

Diabetes Mellitus Type 1

What You Should Know

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Please refer to the glossary for a definition of terms.

What is diabetes?

Food is broken down in our bodies to make sugar and other nutrients. We use sugar or glucose for energy. Insulin moves glucose out of the blood and into the cells of the body to be used for energy. People with Type 1 diabetes make little to no insulin. Without insulin, the sugar stays in the bloodstream and the body cannot use that sugar for energy. Type 1 diabetes is almost always a permanent condition.

Approximately 16 million people in the United States have diabetes. About 10% of people with diabetes have Type 1 diabetes or about 1 in 200 people.

What causes diabetes?

Type 1 diabetes is an auto-immune disease. Your body produces antibodies that attack the islet cell. Islet cells are the cells in the pancreas that produce insulin. There appears to be a genetic tendency to inherit this disease, but there may also be an environmental trigger (which is as yet unknown). If one identical twin has Type 1 diabetes, the other twin has about a 30% to 50% chance of getting diabetes as well, but not 100%.

What are symptoms of diabetes?

Increased Thirst	Increased Hunger
Increased Urination	Tired
Decreased Energy	Weight Loss
Blurred Vision	Lingering Infections

How is diabetes diagnosed?

Diagnosis of diabetes is made with a blood test called a fasting blood glucose. The diagnosis is made if the result is equal to or greater than 126 mg/dL. Two elevated blood sugars are necessary for diagnosis. A person may also be diagnosed with diabetes if a random blood glucose shows the level to be equal to or greater than 200 mg/dL.

What medication is used to treat diabetes?

Type 1 diabetes is treated with insulin. Insulin is given under the skin with a shot, insulin pen or pump. In the future inhaled insulin may be an option for treatment. Nutrition, exercise and the appropriate insulin therapy are key to controlled diabetes.

Intensive insulin therapy (IIT) is the treatment of choice. IIT includes the use of long acting insulin once or twice a day along with short acting insulin with each meal. The dose of short acting insulin is based on such things as the amount of carbohydrate to be eaten, blood glucose level, and anticipated exercise. IIT Can be done with injections or using an insulin pump.

How is diabetes monitored?

People with diabetes monitor their diabetes control by performing blood glucose monitoring at home. Most people with type 1 diabetes should be monitoring their blood glucose levels four or more times per day. It is important to write down the blood glucose values and look for trends of highs and lows to help determine what is causing them. (Monitors that test alternative sites, such as arms, legs, and hands may not be accurate or safe with Type 1 diabetes. People with Type 1 diabetes, who are interested in using alternative sites for testing, should talk with their provider.) Also, people with diabetes need regular visits with their health care provider to insure proper testing and corrected management of the diabetes.

What happens when diabetes is poorly controlled?

When people with diabetes have prolonged high blood sugars (over years), long term complications develop. Long term complications of high blood sugar are serious and generally decrease quality of life. These complications include the following:

- Heart Disease (Heart Attacks)
- Kidney Disease (Nephropathy)
- Eye Disease (Retinopathy)
- Impotence or Sexual Dysfunction
- Stroke
- High Lipids (high cholesterol or high triglycerides)
- Problems with circulation (Vascular Disease)
- Nerve Problems (Neuropathy)
- Amputation
- Problems with slow digestion (Gastroparesis)
- Infections

The good news about controlling diabetes.

The good news is that blood glucose levels can generally be well controlled. In a study, The Diabetes Control and Complications Trial (DCCT), it was revealed that with intensive insulin therapy in Type 1 diabetes, long term complications of hyperglycemia could be reduced by keeping blood sugars near the normal range. For every 1% that A1C is lowered, the risk of serious retinopathy is decreased by about 35%, kidney disease by 25% and neuropathy by 30%.

How to Stay Healthy with Diabetes

What should people with diabetes do 4 times a year?

- See the endocrinologist/diabetes educator (perhaps more often).
- A1C should be measured every 3 months. A1C is a measure of the average blood glucose over the past 3 months.

What should people with diabetes do every year?

- Have a urine test for microalbumin to check for kidney function.
- Have fasting blood tests drawn for serum creatinine, cholesterol and triglyceride levels.
- See an ophthalmologist for a dilated eye exam.
- Make sure all vaccinations are up to date (flu, pneumonia, tetanus).
- See the dentist (every six months).
- See an OB/GYN (every year for women).

What should people with diabetes be doing regularly?

- Testing blood sugar, recording them and troubleshooting with the diabetes team.
- Examining and caring for feet and skin.
- Having blood pressure assessed.
- Learning about diabetes and taking an active role with diabetes care.
- Using exercise, nutrition, and medication effectively to control diabetes.
- Having regular appointments with a primary care provider.
- Flossing and caring for teeth.
- Not smoking. Smoking cessation programs are available. Smoking increases the risk (4 to 6 times) for heart attack, nephropathy, and amputation.
- Not drinking to much alcohol. Ask the doctor if it is safe to have one drink a day. (This may partially depend on some of the results of your blood tests.) Never drink alcohol without food since this may cause hypoglycemia.

What are normal values for tests?

- A1C:
Normal: 4% to 6%. Goal: less than 7%
- Cholesterol:
Goal: less than 200 mg/dL
- LDL ("Lousy" cholesterol):
Goal: less than 100 mg/dL
- HDL ("Healthy" cholesterol):
Goal: more than 45 mg/dL in men
more than 55 mg/dL in women
- Triglycerides:
Goal: less than 150 mg/dL
- Blood Pressure:
Normal: 120/80 Goal: less than 130/80
- Microalbumin:
Normal: less than 30 mg/G in spot urine sample

- Blood Sugar:
 - Normal is 70 to 110 mg/dL before meals
 - Goal is 70 to 120 mg/dL before meals
 - Goal before bedtime is 100 to 140 mg/dL
 - Goal two hours after a meal is less than 140 mg/dL
 - (When on the correct dose of insulin, there is usually a 30 to 50 mg/dL raise in the blood glucose two hours after a meal.)

Healthy Advice...

If you have diabetes, it is important to be aware of the following items.

- Learn what makes blood sugars go up and down. When problems arise, medications should be adjusted first (with guidance from a health care provider), then diet and exercise routines should be adjusted to get things under control. Most abnormal blood sugar readings have an obvious cause.
- Blood pressure should be maintained at less than 130/80 to decrease the likelihood of eye and kidney disease, or progression of those diseases.
- Impotence may be treatable.
- A diabetes educator should occasionally watch you perform a finger stick blood test. The blood sugar machine needs to be tested against the lab (not another glucose meter) to check for accuracy.
- A diabetes educator should watch you draw up and inject a shot to make sure you are doing it correctly.
- People with diabetes need to work very hard at keeping their diabetes under control since they are the ones ultimately responsible for their care. They should ask their health care provider for assistance and advice about what else to do to improve their diabetes control
- Depression strikes people with diabetes at higher than usual rates. Depression should not be ignored. If you are depressed, be sure to discuss this with your health care provider or seek the help of a mental health professional. Depression is treatable! Medications are safe, non-addictive and usually do not affect blood sugar.
- Be sure to check the insides of your shoes before putting them on and never go barefoot.
- Take advantage of whatever patient education is available.
- Read everything you can about diabetes. Information is available in books, magazines and on the Internet. (Whichever is used, authoritative sources should always be sought. Bad advice can do more harm than no advice at all.)
- Keep up with new medical advances, both in terms of technology and medications.
- Consider how health insurance will be affected before switching jobs. Is the COBRA program an option? Does the new job offer health benefits? Also, it is important for people with diabetes to not have any breaks in their insurance so that they won't be denied coverage due to a pre-existing condition.
- Toenails should be trimmed to follow the natural curve of the nail and the edges filed. Leave a little white showing and don't cut the corners too deep. A moisturizer should be used (not between the toes). Feet should not be soaked (it dries them out)
- If a pair of shoes has caused a blister to develop, they should be discarded.
- Think positively. Diabetes can be controlled. It does not have to control you.
- Consult a dietitians for an update on how to meet current nutritional goals.
- Fat in your diet should be limited and fiber should be increased.
- Five servings of vegetables should be eaten everyday.
- Carry a form of carbohydrate for treatment of hypoglycemia (We suggest dextrose based glucose tablets, Sweet Tarts™, Sprees™ or Smarties™).
- If you are having difficulty with syringe injections, consider alternate delivery routes such as an insulin pump, or an insulin pen.
- Check your blood sugar before driving. Do not drive within 20 minutes of treating a low blood sugar.

- Exercise most days of the week (if approved by your health care provider).
- Be watchful for delayed hypoglycemia after exercise. Hypoglycemia can occur anywhere from 6 to 24 hours following exercise.
- If your blood sugar is above 250 mg/dL before exercise, test for ketones. If ketones are present, they should be treated and you should not exercise until they go away.
- Do not inject your insulin into an exercising muscle.
- If you are overweight, try to lose weight.
- Take one stomach safety coated aspirin daily to help prevent heart attacks (adults only).
- Tobacco may damage the blood vessels in the heart and feet, leading to heart attacks and amputation.
- Use sunscreen.

Glossary of Terms

Blood Glucose Levels: Sometimes called blood sugar. It is a measure of the amount of glucose in the blood. If the blood sugar level is too high or too low, short and long-term health complications will occur. Normal fasting blood sugar levels are 70 - 110 mg/dL.

Gastroparesis: A complication of high sugar. Digestion slows down. This can cause acid-reflux, abdominal discomfort, nausea, vomiting and constipation.

Glucagon: An injection (shot) someone else gives to people with diabetes when they cannot be awakened or are unable to swallow during a low blood sugar reaction. It causes an increase in blood sugar by stimulating release of stored glucose from the liver. Onset of action is about 10 minutes.

Glucose: A simple sugar found in the blood. Glucose is the main source of energy or fuel for our bodies.

A1C: A measure of the average blood sugar for the past 3 months. Normal A1C is 4% to 6%. A value of 6% corresponds to a blood glucose of 114 mg/dL. This chart indicates the average blood glucose levels at various A1C values:

Hemoglobin A1C	Blood Glucose Level
6%	114 mg/dL
7%	147 mg/dL
8%	180 mg/dL
9%	214 mg/dL
10%	247 mg/dL
11%	280 mg/dL
12%	314 mg/dL
13%	348 mg/dL

Hypercholesterolemia: High cholesterol levels in the blood. Normal total cholesterol is less than 200. Goal for LDL (bad) is less than 100. Goal for HDL (good) is more than 45. If the cholesterol cannot be kept under

control through diet and exercise, people with diabetes should ask their health care provider if they are candidates for cholesterol-lowering medicines.

Hyperglycemia: High blood sugar. Symptoms may include increased thirst, urination, weakness, abdominal pains, weight loss, increased hunger, nausea, change in vision, yeast infections, and fatigue

Hypertriglyceridemia: High triglycerides (fat) in the blood. Normal is less than 150. If triglycerides cannot be controlled with diet and exercise, ask your health care provider if you are a candidate for triglyceride lowering medicines.

Hypoglycemia: Low blood sugar – sugar below 70 mg/dL. Symptoms may include light-headedness, hunger, excessive sweating, faintness, pounding heart, trembling, headache, irritability, and in extreme cases, the inability to be awakened and seizures.

Insulin: A hormone made in the beta cells in the Islets of Langerhans in the pancreas. Insulin helps the body use glucose (sugar) for energy. If the body cannot make enough insulin, the person must use other means to keep blood glucose levels from getting too high.

Microalbumin: Microalbumin is a small protein. When this protein is spilled into the urine in levels that are too high, it is a sign of kidney damage. Normal is less than 30 mg/G. A urine collection for microalbumin should be done every year.

Nephropathy: Kidney disease, a long-term complication of high blood sugar, which may eventually lead to renal failure, dialysis or kidney transplantation.

Neuropathy: A long-term complication of high blood sugars. The hands and feet can have pain, tingling, burning, or decreased sensation. Blood sugars must be brought under control and the endocrinologist may also prescribe appropriate medications for pain. Also, feet should be examined everyday for cracks, blisters, and sores. The health care provider should examine the patient's feet at regular visits and test for sensation with a monofilament (a thin wire). Early neuropathy may be reversible with improved blood sugar control.

Retinopathy: A long-term complication of high blood sugars that affects the eyes. The blood vessels change and as the retinopathy progresses, new tiny blood vessels form in the retina of the eye. These vessels sometimes bleed, causing transient loss of vision. Repeated bleeding can lead to scarring which may cause detachment of the retina from the back of the eye. This can cause blindness. Laser surgery helps burn the small vessels to prevent them from bleeding and growing. Patients may also suffer loss of vision due to a condition called macular edema which must be diagnosed by an ophthalmologist. The ophthalmologist should be visited every year for a dilated eye exam!