



Patient education: Diabetic neuropathy (Beyond the Basics)

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DIABETIC NEUROPATHY OVERVIEW

Neuropathy is the medical term for nerve damage. Neuropathy is a common complication of type 1 and type 2 diabetes; up to 26 percent of people with type 2 diabetes have evidence of nerve damage at the time that diabetes is diagnosed [1]. A generalized type of neuropathy, known as polyneuropathy, is the most common type of diabetic neuropathy. Other types of neuropathy can also affect people with diabetes but will not be discussed here.

Signs and symptoms of diabetic neuropathy include loss of sensation and/or burning pain in the feet. Early detection of diabetes and control of blood sugar levels may reduce the risk of developing diabetic neuropathy.

Treatments for diabetic neuropathy are available and include several elements: diet and exercise, control of blood glucose levels, prevention of injury, and control of painful symptoms.

DIABETIC NEUROPATHY RISK FACTORS

In people with type 1 or type 2, the biggest risk factor for developing diabetic neuropathy is having high blood sugar levels over time.

Other factors can further increase the risk of developing diabetic neuropathy, including:

- Coronary artery disease
 - Increased triglyceride levels
 - Being overweight (a body mass index >24) ([calculator 1](#) and [calculator 2](#))
 - Smoking
 - High blood pressure
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DIABETIC NEUROPATHY SYMPTOMS

The most common symptoms of diabetic neuropathy include pain, burning, tingling, or numbness in the toes or feet and extreme sensitivity to light touch. The pain may be worst at rest and improve with activity, such as walking. Some people initially have intensely painful feet, while others have few or no symptoms.

Diabetic neuropathy usually affects both sides of the body. Symptoms are usually noticed first in the toes. If the disease progresses, symptoms may gradually move up the legs; if the mid-calves are affected, symptoms may develop in the hands. Over time, the ability to sense pain may be lost, which greatly increases the risk of injury. (See "[Screening for diabetic polyneuropathy](#)".)

Potential complications — As you lose the ability to sense pain or hot and cold, your risk of injuring your feet increases. Injuries that would normally cause pain (eg, stepping on a splinter, wearing shoes that create a blister, developing an ingrown toenail) do not necessarily cause pain if you have neuropathy. Unless you inspect your feet on a daily basis, a small injury has the potential to develop into a large ulcer. One of the most serious complications of foot ulcers is the need for amputation of a toe or, in extreme cases, the foot itself.

DIABETIC NEUROPATHY TESTS

Diabetic neuropathy is diagnosed based upon a medical history and physical examination of the feet. During an examination, there may be signs of nerve injury, including:

- Loss of the ability to sense vibration and movement in the toes or feet (eg, when the toe is moved up or down)
- Loss of the ability to sense pain, light touch, and temperature in the toes or feet
- Loss or reduction of the Achilles tendon reflex

More extensive testing, including nerve conduction studies, nerve biopsy, or imaging tests (eg, X-ray or computed tomography [CT] scan), is not usually needed to diagnose diabetic neuropathy.

DIABETIC NEUROPATHY TREATMENT

There are four main components of diabetic neuropathy treatment [2]:

- Control of blood sugar levels
- Lifestyle interventions, specifically diet and exercise
- Care for the feet to prevent complications
- Control of pain caused by neuropathy

Although there is no cure for diabetic neuropathy, use of these treatments can improve painful symptoms and prevent complications. (See "[Management of diabetic neuropathy](#)".)

Control blood sugar levels — An important treatment for diabetic neuropathy is to control blood sugar levels. Symptoms of pain and burning may improve when blood glucose sugar improves. (See "[Patient education: Glucose monitoring in diabetes \(Beyond the Basics\)](#)".)

If blood sugar levels are not adequately controlled with the current treatment regimen, a different regimen may be recommended.

- For people with type 1 diabetes, this may mean taking more frequent insulin injections or using an insulin pump. (See "[Patient education: Type 1 diabetes: Insulin treatment \(Beyond the Basics\)](#)".)
- For people with type 2 diabetes, this may mean taking an additional oral medication or starting insulin injections. (See "[Patient education: Type 2 diabetes: Treatment \(Beyond the Basics\)](#)".)

Diet and exercise in type 2 diabetes — The American Diabetes Association recommends lifestyle interventions, specifically diet and exercise, as the first line in treating diabetic neuropathy in type 2 diabetes [3]. The goal is to achieve and maintain a normal body weight with a nutrient-dense diet low in saturated fats and high in whole grains, vegetables, fruits, and lean meats. Exercise should consist of at least 150 minutes of moderate-to-vigorous physical activity, such as brisk walking, at least three times per week. Muscle-strengthening activities that involve all major muscle groups are recommended two or more days per week. Sedentary activities (eg, sitting at a desk) should be interrupted every 30 minutes by brief periods of standing, walking, or other physical activities [4].

Care for the feet — People with neuropathy do not always feel pain when there is a wound or injury on the foot. As a result, daily foot care is necessary to monitor for changes in the skin (such as cracks or wounds), which can increase the risk of infection. The American Diabetes Association recommends that people with diabetes have a comprehensive foot examination once per year and a visual examination of the feet at each visit (usually every

three to four months). Foot examinations are described in detail separately. (See "[Patient education: Foot care for people with diabetes \(Beyond the Basics\)](#)".)

Control pain — Neuropathic pain can be difficult to control and can seriously affect your quality of life. Neuropathic pain is often worse at night, seriously disrupting sleep.

Fortunately, only a small percentage of people with diabetic neuropathy experience pain. Pain resolves without treatment in some people over a period of weeks to months, especially if the episode of pain developed after a sudden change in health (eg, an episode of diabetic ketoacidosis, a significant weight loss, or a significant change in blood glucose control).

There are several medications that are useful for the treatment of diabetic neuropathy and have been approved by the US Food and Drug Administration (FDA), including [duloxetine](#) and [pregabalin](#). Other medications are also useful, including tricyclic medications (eg, [amitriptyline](#)), [gabapentin](#), [tramadol](#), and alpha-lipoic acid [5].

Tricyclic antidepressants — There are several tricyclic antidepressants available for the treatment of chronic pain, including [amitriptyline](#), [nortriptyline](#), and [desipramine](#). Clinical trials have shown that tricyclic antidepressant drugs are effective for patients with painful diabetic neuropathy. The dose of tricyclic antidepressants used to treat diabetic neuropathy is typically much lower than that used to treat depression.

These medications are usually taken at bedtime, starting with a low dose and gradually increasing over a period of several weeks. People with heart disease should not take [amitriptyline](#) or [nortriptyline](#). Tricyclic medications can be taken with [gabapentin](#) and [pregabalin](#) but should not be taken with [duloxetine](#). Side effects can include dry mouth, sleepiness, dizziness, and constipation.

Duloxetine — [Duloxetine](#) is an antidepressant that is often effective in relieving pain caused by diabetic neuropathy. In short-term clinical trials, duloxetine was more effective than placebo. However, the long-term effectiveness and safety of duloxetine for diabetic neuropathy is uncertain [6]. There are no trials comparing duloxetine with other drugs for the treatment of diabetic polyneuropathy.

[Duloxetine](#) is usually taken by mouth once per day on a full stomach, although in some cases it is taken twice per day. It should not be taken by people who take other antidepressant medications (see '[Tricyclic antidepressants](#)' above). Side effects can include nausea, sleepiness, dizziness, decreased appetite, and constipation.

Gabapentin — [Gabapentin](#) is an anti-seizure medication. It is usually taken by mouth three times per day. Side effects can include dizziness and confusion. Gabapentin can be taken with a tricyclic antidepressant or [duloxetine](#). In some cases, gabapentin can be taken at night to prevent pain during sleep.

Pregabalin — [Pregabalin](#) is an anti-seizure medication, similar to [gabapentin](#). Pregabalin is taken by mouth, starting at bedtime at a low dose and then gradually increasing to three times per day over a period of several weeks.

Side effects can include dizziness, sleepiness, confusion, swelling in the feet and ankles, and weight gain. It may be possible to become addicted to [pregabalin](#), and changes in dosing should be monitored carefully. Pregabalin can be taken with [duloxetine](#) or tricyclic antidepressants but not with [gabapentin](#).

Anesthetic drugs — [Lidocaine](#) is an anesthetic drug that may be recommended if other treatments have not improved pain. It is applied to the painful area in a patch, which slowly releases the medication over time. Patches should stay in place for no more than 12 hours in any 24-hour period.

Alpha-lipoic acid — Alpha-lipoic acid (ALA) is an antioxidant medication. Several short-term trials showed that it was helpful in relieving pain caused by diabetic neuropathy. Thus, ALA may be recommended to people with diabetic neuropathy who do not improve with or who cannot tolerate other treatments. However, longer-term studies are still needed to confirm its safety and effectiveness. In the United States, ALA is available without a prescription as a dietary supplement. It is usually taken by mouth once per day.

WHERE TO GET MORE INFORMATION

Your healthcare 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 web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare 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: Type 2 diabetes \(The Basics\)](#)

[Patient education: Nerve damage caused by diabetes \(The Basics\)](#)

[Patient education: The ABCs of diabetes \(The Basics\)](#)

[Patient education: Neuropathic pain \(The Basics\)](#)

[Patient education: Diabetes and infections \(The Basics\)](#)

[Patient education: Foot care for people with diabetes \(The Basics\)](#)

[Patient education: Diabetic foot ulcer \(The Basics\)](#)

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: Foot care for people with diabetes \(Beyond the Basics\)](#)

[Patient education: Glucose monitoring in diabetes \(Beyond the Basics\)](#)

[Patient education: Type 1 diabetes: Insulin treatment \(Beyond the Basics\)](#)

[Patient education: Type 2 diabetes: Treatment \(Beyond the Basics\)](#)

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.

[Screening for diabetic polyneuropathy](#)

[Diabetic autonomic neuropathy](#)

[Diabetic autonomic neuropathy of the gastrointestinal tract](#)

[Epidemiology and classification of diabetic neuropathy](#)

[Evaluation of the diabetic foot](#)

[Pathogenesis of diabetic polyneuropathy](#)

[Management of diabetic neuropathy](#)

The following organizations also provide reliable health information.

- [National Library of Medicine](#) (available in Spanish)
- [National Institute of Diabetes and Digestive and Kidney Diseases](#)
- [American Diabetes Association](#) (800)-DIABETES (800-342-2383)

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