



Patient education: Preventing complications from diabetes (Beyond the Basics)

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DIABETES OVERVIEW

Diabetes (also called "diabetes mellitus") is a disorder that is known for disrupting the way your body uses glucose (sugar). It also causes problems with the way your body stores and processes other forms of energy, including fat.

All the cells in your body need glucose to work normally. Glucose gets into most cells with the help of a hormone called insulin. If there is not enough insulin or if your body stops responding to insulin, glucose builds up in the blood. This is what happens to people with diabetes.

There are two main types of diabetes, type 1 and type 2:

- In **type 1** diabetes, the problem is that the pancreas (an organ in the abdomen) stops making insulin.
- In **type 2** diabetes, the body has a decreased response to normal or even high levels of insulin, and over time, the pancreas does not make enough insulin.

Over time, both type 1 and type 2 diabetes can lead to various complications, many of which can be serious if they are not identified and addressed promptly. You can lower your risk of many problems by keeping your blood glucose in the goal range, managing related health conditions, and seeing your health care providers for regular checkups.

This article will discuss some of the common complications from diabetes and how you can reduce your risk of these problems. More information about the general management of type 1 and type 2 diabetes is available separately.

- (See "[Patient education: Type 1 diabetes: Overview \(Beyond the Basics\)](#)".)
- (See "[Patient education: Type 1 diabetes: Insulin treatment \(Beyond the Basics\)](#)".)
- (See "[Patient education: Type 2 diabetes: Overview \(Beyond the Basics\)](#)".)
- (See "[Patient education: Exercise and medical care for people with type 2 diabetes \(Beyond the Basics\)](#)".)
- (See "[Patient education: Type 2 diabetes: Treatment \(Beyond the Basics\)](#)".)
- (See "[Patient education: Type 2 diabetes: Insulin treatment \(Beyond the Basics\)](#)".)

IMPORTANCE OF GLUCOSE MANAGEMENT

The long-term complications of diabetes are related in part to damage caused by high blood glucose levels. In general, people with glucose levels closer to normal have fewer complications than those with higher levels. Managing your glucose requires ongoing treatment and regular monitoring. It's also important not to let your glucose fall below normal as this condition (called "hypoglycemia") can lead to problems as well. (See "[Patient education: Hypoglycemia \(low blood glucose\) in people with diabetes \(Beyond the Basics\)](#)".)

Living with diabetes can be challenging, but most people are able to adjust and manage their diabetes successfully. Your health care provider will work closely with you to monitor your health and help you manage diabetes and related health conditions. More information about diabetes management is available separately. (See "[Patient education: Type 1 diabetes: Insulin treatment \(Beyond the Basics\)](#)" and "[Patient education: Type 2 diabetes: Treatment \(Beyond the Basics\)](#)" and "[Patient education: Glucose monitoring in diabetes \(Beyond the Basics\)](#)".)

CARDIOVASCULAR COMPLICATIONS IN DIABETES

People with diabetes are at increased risk of cardiovascular disease, which can lead to heart attack and stroke. Cardiovascular disease is the leading cause of death in people with diabetes.

Whether you have type 1 or type 2 diabetes, you can lower your risk of cardiovascular disease by doing the following:

- **Quit smoking, if you smoke** – While this can be difficult, it's one of the most important things you can do to improve your overall health and reduce your risk of cardiovascular disease. Your health care provider can help you and provide other resources for support. (See "[Patient education: Quitting smoking \(Beyond the Basics\)](#)".)
- **Keep your blood pressure in a healthy range** – This may involve lifestyle changes and/or medication(s) if you have high blood pressure. (See "[Patient education: High blood pressure, diet, and weight \(Beyond the Basics\)](#)" and "[Patient education: High blood pressure treatment in adults \(Beyond the Basics\)](#)".)
- **Keep your cholesterol and triglyceride levels in a healthy range** – Your health care provider can measure these with a blood test. In addition to making healthy lifestyle changes, most people with diabetes will also need to take a cholesterol-lowering medication. If you are over 40 years old or have multiple risk factors for cardiovascular disease (eg, family history, high cholesterol, high blood pressure, or obesity), your doctor will likely prescribe a cholesterol-lowering medication called a statin. In people with diabetes, statins have been shown to decrease the future risk of heart attacks, strokes, and death, even when cholesterol levels are normal. (See "[Patient education: High cholesterol and lipids \(Beyond the Basics\)](#)" and "[Patient education: High cholesterol and lipid treatment options \(Beyond the Basics\)](#)".)
- **Consider daily low-dose aspirin, depending on your other conditions** – Most people with diabetes and heart disease (such as history of angina or heart attack) should take low-dose [aspirin](#) (for example, 81 mg per day). For some people with diabetes and heart disease, aspirin is combined with another antiplatelet medication.

For people with diabetes who do not have heart disease, the decision to take low-dose [aspirin](#) should be based on the individual's risks for heart disease and bleeding. Because aspirin can cause bleeding (most frequently in the gastrointestinal tract), it may not be recommended for people at high risk of bleeding who do not have a history of angina or heart attack. Your health care provider can talk to you about the risks and benefits of daily aspirin. (See "[Patient education: Aspirin in the primary prevention of cardiovascular disease and cancer \(Beyond the Basics\)](#)".)

In people with type 1 diabetes, keeping glucose levels close to normal reduces the risk of cardiovascular disease. In people with type 2 diabetes, the relationship between glucose management and cardiovascular disease is less clear. However, glucose management remains a central part of diabetes care as it reduces the risk of eye, kidney, and nerve damage.

EYE COMPLICATIONS IN DIABETES

There are several eye problems related to diabetes. The most common affects the retina, a layer at the back of the eye; this is called "diabetic retinopathy." In diabetic retinopathy, the small blood vessels in the retina grow abnormally and leak, which can lead to vision loss and eventually blindness if not treated. Other eye problems associated with diabetes include diabetic macular edema (swelling of the central area of the retina that has the sharpest vision), glaucoma (high pressure in the eyeball), and cataracts (clouding of the lens of the eye). Regular eye exams are essential for detecting retinopathy and other eye problems at an early stage, when the condition can be monitored and treated to preserve vision.

The initial eye exam can be performed by a doctor who specializes in the eyes (called an ophthalmologist or optometrist) or by a trained retinal photographer who takes photographs of the retina. The eye doctor uses medicated eye drops to dilate your pupils so the retina can be completely examined. Pupil dilation is not required for the retinal photographs. The photographs are interpreted by an eye doctor or by a computer. If there is evidence of diabetic retinopathy on the retinal photographs, you will need to have a full dilated eye exam by the eye doctor.

The risk of diabetic retinopathy and the recommendations for monitoring vary depending on which type of diabetes you have:

- **Type 1 diabetes** – People with type 1 diabetes should have regular eye exams by an ophthalmologist or optometrist beginning five years after they are diagnosed with diabetes, although screening is usually not necessary before 10 years of age. People who have difficulty with their vision or require glasses or contacts may need to be seen sooner.
- **Type 2 diabetes** – People with type 2 diabetes should have an eye exam by an ophthalmologist or optometrist when they are first diagnosed with diabetes. The reason for this is that blood glucose levels often increase over a period of several years before the person is diagnosed. Eye complications can develop during this time and often have no symptoms. Having an eye exam soon after diagnosis can help to determine if there are eye complications, the extent or severity of the complications, and if treatment is needed.

The frequency of subsequent exams will depend upon the results of the initial exam. Eye exams are usually recommended every one to two years after the first one.

In addition to keeping blood glucose levels in your target range, lowering your blood pressure (if it is high) can also help prevent eye-related complications. (See '[High blood pressure in diabetes](#)' below.)

FOOT PROBLEMS IN DIABETES

Diabetes can decrease blood flow to the feet and damage the nerves that carry sensation; this nerve damage is known as "diabetic neuropathy." Because people with neuropathy may lose their ability to sense pain, they are at increased risk for developing potentially serious foot-related complications such as ulcers. Foot complications are very common among people with diabetes and sometimes go unnoticed until symptoms become severe. (See ["Patient education: Diabetic neuropathy \(Beyond the Basics\)"](#).)

Although there is no way to reverse nerve damage once it has happened, there are things you can do to lower your risk of developing serious foot problems as a consequence. In addition to managing your glucose levels, doing regular exams to check for any changes in the feet also helps reduce the risk of serious foot problems.

Self-exams and foot care — It is important to examine your feet every day. This should include looking carefully at all parts of your feet, especially the area between the toes. Look for broken skin, ulcers, blisters, areas of increased warmth or redness, or changes in callus formation; let your health care provider know if you notice any of these changes or have any concerns. (See ["Patient education: Foot care for people with diabetes \(Beyond the Basics\)"](#).)

It may help to make the foot exam a part of your daily bathing or dressing routine. You might need to use a mirror to see the bottoms of your feet clearly. If you are unable to reach your feet or see them completely, even with a mirror, ask another person (such as a spouse or other family member) to help you. It is important to dry your feet thoroughly after bathing and wear cotton socks and comfortable, well-fitting shoes.

Clinical exams — During your routine medical visits, your health care provider will check the blood flow and sensation in your feet. The frequency of these clinical exams will depend on which type of diabetes you have:

- In people with **type 1 diabetes**, annual foot exams should begin five years after diagnosis.
- In people with **type 2 diabetes**, annual foot exams should begin at the time of diagnosis.

During each foot exam, your provider will look for changes such as ulcers, cold feet, thin skin, bluish skin color, and skin breaks associated with athlete's foot (a fungal infection). They will also check the pulses and test the sensation in your feet to determine if these are normal or decreased. If you have decreased pulses or sensation, this increases your risk for foot injuries.

KIDNEY COMPLICATIONS IN DIABETES

Diabetes can alter the normal function of the kidneys. Kidney problems related to diabetes are referred to as "diabetic kidney disease" or by the older term, "diabetic nephropathy." Over time, diabetic kidney disease can lead to chronic kidney disease and even kidney failure. (See "[Patient education: Diabetic kidney disease \(Beyond the Basics\)](#)".)

To monitor your kidney function, your health care provider will check your blood creatinine level and use this to calculate an estimated glomerular filtration rate, or eGFR, which measures how well your kidneys are working. Your provider will also order urine tests to measure the amount of protein in your urine. When the kidneys are working normally, they prevent protein from leaking into the urine, so finding protein (measured as albumin) in the urine (even in very small amounts) may be an early sign of kidney damage. These tests are usually checked once yearly. (See "[Patient education: Protein in the urine \(proteinuria\) \(Beyond the Basics\)](#)".)

Recommendations for when to begin regular urine albumin-to-creatinine ratio screening tests depend on which type of diabetes you have:

- In people with **type 1 diabetes**, testing should begin about five years after diagnosis.
- In people with **type 2 diabetes**, testing should begin at the time of diagnosis.

If the test shows that there is protein in your urine, you can help slow the rate of progression by managing your blood glucose and your lipid (cholesterol and triglycerides) levels.

If you continue to have protein in your urine over time, your health care provider may prescribe a medication called an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB). These medications can help decrease the amount of protein in the urine and slow the progression of kidney disease. These medications also help lower blood pressure; this is important as high blood pressure can speed up the development of kidney problems. (See '[High blood pressure in diabetes](#)' below.)

A class of medications called sodium-glucose cotransporter 2 (SGLT2) inhibitors lowers blood glucose and blood pressure and prevents worsening of kidney function in people with early kidney damage, especially when the urine albumin level is high.

HIGH BLOOD PRESSURE IN DIABETES

Many people with diabetes have high blood pressure (hypertension). Although high blood pressure causes few symptoms, it has two negative effects: it stresses the cardiovascular system (see '[Cardiovascular complications in diabetes](#)' above) and speeds the development

of diabetic complications of the eyes and kidneys (see '[Eye complications in diabetes](#)' above and '[Kidney complications in diabetes](#)' above). Your health care provider will check your blood pressure regularly to see if it gets too high. (See "[Patient education: High blood pressure in adults \(Beyond the Basics\)](#)".)

In general, experts recommend keeping blood pressure below 130/80 mmHg for adults with diabetes. If you need to lower your blood pressure, your provider will probably recommend lifestyle changes such as weight loss, exercise, changing your diet (to cut back on salt and processed foods and eat more fruits, vegetables, and whole grains), quitting smoking (if you smoke), and cutting back on alcohol. Most people with type 2 diabetes also need to take medications to keep their blood pressure within the goal range. Your health care provider can talk to you about the benefits and risks of the different treatment options. (See "[Patient education: High blood pressure, diet, and weight \(Beyond the Basics\)](#)" and "[Patient education: High blood pressure treatment in adults \(Beyond the Basics\)](#)" and "[Patient education: High blood pressure, diet, and weight \(Beyond the Basics\)](#)", section on '[Dietary Approaches to Stop Hypertension \(DASH\) eating plan](#)'.)

PREGNANCY AND DIABETES

Managing blood glucose and monitoring for any complications is especially important for people who are pregnant or planning to get pregnant. Keeping blood glucose levels as close to normal as possible before and during pregnancy decreases the risk of many complications in both the pregnant person and the baby. Pregnancy in people with diabetes is discussed in more detail separately. (See "[Patient education: Care during pregnancy for patients with type 1 or 2 diabetes \(Beyond the Basics\)](#)".)

WHERE TO GET MORE INFORMATION

Your health care provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our website (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for health care professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient education: The ABCs of diabetes (The Basics)

Patient education: Type 1 diabetes (The Basics)

Patient education: Type 2 diabetes (The Basics)

Patient education: Treatment for type 2 diabetes (The Basics)

Patient education: Using insulin (The Basics)

Patient education: Diabetic ketoacidosis (The Basics)

Patient education: Hyperosmolar hyperglycemic state (The Basics)

Patient education: Gangrene (The Basics)

Patient education: Diabetic retinopathy (The Basics)

Patient education: Nerve damage caused by diabetes (The Basics)

Patient education: Preparing for pregnancy when you have diabetes (The Basics)

Patient education: Foot care for people with diabetes (The Basics)

Patient education: Latent autoimmune diabetes in adults (The Basics)

Patient education: How to give an insulin shot (The Basics)

Patient education: How to use an insulin pen (The Basics)

Patient education: Diabetes and heart disease (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient education: Care during pregnancy for patients with type 1 or 2 diabetes (Beyond the Basics)

Patient education: Foot care for people with diabetes (Beyond the Basics)

Patient education: High blood pressure in adults (Beyond the Basics)

Patient education: High cholesterol and lipids (Beyond the Basics)

Patient education: High cholesterol and lipid treatment options (Beyond the Basics)

Patient education: Glucose monitoring in diabetes (Beyond the Basics)

Patient education: Diabetic neuropathy (Beyond the Basics)

Patient education: Type 1 diabetes: Insulin treatment (Beyond the Basics)

Patient education: Hypoglycemia (low blood glucose) in people with diabetes (Beyond the Basics)

Patient education: Type 2 diabetes: Insulin treatment (Beyond the Basics)

Patient education: Diabetic kidney disease (Beyond the Basics)

Patient education: Protein in the urine (proteinuria) (Beyond the Basics)

Patient education: High blood pressure, diet, and weight (Beyond the Basics)

Patient education: High blood pressure treatment in adults (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which

they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Clinical presentation, diagnosis, and initial evaluation of diabetes mellitus in adults](#)

[Measurements of chronic glycemia in diabetes mellitus](#)

[Glycemic management and vascular complications in type 1 diabetes mellitus](#)

[Glycemic management and vascular complications in type 2 diabetes mellitus](#)

[Preexisting \(pregestational\) diabetes mellitus: Antenatal glycemic management](#)

[Management of blood glucose in adults with type 1 diabetes mellitus](#)

[Insulin therapy in type 2 diabetes mellitus](#)

[Management of diabetes mellitus in hospitalized patients](#)

[Management of persistent hyperglycemia in type 2 diabetes mellitus](#)

[Overview of general medical care in nonpregnant adults with diabetes mellitus](#)

[Screening for type 2 diabetes mellitus](#)

[Treatment of hypertension in patients with diabetes mellitus](#)

[Treatment of type 2 diabetes mellitus in the older patient](#)

The following organizations also provide reliable health information.

- National Library of Medicine
(www.nlm.nih.gov/medlineplus/healthtopics.html)
- National Institute of Diabetes and Digestive and Kidney Diseases
(www.niddk.nih.gov/Pages/default.aspx)
- American Diabetes Association (ADA)
(800)-DIABETES (800-342-2383)
(www.diabetes.org)
- Hormone Health Network
(www.hormone.org, available in English and Spanish)

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advice or a substitute for the medical advice, diagnosis, or treatment of a health care provider based on the health care provider's examination and assessment of a patient's specific and unique circumstances. Patients must speak with a health care provider for complete information about their health, medical questions, and treatment options, including any risks or benefits regarding use of medications. This information does not endorse any treatments or medications as safe, effective, or approved for treating a specific patient. UpToDate, Inc. and its affiliates disclaim any warranty or liability relating to this information or the use thereof. The use of this information is governed by the Terms of Use, available at <https://www.wolterskluwer.com/en/know/clinical-effectiveness-terms>.
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