrations).[29,37–40] However, when examining longer-term effectiveness trials (ie, $\geq$6 months) or those that use free-living conditions, those benefits appear to diminish over time.[6,26,37,38] Within the DIETFITS trial where participants were randomized to a healthy low-fat or low-carbohydrate diet, weight loss did not differ between groups at 12 months.[41] Similarly, within the POUNDS Lost trial, a 2-year clinical trial that investigated the impact of different macronutrient interventions (20% or 40% fat, 15% or 25% protein) on weight loss and other metabolic changes in individuals with overweight or obesity, comparable weight loss was observed at both 6 months and 2 years.[42] The reduced effectiveness in longer-term studies likely reflects declining adherence to the prescribed macronutrient restriction rather than a diminishing physiological effect of the diet itself.

Very-low-carbohydrate diets (ie, ketogenic diet) where carbohydrate intake is restricted to <20 to 50 g/d or 10% of total energy intake were not included in the AHA/ACC/TOS Guidelines.[6] Evidence suggests that while very-low-carbohydrate diets have shown reductions in weight over time, long-term adherence can be challenging for individuals.[37,43] Within the DIETFITS intervention even among participants who achieved the most extreme restriction of dietary fat vs carbohydrate, weight loss was similar between groups.[44] Very-low-carbohydrate diets may have concerning cardiovascular effects due to their typically high saturated fat content, which can elevate LDL cholesterol levels in some individuals and promote atherosclerosis.[45,46] However, improvements in appetite control, reductions in triglycerides, and an increase in HDL cholesterol levels have been observed.[37] Furthermore, the restricted intake of fiber and plant-based foods limits consumption of cardioprotective nutrients and antioxidants that play important roles in vascular health and inflammation reduction.[45,47] Despite some weight loss benefits, very-low-carbohydrate diets may not be appropriate for all individuals.[29,48]

The AHA/ACC/TOS Guidelines rate the evidence supporting using a high-protein diet (protein contributes 20%-30% to the total daily energy intake) as treatment for obesity as high-grade.[6] It is thought that higher protein intake during weight loss may promote satiety and also prevent some of the inevitable loss of lean body mass.[38] However, since the publication of the 2013 AHA/ACC/TOS Guidelines, more recent studies have found mixed evidence in support of a high-protein diet.[49–52] Some studies have observed modest benefits of a high-protein diet compared to other dietary patterns for initial weight loss, longer duration studies have failed to detect a beneficial impact.[50–54] Further, if high-protein diets are used, the optimal amount and sources of dietary protein remain undetermined.[55] There is some concern that dietary patterns high in protein are associated with high intake of animal products and saturated fat, which may increase cardiovascular risk.[56] However, research supports that higher protein diets may have a protective effect against cardiovascular risk when other macronutrients are carefully considered.[55]

Dietary patterns

Dietary patterns reflect the quantities, proportions, variety, or combination of different foods, drinks, and nutrients habitually consumed.[57] Among the most well-researched and clinically effective dietary patterns for weight loss are plant-based and Mediterranean-style approaches, commonly known as The Mediterranean Diet. Unlike approaches that focus primarily on macronutrient manipulation, dietary patterns emphasize food quality, variety, and overall eating behaviors, often incorporating moderate calorie restriction when weight loss is the goal.[49] This approach may offer greater sustainability and adherence compared to more rigid diets or diets that require a greater degree of self-monitoring of dietary intake.[22] Additionally, evidence suggests that adopting certain dietary patterns can facilitate weight management while simultaneously promoting improvements in other health outcomes.

Plant-based dietary patterns

Plant-based diets consist of a diverse family of dietary patterns.[58] Within this umbrella of dietary patterns are vegetarian and vegan dietary patterns which encourage eating foods derived from plant sources such as vegetables, fruits, whole grains, legumes, and beans, with no or limited animal food sources. Plant-based dietary patterns have been endorsed by several professional and health organizations such as the AHA, Academy of Nutrition and Dietetics, American College of Lifestyle Medicine, and American Cancer Society.[27,59–62] The 2013 AHA/ACC/TOS guidelines identified a lacto-ovo-vegetarian-style dietary approach with energy restriction and a low-fat vegan-style diet with an energy restriction as having a high-grade for evidence for weight loss.[6] Since the 2013 guidelines, a growing body of evidence supports vegetarian and other plant-based dietary patterns lowering weight.[63,64] In addition to improvements in weight, reductions in cardiovascular disease risk factors have also been consistently observed.[63,65,66] The EASO guidelines endorse plant-based dietary patterns, such as the Portfolio Diet, or components of a plant-based diet (eg, whole grains, pulses, vegetables, and fruit) for weight management.[31] In particular, the Portfolio Diet which combines nuts, soy protein, viscous fiber, and plant sterols into 1 eating plan is supported by Level 1a, Grade B evidence. Despite benefits, adoption and implementation of plant-based diets face challenges including cultural food traditions, family dietary preferences, social eating contexts, food access inequities, and concerns about nutritional adequacy.[58,67]

Mediterranean-style dietary pattern

The Mediterranean-style dietary pattern, characterized by abundant plant foods (fruits, vegetables, whole grains, legumes, nuts), olive oil as the primary fat source, moderate consumption of fish and seafood, limited dairy, and minimal red meat and processed foods has demonstrated effectiveness for weight management despite lacking a strict energy restriction.[68] Although there is no consensus on an exact definition of a Mediterranean diet, research suggests that replacing high glycemic index foods with minimally processed food options typical of this pattern may contribute to weight loss even without explicit caloric deficit.[69] Both the 2013 AHA/ACC/TOS guidelines and the EASO give a strong recommendation for the Mediterranean-style dietary pattern with energy restriction for weight loss.[6,31] More recent studies and systematic reviews of trials and cohort studies show weight loss associated with a Mediterranean-style dietary pattern.[68,70–72] Similar to plant-based dietary patterns, Mediterranean-style dietary patterns consistently demonstrate cardiometabolic benefits including improved lipid profiles, reduced inflammation, better glycemic control, and lower cardiovascular disease risk.[29,73,74] Many individuals find this dietary pattern appealing due to its flexibility and lack of emphasis on specific macronutrient targets, making it a sustainable approach for long-term adherence.[49] A systematic review and meta-analysis of cohort studies found that greater Mediterranean diet adherence was associated with lower risk of overweight and/or obesity and less 5-year weight gain.[75]

Intermittent fasting and time restricted approaches

Traditional weight loss diet approaches have centered on *what* to eat, meanwhile newer approaches have focused on *when* to eat. This shift in strategy has given rise to chrononutrition concepts like time-restricted eating, intermittent fasting, and fasting mimicking diets.[13,76] Various paradigms have been proposed. Some approaches may restrict dietary intake to a consistent daily eating period (eg, 6-11-hour) without necessarily focusing on restrictions to diet quality or quantity of food.[76] Other approaches, like the 5:2 periodic fasting diet, involve 5 days of unrestricted intake and 2 days of energy restriction (eg, 60%-70% of total daily energy intake).[49] A benefit of these approaches for weight loss are that they only require individuals to limit their intake for defined eating windows which may be easier for adherence than continuous energy restriction with other weight loss dietary patterns.[49,76] Additionally this may help individuals with challenges of behavioral fatigue or monotony within their diet. Research finds modest benefits for weight outcomes; however, effect sizes are generally small and there is often large heterogeneity between study methods.[76–80] For other metabolic outcomes such insulin sensitivity, blood pressure, lipids, and inflammatory markets, research has found that intermittent fasting may improve these parameters.[29,31,81] However, intermittent fasting may not be suitable for everyone, particularly individuals who need to remain in a fed state throughout the day, such as those with diabetes or those who must take medications with food.[82,83] Additionally, most intermittent fasting and time restricted approaches do not necessarily emphasize healthy meal quality. Future research is needed to identify which specific timing strategies are most effective for different populations, how meal timing interacts with dietary composition, and the long-term sustainability and health impacts of these approaches beyond weight loss.

Fad diets and commercial weight loss products

Despite the proliferation of commercial weight loss products and dietary programs available to the general public, many lack rigorous scientific evaluation and/or sufficient evidence to support their use.[84] These products or interventions frequently overpromise rapid or significant weight loss while underdelivering measurable, sustainable results. They may potentially provide false hope to individuals who have previously struggled with weight management or may hinder an individual's progress through weight management. The absence of methodologically rigorous clinical trials, adequate sample sizes, adherence data and long-term follow-up data for many of these products creates a significant gap between marketing and evidence-based practice.[56] Clinicians should be aware of how this discrepancy may mislead consumers and dissuade individuals from pursuing lifestyle modification interventions with established efficacy.

Physiological and behavioral drivers of weight loss plateaus and weight regain

The usual trajectory for weight change from diet and lifestyle interventions involves a period of rapid weight loss in the early stages of the intervention. This is followed by a static plateau phase in weight loss around 6 to 9 months, despite active engagement in a lifestyle-based intervention.[85] Numerous physiological and psychological explanations have been given to account for weight loss plateaus that may occur.[20,86] As an individual loses weight, their resting metabolic rate (RMR) also decreases because there is less mass to support.[20] At the same time, the body also responds with both orexigenic and anorexigenic adaptions that influence appetite, satiety, and energy homeostasis.[20,87,88] In the absence of ongoing efforts to restrain food intake following weight loss, there is a proportional increase in appetite. This typically results in dieters eating about 100 calories per day above baseline levels per kilogram of lost weight, thus accelerating their weight regain.[18] Over the long-term, most individuals struggle with maintaining their lost weight and only about 20 percent of individuals with overweight and obesity maintain their initial weight loss after 5 years.[19,89]

Strategies that were most effective for weight loss may not be the same strategies that guide successful weight maintenance.[19,89] Although future calorie restriction may seem like an obvious target, it is often not feasible.[19] Instead, the goal is to find a combination of energy intake and physical activity expenditure that leads to a new energy deficit sufficient to resume weight loss or maintain weight that has been lost.[21] Simply switching from one weight loss dietary approach to another around the time weight plateaus typically occur (eg, 6 months) may not help to renew weight loss.[86] Instead, one potential strategy when individuals experience weight loss plateaus is to increase energy intake (∼100 kcal/d) alongside alterations in physical activity programming to circumvent physiological adaptations and lead to a higher energy flux state.[21] Crucially, the most effective diet for continued progress is one that an individual can maintain consistently, even when the rate of weight loss slows. This may mean personalizing approaches based on food preferences, cultural considerations, schedule constraints, and individual metabolic responses.[28]

Consistent dietary self-monitoring is predictive of weight loss and maintenance,[90–92] but few people consistently commit to monitoring their diet long term.[93] As a result, adherence often begins to wane, negative behaviors and habits that predate weight loss return, and many dieters can regain their lost weight.[94–96] Mastering cognitive-behavioral techniques becomes critical during weight loss plateau phases. These include regular self-monitoring of food intake, weight, and physical activity; developing problem-solving skills for high-risk situations; cultivating mindfulness around eating behaviors; implementing stimulus control strategies to manage environmental cues; establishing support systems for accountability and motivation; and setting process-oriented goals rather than solely outcome-focused ones.[13,97]

Physical activity approaches for obesity management

Guidelines for physical activity

The AHA's "Life's Essential 8" identifies physical activity as essential to maintaining cardiovascular health.[98] Multiple studies over the years have consistently shown that physical activity significantly improves cardiometabolic risk factors, reduces cardiovascular events, promotes sustained weight loss and maintenance, and enhances both quality of life and physical function.[99–101] Professional guidelines from the AHA and the U.S. Department of Health and Human Services (DHHS) provide the foundation for individualized exercise prescriptions. The AHA recommends at least 150 minutes per week of moderate-intensity or 75 minutes per week of vigorous-intensity aerobic activity.[102] The 2018 DHHS Physical Activity Guidelines for Americans expand upon this, recommending 150 to 300 minutes of moderate-intensity or 75 to 150 minutes of vigorous-intensity aerobic activity per week, along with muscle-strengthening exercises on 2 or more days per week.[103]

Exercise recommendations in obesity guidelines

Specifically for individuals with obesity, the 2018 DHHS guidelines highlight that engaging in ≥300 minutes per week of moderate-intensity physical activity is associated with meaningful weight loss. Similarly, the American Association of Clinical Endocrinology recommends 150 to 300 minutes per week of aerobic activity, combined with resistance training to preserve lean muscle mass during weight loss. Other guidelines, such as those from the American College of Sports Medicine and the World Health Organization physical activity guidelines, also emphasize that ≥300 minutes per week of moderate-intensity activity is often needed for significant weight loss.[104–106] Across all guidelines, resistance training is consistently recommended to preserve muscle mass. For individuals with obesity, supervised exercise programs and a gradual increase in activity intensity and duration are advised to enhance safety and adherence.

Types of exercise

Exercise can be categorized into 3 primary types: aerobic, resistance, and flexibility training, each of which offers a distinct benefit and are often used in combination for cardiovascular risk reduction. Aerobic exercise is described as sustained, rhythmic movements of the large muscle groups, such as brisk walking, cycling, or swimming performed at moderate-to-vigorous intensity. Aerobic training improves peak oxygen uptake, lowers abdominal adiposity, and improves blood pressure and lipid profiles.[107] Resistance or strength training imposes an external or body-weight load on skeletal muscle (eg, free weights, resistance bands, or push-ups). It preserves or increases lean mass during caloric restriction, improves muscle strength, and augments overall functional capacity.[108,109] Flexibility and balance activities, like yoga, Pilates, tai chi, and static stretching, have minimal direct impact on energy expenditure but improve joint range of motion, core stability, and reduce fall risk.[110,111]

Exercise for weight loss

Aerobic exercise is the main contributor of negative energy balance; meta-analyses show that 150 to 200 minutes per week of moderate-intensity aerobic activity yields an average loss of 2 to 3 kg when performed without dietary change, with greater volumes (≥300 minutes per week) required for meaningful reductions.[112] Resistance training alone has little effect on scale weight, yet when added to aerobic programs it mitigates fat-free-mass loss, supports RMR, and improves cardiometabolic markers beyond aerobic work alone.[108,113] Accordingly, and as mentioned previously, current guidelines advise combining ≥300 minutes per week of moderate aerobic activity with muscle-strengthening exercises on 2 or more days each week for adults living with obesity.[103]

Mechanism for weight loss—energy expenditure

Body weight change ultimately reflects energy balance; sustained energy expenditure that exceeds energy intake creates a cumulative calorie deficit. Roughly 3500 kcal correspond to about 0.45 kg (1 lb) of adipose tissue, although the relationship becomes nonlinear over time because of metabolic adaptation, partial loss of lean mass, behavioral compensation, and wide interindividual variability.[19] This simplified linear estimate, often referred to as the "static rule," assumes a fixed ratio of energy deficit to weight loss regardless of time or physiology. Contemporary dynamic models estimate that the average adult loses only about half the weight predicted by the static rule after 1 year of continued caloric deficit.[114] Total daily energy expenditure consists of RMR, the thermic effect of food, and activity-related energy expenditure.[115] Walking 1 mile (≈1.6 km) uses roughly 100 kcal in an 80-kg adult. A practical rule of thumb is calories burned per hour ≈ metabolic equivalent of task (MET) × body-weight (kg), so a 5-MET brisk walk for the same individual costs about 400 kcal per hour.[116] Meeting the guideline target of 150 minutes of brisk walking each week therefore generates a deficit of roughly 1000 kcal, or 0.1 to 0.25 kg of body weight, provided dietary intake is unchanged. In contrast to continuous moderate-intensity aerobic exercise, high-intensity interval and resistance training sessions burn fewer calories while they are performed but, through prolonged postexercise oxygen consumption and lean-mass preservation, add extra energy expenditure afterward and help maintain, or even raise, RMR.[108,117]

Impact on body composition

Long-term aerobic exercise training typically results in modest reductions in body weight. Moderate-intensity aerobic exercise programs sustained over 6 to 12 months have been shown to modestly reduce both weight and waist circumference in individuals with overweight and obesity, as demonstrated by a 2011 meta-analysis.[118] While exercise training alone may lead to variable reduction in total body weight or overall fat mass, it has been consistently associated with reductions in visceral and ectopic fat. These changes are particularly beneficial given their strong link to increased cardiometabolic risk.[119]

Resistance exercise performed 2 to 3 times per week preserves or modestly increases lean mass (≈ +0.8 kg), trims whole-body fat by about 1 kg, and offsets the drop in RMR that accompanies dieting; when combined with caloric restriction the same review found average fat-mass losses of 5 kg while lean tissue was fully maintained.[108] Notably, the incremental benefit of adding exercise depends on the degree of energy restriction. With moderate restriction (∼500-700 kcal/d), exercise augments weight loss beyond diet alone, whereas with severe restriction (∼1000 kcal/d), adding exercise generally does not further increase weight loss.[104]

Flexibility and balance activities like yoga, tai chi, Pilates, and structured stretching, improve mobility, balance performance, and fall risk in adults with obesity.[110] A recent systematic review found variable effects on weight loss and waist circumference.[111] Although scale weight seldom changes, these low-intensity sessions lessen musculoskeletal discomfort and boost confidence in movement, thereby making it easier for patients to stick with the higher-intensity aerobic and resistance work that drives substantial fat-mass reduction.

Exercise-induced vs diet-induced weight loss

Randomized studies that have matched the energy deficit show that aerobic exercise can lower body weight as effectively as caloric restriction while conferring additional body-composition and fitness advantages. In the studies by Ross et al., men and pre-menopausal women with obesity underwent a 4 to 5-week isocaloric, weight-maintenance run-in and were then randomized: the exercise group maintained the diet while increasing supervised energy expenditure by ∼500 to 700 kcal/d, whereas the diet group reduced intake from the same diet by ∼500 to 700 kcal/d, yielding a 6% to 8% reduction in body mass. In both studies, the exercise and diet arms achieved similar reductions in visceral adipose tissue. However, the exercise groups experienced significantly greater reductions in total and abdominal subcutaneous fat, along with preservation of lean mass, which were not observed in the diet-only groups.[120,121]

Exercise vs antiobesity pharmacotherapy

While caloric restriction and aerobic exercise can achieve comparable weight loss when energy deficits are matched, pharmacologic agents, particularly glucagon-like peptide-1 receptor agonists (GLP-1 RAs), typically produce greater absolute reductions in body weight. However, these medications do not confer the same improvements in physical fitness, body composition, or functional capacity observed with exercise. In the NEW (S-LiTE) trial, individuals with obesity who had completed an 8-week very-low-calorie diet were randomized to 52 weeks of high-volume exercise, liraglutide 3 mg daily, their combination, or placebo.[122] Compared with the placebo, the exercise group lost 4.1 kg, the liraglutide group 6.8 kg, and the combination group lost 9.5 kg, demonstrating additive effects. Notably, only participants in the exercise groups improved cardiorespiratory fitness (mean VO_2max increase of 6.6 mL/kg/min), while fitness declined in the placebo and liraglutide-only arms. In addition, exercise mitigated adverse effects associated with GLP-1 RA therapy, such as resting tachycardia and gallstone formation. These findings underscore the value of combining pharmacotherapy with structured physical activity to optimize both weight outcomes and broader health metrics.

Although direct comparisons of exercise vs modern pharmacologic agents remain limited, earlier systematic reviews suggest that exercise alone is less potent than medications in inducing weight loss,[123] yet may yield meaningful reduction in visceral fat and greater improvements in insulin sensitivity, particularly when sustained at higher volumes.[100] Sustained physical activity also supports weight loss maintenance. In Look AHEAD, participants with higher physical activity and program engagement maintained greater 4-year losses,[124] and in a separate 6-year follow-up after major weight loss, more daily activity was associated with less regain.[125] Mechanistically, regular exercise helps maintain energy expenditure and may blunt adaptive changes in metabolism and appetite that promote regain.[126] While antiobesity medications have demonstrated greater efficacy than exercise for weight loss maintenance in pooled analyses, structured physical activity remains a recommended component of long-term obesity management due to its benefits for fitness, metabolic health, and weight stability.

Exercise training after bariatric surgery

Although bariatric surgery leads to the most substantial and sustained weight loss of any current intervention, often exceeding 25% of baseline body weight, it does not fully address losses in aerobic capacity, muscle strength, or lean body mass.[127,128] As such, exercise serves a distinct and complementary role in the postoperative setting, targeting improvements in functional status, metabolic health, and body composition quality, rather than scale weight alone.

Randomized trials have shown that structured exercise introduced after Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy yields modest additional weight and fat-mass reductions but more consistently enhances cardiorespiratory fitness and muscular strength. In a 6-month trial by Mundbjerg et al., patients who initiated supervised aerobic-plus-resistance training 6 months post-RYGB experienced an increase in absolute VO_2max of 0.33 L/min and significantly greater hip-adductor strength compared with standard care, despite equivalent weight loss between groups.[129] However, these gains were not sustained after training stopped, underscoring the need for ongoing physical activity to preserve postoperative improvements. Similarly, 5-year follow-up data from Bellicha et al.[130] demonstrated that patients who engaged in higher volumes of moderate-to-vigorous physical activity were significantly more likely to limit weight regain over time.

A 2022 meta-analysis pooling 15 randomized trials (n = 638) confirmed that postbariatric exercise programs consistently improved strength and VO_2max though the average additional weight loss was modest (~2-3 kg).[130] These findings support consensus recommendations from the European Association for the Study of Obesity and European Society for Clinical Nutrition and Metabolism, which endorse combined aerobic and resistance training after bariatric surgery, even when the primary goal is not further weight loss. Exercise in this context improves physical function, preserves lean mass, and may help defend long-term weight stability, particularly when performed at moderate-to-high intensity over extended periods.[131]

Clinical implications

Across modalities, exercise alone at 150 to 200 minutes per week typically yields a modest 2 to 3 kg weight loss, but when energy deficits are matched, its efficacy rivals diet-first approaches and surpasses them for visceral-fat reduction and fitness gains. Pharmacologic and surgical therapies deliver greater absolute weight change, yet integration of structured physical activity maximizes durability, preserves lean mass, and amplifies cardiometabolic benefit. These findings support guideline recommendations that exercise remain a foundational therapy and a required supplement to diet, medication, and bariatric surgery in comprehensive obesity management.

Large-scale trials further reinforce the value of integrating structured lifestyle interventions across obesity treatment. The Look AHEAD trial demonstrated that weight loss programs combining diet and physical activity led to sustained improvements in fitness and cardiometabolic risk factors among individuals with type 2 diabetes.[132] Meanwhile, the STAMPEDE trial confirmed the superiority of bariatric surgery over intensive medical therapy, including lifestyle counseling and pharmacologic treatment, for sustained weight loss and glycemic control in individuals with obesity and diabetes.[133] Together, these findings underscore that while surgery and medication can deliver larger absolute weight change, structured physical activity remains essential across all treatment pathways for optimizing long-term health outcomes.

The exercise prescription—core principles

An exercise prescription is a structured, individualized plan that specifies the frequency, intensity, time, and type of activity (FITT) and how these progress over time, aligned with patient preferences and clinical considerations. Effective exercise prescriptions for obesity management rest upon 2 foundational principles: aerobic training and resistance training. Aerobic exercise is central as it drives the greatest energy expenditure and fat loss and should constitute the largest percentage of the exercise program.[134] Resistance training complements aerobic activity by preserving and even enhancing lean muscle mass and thereby mitigating the typical decline in RMR seen during weight loss.[135] Together, these modalities form the physiological cornerstone of obesity treatment through physical activity. Both the amount of physical activity performed, and an individual's cardiorespiratory fitness (CRF) are inversely associated with the risk of coronary artery disease.[136,137] As these are modifiable risk factors, clinicians should routinely assess and encourage physical activity and prescribe structured exercise programs.

When prescribing exercise, clinicians should consider both CRF and the personal activity intelligence (PAI) score.[138] In fact, CRF has been proposed as a clinical vital sign, as numerous studies have demonstrated its strong association with cardiovascular disease mortality.[137] Given the substantial evidence supporting the benefits of improved CRF and PAI, the goals of an exercise program should extend beyond weight loss in individuals with obesity to include improvements in these parameters as well.[137,139,140]

Assessing baseline activity

The first step of an effective exercise prescription is determining the patient's baseline activity levels, past successes, medical history, and personal goals. Clinicians can employ the Physical Activity Vital Sign, a simple 2-question assessment quantifying weekly minutes of moderate-to-vigorous activity, where <150 minutes per week identifies patients needing intervention.[141] Step counts via wearable devices or smartphone apps provide further clarity: fewer than 5000 steps per day indicate sedentary behaviors, while around 10,000 steps per day correspond to an active lifestyle. Although clinicians can use pedometer-based interventions to improve physical activity level, weight loss tends to be very modest (<2 kg).[142,143]

Beyond activity metrics, it is crucial to evaluate physical limitations that may affect exercise capacity. Obesity is often associated with musculoskeletal issues such as osteoarthritis, joint pain, and reduced mobility, which can hinder participation in physical activity.[144] For instance, individuals with obesity and knee osteoarthritis may experience significant pain and functional limitations, necessitating a tailored plan which may include referral to a physical therapist for targeted mobility and strength therapy to improve function or to an orthopedic specialist for detailed joint evaluation.

Socioeconomic and environmental factors can further constrain activity. Limited access to safe neighborhoods, financial barriers to a gym membership, and lack of transportation disproportionately affect lower-income adults and are associated with lower physical-activity levels and higher cardiometabolic risk.[145] Identifying these barriers upfront allows clinicians to prescribe home-based or community options tailored to each patient's resources and lifestyle.

Practical exercise strategies

Numerous studies have shown that any level of physical activity is better than none.[103,146] A real-world example of this principle is found in the Blue Zones, regions around the world where people live functionally longer and healthier lives. In these communities, physical activity consists of natural movement embedded in daily routines, such as walking, farming, climbing hills, gardening, and cooking. This illustrates how regular, even low-intensity activity can meaningfully enhance cardiovascular health and longevity.[147] An effective exercise strategy is adaptable, patient-centered, and accounts for potential limitations such as orthopedic conditions or joint pain. Practically, a combination of tailored aerobic and resistance program should be prescribed as its superior to either alone.[148] Aerobic exercises, such as brisk walking and stair climbing, can be incorporated into daily routines; small changes such as taking the stairs or parking farther from an entrance accumulate meaningful additional activity through nonexercise activity thermogenesis.[149] For patients with orthopedic restrictions, aquatic exercises or stationary cycling may be preferable.[150,151] Resistance training can be implemented using body weight circuits, resistance bands, or free weights at home or in a gym setting. Home-based regimens demonstrate equivalent strength gains to facility-based routines and may overcome barriers related to accessibility or cost. Personalized plans that respect patient limitations, preferences, and resources support long-term adherence and maximize the clinical benefits of exercise.

Aerobic exercise prescription

It is important to gauge exercise intensity to counsel patients appropriately and ensure safety and efficacy. Activities can be categorized using METs: moderate intensity (3-6 METs) and vigorous activity (>6 METs).[106] Intensity can also be categorized by heart rate (HR) zones, calculated as percentage of estimated maximum HR (220 – a patient's age). Moderate activity corresponds to 50% to 70% HR_{max} and vigorous activity to 70% to 85% HR_{max}.[110] It is important to consider a patient's age, fitness level, medical history, and use of certain medication (atrioventricular nodal blockers) which may limit HR response. Additionally, variability exists based on a patient's conditioning, age, and sex. As an alternative to using HR alone to clinically determine intensity of exercise, the 6-to-20 Borg rating of perceived exertion (RPE) is useful (Table 1).

A stepwise framework simplifies the design of an aerobic program:

1. **Assess readiness and risk:** Screen for cardiovascular risk factors, orthopedic limitations, and current medications.
2. **Define frequency and duration:** Prescribe at least 150 minutes per week of moderate-intensity activity, ideally divided into 20 to 60-minute sessions on most days.[103]

Table 1. Borg 20-grade scale for rating perceived exertion.[a,b]

6	
7	Very, very light
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	

[a]A rating between 12 and 14 typically reflects a moderate intensity. A rating from 15 to 17 reflects vigorous intensity.
[b]Adapted from Fletcher et al.[110]

3. **Select intensity:** Apply MET or HR_{max} targets as above or use Borg RPE when appropriate.
4. **Implement progression:** Follow the FITT principle: begin by increasing time, then frequency, then intensity, and adhering to a 5% to 10% weekly incremental rule to minimize injury.[106]
5. **Monitor and adjust:** Review patient logs (heart rate, RPE, step counts) and symptom reports, reassess tolerability every 4 to 6 weeks, and modify the prescription to balance challenge with safety.[106]

Challenges in diet- and exercise-based weight loss programs

There are multiple challenges for both clinicians (physicians and advanced practice providers) and patients when implementing nutrition and physical activity programs. For clinicians, key barriers include limited time during clinic visits and insufficient training in nutrition and exercise counseling.[152] Primary care providers, including internists and family physicians, often spend between 13 and 24 minutes per visit, depending on case complexity.[153,154] Given the prevalence of obesity, it would be prudent for clinicians across different specialties to receive formal training in obesity medicine and exercise prescription.[155,156] Clinicians with such training are significantly more likely to counsel patients on behavioral change. As of early 2024, >8000 physicians in the United States and Canada are certified in obesity medicine by the American Board of Obesity Medicine—a notable increase from 5881 in 2022, reflecting 40% growth in just 1 year.[157] This expansion of specialized training broadens access to evidence-based obesity care and increases capacity for structured lifestyle counseling and medication management, complementing the roles of registered dietitian nutritionists and exercise physiologists.

Table 2. The 5 As brief counseling framework.

Step	What the clinician does	Nutrition examples	Exercise examples
Ask	Ask permission; identify the priority for this visit.	"Would it be okay to talk about meals this week?"	"Could we spend a minute on activity today?"
Advise	Give clear, personalized next steps.	"Include a plant-based protein source at each meal; plan 2 weekday lunches."	"Walk 20-30 min on 5 days; add 2 days of light resistance."
Assess	Surface readiness, risks, and barriers.	Cost/time, food access, social support.	Pain/injury history, facility access, schedule.
Agree	Together create 1-2 SMART goals and a start date.	"On Sunday, prepare 5 lunches for the week."	"Walk 15 min Mon/Wed/Fri after dinner."
Assist/Arrange	Provide supports and schedule follow-up.	Dietitian referral; food log/app; 2-6-week check-in.	Physical therapy referral; pedometer or HR target; 2-6-week check-in.

Abbreviations: HR, heart rate; SMART, Specific, Measurable, Achievable, Relevant, Time-bound.

Other significant clinician-based barriers include poor reimbursement, limited access to multidisciplinary support, and a perceived lack of efficacy. Clinicians are rarely compensated for exercise or lifestyle counseling, and in a revenue-driven healthcare system, this limits the incentive to devote time to preventive discussions.[158] Furthermore, access to coordinated care, including registered dietitians and exercise specialists, is often limited. Additionally, when clinicians perceive their counseling efforts to have minimal impact, they may be discouraged from initiating these conversations, particularly during time-constrained visits. From the patient's perspective, challenges include transportation barriers, musculoskeletal pain or fear of injury, limited access to safe spaces for activity or affordable healthy foods, and a lack of support and motivation to adhere to a structured nutrition or exercise plan.[159,160]

Role of behavior therapy within obesity management

A critical component of lifestyle modification interventions is behavior therapy as it provides tools for facilitating changes to eating patterns or physical activity patterns. One of the biggest challenges in the initiation of behavioral strategies is identifying the modifiable factors that contribute to an individual's obesity (eg, specific eating, activity, emotional, or environmental factor) which can then become targets for personalized behavior modification.[13]

Table 2 summarizes the 5 As model that can be used as a framework to support counseling on lifestyle behaviors.[161] Interprofessional obesity care providers can use motivational interviewing to enhance intrinsic motivation and help bring a patient from ambivalence toward change by eliciting personal motives, surfacing barriers, and cocreating strategies to overcome them.[162,163] Cognitive behavior therapy complements this by examining unhelpful thoughts and behaviors, modifying unrealistic weight goals or expectations, and building skills for behavior change.[163,164] Core techniques include setting SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals, self-monitoring (food/activity logs, weight, step counts), problem solving, stimulus control, peer support, patient-identified rewards, cognitive restructuring, and relapse-prevention planning.[13,163,165] Behavior therapy can be provided in-person or via alternative modalities as well as on an individual basis or within a group-based setting. Throughout the process of behavior therapy, managing expectations and communicating realistic expectations about the challenges of losing and maintaining weight loss is important.

To translate these strategies into day-to-day action, practical supports can be helpful. Leveraging community and online support further strengthens adherence. For appropriate patients, cardiac or pulmonary rehabilitation programs can offer supervised sessions; community walking groups and classes build social support; free park-based exercise stations give outdoor options; and virtual classes let people exercise safely at home. For nutrition, referral to a registered dietitian nutritionist for medical nutrition therapy, simple meal-planning templates and grocery lists, culturally tailored recipes or cooking skills classes, and linkage to food-access resources (eg, community pantries or produce programs) help patients implement dietary goals. It is important to schedule frequent check-ins by phone, telehealth, or in the office to review logs or tracker data, celebrate wins, and reset goals as needed. By giving a clear plan with arranged follow up, counseling becomes a practical roadmap rather than just general advice.

Team implementation of lifestyle modification

Individuals for whom weight loss is recommended should be offered or referred to comprehensive lifestyle intervention, ideally with a trained interventionist or multidisciplinary team of interventionists (eg, registered dietitian nutritionist, psychologist, exercise specialist). Personalized nutrition care delivered by a registered dietitian nutritionist is a vital component of comprehensive lifestyle modification for weight management,[28] regardless of whether the approach taken includes lifestyle interventions discussed in this article, pharmacotherapy, bariatric surgery, or a combination of approaches. Research indicates that identifying relevant psychosocial and demographic factors associated with weight loss success is essential for appropriately tailoring lifestyle modification interventions to individual needs, thereby increasing the likelihood of achieving sustainable outcomes.[166,167] However, some individuals may lack access to obesity care due to financial, time scarcity, or other environmental reasons, which can affect an individual's ability to make lifestyle modifications and sustain those changes in the long term.[28] Therefore, a team approach must be used to help provide equitable strategies or cost-friendly alternatives to facilitate lifestyle modification. Additionally, since individuals with obesity may experience internalized weight bias and weight stigma,[168] the interprofessional health care team should aim to provide compassionate, patient-centered care and consider how these factors may affect lifestyle modification interventions.

Barriers and opportunities to implement lifestyle management approaches

As our understanding of obesity pathophysiology continues to evolve alongside advancements in pharmacotherapy, lifestyle management remains the foundation of effective treatment. Research consistently demonstrates that intensive lifestyle modification approaches that individuals can sustain long-term are effective in helping achieve weight management goals.[13,16] For maximum effectiveness, these approaches must incorporate components that promote lasting behavior change. There is a recognized need for earlier intervention with lifestyle modification, particularly in primary care settings, to address obesity before it progresses to more severe stages requiring potentially more intensive interventions.[13]

The landscape of obesity management has evolved significantly with the emergence of highly effective antiobesity pharmacological agents, particularly GLP-1 RAs and glucose-dependent insulinotropic polypeptide. However, these medications are most effective when implemented alongside comprehensive lifestyle interventions, which not only support weight management but may also provide synergistic benefits on glucose metabolism and lipid profiles.[169–171] Currently, there is some evidence specifically guiding nutritional recommendations for patients receiving antiobesity medications.[172,173] With the initiation of these medications, nutrition counseling should be provided to help prevent, limit, and/or manage any gastrointestinal adverse effects of the medications.[174] Although the amount of weight loss from physical activity and exercise varies, it is strongly associated with long-term weight management.[175] Lifestyle interventions that incorporate nutrition and physical activity should be encouraged to help counter the effect of rapid weight loss with pharmacological agents on preserving muscle mass.[176,177] Additionally, nutritional interventions for patients on incretin-based therapies should focus on ensuring adequate nutrition, preventing micronutrient deficiencies, optimizing protein intake (both quantity and quality), and maintaining proper hydration and fiber consumption.[172,174] These considerations are particularly important as individuals treated with antiobesity medications typically experience reduced appetite and decreased food intake.[174] The importance of lifestyle interventions is further underscored by practical barriers to accessing antiobesity pharmacological agents, including high costs and insurance coverage limitations. For individuals who cannot access these medications, comprehensive lifestyle interventions remain the cornerstone of obesity management. While questions remain regarding the optimal therapeutic duration and dosage of newer incretin-based therapies, evidence suggests that patients who develop healthy eating patterns and regular physical activity habits may achieve successful outcomes with lower medication dosages.[173]

One critical barrier to lifestyle management approaches for obesity is lack of or inadequate insurance coverage. Medicare currently covers only select obesity treatments, such as behavioral therapy and bariatric surgery, and only under certain conditions. Coverage also excludes antiobesity medications. First introduced in 2013 and reintroduced in every congressional session since, the bipartisan Treat and Reduce Obesity Act (TROA) represents a promising legislative solution to expand access to comprehensive obesity care. TROA aims to improve access to treatment by enhancing Medicare beneficiaries' access to healthcare providers best suited to provide intensive behavioral therapy and allowing Medicare Part D to cover US Food and Drug Administration-approved obesity medications.[178] At this time, TROA remains in the legislative process; the overall status is unclear as the Trump administration will decide if and how to move forward.

Beyond insurance coverage reform, comprehensive public health approaches are needed to create environments that support healthy behaviors. Obesity is significantly shaped by complex socioecological factors across multiple levels, where the built environment—characterized by food access and availability, neighborhood walkability, recreational spaces, and transportation infrastructure—intersects with social determinants such as socioeconomic status, sex and gender identity, and race and ethnicity to create conditions that either promote or hinder healthy behaviors.[179,180] At the federal level, policies, programs, and initiatives for overweight and obesity management are informed by Healthy People 2030 objectives,[181] while some states and local communities have implemented their own policy measures with varying degrees of success.[182,183] The critical importance of public health approaches lies in their ability to address many of the root causes of obesity, with asset-based, culturally relevant interventions.[184,185] Examples of these interventions include farmers' markets in neighborhoods, creating safe walking paths and bike lanes, developing community gardens in urban spaces, organizing walking groups for seniors, redesigning public spaces to encourage physical activity, partnering with faith-based organizations to host nutrition education workshops, and implementing zoning regulations that limit the density of fast-food establishments while incentivizing grocery stores in areas of limited food accessibility.[180,186] Policy, system, and environmental interventions show modest and variable success tend to be more effective at preventing weight gain than producing significant weight loss in individuals with existing obesity.[187] Success depends heavily on implementation quality, intervention duration, and community/population context, with stronger evidence for improving dietary and physical activity behaviors than for direct weight outcomes.[188]

Research and clinical practice in obesity management should focus on several key areas to enhance outcomes and address current gaps in knowledge. Future research in obesity management related to nutrition should shift from comparing diets to see which is superior relatively to another and instead focusing on maximize adherence. Researchers should investigate strategies that support sustainable behavior change, including behavioral techniques,[189] digital health technologies and expanded telehealth services,[190,191] shared medical appointments,[192] and community-based programs.[193] Another crucial research direction involves examining the role lifestyle management plays alongside pharmacotherapy. This could include investigating how nutrition and physical activity interventions should be tailored during the initiation phase of antiobesity medications, adapted during continued use to ensure maintenance of lean body mass, and potentially intensified during medication de-escalation to maintain therapeutic benefits. Equally important is healthcare professional education across disciplines on effective lifestyle counseling techniques that are not only evidence-based but also culturally appropriate and equitable, with specific emphasis on reducing the pervasive weight bias and stigma that continues to undermine patient care and treatment outcomes.[28,194]

CRediT authorship contribution statement

Matthew J. Landry: Writing – review & editing, Writing – original draft, Conceptualization. **Zohaib Bagha:** Writing – review & editing, Writing – original draft, Conceptualization.

Ethical approval

Ethics approval was waived for this study because no animal or human subjects' data were reported.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Claude.ai and ChatGPT to review the manuscript for grammatical errors. The authors subsequently reviewed and edited the content as needed and take full responsibility for the final version of the publication.

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