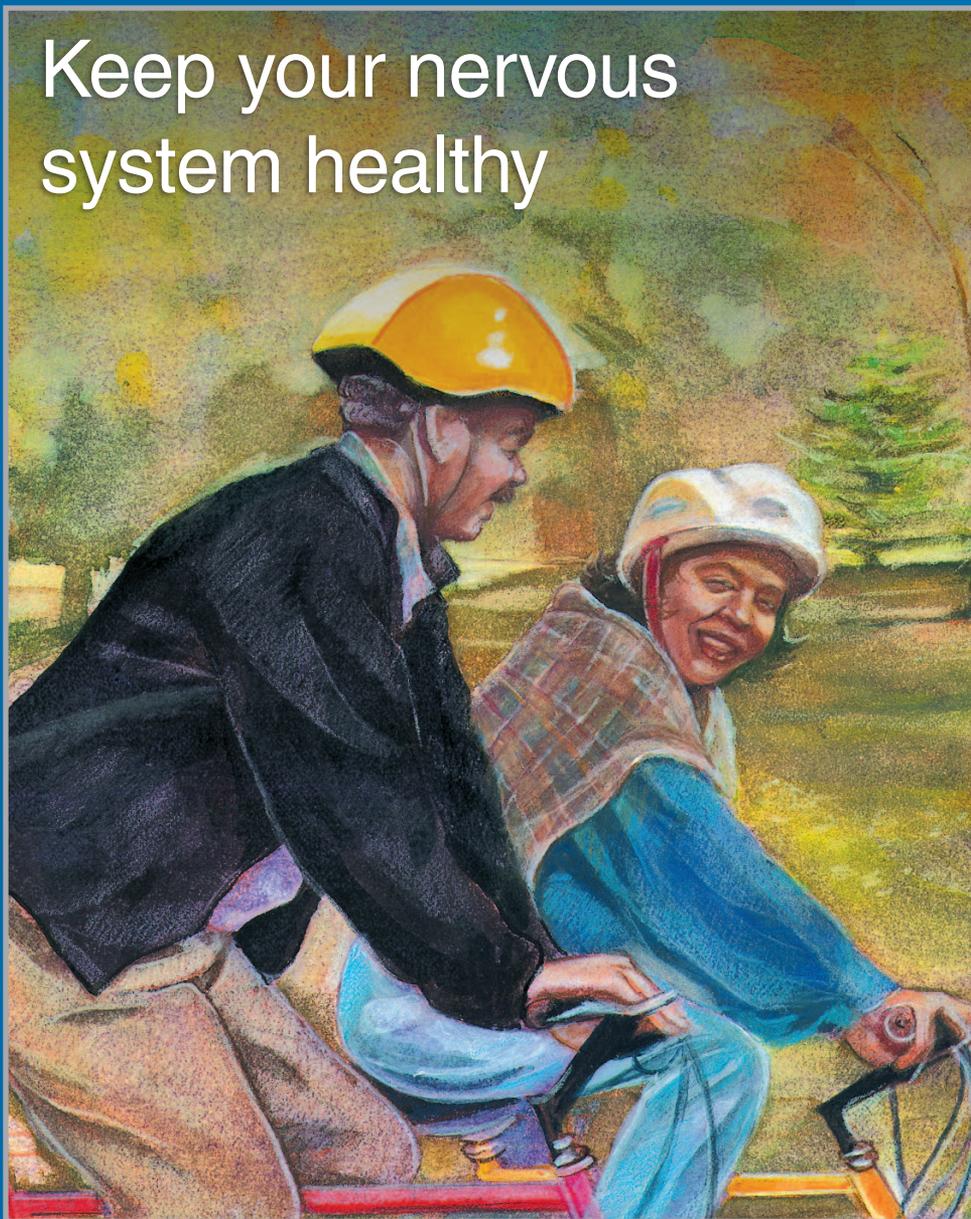


Prevent diabetes problems

Keep your nervous system healthy



National Institute of
Diabetes and Digestive
and Kidney Diseases

National Diabetes Information
Clearinghouse

Prevent diabetes problems:
Keep your nervous
system healthy

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What is my nervous system and what does it do?

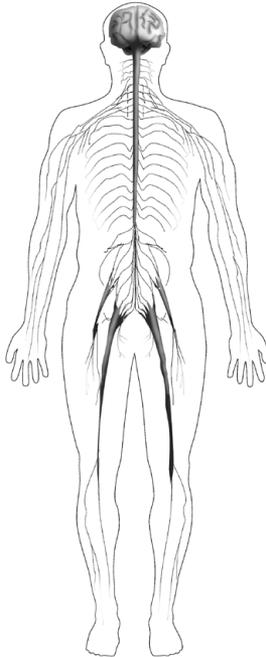
Your nervous system carries signals between your brain and other parts of your body through your spinal cord. Nerves are bundles of special tissues that transmit these signals.

The signals share information between your brain and body about how things feel. The signals also send information between your brain and body to control automatic body functions, such as breathing and digestion, and to move your body parts.

The nerves in your spinal cord branch out to all of your organs and body parts. All your nerves together make up your nervous system.

Your nervous system is composed of the

- central nervous system—your brain and spinal cord
- **cranial*** nerves—nerves that connect your brain to your head, neck, and face
- **peripheral** nervous system—nerves that connect your spinal cord to your entire body, including your organs and your arms, hands, legs, and feet



Your nervous system carries signals between your brain and other parts of your body through your spinal cord.

*See the Pronunciation Guide for tips on how to say the words in **bold** type.

How can diabetes affect my nervous system?

Over time, too much fat and **glucose**, also called sugar, in your blood from diabetes can damage your nerves. High blood glucose also can damage the small blood vessels that nourish your nerves with oxygen and nutrients. Without enough oxygen and nutrients, nerves cannot function well. Damaged nerves may stop sending signals, or they may send signals too slowly or at the wrong times.

Nerve damage from diabetes is called **diabetic neuropathy**.

If you have diabetes, you can develop nerve damage at any time; however, you are more likely to have it the older you are and the longer you have diabetes. Nerve damage is also more likely if you

- have high **cholesterol** and blood fat
- have high blood pressure
- are overweight
- have kidney disease
- smoke
- drink too many alcoholic beverages

What are the symptoms of nerve damage?

Nerve damage symptoms depend on which nerves have damage. Some people have no symptoms or mild symptoms. Other people have painful and long-lasting symptoms. As most nerve damage develops over many years, a person may not notice mild cases for a long time. In some people, the onset of pain may be sudden and severe.

What are the types of nerve damage from diabetes?

Peripheral Neuropathy

Peripheral neuropathy is the most common type of diabetic neuropathy, and it affects the **sensory** nerves of your feet, legs, hands, and arms. These areas of your body may feel

- numb
- weak
- cold
- burning or tingling, like “pins and needles”

You may feel extreme pain in these areas of your body, even when they are touched lightly. You also may feel pain in your legs and feet when walking.

These feelings are often worse at night and can make it hard to sleep. Most of the time, you will have these feelings on both sides of your body, such as in both feet; however, they can occur just on one side.



You might have other problems, such as

- swollen feet
- loss of balance
- loss of muscle tone in your hands and feet
- a deformity or shape change in your toes and feet
- calluses or open sores on your feet

Autonomic Neuropathy

Autonomic neuropathy can affect your

- digestive system
- sex organs
- bladder
- sweat glands
- eyes
- heart rate and blood pressure
- ability to sense low blood glucose

Digestive system. Damage to nerves in your stomach, intestines, and other parts of your digestive system may

- make it hard to swallow both solid food and liquids
- cause stomach pain, nausea, vomiting, constipation, or diarrhea
- make it hard to keep your blood glucose under control

Your doctor or **dietitian** may advise you to eat smaller, more frequent meals; avoid fatty foods; and eat less fiber.

Sex organs. Damage to nerves in the sex organs may

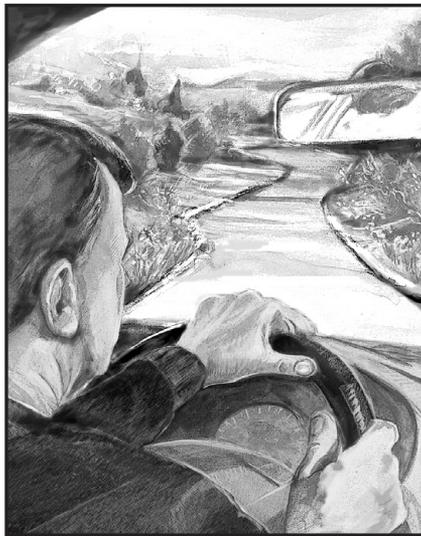
- prevent a man's penis from getting firm when he wants to have sex, called **erectile dysfunction** or **impotence**. Many men who have had diabetes for several years have impotence.
- prevent a woman's vagina from getting wet when she wants to have sex. A woman might also have less feeling around her vagina.

Bladder. Damage to nerves in your bladder may make it hard to know when you need to urinate and when your bladder is empty. This damage can cause you to hold urine for too long, which can lead to bladder infections. You also might leak drops of urine.



Sweat glands. Damage to nerves in your sweat glands may prevent them from working properly. Nerve damage can cause you to sweat a lot at night or while eating.

Eyes. Damage to nerves in your pupils, the parts of your eyes that react to changes in light and darkness, may make them slow to respond to these changes. You may have trouble seeing the lights of other cars when driving at night. Your eyes may take longer to adjust when you enter a dark room.



Heart rate and blood pressure. Damage to nerves that control your heart rate and blood pressure may make these nerves respond more slowly to changes in position, stress, physical activity, sleep, and breathing patterns. You might feel dizzy or pass out when you go from lying down to standing up or when you do physical activity. You also might have shortness of breath or swelling in your feet.



Ability to sense low blood glucose. Autonomic nerves also let you know when your blood glucose is low. Damage to these nerves can prevent you from feeling the symptoms of low blood glucose, also called **hypoglycemia**. This kind of nerve damage is more likely to happen if you have had diabetes for a long time or if your blood glucose has often been too low. Low blood glucose can make you

- hungry
- dizzy or shaky
- confused
- pale
- sweat more
- weak
- anxious or cranky
- have headaches
- have a fast heartbeat

Severe hypoglycemia can cause you to pass out. If that happens, you'll need help bringing your blood glucose level back to normal. Your health care team can teach your family members and friends how to give you an injection of **glucagon**, a hormone that raises blood glucose levels quickly. If glucagon is not available, someone should call 911 to get you to the nearest emergency room for treatment.



Consider wearing a diabetes medical alert identification bracelet or necklace. If you have hypoglycemia and are not able to communicate, the emergency team will know you have diabetes and get you the proper treatment. You can find these bracelets or necklaces at your pharmacy or on the Internet. You can also ask your doctor for information on available products.

Other Neuropathies

Other types of neuropathies from diabetes can cause

- damage to the joint and bones of your foot, called **Charcot's** foot, in which you cannot sense pain or the position of your foot
- carpal tunnel syndrome, in which a nerve in your forearm is compressed at your wrist, causing numbness, swelling, and pain in your fingers
- paralysis on one side of your face, called Bell's palsy
- double vision or not being able to focus your eyes
- aching behind one eye

How will I know if I have nerve damage?

Your doctor can tell whether you have nerve damage by asking about your symptoms and checking your

- blood pressure
- heart rate
- muscle strength
- reflexes
- response to vibrations and changes in temperature
- feet

Your doctor also may check

- your response to light touch on your feet with a soft nylon string, called a **monofilament** test
- how well your muscles respond to electrical signals by ordering a test called an **electromyogram** (EMG)

- how well and how fast your nerves can send electrical signals by ordering a test called a **nerve conduction velocity** test
- how your heart rate responds to deep breathing
- how your blood pressure responds when you go from lying down to sitting or standing
- whether your organs look healthy by ordering a test called an **ultrasound**

Tell your doctor if you have one or more symptoms of nerve damage.



How does nerve damage affect my feet?

The nerves to your feet are the longest in your body and are the most affected by nerve damage. If you have damage to these nerves, you may not feel pain, heat, or cold in your legs and feet. You might not notice sores or injuries, which can become infected. If you have any sores on your feet, see your doctor right away. Prompt attention to any sore or infection on your toe or foot can prevent more serious problems with your toes, feet, or parts of your legs.

Remind your doctor to check your feet at every office visit. See your doctor at least once a year for a foot exam, or more often if you have foot problems.

Check your feet every day for problems. If you have problems with your feet, your doctor may send you to a foot doctor, called a **podiatrist**.

Read more in *Prevent diabetes problems: Keep your feet healthy* at www.diabetes.niddk.nih.gov.



Check your feet every day for problems.

How does smoking affect my diabetes and nervous system?

Smoking can narrow and harden the blood vessels that nourish your nerves with oxygen and nutrients.

Smoking and diabetes are a dangerous mix. Smoking raises your risk for many diabetes problems. If you quit smoking,

- you will lower your risk for heart attack, stroke, nerve disease, kidney disease, and amputation
- your cholesterol and blood pressure levels might improve
- your blood **circulation** will improve

If you smoke, stop smoking. Ask for help so that you don't have to do it alone. You can start by calling 1-800-QUITNOW or 1-800-784-8669.



What is the treatment for nerve damage from diabetes?

The treatment for nerve damage from diabetes is based on your symptoms. No treatment can reverse nerve damage; however, it can help you feel better. Your doctor might suggest taking low doses of medicines that both treat other health problems and help the pain of neuropathy. Some of these medicines include

- **antidepressants**
- **anticonvulsants**, or anti-seizure medicines

Other treatment options include

- creams or patches on your skin for burning pain
- over-the-counter pain medicines
- **acupuncture**, a form of pain treatment that uses needles inserted into your body at certain pressure points

- physical therapy, which helps with muscle weakness and loss of balance
- relaxation exercises, such as yoga
- special shoes to fit softly around sore feet or feet that have changed shape

Your doctor also can prescribe medicines to help with problems caused by nerve damage in other areas of your body, such as poor digestion, dizziness, sexual problems, and lack of bladder control.

Stopping smoking and drinking alcoholic beverages also may help with symptoms.

How can I keep my nervous system healthy?

You can keep your nervous system healthy by taking these steps:

- Keep your blood glucose numbers as close to your target as possible. If you already have nerve damage, doing so will help you prevent more nerve damage and may decrease pain or other symptoms. Your doctor will work with you to set your target blood glucose numbers and teach you what to do if your numbers are too high or too low.
- Be physically active and take your diabetes medicines, as advised by your doctor.
- If you smoke, stop smoking.

- Tell your doctor right away about any problems you have with
 - your hands, arms, feet, or legs
 - your stomach, bowels, or bladder
 - having sex
 - knowing when your blood glucose is too low
 - feeling dizzy when you go from lying down to sitting or standing
- Take care of your feet.
- Remind your doctor to check your feet at every office visit. See your doctor at least once a year for a foot exam, or more often if you have foot problems.

Eating, Diet, and Nutrition

You can keep your nervous system healthy by taking these steps:

- Eat healthy meals and follow the meal plan that you and your doctor or dietitian have worked out.
- If you drink alcoholic beverages, limit your intake to no more than one drink per day for women and two drinks per day for men. Drinking too many alcoholic beverages can make nerve damage worse.

Read more in *What I need to know about Eating and Diabetes* at www.diabetes.niddk.nih.gov.

Pronunciation Guide

acupuncture (AK-yoo-PUNK-chur)

anticonvulsants (AN-tee-kon-VUHL-sants)

antidepressants (AN-tee-dee-PRESS-uhnts)

autonomic (AW-toh-NOM-ik)

Charcot's (SHAHR-kohz)

cholesterol (koh-LESS-tur-ol)

circulation (SUR-kyoo-LAY-shuhn)

conduction velocity (kon-DUHK-shuhn)
(vuh-LOS-ih-tee)

cranial (KRAY-nee-uhl)

dietitian (DY-uh-TISH-shuhn)

electromyogram (ee-lek-troh-MY-oh-gram)

erectile dysfunction (ee-REK-tyl)
(diss-FUHNK-shuhn)

glucagon (GLOO-kuh-gon)
glucose (GLOO-kohss)
hypoglycemia (HY-poh-gly-SEE-mee-uh)
impotence (IM-puh-tenss)
monofilament (mon-oh-FIL-uh-ment)
neuropathy (noo-ROP-uh-thee)
peripheral (puh-RIF-ur-uhl)
podiatrist (poh-DIE-uh-trist)
sensory (SEN-suh-ree)
ultrasound (UHL-truh-sound)

For More Information

To find diabetes educators (nurses, dietitians, pharmacists, and other health care providers), contact

American Association of Diabetes Educators

200 West Madison Street, Suite 800

Chicago, IL 60606

Phone: 1-800-338-3633

Internet: www.diabeteseducator.org

To find dietitians, contact

Academy of Nutrition and Dietetics

120 South Riverside Plaza, Suite 2000

Chicago, IL 60606-6995

Internet: www.eatright.org

Click on “Find a Registered Dietitian.”

To learn more about nervous system problems, contact

National Institute of Neurological Disorders and Stroke

NIH Neurological Institute

P.O. Box 5801

Bethesda, MD 20824

Phone: 1-800-352-9424 or 301-496-5751

Telecommunications Relay Services: 7-1-1

Internet: www.ninds.nih.gov

To get more information about taking care of diabetes, contact

National Diabetes Information Clearinghouse

1 Information Way

Bethesda, MD 20892-3560

Phone: 1-800-860-8747

TTY: 1-866-569-1162

Fax: 703-738-4929

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Email: ndep@mail.nih.gov

Internet: www.ndep.nih.gov

www.yourdiabetesinfo.org

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Email: askADA@diabetes.org

Internet: www.diabetes.org

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26 Broadway, 14th Floor

New York, NY 10004

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Fax: 212-785-9595

Email: info@jdrf.org

Internet: www.jdrf.org

More in the Series

The Prevent Diabetes Problems Series includes seven booklets that can help you learn more about how to prevent diabetes problems:

- *Prevent diabetes problems: Keep your diabetes under control*
- *Prevent diabetes problems: Keep your eyes healthy*
- *Prevent diabetes problems: Keep your feet healthy*
- *Prevent diabetes problems: Keep your heart and blood vessels healthy*
- *Prevent diabetes problems: Keep your kidneys healthy*
- *Prevent diabetes problems: Keep your mouth healthy*
- *Prevent diabetes problems: Keep your nervous system healthy*



For free single copies of these booklets, write, call, fax, or email the

National Diabetes Information Clearinghouse
1 Information Way
Bethesda, MD 20892-3560
Phone: 1-800-860-8747
TTY: 1-866-569-1162
Fax: 703-738-4929
Email: ndic@info.niddk.nih.gov

These booklets are also available at www.diabetes.niddk.nih.gov.

Acknowledgments

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. The National Diabetes Information Clearinghouse (NDIC) thanks Robin Conwit, M.D., program director, Division of Extramural Research, National Institute of Neurological Disorders and Stroke, National Institutes of Health, for reviewing the updated version of this publication.

The NDIC also thanks the following people who helped review or field-test the original version of this publication:

For the American Association of Diabetes Educators

Lynn Grieger, R.D., C.D.E.
Arlington, VT
Celia Levesque, R.N., C.D.E.
Montgomery, AL
Teresa McMahon,
Pharm.D., C.D.E.
Seattle, WA
Barbara Schreiner, R.N.,
M.N., C.D.E.
Galveston, TX

For the American Diabetes Association

Phyllis Barrier, M.S., R.D.,
C.D.E.
Alexandria, VA
Linda Haas, Ph.C., R.N.,
C.D.E.
Seattle, WA
Kathleen Mahoney, M.S.N.,
R.N., C.D.E.
Drexel Hill, PA
Randi Kington, M.S., R.N.,
C.S., C.D.E.
Hartford, CT

For the Centers for Medicare & Medicaid Services

Baltimore, MD
Jan Drass, R.N., C.D.E.

For the Diabetes Research Centers

Albert Einstein School
of Medicine
Norwalk Hospital
Norwalk, CT
Jill Ely, R.N., C.D.E.
Sam Engel, M.D.
Pam Howard, A.P.R.N.,
C.D.E.

Indiana University School
of Medicine
Indianapolis, IN
Madelyn Wheeler, M.S.,
R.D., F.A.D.A., C.D.E.

VA/JDF Diabetes Research
Center
Vanderbilt School of
Medicine
Nashville, TN
Ok Chon Allison, M.S.N.,
R.N.C.S., A.N.P., C.D.E.

Barbara Backer, B.S.
James W. Pichert, Ph.D.
Alvin Powers, M.D.
Melissa E. Schweikhart
Michael B. Smith
Kathleen Wolffe, R.N.

For the Grady Health System Diabetes Clinic

Atlanta, GA
Ernestine Baker, R.N.,
F.N.P., C.D.E.
Kris Ernst, R.N., C.D.E.
Margaret Fowke, R.D., L.D.
Kay Mann, R.N., C.D.E.

For the Indian Health Service

Albuquerque, NM
Ruth Bear, R.D., C.D.E.
Dorinda Bradley, R.N.,
C.D.E.
Terry Fisher, R.N.
Lorraine Valdez, R.N.,
C.D.E.

Red Lake, MN
Charmaine Branchaud,
B.S.N., R.N., C.D.E.

For the Medlantic Research Center

Washington, D.C.
Resa Levetan, M.D.

For the Texas Diabetes Council

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The National Diabetes Education Program is a federally funded program sponsored by the U.S. Department of Health and Human Services' National Institutes of Health and the Centers for Disease Control and Prevention and includes over 200 partners at the federal, state, and local levels, working together to reduce the morbidity and mortality associated with diabetes.

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The National Diabetes Information Clearinghouse (NDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1978, the Clearinghouse provides information about diabetes to people with diabetes and to their families, health care professionals, and the public. The NDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about diabetes.

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This publication may contain information about medications and, when taken as prescribed, the conditions they treat. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (1-888-463-6332) or visit www.fda.gov. Consult your health care provider for more information.



National Institute of
Diabetes and Digestive
and Kidney Diseases

NIH Publication No. 14-4284
February 2014

 The NIDDK prints on recycled paper with bio-based ink.