



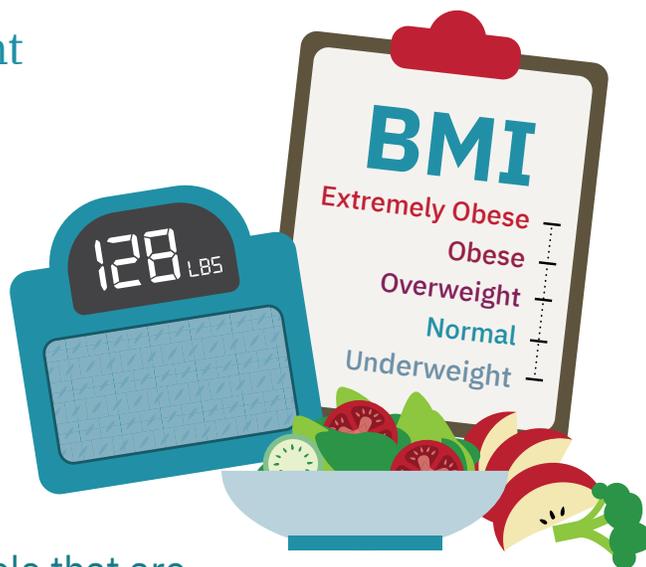
Effective Diabetes Prevention for Adults: Prediabetes Screening and Treatment

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Clinicians are challenged to manage both prediabetes and obesity in patients.

Prediabetes is defined as blood glucose levels that are higher than normal, but not high enough to be diagnosed as diabetes.¹

Eighty-five percent of individuals with prediabetes are overweight or obese.² Treatment should be individualized to reflect the severity of both conditions. This document provides clinicians with useful information and tools to integrate patient management with these frequently co-occurring conditions through prediabetes screening and communicating results, as well as prediabetes prevention and treatment.

Screening for Prediabetes and Communicating Results: Considerations and Recommendations

Approximately 1 in 3 American adults has prediabetes, and is usually overweight or obese as well, with a Body Mass Index (BMI) ≥ 25 in most cases. A person with prediabetes has a 5-10% annual risk and a 70% lifetime risk to convert to diabetes.²⁻⁴ People with prediabetes have an even higher annual risk of conversion to diabetes if their HbA1C and BMI are in upper ranges.^{3,4} Early intervention is known to reduce the risk of complications. Therefore, it is important to identify diabetes early in its course.



More than **1 in 3 adults** have prediabetes, but most are unaware. **Eighty-five percent** of individuals with prediabetes are overweight or obese.¹

Recommended Screening Process for Prediabetes ? ⁵⁻⁷

Age and BMI are the strongest risk factors for prediabetes. Take the following steps to screen appropriately for prediabetes and monitor the patient if it has been identified.

- 1. Screen every three years for all people beginning at age 45, OR Screen every three years for all people who are overweight or obese (BMI is ≥ 25 kg/m² (or ≥ 23 kg/m² in Asian Americans)) and who have one or more of the following risk factors at any age:**
 - African American, Hispanic/Latino, Native American, Asian American, or Pacific Islander
 - History of hypertension, cardiovascular disease, polycystic ovarian syndrome, or gestational diabetes
 - HDL cholesterol < 35 mg/dL and/or a triglyceride level > 250 mg/dL
 - Physically inactive
 - First degree relative with type 2 diabetes
- 2. If a patient has been determined to have prediabetes, monitor annually:**
 - A1C is 5.7-6.4% or fasting glucose is 100-125 mg/dL
- 3. The American Diabetes Association (ADA) recommends that:**
 - A person with a negative screening test be retested every three years, and
 - If a person has a positive screen, confirm with a repeat test, treat per recommendations (see next section), and recheck the prediabetes test at least annually.

Other prediabetes screening considerations are as follows:

- Risks for prediabetes increases at a BMI of ≥ 23 kg/m² in people of Asian heritage, American Indians, and some other ethnic groups.
- Muscle loss due to aging or immobility (sarcopenia) increases the risk for prediabetes and may be just as much of a risk as increased adiposity.
- Current reviews of the screening criteria above for prediabetes suggest that screening recommendations, particularly those with an upper age limit, may miss up to half of prediabetes in some groups. The U.S. Preventive Services Task Force recommendations are currently under review.⁸
- The ADA has a **60-Second Type 2 Diabetes Risk Test** that patients can take online.

What is a Prediabetes Positive Screen? ^{4,6}

HbA1C:

5.7-6.4%

Fasting glucose:

100-125mg/dL

or

110-125 mg/dL

A person with prediabetes and no symptoms of diabetes should have HbA1C measured annually.⁵

Communicating a positive test for prediabetes to a patient

It is important to tell patients when they have prediabetes and describe how this impacts them with clear language. The Centers for Disease Control and Prevention uses this message for those with prediabetes:

“You have prediabetes. This means that your blood sugar level is higher than normal, but not high enough yet to be diagnosed as diabetes. Prediabetes puts you at increased risk of developing type 2 diabetes, heart disease, and stroke.”⁹

Treating Prediabetes:

Partnering with Patients to Improve and Normalize Prediabetes Measures

The overall long-term goal for patients is to reverse prediabetes and to treat obesity. Evidence-based treatments for prediabetes include lifestyle modification, pharmacotherapy, bariatric surgery, and management of other health conditions.

Lifestyle Modification^{7,10, 11,16}

For patients with prediabetes, the goal of lifestyle modification is to engage in and sustain behavior changes to achieve and maintain a weight loss of 5-10% from their current body weight with higher activity levels and better food choices.^{7,10} People who can achieve and sustain weight loss, increased activity, and improved eating goals have a significantly lower risk for converting from prediabetes to diabetes and developing cardiovascular disease or related conditions.

Dietary changes most directly impact weight. Exercise helps to maintain short-term weight loss by improving resting metabolic rate and calorie expenditure, and long-term by improving and maintaining body composition. Tracking helps people manage and sustain or adapt changes for longer-term adherence and better weight loss.

The key question for patients adopting any lifestyle change is, “Would you do this long-term?” If not, then another plan should be considered. Lifestyle changes only work if consistently done over time. Consider the following evidence-based recommendations for your patients with prediabetes to help them reach these behavioral goals.

1. Diabetes Prevention Program (DPP) referral

Referral of a patient with prediabetes to a DPP is the first-line recommendation by the Centers for Disease Control and Prevention (CDC) and other organizations.¹⁷⁻²⁰ A Diabetes Prevention Program is an evidence-based, 1-2 year program offered as a weekly group class that engages participants to make and achieve changes in diet, exercise, tracking, and behavioral skills to achieve recommended weight loss and behavior change. Now offered through web-based platforms as a result of the COVID-19 pandemic, and largely in person before, participation in the DPP at recommended levels is shown to reduce the risk of developing diabetes by 56%.^{13, 17-20}

While the original DPP interventional trial was quite rigorous, real-world programs that utilize high intensity interventions or less intensive intervention with high uptake have demonstrated reduced diabetes risk.²¹ The DPP was not designed to study complications, in part due to the relatively short follow-up period. However, the Diabetes Prevention Program Outcomes Study demonstrated a 28% reduction in composite microvascular complications in those who did not progress to diabetes over a 15-year period.²² More data are needed to understand the long-term effects of diabetes prevention interventions on diabetes complications and mortality.

If the patient has no significant barriers to learning, is an appropriate learner, at least with support, in a group setting, then the DPP can be recommended. The DPP can be recommended even if a person is also pursuing medical or surgical treatment for obesity.

Patients should check with their insurance plan regarding coverage of DPP. See the [National DPP's Coverage Toolkit](#) for patient flyers and programs in your region in which to refer patients.

2. Help patients increase physical activity

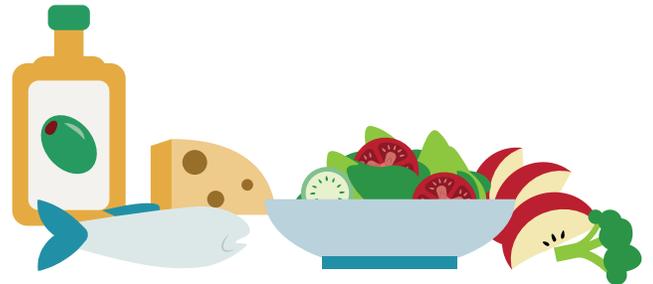
Achieving and maintaining a minimum of 150 minutes or more of moderate intensity physical activity each week greatly lowers the risk for developing both diabetes and cardiovascular disease. No matter what level of activity from which a patient begins, counseling patients to increase **physical activity** has been shown to improve activity level 6-12 months later.

3. Partner with patients to find the best dietary approach

No single diet or approach is best proven to prevent diabetes or cardiovascular disease, or to achieve and maintain weight loss. Some diet approaches, if used long-term, improve metabolic indices, including weight, blood sugar, blood pressure, and lipids. The wisest approach is the one that best fits a patient's preferences and situation so that it might be adopted long-term.

Dietary approaches most proven for long-term weight loss and improved metabolic measures are listed in Table 1 at the end of this document.²⁴⁻³⁶ These include:

- The Mediterranean-style diet
- Vegetarian or vegan diet
- Low fat and very low fat diets
- Low carbohydrate and very low carbohydrate diets
- Dietary Approaches to Stop Hypertension (DASH) diet
- Healthy Plate/Healthy Eating Index approach



Review of other dietary approaches is beyond the scope of this document.

Consider using other tools to promote behavioral change success as well. Some tools and strategies are associated with better weight loss and weight loss sustainment and should be part of a strategy consistent with the eating and activity approaches recommended above. These tools improve consistency in diet and activity, and are shown to improve the amount of weight loss and weight loss maintenance.

- **Tracking** – Tracking food eaten and exercise completed, whether by paper, computer, or wearables, increases the amount of weight lost and helps inform what facilitates or impedes consistency. It can also increase awareness and motivation.¹⁶
- **Meal replacements: protein shakes/bars** – For decades, meal replacements, if used as part of a diet plan and with tracking, have improved the amount of weight lost and the maintenance of it. The drawbacks are maintaining the willingness to stick with this approach long-term for 1-2 meals a day and knowing which products are best.³⁷
- **Commercial low calorie diet plans** – These plans, like Weight Watchers or Jenny Craig, combine healthy eating approaches and tracking. They usually are successful with initial weight loss and some maintenance, but they can be too costly or impractical for long-term adherence.³⁸

4. Address other health behaviors with patients

When prediabetes is diagnosed, it is important to help patients understand and address other risk factors they can modify to lower their cardiovascular risk.

Tobacco use is the most important modifiable risk factor for most patients. Most patients do not know that smoking may increase the risk of type 2 diabetes.⁴³ Evaluation for tobacco use and referral for tobacco cessation should be part of routine care for those at risk for diabetes. Please refer to the [Smoking Cessation FAQ](#) document on the Cardi-OH website for evidence and tools to help patients improve their success at quitting tobacco.

Alcohol use is another important modifiable risk factor. Adults with prediabetes are recommended to consume alcohol in moderate amounts. Increased consumption levels increase the risk for progression to diabetes as well as other related health risks.²⁴

Other considerations, like improving sleep quantity and quality, learning and using mindfulness-based stress reduction tools, may help patients better address unhealthy coping, like substance use and over-eating.⁴⁴

Pharmacotherapy^{7,10}

Consider adding an anti-diabetic agent to lifestyle modification, especially for the following patients:

- Patients with a BMI ≥ 35 kg/m²
- Women with history of Gestational Diabetes Mellitus (GDM)
- Patients < 60 years old

Metformin has the strongest evidence base and demonstrated long-term safety when used as pharmacologic therapy for diabetes prevention. The risk/benefit ratio must be weighed for each individual. Long-term use of Metformin should not be given and should be discontinued in patients with an estimated glomerular filtration rate (eGFR) of ≤ 30 . Metformin may be associated with Vitamin B-12 deficiency, so periodic monitoring should be considered.^{10, 41-42} Long-acting metformin is better tolerated with fewer gastrointestinal side effects. For other anti-diabetic drugs, consider the cost, possible side effects, and durable efficacy for the individual patient.

Determine whether obesity treatment medications should be initiated. As described above, 85% of individuals with prediabetes are overweight or obese. Medication for obesity treatment can be considered in these individuals as part of an obesity treatment plan that also includes lifestyle modification.¹⁰ Many primary care clinicians are not comfortable initiating and following medications for obesity treatment. If this is the case, consider referring your patient to an Obesity Medicine specialist.

Using Medication in Obesity Treatment

To date, the effectiveness of weight loss medication monotherapy is greater than behavior alone.¹⁰ However, the degree and sustainment of weight loss depends on the patient's engagement in lifestyle treatment to both maximize and sustain weight loss. Weight loss medications typically increase the amount of weight lost and kept off by about 5-10% on average. The added medical benefit of treating obesity with medication in addition to lifestyle treatment is much less clear. A full discussion of the treatment of obesity with medication is beyond the scope of this document.

Bariatric surgery

The ADA recommends screening all adults annually for obesity using BMI, calculated from height and weight.¹⁰ Treatment for obesity should be offered depending on the readiness of the patient to engage, the presence of related medical issues, and the severity of obesity.¹¹⁻¹⁴

The recommended treatment of obesity always includes behavioral changes, but with more severe obesity, should include the consideration of medication and bariatric surgery.¹⁰ For more than 20 years, evidence increasingly shows bariatric surgery to be the most effective treatment for moderate to severe obesity and the improvement or remission of many co-morbid conditions, particularly diabetes and prediabetes. The goal of prediabetes treatment is to normalize glycemia as well as improve BMI and behaviors. This means that prediabetes usually cannot be addressed independently of obesity.

Medical evidence consistently shows that obesity management can delay the progression from prediabetes to type 2 diabetes and improves control and outcomes in type 2 diabetes.^{10, 43-45} Recommendations from the American Association of Clinical Endocrinologists, the American College of Endocrinology, and the Obesity Society all recommend that bariatric procedures should be recommended for patients less than 65 years of age with a BMI ≥ 40 regardless of co-morbid medical conditions, and for those with a BMI ≥ 35 with medical co-morbidities that are known to be improved and remediated by weight loss, including prediabetes,

metabolic syndrome, and type 2 diabetes. These clinical practice guidelines for the perioperative nutrition, metabolic, and nonsurgical support of patients undergoing bariatric procedures are updated yearly and list current criteria for metabolic and weight loss surgery.⁴³⁻⁴⁵

Weight loss surgery is recommended because of its medical effectiveness and durable results. In a meta-analysis, participants who had roux-en-Y-gastric bypass had a remission rate of 52% for diabetes mellitus 2 at two years and 27% at five years, compared with those who completed medical and behavioral treatment, who had a remission rate of 3.5% at two and five years. Surgical participants also had improved HDL cholesterol and triglyceride levels.⁴⁶ A British study found that more than ten years after bariatric surgery, there was a more than a 65% reduction in cardiovascular events in those who had surgery compared to those who did not. Bariatric surgery also is associated with decreased microvascular complications from diabetes, an increased lifespan, and decreased rates of disability.⁴⁶ Patients should check with their insurance plan regarding bariatric surgery coverage.

Metabolic and Bariatric Surgery Programs⁴⁷

The Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) is an accreditation process that programs voluntarily participate in to provide registry data about patients, procedures, and outcomes, and annually commit to quality improvement projects. Some payors limit coverage of bariatric surgery to centers with MBSAQIP certification. It may be helpful to have your practice reach out to a nearby program to arrange for a conversation between their team and your practice to see how to best partner in order to help patients choose a surgical program, prepare for, and receive a safe bariatric surgery.

Obesity Medicine Professionals

Obesity Medicine specialists and medical weight management programs are less common, but the availability of Obesity Medicine specialists is rapidly increasing. Obesity Medicine specialists can partner with primary care clinicians to provide and direct intensive behavioral weight loss, very low calorie diets; medication to facilitate weight loss, and preparation and aftercare for those having bariatric surgery.⁴⁸

Management of Other Health Conditions

Assessment for and good management of medically related conditions such as hypertension, hyperlipidemia, and sleep apnea all help to reduce overall cardiovascular risk, and in the case of sleep apnea, may reduce the risk for progression to diabetes. Assessing for and optimizing treatment of mood disorders is often essential for patients to engage in lifestyle change. In addition, the dietary, activity, and weight management recommendations for prediabetes are consistent with managing all the related conditions as well.^{7, 12, 13, 23, 34, 36}

Quality Improvement Resources for Prediabetes Practice Integration

If you and your practice need help with dependable, simple processes for prediabetes screening; sharing results with patients; making and connecting patients to resources; and following progress, the following resources may be useful:

- **Prediabetes** — Office tools including process, patient flyers, and letters in English and Spanish:
<https://assets.ama-assn.org/sub/prevent-diabetes-stat>
- **Obesity** — Guideline-based summary to assess, address, and treat obesity in the office:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4666822/pdf/nihms698818.pdf>

Dietary approaches most proven for weight loss and improved metabolic measures

(Adapted from table Evert Diabetes Care 2019 nutrition therapy for adults with diabetes mellitus (DM) or pre-DM with additions from authors.)^{5, 9, 10, 11, 12, 20-32}

Overview

Benefits

Mediterranean-style



Emphasizes plant-based food (vegetables, beans, nuts and seeds, fruits, and whole intact grains); fish and other seafood; olive oil as the principal source of dietary fat; dairy products (mainly yogurt and cheese) in low to moderate amounts; typically fewer than four eggs/week; red meat in low frequency and amounts; wine in low to moderate amounts; and concentrated sugars or honey rarely.

- Reduced risk of diabetes
- A1C reduction
- Lowered triglycerides
- Reduced risk of major cardiovascular events

Vegetarian or vegan



The two most common approaches found in the literature emphasize plant-based vegetarian eating devoid of all flesh foods but including egg (ovo) and/or dairy (lacto) products, or vegan eating devoid of all flesh foods and animal-derived products.

- Reduced risk of diabetes
- A1C reduction
- Weight loss
- Lowered LDL-C and non-HDL-C

Low fat



Emphasizes vegetables, fruits, starches (e.g., breads/crackers, pasta, whole intact grains, starchy vegetables), lean protein sources (including beans), and low-fat dairy products. In this review, defined as total fat intake of $\leq 30\%$ and saturated fat intake $< 10\%$ of total calories.

- Reduced risk of diabetes
- Weight loss

Very low fat



Emphasizes fiber-rich vegetables, beans, fruits, whole intact grains, nonfat dairy, fish, and egg whites. Comprised of 70–77% carbohydrate (including 30–60 g fiber), 10% fat, and 13–20% protein.

- Weight loss
- Lowered blood pressure

Low carbohydrate



Emphasizes vegetables low in carbohydrate (such as salad greens, broccoli, cauliflower, cucumber, cabbage, and others); fat from animal foods, oils, butter, and avocado; and protein in the form of meat, poultry, fish, shellfish, eggs, cheese, nuts, and seeds. Some plans include fruit (e.g., berries) and a greater array of non-starchy vegetables.

- A1C reduction
- Weight loss
- Lowered blood pressure
- Increased HDL-C and
- Lowered triglycerides

Avoids starchy and sugary foods such as pasta, rice, potatoes, bread, and sweets. There is no consistent definition of “low” carbohydrate. In this review, a low carbohydrate eating pattern is defined as reducing carbohydrates to 26–45% of total calories.

Very low carbohydrate (VLC)



Similar to low carbohydrate pattern but further limits carbohydrate-containing foods, and meals typically derive more than half of calories from fat. Often has a goal of 20–50g of non-fiber carbohydrate per day to induce nutritional ketosis. In this review a very low carbohydrate eating pattern is defined as reducing carbohydrate to $< 26\%$ of total calories.

- A1C reduction
- Weight loss
- Lowered blood pressure
- Increased HDL-C and lowered triglycerides

Dietary Approaches to Stop Hypertension (DASH)



Emphasizes vegetables, fruits, and low-fat dairy products; includes whole intact grains, poultry, fish, and nuts; reduced in saturated fat, red meat, sweets, and sugar-containing beverages. May also be reduced in sodium.

- Reduced risk of diabetes
- Weight loss
- Lowered blood pressure

Healthy Plate/Healthy Eating Index approach



Used in the National Diabetes Prevention Program, the main message of the Healthy Eating Plate is to focus on diet quality, with vegetables, fruits, beans, whole grains, and healthy oils. Focuses on portion control and better choices; avoidance and limitation of sugary beverages; and processed high carbohydrate and high fat foods..

- Reduced cardiovascular mortality
- Reduced all-cause mortality
- Promotes weight loss to 5% and reduced development of diabetes when part of a Diabetes Prevention Program

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