

**JOSLIN DIABETES CENTER & JOSLIN CLINIC**  
**CLINICAL NUTRITION GUIDELINE FOR OVERWEIGHT AND OBESE ADULTS WITH TYPE 2 DIABETES, PREDIABETES OR THOSE AT HIGH RISK FOR DEVELOPING TYPE 2 DIABETES**  
**03/29/2007**

The Joslin Clinical Nutrition Guideline For Overweight and Obese Adults With Type 2 Diabetes, Prediabetes or Those at High Risk for Developing Type 2 Diabetes is designed to assist primary care physicians, specialists, and other healthcare providers in individualizing the care of and set goals for adult, non-pregnant patients with type 2 diabetes or individuals at high risk for developing type 2 diabetes. This guideline focuses on the unique needs of those individuals, and complements the 2005 Dietary Guidelines for Americans, which is jointly developed by the Department of Health and Human Services and the Department of Agriculture. It 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.

The objectives of the Joslin Clinical Diabetes Guidelines are to support clinical practice and to influence clinical behaviors in order to improve clinical outcomes and assure that patient expectations are reasonable and informed. Guidelines are developed and approved through the Clinical Oversight Committee that reports to the Joslin Clinic Medical Director of Joslin Diabetes Center. The Clinical Guidelines are established after careful review of current evidence, medical literature and sound clinical practice. These Guidelines will be reviewed periodically and the Joslin Diabetes Center will maintain, upgrade or downgrade the rating for each recommendation when new evidence mandates such changes.

Joslin's Guidelines are evidence-based; in order to allow the user to evaluate the quality of the evidence used to support each standard of care, a modification of the GRADE system has been adopted. The table provided on page 9 describes the categories in which methodological quality and strength of recommendations have been classified.<sup>1</sup> Evidence levels are graded 1A through 2C, as indicated in brackets.

### Target Individuals and General Goals of Clinical Nutrition Guideline

<b>Target Population</b>	<b>BMI</b>	<b>&gt; 25 kg/m<sup>2</sup> [1C]</b>	<b>Type 2 Diabetes</b>		
	<b>and</b>		<b>or</b>	<b>Prediabetes</b>	<b>IGT (impaired glucose tolerance) [1A]</b>
	<b>or</b>	<b>Waistline &gt; 40"/102 cm (men)</b> <b>[1B]</b>		<b>Prediabetes</b>	<b>IFG (impaired fasting glucose)</b>
		<b>&gt; 35"/88 cm (women)</b>		<b>or</b>	
	<b>High Risk for</b>				
	<b>The Metabolic Syndrome (AHA/NHLBI criteria)</b> <b>[1B]</b>				
	<b>Type 2 Diabetes</b>				
	Family history of type 2 DM (first degree relative) Confirmed diagnosis of insulin resistance (e.g., high basal insulin)				
	For Asian populations (South Asian Indians, East Asians and Malays) a BMI >23 kg/m <sup>2</sup> and a waistline >35"/90 cm in men or >31"/80 cm in women is considered. <b>[1B]</b>				
<b>Goals</b>	<ol style="list-style-type: none"> <li>To improve overall metabolic control while achieving gradual weight reduction and maintaining achieved weight loss.</li> <li>To improve fasting and postprandial hyperglycemia in order to prevent or reduce diabetes complications.</li> <li>To improve fasting and postprandial hypertriglyceridemia as a major lipid abnormality in the target population.</li> <li>To improve lipid profile including increase of HDL-cholesterol and decrease of LDL-cholesterol.</li> <li>To improve insulin sensitivity as a major precursor of type 2 diabetes.</li> <li>To improve body fat distribution and to reduce visceral fat burden.</li> <li>To reduce cardiovascular risk as evidenced by improvement of endothelial function and endothelial markers.</li> <li>To reduce inflammatory cytokines, and markers of inflammation and increased coagulation.</li> <li>To improve blood pressure as a contributing risk factor for cardiovascular and renal complications.</li> <li>To enhance thermogenesis and maintain lean body mass.</li> <li>To provide a balanced meal plan of carbohydrate, protein and fat.</li> <li>To improve overall health through increased physical activity.</li> <li>To prevent and treat the chronic complications of diabetes.</li> </ol>				

## General Recommendations

1. Consideration of recent consistent and strong evidence that weight reduction improves insulin sensitivity and glycemic control in type 2 diabetes and decreases the risk of developing type 2 diabetes in prediabetes and high-risk populations. **Weight reduction** should be considered one of the prime objectives of any nutrition recommendations suggested to the target population. [1A]
2. Any meal plan modifications should first be discussed with a **Registered Dietitian (RD)** or a qualified healthcare provider. [1C]
3. Target individuals should meet with an **RD** for assessment and review of medical management and treatment goals to select approach for medical nutrition therapy. [1B]
4. The diet composition, described below, is for general guidance only and may be individualized by the RD or the healthcare provider according to clinical judgment. (See Appendix A).
5. Meal plans do not need to include between-meal or evening snacks.
6. Meal-to-meal consistency in carbohydrate is of primary importance to patients with fixed medication/insulin programs. [1C]

## Weight Reduction

1. A structured lifestyle plan that combines dietary modification and exercise is necessary for weight reduction. [1B]
2. A modest and gradual weight reduction of one pound every one to two weeks should be the optimal target. [2A]
3. Reduction of daily caloric intake should be by 250 to 500 calories. [1C] Total daily caloric intake should not be less than 1000-1200 for women and 1200-1600 for men, or based on an RD assessment of usual intake. [1C]
4. Weight reduction should be individualized and continued until BMI reaches the normal range ( $18.5\text{-}25 \text{ kg/m}^2$ ) or until an agreed upon BMI goal is reached. [2B]
5. Target individuals should meet with RD to learn and practice portion control as an effective way of weight control. [1B]
6. Meal replacements (MR) in the form of shakes, bars, ready-to-mix powders, and pre-packaged meals that match these nutrition guidelines are helpful for some patients. [1B] Blood glucose patterns frequently change with the initiation of meal replacements, and diabetes medications may need adjustment. Patients should be told to monitor their blood glucose carefully to identify hypoglycemia. [2A]
7. FDA approved weight management medications should be prescribed, if indicated. [2A] Approved medications are an adjunct to dietary and lifestyle changes. [1A]
8. Bariatric surgeries are effective options and should be encouraged when indicated (consider in individuals with  $\text{BMI} >40 \text{ kg/m}^2$  and those with  $\text{BMI} >35 \text{ kg/m}^2$  with other comorbidities). [2B]

## Macronutrient Composition

Carbohydrate	Percentage	~ 40% of total caloric intake. [1A] The total should not be less than 130 gm/day. [1B]
	Glycemic Index and Glycemic Load	Reduction of the quality (Glycemic Index, GI) and quantity (Glycemic Load, GL) of carbohydrate choices is essential for blood glucose control. The GI/GL concept is an important factor that patients should apply in their daily selection of carbohydrates foods. Foods with a low glycemic index should be selected (e.g., cereals based on oats and barley, legumes, fruits, green salad with olive oil-based dressing, and vegetables, except potatoes) [2B]
	Recommended	Vegetables and fruits (preferably fresh), legumes, whole and minimally processed grains.
	Not Recommended	Refined carbohydrates or processed grains and starchy foods especially pasta, white bread, low-fiber cereal and white potatoes should be consumed in very limited quantities (e.g., pasta ~ 2 oz.) [2B]
	Fiber	A minimum of 20-35 gm of fiber per day is recommended. [1A] If tolerated, ~50 gm/day is effective in improving postprandial hyperglycemia and should be encouraged. [2A] Fiber from unprocessed food, such as fresh vegetables and fruits, is preferable but, if needed, fiber supplements such as psyllium and $\beta$ -glucan can be added. [1A]

## Macronutrient Composition (continued)

<b>Fat</b>	<b>Percentage</b>	~ 30-35 % of total caloric intake; [2B] saturated fat should be limited to < 10% of total caloric intake or < 7% in individuals with LDL-Cholesterol > 100 mg/dl. [1B] Polyunsaturated fat should comprise up to 10% of total calories, and monounsaturated fat up to 15-20% of total calories. [2B]
	<b>Recommended</b>	Mono- and polyunsaturated fats (e.g., olive oil, canola oil, nuts/seeds and fish, particularly those high in omega-3 fatty acids). Oily fish (e.g., salmon, herring, trout, sardines, fresh tuna) 2 times/week is an ample source of omega-3 fatty acids. [1B]
	<b>Not Recommended</b>	Foods high in saturated fat, including beef, pork, lamb and high-fat dairy products (e.g., cream cheese, whole milk or yogurt) should be consumed only in small amounts. Foods high in trans-fats (e.g., fast foods, commercially baked goods, some margarines) should be avoided. [1A]
	<b>Cholesterol</b>	<300 mg/day or <200 mg/day in individuals with LDL-Cholesterol >100 mg/dl. [1C] Egg yolks should be limited to 2 to 3 per week; other foods high in dietary cholesterol, such as red meat, whole-fat dairy foods, shellfish and organ meats should be limited, as well.
<b>Protein</b>	<b>Percentage</b>	~ 20-30% of total caloric intake. [2B]
	<b>Favorable Protein</b>	Fish, skinless poultry, nonfat or low-fat dairy, legumes, tofu, tempeh and seitan. It is not recommended to <i>increase</i> protein from high saturated fat animal sources (e.g., beef, pork, lamb and high-fat dairy products), as it may be associated with increased cardiovascular risk. [1B]  Emerging data suggest that protein aids in the sensation of fullness and that low-protein meal plans are associated with increased hunger. Thus, lean protein together with healthy fats may serve to reduce appetite and assist patients in achieving and maintaining a lower calorie level. [2B] Protein also helps to maintain lean body mass during weight reduction. [1B]
	<b>Patients with Renal Issues</b>	Although reducing total calories may result in a reduction of the absolute total amount of protein intake, any patient with signs of kidney disease (i.e., one or more of the following: albuminuria, proteinuria, creatinine clearance <60 ml/min) should consult a nephrologist before increasing total or percentage protein in their diet. [1A] 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.

## Physical Activity and Behavioral Modification

- 1- Physical activity, behavior modification and good support systems are extremely important and should be included in the nutrition prescription described above. Increased physical activity, in particular, should be an integral component of any weight reduction plan to maximize the benefits of weight reduction on diabetes control and to prevent coronary and cerebral vascular disease. [1B]
- 2- A minimum of 150-175 minutes of moderate intensity physical activity/week should be achieved unless contraindicated. [1A] A target of 60-90 minutes most days of the week is encouraged. [1B]
- 3- Exercise should be a mix of cardiovascular, stretching, and resistance exercises to maintain or increase lean body mass. [1B]

Approved by the Joslin Clinical Oversight Committee on 3/29/07.

### Clinical Nutrition Task Force

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The Joslin Clinical Oversight Committee gratefully acknowledges Elena Savoia, MD, MPH, Research Associate, Division of Public Health Practice, Harvard School of Public Health, Boston, in the supervision of the grading process.

## Appendix A

### **Suggested Macronutrient Distribution According to Clinical Guideline**

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

Recommended calorie levels for weight reduction range from 1200 to 1800 calories to promote optimal health, as well as weight loss. However, if a 1000-calorie meal plan is prescribed, it should be done so under the supervision of both the healthcare provider and a registered dietitian.

In keeping with this Clinical Guideline's recommendation of no less than 130 grams of carbohydrate per day, it should be noted that the percentage of calories from carbohydrate for calorie levels less than 1200 would exceed the goal of 40%. This flexibility in meal planning is necessary to maintain optimal nutritional status during the weight reduction period.

## Grading System Used in Guideline

<b>Grade of Recommendation</b>	<b>Clarity of risk/benefit</b>	<b>Quality of supporting evidence</b>
<b>1A</b> Strong recommendation High quality of evidence	Benefits clearly outweigh risk and vice versa.	Consistent evidence from well performed randomized, controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.
<b>1B</b> Strong recommendation Moderate quality of evidence	Benefits clearly outweigh risk and burdens, or vice versa.	Evidence from randomized, controlled trials with important limitations (inconsistent results, methodological flaws, indirect or imprecise), or very strong evidence of some other research design. Further research is likely to have an impact on our confidence in the estimate of the benefit and risk and may change the estimate.
<b>1C</b> Strong recommendation Low quality of evidence	Benefits outweigh risk and burdens, or vice versa.	Evidence from observational studies, unsystematic clinical experience, or from randomized controlled trials with serious flaws. Any estimate of effect is uncertain.
<b>2A</b> Weak recommendation High quality of evidence	Benefits closely balanced with risks and burdens.	Consistent evidence from well performed randomized controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.
<b>2B</b> Weak recommendation Moderate quality of evidence	Benefits closely balanced with risks and burdens; some uncertainty in the estimates of benefits, risks and burdens.	Evidence from randomized controlled trials with important limitations (inconsistent results, methodological flaws, indirect or imprecise), or very strong evidence of some other research design. Further research is likely to have an impact on our confidence in the estimate of benefit and risk and may change the estimate.
<b>2C</b> Weak recommendation Low quality of evidence	Uncertainty in the estimates of benefits, risks and burdens; benefits may be closely balanced with risks and burdens.	Evidence from observational studies, unsystematic clinical experience, or from randomized controlled trials with serious flaws. Any estimate of effect is uncertain.

Evidence graded less than “A” is acceptable to support clinical recommendations in a guideline. It is also assumed that for many important clinical recommendations, it would be unlikely that level A evidence be obtained because appropriate studies may never be performed.

<sup>1</sup>Guyatt G et al. Grading strength of recommendations and quality of evidence in clinical guidelines: Report from an American College of Physicians Task Force. *Chest* 129:174-181, 2006.