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CHAPTER 2.

Clinical Nutrition Guideline for Overweight and Obese Adults With Type 2 Diabetes (T2D) or Prediabetes, or Those at High Risk for Developing T2D

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Objective. The Joslin Clinical Nutrition Guideline for Overweight and Obese Adults With Type 2 Diabetes (T2D) or Prediabetes, or Those at High Risk for Developing T2D is designed to assist primary care physicians, specialists, and other healthcare providers in individualizing the care of and setting goals for adult, nonpregnant patients with T2D or individuals at high risk for developing the disease. This guideline focuses on the unique needs of those individuals. Several components complement the *2015-2020 Dietary Guidelines for Americans.* The *Dietary Guidelines for Americans* are jointly developed every 5 years by the US Department of Health and Human Services and the US Department of Agriculture. This Guideline is not intended to replace sound medical judgment or clinical decision making and may need to be adapted for certain patient-care situations where more or less stringent interventions are necessary. This guideline was approved October 19, 2016; updated on January 28, 2018.

2.1.0 TARGET POPULATION

TABLE 1. Individuals Targeted for Intervention Meet 1 Criterion in Each of 2 Categories

Overweight or Obese[a]	Type 2 Diabetes or Prediabetes
BMI ε25 kg/m^2 or Waistline Men: ε40 in (102 cm) **[1B]** Women: ε35 in (88 cm) **[1B]**	Diagnosis of type 2 diabetes (T2D) or prediabetes, determined by IGT or IFG **[1A]** or High-risk of T2D, determined by: • Metabolic syndrome, per AHA/NHLBI criteria **[1B]** • First-degree relative with T2D • Confirmed diagnosis of insulin resistance (eg, high basal insulin) •

AHA indicates American Heart Association; BMI, body mass index; IGT, impaired glucose tolerance; IFG, impaired fasting glucose; in, inches; NHLBI, National Heart, Lung, and Blood Institute, T2D, type 2 diabetes.

[a]For Asian populations (South Asian Indians, East Asians, and Malays), a BMI ε23 kg/m^2 and a waistline ε35 in/90 cm in men or ε31 in/80 cm in women **[1B]**.

2.2.0 GENERAL GUIDELINES

- There is strong evidence that weight reduction improves insulin sensitivity and glycemic control, lipid profile, and blood pressure in T2D, and decreases the

risk of developing T2D in prediabetes and high-risk populations [1A].

- Refer individuals to a registered dietitian (RD) experienced in diabetes and weight management for individualized medical nutrition therapy (MNT); care should be coordinated with an interdisciplinary team including the patient's primary care physician (PCP) [1B].
  - To enhance effectiveness of MNT, a series of 3 to 4 encounters with an RD, each lasting 45 to 90 minutes, is recommended to begin at diagnosis
- Priorities for this population include:
  - Weight reduction
  - Glycemic control as well as achieving blood pressure and low-density lipoprotein cholesterol goals
  - Meal-to-meal consistency in carbohydrate distribution for those with fixed medication/insulin programs
  - Individualization for cultural and food preferences (eg, vegetarian)
  - Adoption of a healthy eating pattern that is sustainable over time. The Mediterranean diet, the DASH [Dietary Approaches to Stop Hypertension] diet, and a plant-based or vegetarian diet are examples of healthy dietary patterns
  - Integration of behavior-change therapies to adopt healthy eating behaviors and sustainable weight loss
- The meal plan composition, described below, is for general guidance only and may be individualized by the RD or other healthcare provider according to clinical judgment, individual (patient) preferences and needs, and metabolic response.
- Physical activity is an integral component of a weight loss program for both initial weight loss and for weight maintenance.

2.3.0 WEIGHT REDUCTION

- A structured lifestyle plan that combines dietary modification, activity, and behavioral modification, along with ongoing support, is necessary for weight reduction **[1B]**. To maintain long-term weight loss, ongoing weight-maintenance counseling and support is recommended.
- A modest and gradual weight reduction of 1 to 2 pounds every 1 to 2 weeks should be the optimal target **[2A]**. Reduction of daily caloric intake should be between 250-750 calories **[1C]**. Total daily intake should not be less than 1000 to 1200 calories for women and 1200 to 1600 calories for men, or based on an RD assessment of usual intake **[1C]**.
- A 5% to 10% weight loss may result in significant improvement in blood glucose control among patients with diabetes and may help prevent the onset of diabetes among individuals with prediabetes **[1B]**. Weight reduction should be individualized and continued until an agreed-upon BMI and/or other metabolic goals are reached.
- Target individuals should meet with an RD to discuss a structured MNT plan for weight management that includes menus and snacks as well as education and practice in portion control, all effective components of weight-management plans **[1B]**.
- Diabetes-Specific Meal Replacements (DSMRs) in the form of shakes, bars, ready-to-mix powders, and prepackaged meals that match these nutrition guidelines may be effective in initiating and maintaining weight loss.
  - Meal replacements should be used under the supervision of a RD
  - When meal replacements are initiated, glucose levels should be carefully monitored and, if needed, antihyperglycemic medications should be adjusted
  - Meal replacements should be used with caution by those with hyperkalemia
- Bariatric surgeries, although not without medical and nutrition risks, are effective options and may be discussed when indicated (consider in individuals with BMI $\geq$40 kg/m^2 and those with BMI $\geq$35 kg/m^2 with other comorbidities. Reduce calculations by 2.5 kg/m^2 for Asians) **[2B]**. To date, there is limited evidence to support the recommendation of bariatric surgeries for patients with BMI <35 kg/m^2 even if a person has diabetes or other comorbid conditions.
- Anti-obesity medications may be considered for patients who were not able to lose weight through lifestyle modifications, but the long-term risks and benefits of these medications are unclear **[2C]**.
- The effect of diabetes medications should be evaluated throughout the weight loss program and adjusted as necessary to avoid hypoglycemia.

2.4.0 MACRONUTRIENT COMPOSITION

2.4.1 Fat:

Amount. There is general agreement that the type of fat consumed is more important than the quantity (generally 30% to 40% of total calories). Trans fats from partially hydrogenated oil should be eliminated **[1B]**.

- Monounsaturated and polyunsaturated fats should comprise the majority of fat intake **[2B]**.
- Limit saturated fat intake to <10% of total calories.
  - Recent evidence demonstrates that saturated fat from dairy foods (milk, yogurt, cheese) may be acceptable within the total daily caloric intake **[2B]**

- Despite recent evidence suggesting that saturated fat poses a weak or neutral effect on health, further research in this area is warranted

- Low-fat diets are generally less effective than low-carbohydrate diets for weight reduction **[2C]**

Recommended.

- Plant fats rich in mono- and polyunsaturated fats (eg, olive oil, canola oil, soybean oil, nuts/seeds, and avocado) **[2A]**
- Oily fish rich in omega-3 fatty acids (eg, salmon, herring, trout, sardines, fresh tuna) 2 times/week, as a source of these fatty acids **[2B]**

Not recommended.

- Foods high in saturated animal fat, including nonlean pork, lamb, and beef; processed meat; butter and cream
- Foods high in trans fats (eg, most fast foods; most commercially baked goods; margarines from partially hydrogenated oil)

2.4.2 Protein

Amount. Protein intake should range between 1.0-1.5 grams/kg of adjusted body weight. To calculate adjusted body weight, first calculate excess weight: Excess weight = current weight – ideal body weight (IBW). Adjusted body weight = IBW + 0.25 of excess body weight. This amount generally accounts for 20% to 30% of total caloric intake.

- A modest increase in protein reduces appetite and helps achieve and maintain weight reduction **[2B]**. Protein also helps minimize loss of lean body mass during weight reduction **[2B]**.
- No reliable scientific data support a protein intake that exceeds 2 grams/kg of adjusted body weight. Conversely, reduction of protein intake to less than 0.8 grams/kg day may result in protein malnutrition.

Recommended. Fish, skinless poultry, lean meat, dairy, egg whites, nuts, seeds, soy, and other legumes **[2B]**.

Not recommended. Sources of protein that are high in saturated fat (eg nonlean pork, lamb, beef; processed meats) as they may be associated with increased cardiovascular risk **[1B]**. Heme iron in meat is also associated with an increased risk of T2D **[2B]**.

Patients with renal issues. Although reducing total calories may result in a reduction of the total amount of protein intake, any patient with signs of kidney disease (both of the following: proteinuria; estimated glomular filtration rate <60 ml/min) should consult a nephrologist before increasing the total or percentage of protein in their diet **[1B]**. Protein intake for these patients should be modified, but not lowered to a level that may jeopardize their overall health or increase their risk for malnutrition or hypoalbuminemia.

2.4.3 Carbohydrate

Amount. The total daily intake of carbohydrate should be at least 130 grams/day and preferably 40% to 45% of the total caloric intake. Intake should be adjusted to meet the cultural and food preferences of the individual.

Consideration of glycemic index/glycemic load. The glycemic index/glycemic load is an important factor that patients should apply in their daily selection of carbohydrate foods. Foods with a lower glycemic index content should be selected **[2B]** (eg, whole grains, legumes, fruits, green leafy and nonstarchy vegetables, milk, yogurt).

Recommended. Green leafy and nonstarchy vegetables, whole fruits, legumes, whole and minimally processed grains, oats, milk, yogurt **[2B]**.

Not recommended.

- Sugar, or added sugar, especially sugar-sweetened beverages, ice cream, candies, and grain-based desserts. Milk chocolate should be avoided.
- Refined grain products including white bread, white pasta, white rice, low-fiber wheat cereal, cakes, muffins, pizza. White bagels should be limited.
- High glycemic-index carbohydrates, including white potatoes and white rice.

Fiber.

- Approximately 14 grams of fiber/1000 cal (20-35 grams) per day is recommended [**1C**]. If tolerated, approximately 50 grams/day is effective in improving postprandial hyperglycemia; that quantity should be encouraged **[2B].**
- Fiber from unprocessed plant-based food, such as vegetables, fruits, seeds, nuts, and legumes, is preferable. However, if needed, fiber supplements such as psyllium, resistant starch, and β-glucan can be added **[2B]**.

2.5.0 MICRONUTRIENT COMPOSITION

Sodium. Daily consumption should be <2300 mg (about 1 tsp of salt) per day **[1A]**. Further reduction to 1500 mg is recommended in people aged >50 years, especially those including those with hypertension or chronic kidney disease **[2B]**.

Potassium.

- Daily consumption should be a minimum of 4700 mg unless potassium excretion is impaired (eg, patients with chronic kidney disease; patients on certain drugs who retain potassium).
- Potassium helps offset high sodium intake by triggering more sodium excretion by the kidneys.
- Potassium-rich foods include fruits and vegetables like bananas, mushrooms, spinach, and almonds.

2.6.0 VITAMIN AND MINERAL SUPPLEMENTS

- In individuals who are not deficient, there are no significant data supporting the routine use of vitamins or minerals to improve glucose control. However,

some individuals may benefit from multivitamin supplementation, as calorie-restricted diets may be inadequate in some nutrients, such as calcium.
- No significant data support the use of herbal supplements or spices to improve glucose control.

2.7.0 NONNUTRITIVE SWEETENERS

All FDA-approved nonnutritive sweeteners are permissible in moderate quantities.

2.8.0 ALCOHOL

- If alcohol is consumed, consumption must remain moderate: no more than 1 drink per day for women and no more than 2 drinks per day for men (1 drink is equal to 12 ounces of regular beer, 5 ounces of wine, or 1.5 ounces of 80-proof distilled alcohol).
- Alcoholic beverages contain calories and are low in nutritional value. They may contribute to hypoglycemia or, in the case of high-carbohydrate alcoholic beverages, hyperglycemia.
- It is not advisable to increase alcohol consumption for the purpose of deriving purported health benefits.

2.9.0 HEALTHY DIETARY PATTERN

The following dietary patterns have been shown to be effective in the prevention and management of diabetes:

- Mediterranean diet
- DASH diet
- Plant-based, vegetarian, and vegan diets
- Moderately low carbohydrate consumption; high consumption of plant-based protein; fats from plants

The following specific foods have been shown in some study results to be associated with a reduced risk of developing T2D:

- Oat cereal
- Yogurt
- Dairy products
- Tea, coffee, and decaffeinated coffee
- Green leafy vegetables
- Fish and seafood (only in Asia)
- Red grapes, apples, blueberries
- Nuts (especially walnuts)

2.10.0 PHYSICAL ACTIVITY

- Physical activity should be an integral component of the weight loss and diabetes care plan to optimize glucose control, decrease cardiovascular risk factors, and achieve or maintain optimal body weight.
- All adults should consult their healthcare provider and/or see an exercise physiologist to discuss a safe exercise program appropriate to their abilities **[1C]**.
- To increase lean body mass, full-body resistance training should be incorporated into the activity plan 3 to 4 days per week. The training should include upper-body, core, and lower-body strengthening exercises using free weights, resistance machines, or resistance bands **[1B]**.

Guidelines for healthy adults with diabetes or prediabetes:

- Moderate-intensity aerobic (endurance) physical activity performed a minimum of 30 minutes 5 days per week, or vigorous-intensity aerobic physical activity performed a minimum of 20 minutes 3 days per week, should be achieved unless contraindicated. Activity can be accumulated toward the 30-minute minimum by performing bouts, each lasting 10 or more minutes **[1A]**.
- A target of 60 to 90 minutes of moderate-intensity aerobic activity per day, 6 to 7 days per week, is encouraged for weight loss if overweight or obese **[1B]**.
- Stretching exercises should be done when muscles are warm or at the end of the activity plan to loosen muscles and prevent soreness **[1B]**.

Additional guidelines for adults with medical or physical limitations:

- Incorporate balance exercises to prevent falls and injuries.
- Functional Fitness Testing is useful to assess patients' functionality and to track their progress. Testing such as 6-Minute Walk Test, 2-Minute Step Test, Balance Assessment and Hand Strength should be included at baseline and post intervention **[1C]**.
- For those with proliferative diabetic retinopathy, retinal traction, or severe nonproliferative diabetic retinopathy, activity programs that involve strenuous lifting; harsh, high-impact components; or components that place the head in an inverted position for extended periods of time may need to be revised, depending on the level of retinopathy and other retinal disease. Consultation with an eye specialist in diabetes eye care is advised.

Appendix A.

TABLE 2. Suggested Approximate Macronutrient Distribution According to Clinical Guideline

Daily Calorie Level	Carbohydrate		Protein		Fat	
	Grams	%	Grams	%	Grams	%
1000	130	~50[a]	75	30	22	20
1200	135	45	75-90	25-30	40	30
1500	150-170	40-45	75-110	20-30	50	30
1800	180-200	40-45	90-135	20-30	60	30
2000	200-225	40-45	100-150	20-30	70	~30

[a]A minimum of 130 grams of carbohydrate per day, in a 1000-calorie meal plan, calculates to ~50% of the total daily calories.

NOTE: The diets within the rectangle represent most common diet plans for weight loss.
Source: American Diabetes Association

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