Multidisciplinary Team–Based Obesity Treatment in Patients With Diabetes: Current Practices and the State of the Science

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IN BRIEF Rates of obesity and diabetes are growing, as are their costs. Because the two diseases share many key determinants, the paradigms for their treatment overlap. For both, optimal treatment involves a multidisciplinary team following the Chronic Care Model of health care delivery. Combined treatment programs that include *1*) a low-calorie diet individualized to patients' preferences, *2*) structured exercise that is also tailored to each patient, and *3*) psychotherapy induce the largest weight changes in patients with diabetes. Although diet alone can achieve weight loss, exercise and cognitive behavioral therapy components can enhance the effects of dietary modification. A multidisciplinary team that includes a physician with expertise in pharmacotherapy, a nurse and/or nurse practitioner, a dietitian, an exercise physiologist, and a psychologist can provide a comprehensive weight loss program combining the most effective interventions from each discipline.

Obesity is a serious clinical and public health issue. More than one-third of the adult population in the United States has a BMI >30 kg/m^2 (1). This condition shortens life expectancy by 2–10 years and accounts for 15% of excess deaths in America, mostly from negative cardiovascular and metabolic effects (2,3). Obesity affects not only life span, but also health span, contributing to physical pain, immobility, and depression, among many other comorbidities (4). In the United States, direct medical costs for obesity have risen to ~$147 billion annually, with newer analyses estimating even higher costs (1,5,6).

Diabetes is another major health threat and is intimately related to obesity. Nearly 10% of Americans suffer from diabetes (7). Chronically elevated blood glucose shortens life expectancy by almost 9 years and accounts for 12–16% of adult deaths in the United States (8,9). Although most mortality accompanying diabetes stems from vascular disease, several different conditions contribute to the increased morbidity of people with diabetes, including blindness, amputations, and kidney failure (10). The human cost of diabetes is great and so is the economic cost—an estimated $176 billion annually for direct medical care (5).

Diabetes and Obesity: Shared Key Determinants

Diabetes and obesity share many key determinants. Both are progressive, multifactorial diseases that are amplified by a Western diet and physical inactivity (11–14). These two key factors, which lead to a positive energy imbalance, have many socioeconomic and environmental roots. Diabetes and obesity also share pathophysiological links. Lipid overflow, lipotoxicity, and pathogenic adipocytokines are mechanisms through which

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excess adiposity causes hyperglycemia (15,16).

Weight gain and obesity increase diabetes risk—3-fold for people who are overweight, 7-fold for those who are obese, and 60-fold for those with severe obesity (17). Fortunately, this risk decreases with weight loss. Bariatric surgery trials, including the landmark Swedish Obesity Study, found that such surgeries, and especially the Roux-en-Y gastric bypass procedure, prevent or reverse diabetes (18,19).

The relationship between excess weight and high blood glucose is imperfect. Most, but not all, people with type 2 diabetes are overweight. Most, but not all, people with obesity eventually develop type 2 diabetes. Overall, though, excess body fat is the most important reversible risk factor for type 2 diabetes.

Diabetes and Obesity: Common Treatment Solutions

Losing weight and keeping it off can be daunting for anyone, and people with obesity and diabetes have greater difficulty losing weight than those who do not have diabetes. However, trials such as the Finnish Diabetes Prevention Study (20), the National Institutes of Health's Diabetes Prevention Program (21), and the Look AHEAD (Action for Health in Diabetes) trial (22) showed that intensive lifestyle interventions can reduce weight and prevent or mitigate diabetes and its comorbidities. Such interventions have been successfully replicated in academic settings and endorsed by numerous obesity and diabetes professional societies (23–25).

Intensive lifestyle intervention was based in part on the Chronic Care Model (CCM) of health care delivery (26–30), the core principles of which include:

- Long-term commitment: acknowledgment that the condition is lifelong; that it requires sustainable lifestyle and behavior changes plus maintenance of these changes; and that this often requires motivational interviewing by the health care provider and integration of the clinic with community resources
- Patient-centered care: focused on patient participation, patient goal-setting, patient skill-building, and patient self-management
- Multidisciplinary team: including specialists who are socialized to each other and who have defined roles, harmonized messages, and a common focus
- Evidence-based and protocol-driven care: decisional aids and algorithms based on best practices to decrease harmful variations in care

Multidisciplinary obesity clinics and multidisciplinary diabetes clinics share not only the general CCM philosophy, but also specific goals and methods. They both aim for realistic, modest weight loss targets (5–10% during 6 months) (31). Both view weight as an indirect indicator of metabolic disease, cardiovascular disease, and poor quality of life (32); in the later stages of diabetes, however, the emphasis may shift from weight loss to glucocentric strategies while avoiding further weight gain.

The weight loss goals and plans are often quite similar for people with obesity and those with diabetes (33). Weight is lost primarily through various low-calorie diets. Regular aerobic exercise augments this loss and mitigates the underlying cardiovascular and metabolic derangements (34,35).

Many of the same team members are found in multidisciplinary obesity clinics and multidisciplinary diabetes clinics. Patients are at the center of both types of team, assisted by a primary physician, nurse and/or nurse practitioner, dietitian, exercise physiologist, and behaviorist (36,37). This core group may be complemented by a pharmacist (drug management currently plays a larger role in diabetes care than in obesity care), and perhaps a case manager.

One of the biggest differences between obesity and diabetes multidisciplinary clinics involves referrals to outside specialty physicians. Obesity centers often refer patients for bariatric surgery, psychiatry, and gastroenterology services (38). Diabetes centers more commonly refer for ophthalmology, podiatry, vascular surgery, cardiology, nephrology, and endocrinology (39,40).

Weight Loss Challenges of People With Diabetes

For people with both obesity and diabetes, the greater degree of difficulty in achieving weight loss stems from multiple factors. One study found that overweight patients with diabetes lost less weight than their spouse without diabetes following the same program. However, the differences could be explained by poorer dietary adherence and higher reports of dysphoria among the participants with diabetes (41). Another study showed that an intensive lifestyle program for women with obesity was equally effective in the short term for people with and without diabetes. However, those with diabetes had greater weight gain in the year after the program ended (42).

One possible explanation is the effect of diabetes medications such as insulin and sulfonylureas, which enhance anabolic activity (43). In the U.K. Prospective Diabetes Study, patients with diabetes who were treated with insulin or sulfonylureas gained significantly more weight during 10 years than those treated with diet alone (44).

People with poor glycemic control also have a high energy expenditure, higher metabolic rate, more protein turnover, and glycosuria with calories excreted in the urine (45,46). These catabolic processes are reversed by adequate glycemic control achieved through medication and weight loss itself.

Furthermore, diabetes complications such as neuropathy, heart disease, and foot ulcers can limit

physical activity (43). In response to these multiple challenges, a multidisciplinary weight-management team must provide a multifaceted approach that includes effective diet options, specialized exercise programs, and supportive behavioral therapy.

Core Elements of Weight Loss Programs for Obesity and Diabetes

Diet

People with diabetes and obesity have multiple diet options that have been proven effective for weight loss. Common options include low–glycemic index, Mediterranean-style, low-carbohydrate Mediterranean-style, very-low-calorie ketogenic, low-fat, and low-fat vegan eating patterns.

These eating patterns differ in macronutrient content (i.e., amount of carbohydrates, proteins, and fats). The Institute of Medicine recommends that adults in general should get 45–65% of their energy from carbohydrates, 10–35% from protein, and 20–35% from fats (47). Although the evidence is mixed regarding the macronutrient proportions that are most effective for weight loss (48), there is some evidence that low-carbohydrate diets yield greater initial mean weight loss, both in general and for people with diabetes. In people with or without diabetes, reduced caloric intake over time is essential for achieving weight loss (48,49). Low-carbohydrate diets tend to have either a high protein content such as the very-low-calorie ketogenic diet or a high fat content such as the low-carbohydrate Mediterranean-style eating pattern. Furthermore, high protein content has been found to be safe in people with diabetes and does not increase albuminuria or worsen kidney function (50).

In comparison to the 2003 American Diabetes Association (ADA) nutrition recommendations (50–55% carbohydrate, 30% fats, and 20% protein) and the Mediterranean-style diet (50–55% carbohydrate, 30% fats, 15–20% protein), the low-carbohydrate Mediterranean-style diet (35% carbohydrate, 45% fats, and 15–20% protein) was found to achieve the greatest weight loss (51). Both the traditional Mediterranean and the low-carbohydrate Mediterranean diets only included low–glycemic index carbohydrates, whereas the ADA diet included mixed–glycemic index carbohydrates. The low-carbohydrate diet had a reduced percentage of carbohydrates and an increased percentage of fat (51). Other eating patterns such as the low-fat vegan, standard low-fat, and low–glycemic index diets induce significant reductions in A1C, but there are no significant differences among them in weight loss achieved (52,53).

Given that different macronutrient combinations can lead to successful weight loss, clinicians should consider patients' preferences when choosing a specific eating pattern. In a study comparing low-fat and low-carbohydrate diets, only the low-carbohydrate group had improvements in health-related quality of life; these improvements were seen in physical function and general health, but not in mental health (54). Thus, diet alone may achieve weight loss but may not address the mental health issues that also affect the long-term management of diabetes and obesity.

Exercise

People with obesity and diabetes lose minimal weight through exercise (aerobic or a combination of aerobic and resistance) alone (55,56). The Studies of a Targeted Risk Reduction Intervention Through Defined Exercise (57) found weight loss ranging from 0.2 to 1.5 kg during a 6-month period from exercise alone. However, exercise appears to augment the effects of diet on weight loss. Specifically, the addition of aerobic exercise to a low-calorie diet leads to a loss of fat mass but not necessarily a loss of weight (58). Resistance training combined with virtually any diet (i.e., energy-restricted standard carbohydrate, low-protein, or low-fat) leads to greater weight loss than with diet alone (59).

Recently published ADA exercise guidelines recommend a goal of 150 min/week of moderate-vigorous physical activity and lapses of no more than 2 days between exercise sessions. This exercise can be either structured exercise or general physical activity. Structured exercise programs include prescriptions for planned and individualized exercise. Structured exercise programs have been found to lead to greater reductions in A1C than general physical activity advice given by the physician (60).

The level of energy expenditure affects the degree of observed weight loss. Energy expenditures >20 metabolic equivalent [MET]-hours/week can achieve significant changes in body weight, BMI, waist circumference, heart rate, and LDL cholesterol. Energy expenditures in the range of 11–19 MET-hours/week do not lead to significant weight loss but still induce reduction in the A1C, blood pressure, triglycerides, total cholesterol, and 10-year coronary heart disease risk. Energy expenditures <11 MET-hours/week do not cause significant changes in any parameters (61). As part of the multidisciplinary team, an exercise physiologist can design personalized exercise regimens based on patients' specific needs.

Psychotherapy

For obesity management, there are two main psychological methods: behavioral therapy and cognitive therapy. Behavioral therapy teaches patients how to act differently around food, whereas cognitive therapy teaches patients how to change their thoughts and emotions related to food (62,63). Among other things, behavioral therapy for weight loss teaches the skills of problem-solving and awareness of negative thought processes. Topics addressed during sessions include self-control, self-esteem, stress management, and relapse prevention (64,65). When un-

realistic weight goals are not achieved, patients' motivation for long-term behavior change tends to decline. Cognitive therapy can help guide patients to set more realistic goals and thus maintain the motivation that is essential for long-term success (62).

One study showed that obese patients with binge-eating disorder who underwent cognitive behavioral therapy (CBT) followed by behavioral weight loss treatment (such as diet and exercise) had a greater percentage BMI reduction than those who received CBT or behavioral weight loss treatment alone (66,67). In many cases, group sessions have a greater weight loss effect than individual sessions (68). This result may be because patients in group treatment benefit from the support they receive from each other and the positive peer influence to maintain the group norm of losing weight (69).

Pharmacology

Multidisciplinary clinics use a patient-centered approach to medication counseling for weight loss. Although physicians are ultimately responsible for choosing the appropriate appetite-suppressant medications, they incorporate the expertise and input of other team members, who may have insights into the need for and likely effect of the various medications based on their observations of patients. Team members consider how a drug may affect patients' overall long-term goals through their own specialty lens. Dietitians consider drug-nutrient interactions (e.g., metformin-induced cobalamin deficiency) (70). Exercise physiologists consider how to coordinate patients' insulin timing and doses with episodes of aerobic exercise to avoid hypoglycemia (71). Behavioral therapists consider the psychological and social aspects of patients' medication adherence. As with other chronic conditions, treating depression with psychopharmacology can improve diabetes medication adherence (72–74).

Understanding the patient, provider, and prescription factors related to adherence with weight loss medications is also a job shared by all members of the weight loss team (75,76). Adherence is a key factor in the effectiveness of medications. It is also fundamental to every aspect of patient self-care for both diabetes and obesity and therefore demands a team approach.

Bariatric Surgery

According to the American Society for Metabolic and Bariatric Surgery, bariatric surgery is a treatment option for patients with morbid or severe obesity and obesity-related comorbidities such as diabetes for whom nonsurgical attempts at weight loss have failed. Multiple studies have shown that bariatric surgery leads to similar weight loss results for patients with obesity regardless of their diabetes status (77). For patients with diabetes, clinical trials have shown that bariatric surgery can lead to greater weight loss and greater improvement in diabetes than intensive medical therapy alone (78). Likewise, bariatric surgery followed by lifestyle interventions, including diet and exercise, results in more weight loss than bariatric surgery alone (79,80).

Bariatric surgery leads to diabetes remission through several mechanisms, including alteration of gut microbiota (81). Of the two main types of bariatric surgery, gastric restrictive procedures (i.e., laparoscopic adjustable gastric banding and sleeve gastrectomy) bring about a quicker remission of diabetes than intestinal bypass procedures (i.e., Roux-en-Y gastric bypass) (82,83). However, further research is required to determine the long-term sustainability of diabetes remission after bariatric surgery.

Conclusion

Combination programs that focus on a low-calorie diet, adequate physical activity, and psychotherapy induce the greatest weight losses in patients with diabetes (84). Although dietary modification alone can achieve weight loss, exercise and CBT enhance the effects of dietary treatment. Multidisciplinary teams that include a physician with expertise in pharmacotherapy, a nurse and/or nurse practitioner, a dietitian, an exercise physiologist, and a psychologist can provide a comprehensive weight loss program that uses the most effective interventions from each discipline.

Duality of Interest

L.J.C. is chair of the scientific advisory board of Medifast, Inc., a commercial weight-loss program. No other potential conflicts of interest relevant to this article were reported.

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