TYPE 1 DIABETES

Title: Endocrinology
Source: Mayo Clinic
Link: http://www.mayoclinic.com/health/type-1-diabetes/DS00329

Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin, a hormone needed to allow sugar (glucose) to enter cells to produce energy. Type 2 diabetes, which is far more common, occurs when the body becomes resistant to the effects of insulin or doesn't make enough insulin.

Various factors may contribute to type 1 diabetes, including genetics and exposure to certain viruses. Although type 1 diabetes typically appears during adolescence, it can develop at any age.

Despite active research, type 1 diabetes has no cure, although it can be managed. With proper treatment, people who have type 1 diabetes can expect to live longer, healthier lives than in the past.

Symptoms

By Mayo Clinic staff

Type 1 diabetes signs and symptoms can come on quickly and may include:

- **Increased thirst and frequent urination.** As excess sugar builds up in your bloodstream, fluid is pulled from your tissues. This may leave you thirsty. As a result, you may drink — and urinate — more than usual.
- **Extreme hunger.** Without enough insulin to move sugar into your cells, your muscles and organs become depleted of energy. This triggers intense hunger that may persist even after you eat. Without insulin, the sugar in your food never reaches your energy-starved tissues.
- **Weight loss.** Despite eating more than usual to relieve hunger, you may lose weight — sometimes rapidly. Without the energy sugar supplies, your muscle tissues and fat stores may simply shrink.
- **Fatigue.** If your cells are deprived of sugar, you may become tired and irritable.
- **Blurred vision.** If your blood sugar level is too high, fluid may be pulled from your tissues — including the lenses of your eyes. This may affect your ability to focus clearly.

When to see a doctor
Consult your doctor if you're concerned about diabetes or if you notice any type 1 diabetes signs and symptoms.

Causes

By Mayo Clinic staff

The exact cause of type 1 diabetes is unknown. Scientists do know that in most people with type 1 diabetes, their body's own immune system — which normally fights harmful bacteria and viruses — mistakenly destroys the insulin-producing (islet) cells in the pancreas. Genetics may play a role in this process, and exposure to certain viruses may trigger the disease.

Whatever the cause, once the islet cells are destroyed, you'll produce little or no insulin. Normally, the hormone insulin helps glucose enter your cells to provide energy to your muscles and tissues. Insulin comes from the pancreas, a gland located just behind the stomach. When everything is working properly, once you eat, the pancreas secretes insulin into the bloodstream. As insulin circulates, it acts like a key by unlocking microscopic doors that allow sugar to enter the body's cells. Insulin lowers the amount of sugar in the bloodstream, and as the blood sugar level drops, so does the secretion of insulin from the pancreas.

The liver acts as a glucose storage and manufacturing center. When insulin levels are low — when you haven't eaten in a while, for example — the liver converts stored glycogen back to glucose to keep your blood glucose level within a normal range.

In type 1 diabetes, none of this occurs because there's no insulin to let glucose into the cells. So instead of being transported into your cells, sugar builds up in your bloodstream, where it can cause life-threatening complications.

The cause of type 1 diabetes is different from the cause of the more familiar type 2 diabetes. In type 2 diabetes, the islet cells are still functioning, but the body becomes resistant to insulin or the pancreas doesn't produce enough insulin or both.

Risk factors

By Mayo Clinic staff

There aren't many known risk factors for type 1 diabetes, though researchers continue to find new possibilities. Some known risk factors include:

- **A family history.** Anyone with a parent or sibling with type 1 diabetes has a slightly increased risk of developing the condition.
- **Genetics.** The presence of certain genes indicates an increased risk of developing type 1 diabetes. In some cases — usually through a clinical trial — genetic testing can be done to determine if someone who has a family history of type 1 diabetes is at increased risk of developing the condition.
- **Geography.** The incidence of type 1 diabetes tends to increase as you travel away from the equator. People living in Finland and Sardinia have the highest incidence of type 1

diabetes — about two to three times higher than rates in the United States and 400 times that of people living in Venezuela.

Possible risk factors for type 1 diabetes include:

- **Viral exposure.** Exposure to Epstein-Barr virus, coxsackievirus, mumps virus or cytomegalovirus may trigger the autoimmune destruction of the islet cells, or the virus may directly infect the islet cells.
- **Low vitamin D levels.** Research suggests that vitamin D may be protective against type 1 diabetes. However, early drinking of cow's milk — a common source of vitamin D — has been linked to an increased risk of type 1 diabetes.
- **Other dietary factors.** Omega-3 fatty acids may offer some protection against type 1 diabetes. Drinking water that contains nitrates may increase the risk. Additionally, the timing of the introduction of cereal into a baby's diet may affect his or her risk of type 1 diabetes. One clinical trial found that between ages 3 and 7 months appears to be the optimal time for introducing cereal.

Some other possible risk factors include if your mother was younger than age 25 when she gave birth to you or if your mother had preeclampsia during pregnancy. Being born with jaundice is a potential risk factor, as is experiencing a respiratory infection just after you were born.

Complications

By Mayo Clinic staff

Type 1 diabetes can affect many major organs in your body, including your heart, blood vessels, nerves, eyes and kidneys. Keeping your blood sugar level close to normal most of the time can dramatically reduce the risk of many complications.

Long-term complications of type 1 diabetes develop gradually, over years. The earlier you develop diabetes — and the less controlled your blood sugar — the higher the risk of complications. Eventually, diabetes complications may be disabling or even life-threatening.

- **Heart and blood vessel disease.** Diabetes dramatically increases your risk of various cardiovascular problems, including coronary artery disease with chest pain (angina), heart attack, stroke, narrowing of the arteries (atherosclerosis) and high blood pressure. In fact, about 65 percent of people who have type 1 or type 2 diabetes die of some type of heart or blood vessel disease, according to the American Heart Association.
- **Nerve damage (neuropathy).** Excess sugar can injure the walls of the tiny blood vessels (capillaries) that nourish your nerves, especially in the legs. This can cause tingling, numbness, burning or pain that usually begins at the tips of the toes or fingers and gradually spreads upward. Poorly controlled blood sugar could cause you to eventually lose all sense of feeling in the affected limbs. Damage to the nerves that affect the gastrointestinal tract can cause problems with nausea, vomiting, diarrhea or constipation. For men, erectile dysfunction may be an issue.

- **Kidney damage (nephropathy).** The kidneys contain millions of tiny blood vessel clusters that filter waste from your blood. Diabetes can damage this delicate filtering system. Severe damage can lead to kidney failure or irreversible end-stage kidney disease, requiring dialysis or a kidney transplant.
- **Eye damage.** Diabetes can damage the blood vessels of the retina (diabetic retinopathy), potentially leading to blindness. Diabetes also increases the risk of other serious vision conditions, such as cataracts and glaucoma.
- **Foot damage.** Nerve damage in the feet or poor blood flow to the feet increases the risk of various foot complications. Left untreated, cuts and blisters can become serious infections. Severe damage might require toe, foot or even leg amputation.
- **Skin and mouth conditions.** Diabetes may leave you more susceptible to skin problems, including bacterial and fungal infections. Gum infections also may be a concern, especially if you have a history of poor dental hygiene.
- **Osteoporosis.** Diabetes may lead to lower than normal bone mineral density, increasing your risk of osteoporosis.
- **Pregnancy complications.** High blood sugar levels can be dangerous for both the mother and the baby. The risk of miscarriage, stillbirth and birth defects are increased when diabetes isn't well controlled. For the mother, diabetes increases the risk of diabetic ketoacidosis, diabetic eye problems (retinopathy), pregnancy-induced high blood pressure and preeclampsia.
- **Hearing problems.** Hearing impairments occur more often in people with diabetes.

Preparing for your appointment

By Mayo Clinic staff

After you've been diagnosed with type 1 diabetes, you'll need close medical follow-up until your blood sugar level stabilizes and your doctor determines the proper insulin program and appropriate doses of insulin for you. Diabetes care is generally coordinated by a doctor who specializes in hormonal disorders (endocrinologist), but your health care team likely also will include a certified diabetes educator, a nutritionist, a social worker, a doctor who specializes in eye care (ophthalmologist) and a doctor who specializes in foot health (podiatrist).

Once your blood sugar is under control, your endocrinologist likely will recommend checkups every few months. A thorough yearly exam and regular foot and eye exams also are important — especially if your diabetes isn't well controlled, if you have high blood pressure or kidney disease, or if you're pregnant.

Because appointments can be brief and there's often a lot of ground to cover, it's a good idea to be well prepared. Additionally, your appointment may include visits with several members of your health care team as well as your doctor. Here's some information to help you get ready for your appointment, and to know what to expect from your doctor.

What you can do

- **Write down any concerns you have as they occur,** and take that list to your appointment. Once your diabetes is in good control, the initial symptoms of diabetes should disappear. However, you may have new issues that you need to address, such as recurring low blood sugar episodes or how to address high blood sugar after eating certain foods.
- **Write down key personal information,** including any major stresses or recent life changes. Many factors can affect your diabetes control, including stress.
- **Make a list of all medications, vitamins and supplements you're taking.**
- **For your regular checkups,** bring a book with your recorded glucose values or your meter to your appointments.
- **Write down questions to ask your doctor.**

Preparing a list of questions can help you make the most of your time with your doctor and the rest of your health care team. For type 1 diabetes, topics you want to clarify with your doctor, dietitian or diabetes educator include:

- The frequency and timing of blood glucose monitoring
- Insulin therapy — types of insulin used, timing of dosing, amount of dose
- Insulin administration — shots versus pumps
- Low blood sugar — how to recognize and treat
- High blood sugar — how to recognize and treat
- Ketones — testing and treatment
- Nutrition — types of food and their effect on blood sugar
- Carbohydrate counting
- Exercise — adjusting insulin and food intake for activity
- Medical management — how often to visit the doctor and other diabetes care specialists

Don't hesitate to ask any other questions that occur to you.

What to expect from your doctor

Your doctor is likely to ask you a number of questions. Being ready to answer them may reserve time to go over any points you want to spend more time on. Your doctor may ask:

- How comfortable are you managing your diabetes?
- How often are you having low blood sugar episodes?
- Are you still aware of when your blood sugar is getting low?
- What's a typical day's diet like?
- Are you exercising? If so, how often?
- On average, how much insulin are you using daily?

What you can do in the meantime

If your blood sugar isn't well controlled, or if you're not sure about what to do in a certain situation, don't hesitate to contact your doctor or diabetes educator in between appointments for advice and guidance.

Tests and diagnosis

By Mayo Clinic staff

In June 2009, an international committee of experts from the American Diabetes Association, the European Association for the Study of Diabetes and the International Diabetes Federation recommended that type 1 diabetes testing include the:

- **Glycated hemoglobin (A1C) test.** This blood test indicates your average blood sugar level for the past two to three months. It works by measuring the percentage of blood sugar attached to hemoglobin, the oxygen-carrying protein in red blood cells. The higher your blood sugar levels, the more hemoglobin you'll have with sugar attached. An A1C level of 6.5 percent or higher on two separate tests indicates you have diabetes. A result between 5.7 and 6.4 percent is considered prediabetes, which indicates a high risk of developing diabetes.

If the A1C test isn't available, or if you have certain conditions that can make the A1C test inaccurate — such as if you're pregnant or have an uncommon form of hemoglobin (known as a hemoglobin variant) — your doctor may use the following tests to diagnose diabetes:

- **Random blood sugar test.** A blood sample will be taken at a random time. Blood sugar values are expressed in milligrams per deciliter (mg/dL) or millimoles per liter (mmol/L). Regardless of when you last ate, a random blood sugar level of 200 mg/dL (11.1 mmol/L) or higher suggests diabetes, especially when coupled with any of the signs and symptoms of diabetes, such as frequent urination and extreme thirst. A level between 140 mg/dL (7.8 mmol/L) and 199 mg/dL (11.0 mmol/L) is considered prediabetes, which puts you at greater risk of developing diabetes.
- **Fasting blood sugar test.** A blood sample will be taken after an overnight fast. A fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) is normal. A fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered prediabetes. If it's 126 mg/dL (7 mmol/L) or higher on two separate tests, you have diabetes. A level from 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L) is considered prediabetes.

If you're diagnosed with diabetes, your doctor will also run blood tests to check for autoantibodies that are common in type 1 diabetes. These tests help your doctor distinguish between type 1 and type 2 diabetes. The presence of ketones - byproducts from the breakdown of fat — in your urine also suggests type 1 diabetes, rather than type 2.

After the diagnosis

Once you've been diagnosed with type 1 diabetes, you'll regularly visit your doctor to ensure good diabetes management. During these visits, the doctor will check your A1C levels. Your target A1C goal may vary depending on your age and various other factors, but the American Diabetes Association generally recommends that A1C levels be below 7 percent, which translates to an estimated average glucose of 154 mg/dL (8.5 mmol/L).

Compared with repeated daily blood sugar tests, A1C testing better indicates how well your diabetes treatment plan is working. An elevated A1C level may signal the need for a change in your insulin regimen or meal plan.

In addition to the A1C test, the doctor will also take blood and urine samples periodically to check your cholesterol levels, thyroid function, liver function and kidney function and to test for celiac disease. The doctor will also examine you to assess your blood pressure, and he or she will check the sites where you test your blood sugar and deliver insulin.

Treatments and drugs

By Mayo Clinic staff

Treatment for type 1 diabetes is a lifelong commitment to:

- Taking insulin
- Exercising regularly and maintaining a healthy weight
- Eating healthy foods
- Monitoring blood sugar

The goal is to keep your blood sugar level as close to normal as possible to delay or prevent complications. Although there are exceptions, generally, the goal is to keep your daytime blood sugar levels between 80 and 120 mg/dL (4.4 to 6.7 mmol/L) and your bedtime numbers between 100 and 140 mg/dL (5.6 to 7.8 mmol/L).

If managing your diabetes seems overwhelming, take it one day at a time. And remember that you're not in it alone. You'll work closely with your diabetes treatment team — doctor, diabetes educator and registered dietitian — to keep your blood sugar level as close to normal as possible.

Insulin and other medications
Anyone who has type 1 diabetes needs insulin therapy to survive.

Types of insulin are many and include:

- Rapid-acting insulin
- Long-acting insulin
- Intermediate options

Examples are regular insulin (Humulin R, Novolin R, others), insulin isophane (Humulin N, Novolin N), insulin lispro (Humalog), insulin aspart (NovoLog), insulin glargine (Lantus) and insulin detemir (Levemir).

Depending on your needs, your doctor may prescribe a mixture of insulin types to use throughout the day and night.

An inhaled insulin (Exubera) was previously available, but the manufacturer stopped selling the drug because too few people were using it. Since it was taken off the market, this drug has been linked to an increased number of lung cancers in people with a history of smoking. However, because the additional number of lung cancer cases is so small, it's not clear if there's a link to the medication. If you used Exubera and have a history of smoking, discuss these concerns with your doctor.

Injection options to get insulin into your body currently include injection and insulin pump infusion. Insulin can't be taken orally to lower blood sugar because stomach enzymes interfere with insulin's action.

Insulin injections can be done using:

- **A fine needle** and syringe
- **An insulin pen** — a device that looks like an ink pen, except the cartridge is filled with insulin
- **An insulin pump** — a device about the size of a cell phone worn on the outside of your body. A tube connects a reservoir of insulin to a catheter that's inserted under the skin of your abdomen. There's also a wireless pump option that's available in most areas. You wear a pod filled with insulin on your body that has a tiny catheter that's inserted under your skin. The insulin pod can be worn on your abdomen, lower back, or on a leg or an arm. The programming is done with a wireless device that communicates with the pod.

  Whichever pump you use, it's programmed to dispense specific amounts of rapid-acting insulin automatically. This steady dose of insulin is known as your basal rate, and it replaces whatever long-acting insulin you were using. When you eat, you program the pump with the amount of carbohydrates you're eating and your current blood sugar, and it will give you what's called a "bolus" dose of insulin to cover your meal and to correct your blood sugar if it's elevated. Some research has found an insulin pump to be more effective at controlling blood sugar levels than injections are.

Oral medications are sometimes prescribed as well, such as:

- **Pramlintide (Symlin).** An injection of this medication before you eat can slow the movement of food through your stomach to curb the sharp increase in blood sugar that occurs after meals.
- **High blood pressure medications.** Even if you don't have high blood pressure, your doctor may prescribe medications known as angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs), because these medications can help keep your kidneys healthy in addition to lowering blood pressure. It's recommended that people with diabetes have blood pressures less than 130/80 millimeters of mercury (mm Hg).
- **Cholesterol-lowering drugs.** As with high blood pressure drugs, your doctor may not wait until your cholesterol is elevated before he or she prescribes cholesterol-lowering agents known as statins. Cholesterol guidelines are more aggressive for people with diabetes because of the elevated heart disease risk. The American Diabetes Association recommends that low-density lipoprotein (LDL, or "bad") cholesterol be below 100 mg/dL (2.6 mmol/L) and that high-density lipoprotein (HDL, or "good") cholesterol be over 50 mg/dL (1.3 mmol/L). Triglycerides, another type of blood fat, are ideal when they're less than 150 mg/dL (1.7 mmol/L).

NEA BAPTIST CLINIC

Healthy eating and counting carbohydrates

Contrary to popular perception, there's no such thing as a diabetes diet. You won't be restricted to a lifetime of boring, bland foods. Instead, you'll need plenty of:

- Fruits
- Vegetables
- Whole grains

These foods are high in nutrition and low in fat and calories. And they mean fewer animal products and sweets. This is actually the best eating plan, even for people without diabetes.

You'll need to learn how to count the carbohydrates in the foods you eat so that you can give yourself enough insulin to properly metabolize those carbohydrates. A registered dietitian can help you create a meal plan that fits your health goals, food preferences and lifestyle.

Physical activity

Everyone needs regular aerobic exercise, and people who have type 1 diabetes are no exception. Get your doctor's OK to exercise. Then choose activities you enjoy, such as walking, swimming or biking. What's most important is making physical activity part of your daily routine. Aim for at least 30 minutes of aerobic exercise most days of the week. Stretching and strength training exercises are important, too. If you haven't been active for a while, start slowly and build up gradually.

Remember that physical activity lowers blood sugar, often for long after you're done working out. If you begin a new activity, check your blood sugar level more often than usual until you know how that activity affects your blood sugar levels. You might need to adjust your meal plan or insulin doses to compensate for the increased activity. If you use an insulin pump, you can set a temporary basal rate to keep your blood sugar from dropping. Ask your doctor or diabetes educator to show you how.

Blood sugar monitoring

Depending on what type of insulin therapy you select or require — single-dose injections, multiple-dose injections or insulin pump — you may need to check and record your blood sugar level at least four times a day, and probably more. Careful monitoring is the only way to make sure that your blood sugar level remains within your target range. Be sure to wash your hands before checking your blood sugar levels to get the most accurate reading.

Even if you take insulin and eat on a rigid schedule, the amount of sugar in your blood can change unpredictably. With help from your diabetes treatment team, you'll learn how your blood sugar level changes in response to:

- **Food.** What and how much you eat will affect your blood sugar level. Blood sugar is typically highest one to two hours after a meal.
- **Physical activity.** Physical activity moves sugar from your blood into your cells. The more active you are, the lower your blood sugar level. To compensate, you might need to lower your insulin dose before unusual physical activity.

- **Medication.** You need insulin to lower your blood sugar level. But other medications you take may affect your blood sugar level as well, sometimes requiring changes in your diabetes treatment plan.
- **Illness.** During a cold or other illness, your body will produce hormones that raise your blood sugar level. This might require changes in your diabetes treatment plan.
- **Alcohol.** Alcohol can cause either high or low blood sugar, depending on how much you drink and if you eat at the same time. If you choose to drink, do so in moderation, which means no more than one drink a day for women and two drinks or fewer daily for men.
- **Stress.** The hormones your body may produce in response to prolonged stress may prevent insulin from working properly.
- **For women, fluctuations in hormone levels.** As your hormone levels fluctuate during your menstrual cycle, so can your blood sugar level — particularly in the week before your period. Menopause may trigger fluctuations in your blood sugar level as well.

Continuous glucose monitoring (CGM) is the newest way to monitor blood sugar levels, and may be most helpful for people who have developed hypoglycemia unawareness. Continuous glucose monitors attach to the body using a fine needle just under the skin that checks blood glucose level every few minutes. CGM isn't yet considered as accurate as standard blood sugar monitoring, so it's not considered a replacement method for keeping track of blood sugar, but an additional measure.

Situational concerns

Certain life circumstances call for different considerations.

- **Driving.** Hypoglycemia can occur at any time, even when you're driving. It's a good idea to check your blood sugar anytime you're getting behind the wheel. If it's below 70 mg/dL (3.9 mmol/L), have a snack and then retest again in 15 minutes to make sure it's risen to a safe level. Low blood sugar makes it hard to concentrate or to react as rapidly as you might need to when you're driving.
- **Working.** In the past, people with type 1 diabetes were often refused certain jobs just because they had diabetes. Fortunately, advances in diabetes management and anti-discrimination laws have made such blanket bans largely a thing of the past. However, type 1 diabetes can pose some challenges in the workplace. For example, if you work in a job that involves driving or operating heavy machinery, hypoglycemia could pose a serious risk to you and those around you. You may need to work with your doctor and your employer to ensure that certain accommodations are made, such as your having a quick break for blood sugar testing and fast access to food and drink any time so you can properly manage your diabetes and prevent low blood sugar levels. There are federal and state laws in place that require employers to make reasonable accommodations for people with diabetes.
- **Being pregnant.** Because the risk of pregnancy complications is higher for women with type 1 diabetes, experts recommend that women have a preconception evaluation and that A1C readings should be less than 7 percent before you attempt to get pregnant. Some drugs, such as high blood pressure medications and cholesterol-lowering medications, may need to be stopped before pregnancy. The risk of birth defects is increased for women with type 1 diabetes, particularly when diabetes is poorly controlled during the first six to eight weeks of pregnancy, so planning your pregnancy is key. Careful management of your diabetes during pregnancy can decrease your risk of complications.

- **Being older.** As long as you're still active and have normal cognitive abilities, your diabetes management goals will likely be the same as they were when you were younger. But, for those who are frail, sick or have cognitive deficits, tight control of blood sugar may not be practical. If you're caring for a loved one with type 1 diabetes, ask his or her doctor what the new diabetes goals should be.

Investigational treatments

- **Pancreas transplant.** With a successful pancreas transplant, you would no longer need insulin. But pancreas transplants aren't always successful — and the procedure poses serious risks. You would need a lifetime of potent immune-suppressing drugs to prevent organ rejection. These drugs can have serious side effects, including a high risk of infection and organ injury. Because the side effects can be more dangerous than is the diabetes, pancreas transplants are generally reserved for those with very difficult-to-control diabetes.
- **Islet cell transplantation.** Researchers are experimenting with islet cell transplantation, which provides new insulin-producing cells from a donor pancreas. Although this experimental procedure has met with problems in the past, new techniques and better drugs to prevent islet cell rejection may improve its future chance for success. However, islet cell transplantation still requires the use of immune-suppressing medications, and just as it did with its own natural islet cells, the body often destroys transplanted islet cells, making the time off insulin short-lived. Additionally, a sufficient supply of islet cells isn't available for this treatment to become more widespread.
- **Stem cell transplant.** In a 2007 Brazilian study, a small number of people newly diagnosed with type 1 diabetes were able to stop using insulin after being treated with stem cells made from their own blood. Although stem cell transplants — which involve shutting down the immune system and then building it up again — can be risky, the technique may one day provide an additional treatment option for type 1 diabetes.

Signs of trouble

Despite your best efforts, sometimes problems will arise. Certain short-term complications of type 1 diabetes require immediate care. Left untreated, these conditions can cause seizures and loss of consciousness (coma).

Low blood sugar (hypoglycemia). This occurs when your blood sugar level drops below your target range. Ask your doctor what's considered a low blood sugar level for you. Blood sugar levels can drop for many reasons, including skipping a meal, getting more physical activity than normal or injecting too much insulin.

Learn the symptoms of low blood sugar, and test your blood sugar if you think your blood sugar levels are dropping. When in doubt, always do a blood sugar test. Early signs and symptoms of low blood sugar include:

- Sweating
- Shakiness
- Hunger
- Weakness
- Anxiety

- Dizziness or lightheadedness
- Pale skin
- Rapid or irregular heart rate
- Fatigue
- Headaches
- Blurred vision
- Irritability

Later signs and symptoms of low blood sugar, which can sometimes be mistaken for alcohol intoxication in teens and adults include:

- Lethargy
- Confusion
- Behavior changes, sometimes dramatic
- Poor coordination
- Convulsions

If you develop hypoglycemia during the night, you might wake with sweat-soaked pajamas or a headache. Thanks to a natural rebound effect, nighttime hypoglycemia might cause an unusually high blood sugar reading first thing in the morning.

If you have a low blood sugar reading, have some fruit juice, glucose tablets, hard candy, regular (not diet) soda or another source of sugar. Then retest your blood sugar in about 15 minutes to make sure it has gone up into the normal range. If it's not in the normal range, re-treat with more sugar (juice, candy, glucose tablets or another source of sugar) and then retest in another 15 minutes. Keep doing this until you get a normal reading. It's a good idea to eat a meal or snack once you've gotten a normal reading. A mixed food source, such as peanut butter and crackers, can help stabilize the blood sugar.

If a blood glucose meter isn't readily available, treat for low blood sugar anyway if you have symptoms of hypoglycemia, and then test as soon as possible.

Always carry a source of fast-acting sugar with you. Left untreated, low blood sugar will cause you to lose consciousness. If this occurs, you may need an emergency injection of glucagon — a hormone that stimulates the release of sugar into the blood. Be sure you always have a glucagon emergency kit available — at home, at work, when you're out — and make sure it hasn't expired.

Hypoglycemia unawareness. Some people may lose the ability to sense that their blood sugar levels are coming down, because they've developed a condition known as hypoglycemia unawareness. With hypoglycemia unawareness, the body no longer reacts to a low blood sugar with symptoms such as lightheadedness or headaches. The more you experience low blood sugars, the more likely you are to develop hypoglycemia unawareness. The good news is that if you can avoid having a hypoglycemic episode for several weeks, you may start to become more aware of impending lows.

High blood sugar (hyperglycemia). Your blood sugar can rise for many reasons, including eating too much, eating the wrong types of foods, not taking enough insulin, or illness.

Watch for:

- Frequent urination
- Increased thirst
- Blurred vision
- Fatigue
- Nausea
- Irritability
- Hunger
- Difficulty concentrating

If you suspect hyperglycemia, check your blood sugar. You might need to adjust your meal plan or medications. If your blood sugar is higher than your target range, you'll likely need to administer a "correction" using an insulin shot or through an insulin pump. A correction is an additional dose of insulin that should bring your blood sugar back into the normal range. High blood sugar levels don't come down as quickly as they go up. Ask your doctor how long to wait until you recheck. If you use an insulin pump, random high blood sugar readings may mean you need to change the pump site.

If you have two consecutive blood sugar readings above 250 mg/dL (13.9 mmol/L), test for ketones using a urine test stick. Don't exercise if your blood sugar level is high or if ketones are present. If only a trace or small amounts of ketones are present, drink extra fluids to flush out the ketones.

If your blood sugar is persistently above 300 mg/dL (16.7 mmol/L), call your doctor or seek emergency care.

Increased ketones in your urine (diabetic ketoacidosis). If your cells are starved for energy, your body may begin to break down fat — producing toxic acids known as ketones.

Signs and symptoms of this serious condition include:

- Nausea
- Vomiting
- Abdominal pain
- A sweet, fruity smell on your breath
- Weight loss

If you suspect ketoacidosis, check your urine for excess ketones with an over-the-counter ketones test kit. If you have large amounts of ketones in your urine, call your doctor right away or seek emergency care. Also, call your doctor if you have vomited more than once and you have ketones in your urine.