

### **Introduction**

Patients with diabetes are more likely than other people to have nerve problems. About 60 to 70 percent of diabetes patients have some type of nerve problem.

Nerve problems can often be prevented or delayed when diabetes is well managed. If nerve problems happen, early treatment is important.

This reference summary explains how diabetes affects the nerves. It also covers what diabetic patients can do to prevent these nerve problems from happening.

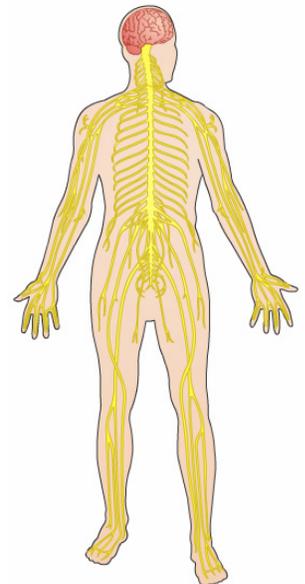
### **The Nerves**

Together, the brain and spinal cord are called the “central nervous system.” The nerves in the rest of the body are called the “peripheral nervous system.”

The brain is the command center of the body. In addition to thinking and feeling, it receives information and sends orders to different parts of the body. Orders from the brain travel through the spinal cord. From the spinal cord, orders travel to the rest of the body through peripheral nerves.

Healthy nerves send and receive messages about movement. For example, if you want to raise your hand, your brain tells your arm and hand to do it. Healthy nerves also send and receive messages about sensation, or feeling. If you burn your hand while cooking, the nerves in the skin send pain signals to your brain.

If nerves become damaged, they cannot send and receive messages properly. This can interfere with movement and sensation. Nerve damage can happen anywhere in the body. Important organs can also be affected by nerve problems.



## Diabetic Neuropathy

If you have diabetes, your blood sugar levels are too high. This can damage your nerves over time. Nerve damage caused by diabetes has a special name. It is called diabetic neuropathy. Damaged nerves may stop sending messages. They may also send messages slowly or at the wrong time.

Diabetic neuropathy is likely caused by a number of factors. It may be caused by metabolic factors. Some examples are:

- High blood sugar levels.
- Abnormal blood fat levels.
- Low levels of insulin.



Diabetic neuropathy may also be caused by neurovascular factors.

These cause damage to the blood vessels that carry oxygen and nutrients to the nerves.

Other factors that may lead to diabetic neuropathy are:

- Inflammation in the nerves.
- Inherited traits that increase risk for nerve disease.
- Lifestyle choices, such as smoking or alcohol abuse.
- Physical injury to the nerves.



The risk of diabetic neuropathy increases the longer you have diabetes. It is more common in people who have had diabetes for 25 years or longer.

## Types of Neuropathy

There are four main types of diabetic neuropathy:

- Peripheral neuropathy.
- Autonomic neuropathy.
- Proximal neuropathy.
- Focal neuropathy.

The type of neuropathy depends on which nerves are affected. Peripheral neuropathy is nerve damage in the arms and legs. It is the most common type. The feet and legs are more likely to be affected before the hands and arms.

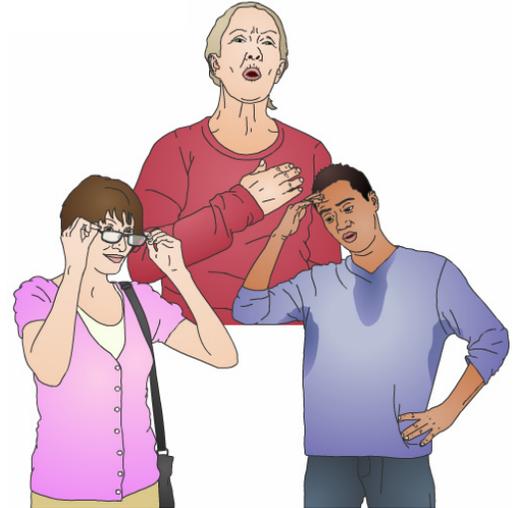
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Autonomic neuropathy affects the nerves in the torso. These nerves control the heart, regulate blood pressure, and keep blood sugar levels normal. It can result in hypoglycemia without causing any symptoms. This can be life threatening. Hypoglycemia is a condition that causes the blood sugar level to drop dangerously low. It is usually a side effect of diabetes medicines. It is important to recognize warning signs so it can be treated successfully.

Autonomic neuropathy also affects other internal organs, causing problems with:

- Breathing.
- Digestion.
- Sexual response.
- Sweating.
- Urination.
- Vision.



Proximal neuropathy affects nerves in the thighs, hips, buttocks, or legs. It is more common in people with type 2 diabetes. It is also more common in older adults with diabetes. Focal neuropathy appears suddenly and affects specific nerves, most often in the head, torso, or leg. It happens mostly in older adults with diabetes. Thankfully, it often gets better by itself over weeks or months. It does not cause long-term damage.

## Symptoms

Symptoms of diabetic neuropathy are often minor at first. Most nerve damage happens over several years. Mild cases may go unnoticed for a long time. Symptoms of neuropathy depend on the type and which nerves are affected. Some people with nerve damage have no symptoms at all. For others, the first symptoms usually start in the feet. They may feel numbness, tingling, or pain in the feet.

Other symptoms of nerve damage are:

- Numbness, tingling, or pain in the toes, legs, hands, arms, and fingers.
- Weakness.

In some cases, the pain caused by damaged nerves may be sudden and severe. This often happens in people with focal neuropathy.

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Diabetic neuropathy may also cause:

- Diarrhea or constipation.
- Dizziness or faintness due to a drop in blood pressure after standing or sitting up.
- Erectile dysfunction in men.
- Indigestion, nausea, or vomiting.
- Problems with urination.
- Vaginal dryness in women.

Erectile dysfunction is the inability to have an erection of the penis adequate for sexual intercourse. It is also called impotence. Weight loss and depression are also common symptoms in people with diabetic neuropathy. But these symptoms are not caused by diabetic neuropathy.



## Diagnosis

To diagnose diabetic neuropathy, your healthcare provider will ask you about your symptoms and perform a physical exam. The physical exam checks your:

- Blood pressure.
- Heart rate.
- Muscle strength.
- Sensation.
- Reflexes.

Your healthcare provider will also check to see if you are sensitive to changes in how you sit or stand. He or she will also check to see if the sensations of vibration, temperature or light touch are affected.



People with diabetes should have a thorough foot exam each year to check for nerve damage. The exam checks the skin, muscles, bones, circulation, and sensation of the feet. If you are diagnosed with diabetic neuropathy, you may need foot exams more than once a year. If the physical exam or foot exam shows nerve damage, more testing may be needed. Other tests can help determine the type of nerve damage and how severe it is.

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Nerve conduction studies may be done. They check how well electrical signals travel through nerves. They also measure how quickly the signals are sent.

Electromyography, or EMG, shows how well muscles respond to electrical signals sent by nearby nerves. It is often done with other nerve tests.

Other tests can look at your heart and other organs to see if nerve damage has affected them. Your heart rate may be measured in response to deep breathing or changes in blood pressure and posture.



An ultrasound may also show if certain organs, such as the bladder, are working properly. An ultrasound is an imaging test that uses sound waves to create an image of internal organs.

## Treatment

The first treatment for diabetic neuropathy is to make sure blood sugar levels are under control. This can help prevent more nerve damage. Blood sugar levels may be controlled with:

- Blood sugar monitoring.
- Meal planning.
- Physical activity.
- Diabetes medicines.
- Insulin.

Additional treatment depends on the type of nerve problem and symptoms. For example, nerve pain is often treated with oral medications. Other medications for pain may be applied to the skin. These may include creams, sprays, or patches. Talk to your health care provider about your best pain control option.



Diet changes can help relieve gastrointestinal problems such as indigestion or nausea. Eat smaller, more frequent meals. Also avoid fats and eat less fiber. If symptoms are severe, medications can be used to speed up digestion, relieve nausea, or reduce stomach acid.

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Dizziness or weakness caused by diabetic neuropathy is associated with blood pressure and circulation problems. To relieve these symptoms, treatment may include:

- High blood pressure medications.
- Increased salt in the diet.
- Physical therapy.
- Raising the head of the bed.
- Wearing elastic stockings.

Treatments are available for urinary and sexual problems as well. Talk to your health care provider for more information about these treatments.

People with neuropathy also need to take special care of their feet. Loss of sensation in the feet means sores or injuries may not be noticed and may become infected. To take care of your feet:

- Clean your feet daily using warm water and a mild soap. Do not soak your feet. Dry them with a soft towel, making sure you get in between your toes.
- Check your feet and toes every day for cuts, blisters, redness, swelling, or other problems. Tell your healthcare provider of any problems.
- Moisturize your feet with lotion, but avoid getting the lotion between your toes.
- After a bath or shower, file corns and calluses gently with a pumice stone.
- Cut your toenails to the shape of your toes and file the edges with an emery board.
- Always wear shoes or slippers to protect your feet from injuries. Prevent skin irritation by wearing thick, soft socks.
- Wear shoes that fit well and allow your toes to move. Break in new shoes slowly.



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## Summary

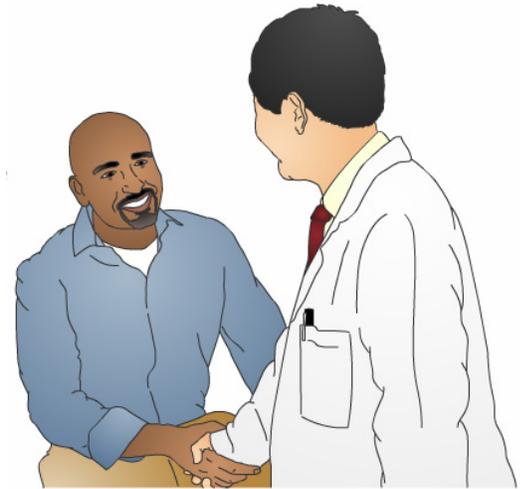
Patients with diabetes are more likely than other people to have nerve problems. About 60 to 70 percent of diabetes patients have some type of nerve problem.

Nerve problems can be prevented or delayed with good diabetes management.

Management of diabetes includes:

- Controlling blood sugar level.
- Eating healthy.
- Exercising.
- Keeping good hygiene.
- Learning about diabetes.

Early treatment is important to prevent more nerve damage. For this reason, diabetic patients are regularly tested for nerve damage in the feet.



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