

# Interpreting the Joslin Diabetes Center and Joslin Clinic Clinical Nutrition Guideline for Overweight and Obese Adults with Type 2 Diabetes

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Interpreting the Joslin Diabetes Center and Joslin Clinic Clinical Nutrition Guideline for Overweight and Obese Adults with Type 2 Diabetes, Prediabetes, or at High Risk for Developing Type 2 Diabetes is a weight loss approach to assist health care providers in a clinical setting when counseling overweight individuals. It recommends an individualized weight reduction plan consisting of a lower carbohydrate, moderate protein, and fat diet, with specific activity and behavior modification guidelines.

## Introduction

Diabetes is a disease that affects 20.8 million people in the United States, or approximately 7% of the population. It is estimated that 6.2 million of these people do not know they have diabetes. In addition, prediabetes is a condition that affects 41 million Americans. Prediabetes occurs when blood glucose is higher than normal but not high enough to be considered diabetes. Impaired fasting glucose is when blood glucose is between 100 and 125 mg/dL after an overnight fast. Impaired glucose tolerance occurs when blood glucose is between 140 to 199 mg/dL after a 2-hour glucose tolerance test. In 2002, diabetes was the sixth leading cause of death in this country, whereas the economic cost (both the direct and indirect cost of diabetes and its complications) was 132 billion dollars or one out of every 10 health care dollars [1].

Type 1 diabetes occurs when the  $\beta$  cells of the pancreas are unable to make insulin. It is found in 5% to 10% of the US population. Type 2 diabetes is associated

with insulin resistance, and over time the pancreas loses its ability to produce insulin. Risk factors for type 2 diabetes include obesity, family history of diabetes, older age, physical inactivity, impaired glucose metabolism, race or ethnicity, and a history of gestational diabetes [1].

Given the high rate of obesity in this county, and the fact that 80% of those with type 2 diabetes are overweight or obese, the Joslin Nutrition Guideline for Overweight and Obese Adults with Type 2 diabetes was developed for the 90% to 95% of the population with type 2 diabetes, as well as the 41 million Americans with prediabetes and those at high risk for developing type 2 diabetes, to help prevent heart disease and stroke in these populations [2].

The American Diabetes Association (ADA) guidelines are generally followed by hospitals and diabetes centers. Health care providers who may not have access to dietitians or diabetes educators may be recommending the 2005 Dietary Guidelines for Americans [3]. The ADA guidelines have centered on hyperglycemia and cardiovascular risk factors such as hyperlipidemia and hypertension.

The ADA guidelines recommend that people with prediabetes should receive education to achieve weight loss of 5% to 10% of body weight and increase physical activity to 30 minutes a day, while stressing the importance of follow-up education to achieve success. The ADA guidelines also recommend a range of 45% to 65% of calories from carbohydrate, no more than 15% to 20% of calories from protein, and agree with the National Cholesterol Education Program recommendations for people with existing cardiovascular disease (CVD), which is the same for people with diabetes: 25% to 35% calories from fat, and less than 7% calories from saturated fat, 20% monounsaturated fat, and 10% polyunsaturated fat, while keeping trans fat to a minimum [4,5].

Because visceral or abdominal fat is a risk factor for type 2 diabetes, heart disease, and hypertension, the Joslin Guideline targets those people with a body mass index greater than 25 kg/m<sup>2</sup> or a waistline of greater than

40 in/102 cm in men and greater than 35 in/88 cm in women with type 2 diabetes, prediabetes, and those at high risk for type 2 diabetes (those with metabolic syndrome or a first-degree relative with type 2 diabetes or confirmed diagnosis of insulin resistance). In the Asian population, a body mass index of greater than 23 kg/m<sup>2</sup> and a waistline of greater than 35 in/90 cm in men and greater than 31 in/80 cm in women is used.

The goals of the Guideline are to improve metabolic control with weight loss and maintaining achieved weight loss; to prevent the complications of diabetes by improving hyperglycemia; to improve hypertriglyceridemia, lipid profile, and insulin sensitivity as well as to improve body fat distribution to reduce visceral fat; to reduce cardiovascular risk by improving endothelial function and endothelial markers; to reduce inflammatory cytokines and markers of inflammation and increased coagulation; to improve blood pressure to decrease the risk of cardiovascular and renal complications; to enhance thermogenesis and maintain lean body mass; to provide a balanced meal plan including carbohydrate, protein, and fat, and improve overall health through physical activity; and to prevent and treat the chronic complications of diabetes.

## Weight Loss

Joslin's Guideline is based on the premise that successful weight loss can be achieved by lowering carbohydrate and changing the type of carbohydrate one eats in addition to raising protein and eating heart-healthy fats. It has been demonstrated that higher protein diets can increase satiety, improve insulin sensitivity, reduce fasting insulin levels, and improve blood glucose control with an energy-restricted meal plan (500 kcal/d) [6].

A modest weight loss is encouraged, or 5% to 10% of body weight. This is supported by previous research in the Diabetes Prevention Program, which demonstrated lifestyle changes with a 7% weight loss delayed the development of type 2 diabetes in high-risk individuals by 58% over 4 years compared with the placebo group [7]. The Joslin Nutrition Guideline recommends that individuals eat 250 to 500 less calories a day, through an individualized and structured meal plan. Total calories should not be less than 1000 to 1200 for women and 1200 to 1600 for men.

Meal replacements in the form of shakes, bars, and ready-to-mix powders can be incorporated into a weight loss meal plan and can be helpful for some individuals. Meal replacements are a successful adjunct therapy for weight loss and may be a convenient way for obese individuals to adhere to an energy-restricted meal plan [8].

The Guideline emphasizes making lifestyle changes and setting short-term and long-term goals that are realistic and achievable.

## Macronutrients

### *Carbohydrates*

In the past, recommendations were higher for carbohydrate intake due to the concern about too much fat being linked to CVD. In the early 1970s there was a great concern about fat causing CVD. As a result, the message was to cut down on fat and replace it with carbohydrates. Research has identified that it is saturated fat and trans fat that contribute to CVD. Although Americans are eating less fat than they did years ago, carbohydrate consumption has increased and Americans continue to get heavier. Short-term data have demonstrated successful weight loss can occur with a lower-carbohydrate, higher protein, higher-fat approach [9].

The Joslin Guideline for carbohydrate recommendations is based on reducing overall daily carbohydrate intake to 40% of total calories. Total carbohydrate intake should not be less than 130 g/d, based on the recommendations of the National Academy of Sciences-Food and Nutrition Board, because the brain and central nervous system use glucose as their primary energy source [10].

The Guideline recommends that when planning meals for weight loss the glycemic index (GI) and glycemic load (GL) should be taken into consideration. The GI and the GL of foods look at individual foods, how quickly the body absorbs them, how much carbohydrate a serving contains, and the impact on blood glucose. The GI/GL concept is an important factor that patients should apply in their daily selection of carbohydrates. Foods with a low GI or a low GL are less likely to cause a sharp rise in blood glucose after eating [11]. Although the concept of GI and GL is controversial, the Joslin Guideline recommends individuals choose foods with a lower GI. Examples of low GI foods are unprocessed, whole grain starches, cereals containing oats and barley, legumes, fruits, and vegetables. In their analysis of randomized controlled trials of the GI on overall blood glucose control, the ADA has suggested that the GI may be of additional benefit other than considering total carbohydrate alone. Further investigation is warranted regarding the GL and mixed meals on blood glucose control [12•].

### *Fiber*

Evidence from both epidemiologic and short-term experimental studies suggest that fiber plays a roll in weight loss and can assist with insulin resistance. In a large prospective cohort study, Liu et al. [13] observed that women who consumed more whole grains consistently than women who ate less whole grains had a 49% lower risk of major weight gain than those consuming whole grains. Joslin's Guideline encourages eating 20 to 35 g of fiber per day and up to 50 g of fiber per day if tolerated. Fiber is found in whole-grain foods, fruits and vegetables, and legumes. The benefits of adding fiber to a healthy meal plan are many. In addition to keeping your digestive tract running smoothly, it helps you feel full, it improves glycemic control, and it decreases hyperinsulinemia.

**Table 1. Suggested macronutrient distribution according to the Joslin Clinical Guideline**

Calorie level	Carbohydrate		Protein		Fat	
	Grams	%	Grams	%	Grams	%
1000	130	52	60	24	27	24
<b>1200</b>	<b>130</b>	<b>43</b>	<b>81</b>	<b>27</b>	<b>40</b>	<b>30</b>
<b>1500</b>	<b>150</b>	<b>40</b>	<b>113</b>	<b>30</b>	<b>50</b>	<b>30</b>
<b>1800</b>	<b>180</b>	<b>40</b>	<b>120</b>	<b>27</b>	<b>68</b>	<b>33</b>
2000	200	40	130	26	75	34

The *bolded area* represents the recommended calorie levels for weight reduction from 1200 to 1800 calories to promote optimal health, as well as weight loss.

(From the Joslin Diabetes Center; with permission.)

In a recent study, fiber intake was determined from dietary records for 2532 men and 3429 women. In those with the highest total dietary fiber intake, there was a lower risk of overweight, elevated waist-to-hip ratio, high blood pressure, and high cholesterol. Research findings suggested that 25 g of total dietary fiber per day is the minimum intake required to achieve a significant protective effect against CVD; however, total dietary fiber intakes of 30 to 35 g/d will provide an even greater protective effect [14]. Chandalia et al. [15] also demonstrated that higher levels (50 g/d) of fiber can lower plasma lipid concentrations in patients with type 2 diabetes. Fiber supplements may be needed to reach higher intakes.

#### Protein

The Joslin Guideline recommends 20% to 30% of calories from protein. This is a range of protein based on calorie consumption. Someone who is eating a higher amount of calories would be in the 20% range, whereas someone eating fewer calories would be in the 30% range. For instance, a meal plan of 1200 calories would provide 81 g of protein or 30% of calories, whereas a meal plan of 1800 calories would provide 120 g of protein or 20%. The amount of protein is individualized based on an individual's total daily calories and proportional to carbohydrate and fat calculations (Table 1) [16]. These recommendations are for people with normal kidney function. Those people with microalbuminuria or impaired renal function who have been identified by a creatinine clearance of less than 60 should not follow the higher protein recommendation.

Adequate protein combined with resistance exercise helps to maintain lean body mass during weight loss. Clinical trials have shown that increasing protein from 15% to 30% of calories enhances weight loss. In addition, insulin sensitivity is increased, with a reduction in  $A_{1c}$ . Systolic and diastolic blood pressure and low-density lipoprotein (LDL) cholesterol go down significantly. Gannon et al. [17] demonstrated an increased protein intake in persons with type 2 diabetes resulted in a 40% decrease in the mean 24-hour glucose response.

Parker et al. [18] found a 5.7% reduction in LDL cholesterol in subjects following a high-protein energy-restricted diet of 28% protein, 42% carbohydrate, and 28% fat (8% saturated fatty acids, 12% monounsaturated fatty acids, 5% polyunsaturated fatty acids.) This was compared with a group following a low-protein energy-restricted diet of 16% protein, 55% carbohydrate, and 26% fat (8% saturated fatty acids, 11% monounsaturated fatty acids, 5% polyunsaturated fatty acids). The low-protein diet resulted in only a 2.7% reduction in LDL cholesterol [18]. Lean sources of protein include fish, turkey, chicken, low-fat dairy, and vegetarian proteins (ie, tofu, beans, and peas).

#### Fat

The Joslin Guideline recommends 30% to 35% of total caloric intake for fat; saturated fat should be limited to less than 10% of total caloric intake or less than 7% in individuals with LDL cholesterol greater than 100 mg/dL. Polyunsaturated fat should comprise up to 10% of total calories and monounsaturated fat up to 15% to 20% of total calories. Joslin emphasizes increasing omega-3 fats and a high intake of monounsaturated and polyunsaturated fat. Sources of omega-3 fats include fatty types of fish (ie, salmon, mackerel, lake trout, herring, and sardines), walnuts, flaxseed, and soy. Foods high in monounsaturated fat include olive oil, canola oil, peanut oil, avocado, and nuts.

#### Physical Activity

The Joslin Guideline recommends that physical activity should be part of a weight loss program. Research has shown that increasing physical activity can improve blood glucose and help prevent coronary artery disease and CVD. Specifically, the Guideline agrees with the 2005 Dietary Guidelines for Americans, 60 to 90 minutes of activity most days of the week (ie, walking, biking, swimming, or dancing), with a minimum of 150 to 175 minutes of moderate physical activity a week. Physical activity should include not only cardiovascular activities and stretching for flexibility, but also resistance activities to maintain or increase lean body mass [19••]. Physical activity is an important part of any weight loss program and is essential in maintaining weight loss [20].

## Implementation of Guidelines

Successful implementation of the Joslin Guideline has been shown in the Joslin Clinic Why Wait? S (Weight Achievement in Intensive Treatment Program) program. It is a 12-week, multidisciplinary, weight reduction and intensified diabetes management program geared for clinical practice. The program is staffed by a physician, nurse practitioner, dietitian, exercise physiologist, and behavioral psychologist and includes individual and weekly group meetings. The program includes physical activity, meal replacements, and a structured meal plan with menus following the Joslin Guideline of 40% carbohydrate, 30% protein, and 30% fat.

## Results

At the end of the 12-week program, the average weight loss was  $24.5 \pm 9$  lbs ( $10.3\% \pm 3.5\%$ ); hemoglobin A<sub>1c</sub> decreased from  $6.95\% \pm 1.6\%$  to  $6.2\% \pm 0.5\%$ ; and diabetes medications decreased approximately 50%. Triglycerides decreased by 30.4%, LDL by 24.8%, and microalbumin/creatinine by 31.2% [21].

## Conclusions

The Joslin Clinical Guideline provides an effective approach to weight loss as proven by the results of the Why Wait? program. Continued follow-up is needed to determine the effectiveness of this weight loss approach in a larger group of subjects for a longer duration.

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