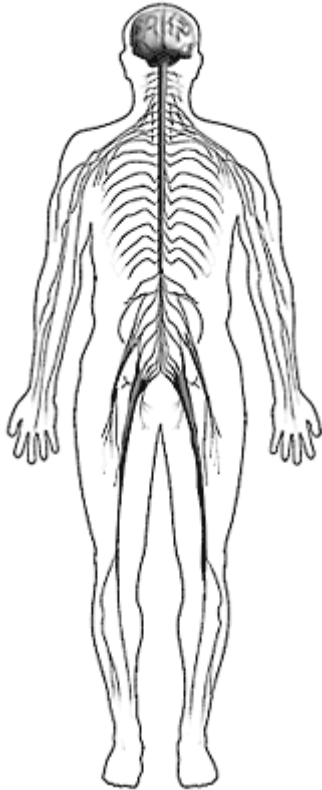


## Prevent diabetes problems: Keep your nervous system healthy

### What are diabetes problems?

Too much glucose in the blood for a long time can cause diabetes problems. This high blood glucose, also called blood sugar, can damage many parts of the body, such as the heart, blood vessels, eyes, and kidneys. Heart and blood vessel disease can lead to heart attacks and strokes. You can do a lot to prevent or slow down diabetes problems.



High blood glucose can cause nerve problems.

This publication is about nerve problems that can be caused by diabetes. You will learn the things you can do each day and during each year to stay healthy and prevent diabetes problems.

### What should I do each day to stay healthy with diabetes?



Follow the healthy eating plan that you and your doctor or dietitian have worked out.



Be active a total of 30 minutes most days. Ask your doctor what activities are best for you.



Take your medicines as directed.



Check your blood glucose every day. Each time you check your blood glucose, write the number in your record book.



Check your feet every day for cuts, blisters, sores, swelling, redness, or sore toenails.



Brush and floss your teeth every day.



Control your blood pressure and cholesterol.



Don't smoke.

## What can I do to prevent diabetes from damaging my nervous system?

Research has shown that people who kept their blood glucose close to normal were able to lower their risk of nerve damage.

Here is what you can do to prevent nerve damage:

- Keep your blood glucose as close to normal as you can.
- Limit the amount of alcohol you drink.
- Don't smoke.
- Take care of your feet (see ["What can I do to take care of my feet?"](#)).
- Tell your doctor about any problems you have with
  - your hands, arms, feet, or legs
  - your stomach, bowels, or bladder
- Also tell your doctor if you
  - have problems when you have sex
  - cannot always tell when your blood glucose is too low
  - feel dizzy when you go from lying down to sitting or standing

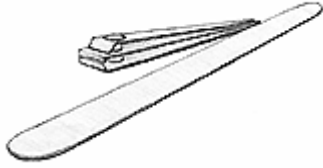
### What can I do to take care of my feet?

- **Wash your feet in warm water every day.** Make sure the water is not too hot by testing the temperature with your elbow. Do not soak your feet. Dry your feet well, especially between your toes.
- **Look at your feet every day to check for cuts, sores, blisters, redness, calluses, or other problems.** Checking every day is even more important if you have nerve damage or poor blood flow. If you cannot bend over or pull your feet up to check them, use a mirror. If you cannot see well, ask someone else to check your feet.



Look at your feet every day to check for problems.

- **If your skin is dry, rub lotion on your feet after you wash and dry them.** Do not put lotion between your toes.
- **File corns and calluses gently with an emery board or pumice stone.** Do this after your bath or shower.



- **Cut your toenails once a week or when needed.** Cut toenails when they are soft from washing. Cut them to the shape of the toe and not too short. File the edges with an emery board. If you cannot cut your own toenails, ask someone who can or go to a foot doctor.
- **Always wear shoes or slippers to protect your feet from injuries.**



Always wear slippers or shoes to protect your feet.

- **Always wear socks or stockings to avoid blisters.** Do not wear socks or knee-high stockings that are too tight below your knee.
- **Wear shoes that fit well.** Shop for shoes at the end of the day when your feet are bigger. Break in shoes slowly. Wear them 1 to 2 hours each day for the first 1 to 2 weeks.
- **Make sure your doctor checks your feet at each checkup.**

## What does my nervous system do?

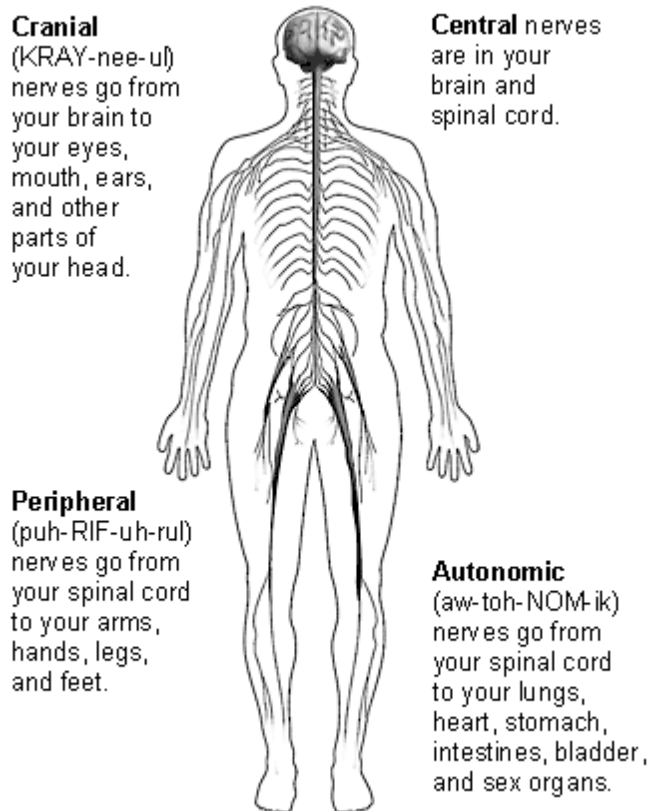
Nerves carry messages back and forth between the brain and other parts of the body. All of your nerves together make up the nervous system.

Some nerves tell the brain what is happening in the body. For example, when you step on a tack, the nerve in your foot tells the brain about the pain. Other nerves tell the body what to do. For example, nerves from the brain tell your stomach when it is time to move food into your intestines.

## How can diabetes hurt my nervous system?

Having high blood glucose for many years can damage the blood vessels that bring oxygen to some nerves. High blood glucose can also hurt the covering on the nerves. Damaged nerves may stop sending messages. Or they may send messages too slowly or at the wrong times.

Diabetic neuropathy is the medical term for damage to the nervous system from diabetes.



The nervous system has four main parts—cranial, central, peripheral, and autonomic. Diabetes can damage the peripheral, autonomic, and cranial nerves.

## How can diabetes damage to the peripheral nerves affect me?

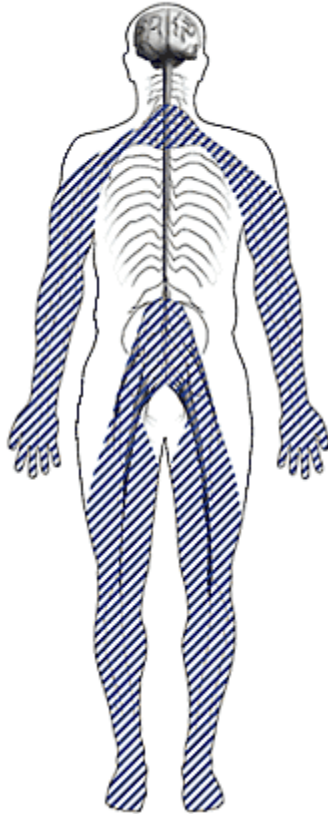
- **Peripheral nerves go to the arms, hands, legs, and feet.** Damage to these nerves can make your arms, hands, legs, or feet feel numb. Also, you might not be able to feel pain, heat, or cold when you should. You may feel shooting pains or burning or tingling, like “pins and needles.” These feelings are often worse at night. They can make it hard to sleep. Most of the time these feelings are on both sides of your body, such as in both of your feet. But they can be on just one side.

Peripheral nerve damage can change the shape of your feet. Foot muscles get weak and the tendons in the foot get shorter. You can get special shoes that are made to fit softly around your sore feet or feet that have changed shape. These special shoes help protect your feet. Medicare and other health insurance programs may pay for special shoes. Talk with your doctor about how and where to get these shoes.

Nerve damage from diabetes can increase your risk for carpal tunnel

syndrome, which occurs when a nerve from your forearm to your hand is compressed. Carpal tunnel syndrome can cause numbness, tingling, pain, and weakness in your hand and arm.

### Peripheral Nerves

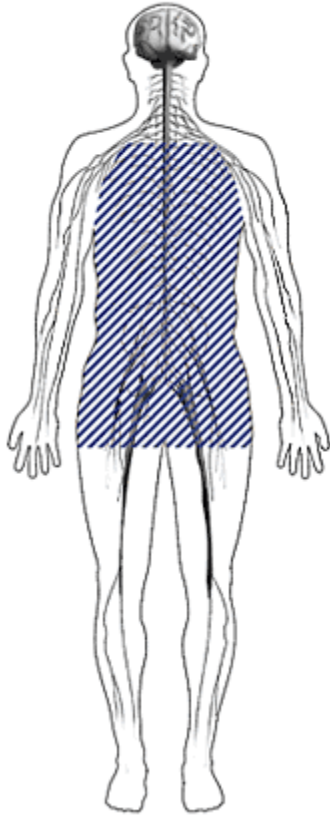


### How can diabetes damage to the autonomic nerves affect me?

- Autonomic nerves help you know your blood glucose is low. Some people take diabetes medicines that can accidentally make their blood glucose too low. Damage to the autonomic nerves can make it hard for them to feel the symptoms of hypoglycemia, also called low blood glucose.

This kind of damage is more likely to happen if you have had diabetes for a long time. It can also happen if your blood glucose has been too low very often.

## Autonomic Nerves



Autonomic nerves go from your spinal cord to your lungs, heart, stomach, intestines, bladder, and sex organs.

- **Autonomic nerves go to the stomach, intestines, and other parts of the digestive system.** Damage to these nerves can make food pass through the digestive system too slowly or too quickly. Nerve problems can cause nausea—feeling sick to your stomach—vomiting, constipation, or diarrhea.

Nerve damage to your stomach is called gastroparesis. When nerves to the stomach are damaged, the muscles of the stomach do not work well and food may stay in the stomach too long. Gastroparesis makes it hard to keep blood glucose under control.

- **Autonomic nerves go to the penis.** Damage to these nerves can prevent a man's penis from getting firm when he wants to have sex. This condition is called erectile dysfunction or impotence. Many men who have had diabetes for several years experience it.
- **Autonomic nerves go to the vagina.** Damage to these nerves can prevent a woman's vagina from getting wet when she wants to have sex. A woman might also have less feeling around her vagina.



Damage to autonomic nerves from diabetes may cause problems with having sex.

- **Autonomic nerves go to the heart.** Damage to these nerves might make your heart beat faster or at different speeds.
- **Autonomic nerves go to the bladder.** Damage to these nerves can make it hard to know when you should go to the bathroom. The damage can also make it hard to feel when your bladder is empty. Both problems can cause you to hold urine for too long, which can lead to bladder infections. Another problem can be leaking drops of urine accidentally.



Damage to autonomic nerves from diabetes can cause bladder and stomach problems.

- **Autonomic nerves go to the blood vessels that keep your blood pressure steady.** Damage to these nerves can make your blood move too slowly to keep your blood pressure steady when you change position. When you go from lying down to standing up or when you exercise a lot, the sudden changes in blood pressure can make you dizzy.



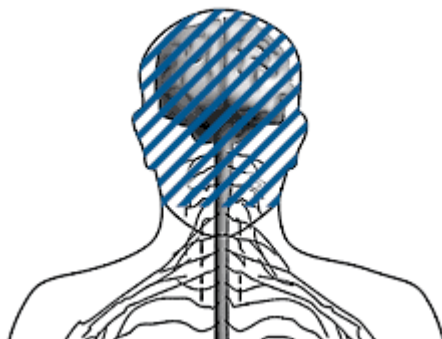


Diabetes can damage autonomic nerves that help keep your blood pressure steady.

### How can diabetes damage to the cranial nerves affect me?

- **Cranial nerves go to the eye muscles.** Damage to these nerves usually occurs in one eye, causing double vision. This problem happens all of a sudden and most often lasts for a short time.
- **Cranial nerves go to the sides of the face.** Damage to these nerves usually happens on only one side of the face. This nerve damage causes that side of the face to hang lower or sag. Usually the lips and lower eyelid sag. This problem is called Bell's palsy. It happens all of a sudden.

#### Cranial Nerves



Cranial nerves go from your brain to your eyes, mouth, ears, and other parts of your head.

### How do I know if I have nerve damage?

If you have one or more of the problems mentioned in this booklet, you may have some nerve damage from diabetes. Tell your doctor about the problem. Ask your doctor what you can do to make the problem better and to stop it from getting worse.



Ask your doctor what you can do about the problems from diabetes nerve damage.

## Pronunciation Guide

**autonomic** (AW-toh-NOM-ik)

**central** (SEN-truhl)

**cranial** (KRAY-nee-uhl)

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

**gastroparesis** (GASS-troh-puh-REE-siss)

**hypoglycemia** (HY-poh-gly-SEE-mee-uh)

**impotence** (IM-puh-tenss)

**neuropathy** (noo-ROP-uh-thee)

**peripheral** (puh-RIF-ur-uhl)

This publication may contain information about medications used to treat a health condition. When this publication was prepared, the NIDDK included the most current information available. Occasionally, new information about medication is released. For updates or for questions about any medications, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (463-6332), a toll-free call, or visit their website at [www.fda.gov](http://www.fda.gov). Consult your doctor for more information.

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### *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 and Training 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 Wolfe, 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, DC  
Resa Levetan, M.D.

*For the **Texas Diabetes Council***

Texas Department of Health  
Austin, TX  
Luby Garza-Abijaoude, M.S., R.D., L.D.

---

## 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](mailto:ndic@info.niddk.nih.gov)  
Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

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.

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts.

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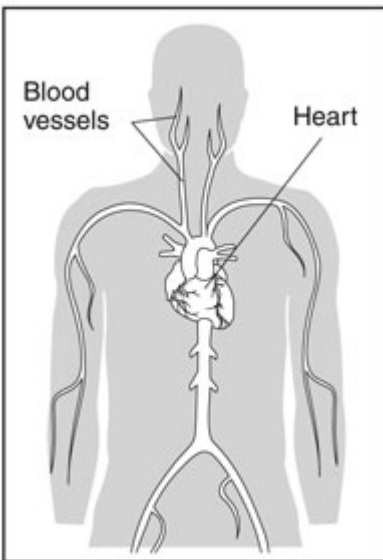
NIH Publication No. 08-4284  
March 2008

## Prevent diabetes problems: Keep your heart and blood vessels healthy

### What are diabetes problems?

Too much glucose in the blood for a long time can cause diabetes problems. This high blood glucose, also called blood sugar, can damage many parts of the body, such as the heart, blood vessels, eyes, and kidneys. Heart and blood vessel disease can lead to heart attacks and strokes, the leading causes of death for people with diabetes. You can do a lot to prevent or slow down diabetes problems.

This booklet is about heart and blood vessel problems caused by diabetes. You will learn the things you can do each day and during each year to stay healthy and prevent diabetes problems.



High blood glucose can cause heart and blood vessel problems.

### What should I do each day to stay healthy with diabetes?



Follow the healthy eating plan that you and your doctor or dietitian have worked out.



Be active a total of 30 minutes most days. Ask your doctor what activities are best for you.



Take your medicines as directed.



Check your blood glucose every day. Each time you check your blood glucose, write the number in your record book.



Check your feet every day for cuts, blisters, sores, swelling, redness, or sore toenails.



Brush and floss your teeth every day.



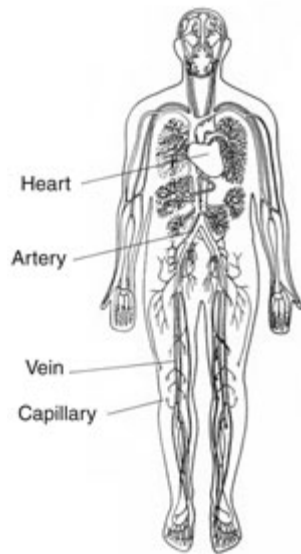
Control your blood pressure and cholesterol.



Don't smoke.

## What do my heart and blood vessels do?

Your heart and blood vessels make up your **circulatory**\* system. Your heart is a muscle that pumps blood through your body. Your heart pumps blood carrying oxygen to large blood vessels, called **arteries**, and small blood vessels, called **capillaries**. Other blood vessels, called veins, carry blood back to the heart.



\*[Go to the “Pronunciation Guide”](#) for tips on how to say the words in **bold** type.

## What can I do to prevent heart disease and stroke?

You can do a lot to prevent heart disease and stroke.

- *Keep your blood glucose under control.* You can see if your blood glucose is under control by having an A1C test at least twice a year. The A1C test tells you your average blood glucose for the past 2 to 3 months. The target for most people with diabetes is below 7. In some people with heart disease or other special circumstances, their doctor may recommend slightly higher levels of A1C.
- *Keep your blood pressure under control.* Have it checked at every doctor visit. The target for most people with diabetes is below 130/80.
- *Keep your cholesterol under control.* Have it checked at least once a year. The targets for most people with diabetes are
  - LDL—bad—cholesterol: below 100
  - HDL—good—cholesterol: above 40 in men and above 50 in women
  - triglycerides—another type of fat in the blood: below 150
- *Make physical activity a part of your daily routine.* Aim for at least 30 minutes of exercise most days of the week. Check with your doctor to learn what activities are best for you. Take a half-hour walk every day. Or walk for 10 minutes after each meal. Use the stairs instead of the elevator. Park at the far end of the lot.



Choose an activity you like and stay active.

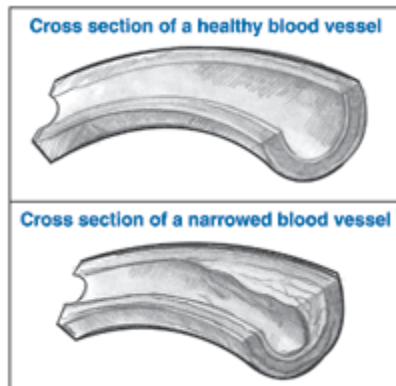
- *Make sure the foods you eat are “heart-healthy.”* Include foods high in fiber, such as oat bran, oatmeal, whole-grain breads and cereals, fruits, and vegetables. Cut back on foods high in saturated fat or cholesterol, such as meats, butter, dairy products with fat, eggs, shortening, lard, and foods with palm oil or coconut oil. Limit foods with trans fat, such as snack foods and commercial baked goods.
- *Lose weight if you need to.* If you are overweight, try to exercise most days of the week. See a registered dietitian for help in planning meals and lowering the fat and calorie content of your diet to reach and maintain a healthy weight.
- *If you smoke, quit.* Your doctor can tell you about ways to help you quit smoking.
- *Ask your doctor whether you should take an aspirin every day.* Studies have shown that taking a low dose of aspirin every day can help reduce your risk of heart disease and stroke.
- *Take your medicines as directed.*

## How do my blood vessels get clogged?

Several things, including having diabetes, can make your blood cholesterol level too high. Cholesterol is a substance that is made by the body and used for many important functions. Cholesterol is also found in some food derived from animals. When cholesterol is too high, the insides of large blood vessels become narrowed or clogged. This problem is called **atherosclerosis**.

Narrowed and clogged blood vessels make it harder for enough blood to get to all parts of your body. This condition can cause problems.





## What can happen when blood vessels are clogged?

When blood vessels become narrowed and clogged, you can have serious health problems:

- *Chest pain, also called **angina**.* When you have angina, you feel pain in your chest, arms, shoulders, or back. You may feel the pain more when your heart beats faster, such as when you exercise. The pain may go away when you rest. You also may sweat a lot and feel very weak. If you do not get treatment, chest pain may happen more often. If diabetes has damaged your heart nerves, you may not feel the chest pain. If you have chest pain with activity, contact your doctor.
- *Heart attack.* A heart attack happens when a blood vessel in or near your heart becomes blocked. Then your heart muscle can't get enough blood. When an area of your heart muscle stops working, your heart becomes weaker. During a heart attack, you may have chest pain along with nausea, indigestion, extreme weakness, and sweating. Or you may have no symptoms at all. If you have chest pain that persists, call 911. Delay in getting treatment may make a heart attack worse.
- *Stroke.* A stroke can happen when the blood supply to your brain is blocked. Then your brain can be damaged. See "What are the warning signs of a stroke?" for more information about strokes.

## What are the warning signs of a heart attack?

You may have one or more of the following warning signs:

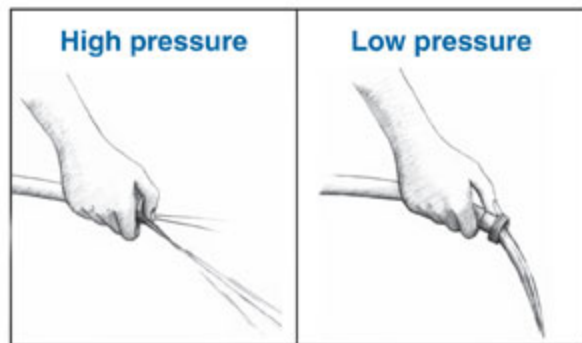
- chest pain or discomfort
- pain or discomfort in your arms, back, jaw, or neck
- indigestion or stomach pain
- shortness of breath
- sweating
- nausea
- light-headedness

Or, you may have no warning signs at all. Warning signs may come and go. If you have any of these warning signs, call 911 right away. Getting prompt treatment can reduce damage to the heart.

## How do narrowed blood vessels cause high blood pressure?

Narrowed blood vessels leave a smaller opening for blood to flow through. Having narrowed blood vessels is like turning on a garden hose and holding your thumb over the opening. The smaller opening makes the water shoot out with more pressure. In the same way, narrowed blood vessels lead to high blood pressure. Other factors, such as kidney problems and being overweight, also can lead to high blood pressure.

Many people with diabetes also have high blood pressure. If you have heart, eye, or kidney problems from diabetes, high blood pressure can make them worse.



A smaller opening in a garden hose makes the water pressure higher. In the same way, clogged blood vessels lead to high blood pressure.

You will see your blood pressure written with two numbers separated by a slash. For example, your reading might be 120/70, said as “120 over 70.” For people with diabetes, the target is to keep the first number below 130 and the second number below 80.

If you have high blood pressure, ask your doctor how to lower it. Your doctor may ask you to take blood pressure medicine every day. Some types of blood pressure medicine can also help keep your kidneys healthy.

You may also be able to control your blood pressure by

- eating more fruits and vegetables
- eating less salt and high-sodium foods
- losing weight if you need to
- being physically active
- not smoking
- limiting alcoholic drinks



To lower blood pressure, get to a healthy weight.

### What are the warning signs of a stroke?

A stroke happens when part of your brain is not getting enough blood and stops working. Depending on the part of the brain that is damaged, a stroke can cause

- sudden weakness or numbness of your face, arm, or leg on one side of your body
- sudden confusion, trouble talking, or trouble understanding
- sudden dizziness, loss of balance, or trouble walking
- sudden trouble seeing in one or both eyes or sudden double vision
- sudden severe headache

Sometimes, one or more of these warning signs may happen and then disappear. You might be having a “mini-stroke,” also called a TIA or a **transient ischemic attack**. If you have any of these warning signs, call 911 right away. Getting care for a TIA may reduce or prevent a stroke. Getting prompt treatment for a stroke can reduce the damage to the brain and improve chances for recovery.

### How can clogged blood vessels hurt my legs and feet?

**Peripheral arterial disease**, also called PAD, can happen when the openings in your blood vessels become narrow and your legs and feet don't get enough blood. You may feel pain in your legs when you walk or exercise. Some people also have numbness or tingling in their feet or legs or have sores that heal slowly.



## What can I do to prevent or control PAD?

- Don't smoke.
- Keep blood glucose and blood pressure under control.
- Keep blood fats close to normal.
- Be physically active.
- Ask your doctor if you should take aspirin every day.

You also may need surgery to treat PAD.

## Pronunciation Guide

**angina** (an-JY-nuh)

**arteries** (AR-tur-eez)

**atherosclerosis** (ATH-ur-oh-sklur-OH-siss)

**capillaries** (KAP-ih-lair-eez)

**circulatory** (SUR-kyoo-luh-TOR-ee)

**peripheral arterial disease** (puh-RIF-ur-uhl) (ar-TEE-ree-uhl) (dih-ZEEZ)

**transient ischemic attack** (TRANZ-see-uhnt) (iss-KEE-mik) (uh-TAK)

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*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 and Training 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, DC

Resa Levetan, M.D.

*For the **Texas Diabetes Council***

Texas Department of Health

Austin, TX

Luby Garza-Abijaoude, M.S., R.D., L.D.

---

## **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](mailto:ndic@info.niddk.nih.gov)

Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

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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.

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts.

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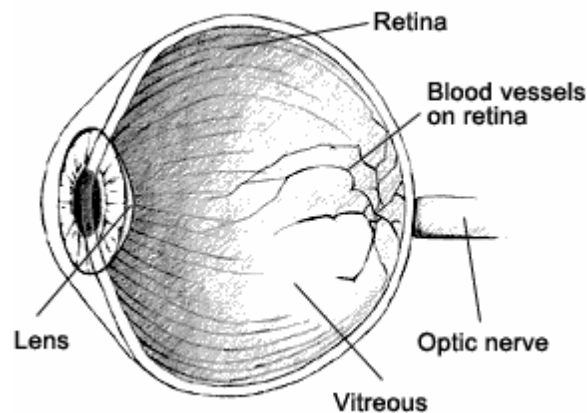
NIH Publication No. 09-4283  
April 2009

## Prevent diabetes problems: Keep your eyes healthy

### What are diabetes problems?

Too much glucose in the blood for a long time can cause diabetes problems. This high blood glucose, also called blood sugar, can damage many parts of the body, such as the heart, blood vessels, eyes, and kidneys. Heart and blood vessel disease can lead to heart attacks and strokes. You can do a lot to prevent or slow down diabetes problems.

This booklet is about eye problems caused by diabetes. You will learn the things you can do each day and during each year to stay healthy and prevent diabetes problems.



High blood glucose can cause eye problems.

## What should I do each day to stay healthy with diabetes?



Follow the healthy eating plan that you and your doctor or dietitian have worked out.



Be active a total of 30 minutes most days. Ask your doctor what activities are best for you.



Take your medicines as directed.



Check your blood glucose every day. Each time you check your blood glucose, write the number in your record book.



Check your feet every day for cuts, blisters, sores, swelling, redness, or sore toenails.



Brush and floss your teeth every day.



Control your blood pressure and cholesterol.



Don't smoke.

## What can I do to prevent diabetes eye problems?

You can do a lot to prevent diabetes eye problems.

- Keep your blood glucose and blood pressure as close to normal as you can.



- Have an eye care professional examine your eyes once a year. Have this exam even if your vision is OK. The eye care professional will use drops to make the black part of your eyes—pupils—bigger. This process is called dilating your pupil, which allows the eye care professional to see the back of your eye. Finding eye problems early and getting treatment right away will help prevent more serious problems later on.



Dilated eye.



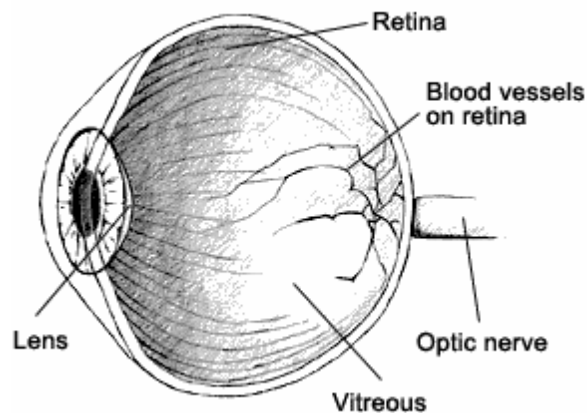
Undilated eye.

- Ask your eye care professional to check for signs of cataracts and glaucoma. See [What other eye problems can happen to people with diabetes?](#) to learn more about cataracts and glaucoma.
- If you are planning to get pregnant soon, ask your doctor if you should have an eye exam.
- If you are pregnant and have diabetes, see an eye care professional during your first 3 months of pregnancy.
- Don't smoke.

## How can diabetes hurt my eyes?

High blood glucose and high blood pressure from diabetes can hurt four parts of your eye:

- **Retina**. The retina is the lining at the back of the eye. The retina's job is to sense light coming into the eye.
- **Vitreous**. The vitreous is a jelly-like fluid that fills the back of the eye.
- **Lens**. The lens is at the front of the eye. The lens focuses light on the retina.
- **Optic nerve**. The optic nerve is the eye's main nerve to the brain.



A side view of the eye.

## How can diabetes hurt the retinas of my eyes?

Retina damage happens slowly. Your retinas have tiny blood vessels that are easy to damage. Having high blood glucose and high blood pressure for a long time can damage these tiny blood vessels.

First, these tiny blood vessels swell and weaken. Some blood vessels then become clogged and do not let enough blood through. At first, you might not have any loss of sight from these changes. Have a dilated eye exam once a year even if your sight seems fine.

One of your eyes may be damaged more than the other. Or both eyes may have the same amount of damage.

Diabetic retinopathy is the medical term for the most common diabetes eye problem.

## What happens as diabetes retina problems get worse?

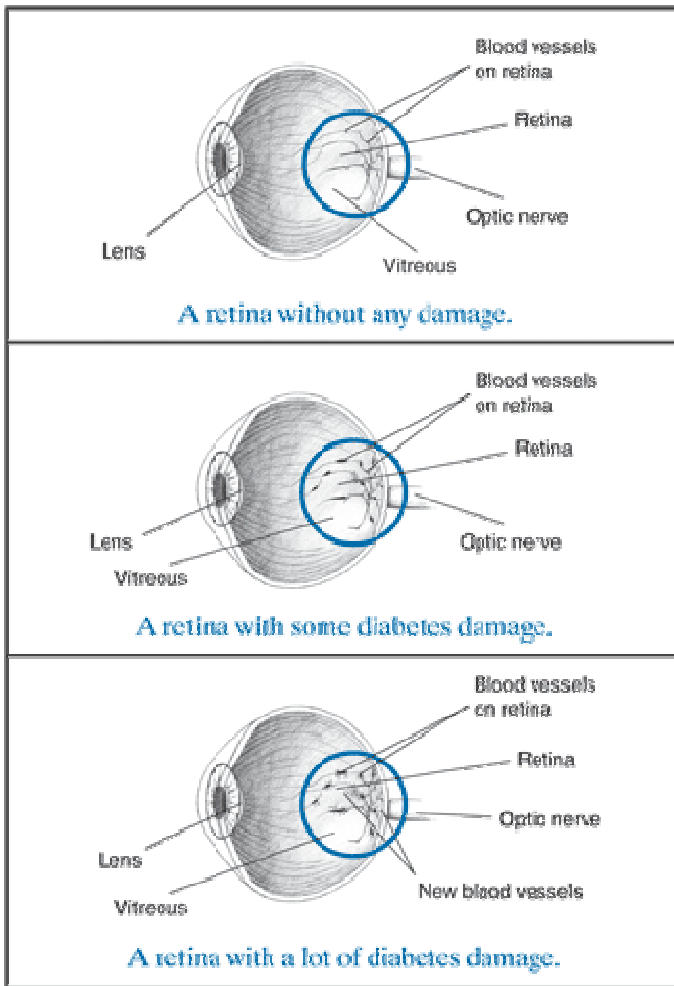
As diabetes retina problems get worse, new blood vessels grow. These new blood vessels are weak. They break easily and leak blood into the vitreous of your eye. The leaking blood keeps light from reaching the retina.

You may see floating spots or almost total darkness. Sometimes the blood will clear out by itself. But you might need surgery to remove it.

Over the years, the swollen and weak blood vessels can form scar tissue and pull the retina away from the back of the eye. If the retina becomes detached, you may see floating spots or flashing lights.

You may feel as if a curtain has been pulled over part of what you are looking at. A detached retina can cause loss of sight or blindness if you don't take care of it right away.

Call your eye care professional right away if you are having any vision problems or if you have had a sudden change in your vision.



[d]

## What can I do about diabetes retina problems?

Keep your blood glucose and blood pressure as close to normal as you can.

Your eye care professional may suggest laser treatment, which is when a light beam is aimed into the retina of the damaged eye. The beam closes off leaking blood vessels. It may stop blood and fluid from leaking into the vitreous. Laser treatment may slow the loss of sight.

If a lot of blood has leaked into your vitreous and your sight is poor, your eye care professional might suggest you have surgery called a vitrectomy. A

vitrectomy removes blood and fluid from the vitreous of your eye. Then clean fluid is put back into the eye. The surgery can make your eyesight better.

## How do I know if I have retina damage from diabetes?

You may not have any signs of diabetes retina damage, or you may have one or more signs:

- blurry or double vision
- rings, flashing lights, or blank spots
- dark or floating spots
- pain or pressure in one or both of your eyes
- trouble seeing things out of the corners of your eyes



Normal vision



Blurry vision

If you have retina damage from diabetes, you may have blurry or double vision.

## What other eye problems can happen to people with diabetes?

You can get two other eye problems—cataracts and glaucoma. People without diabetes can get these eye problems, too. But people with diabetes get these problems more often and at a younger age.

- A cataract is a cloud over the lens of your eye, which is usually clear.

The lens focuses light onto the retina. A cataract makes everything you look at seem cloudy. You need surgery to remove the cataract. During surgery your lens is taken out and a plastic lens, like a contact lens, is put in. The plastic lens stays in your eye all the time. Cataract surgery helps you see clearly again.

- Glaucoma starts from pressure building up in the eye. Over time, this pressure damages your eye's main nerve—the optic nerve. The damage first causes you to lose sight from the sides of your eyes. Treating glaucoma is usually simple. Your eye care professional will give you special drops to use every day to lower the pressure in your eyes. Or your eye care professional may want you to have laser surgery.

## Pronunciation Guide

**cataracts** (KAT-uh-rakts)

**dilating** (DY-layt-eeng)

**glaucoma** (glaw-KOH-muh)

**lens** (lenz)

**optic nerve** (AHP-tik) (nerv)

**retina** (RET-ih-nuh)

**retinopathy** (RET-ih-NOP-uh-thee)

**vitrectomy** (vih-TREK-tuh-mee)

**vitreous** (VIT-ree-uhss)

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

Email: [ndic@info.niddk.nih.gov](mailto:ndic@info.niddk.nih.gov)

Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

### **National Diabetes Education Program**

1 Diabetes Way

Bethesda, MD 20814–9692

Phone: 1-888-693-NDEP (6337)  
TTY: 1-866-569-1162  
Fax: 703-738-4929  
Email: [ndep@mail.nih.gov](mailto:ndep@mail.nih.gov)  
Internet: [www.ndep.nih.gov](http://www.ndep.nih.gov)

**American Diabetes Association**

1701 North Beauregard Street  
Alexandria, VA 22311  
Phone: 1-800-DIABETES (342-2383)  
Internet: [www.diabetes.org](http://www.diabetes.org)

**Juvenile Diabetes Research Foundation International**

120 Wall Street  
New York, NY 10005-4001  
Phone: 1-800-533-CURE (2873)  
Internet: [www.jdrf.org](http://www.jdrf.org)

**Acknowledgments**

The National Diabetes Information Clearinghouse thanks the people who helped review or field-test 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 and Training 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 Wolfe, 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, DC

Resa Levetan, M.D.

*For the **National Eye Institute***

Judith Stein

Bethesda, MD

*For the Texas Diabetes Council*  
Texas Department of Health  
Austin, TX  
Luby Garza-Abijaoude, M.S., R.D., L.D.

---

## 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](mailto:ndic@info.niddk.nih.gov)  
Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

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.

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts.

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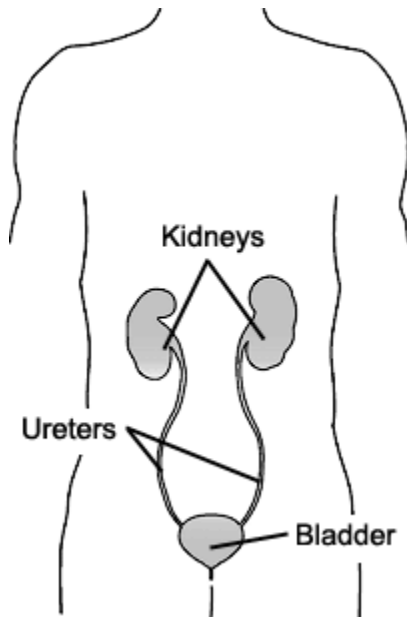
NIH Publication No. 09-4279  
November 2008

## Prevent diabetes problems: Keep your kidneys healthy

What are diabetes problems?



Too much glucose in the blood for a long time can cause diabetes problems. This high blood glucose, also called blood sugar, can damage many parts of the body, such as the heart, blood vessels, eyes, and kidneys. Heart and blood vessel disease can lead to heart attacks and strokes. You can do a lot to prevent or slow down diabetes problems.



Your kidneys are two bean-shaped organs about the size of your fist. They are located just below the rib cage, near your back.

This information is about kidney problems caused by diabetes. You will learn the things you can do each Kidneys day and during each year to stay healthy and prevent diabetes problems.

### What should I do each day to stay healthy with diabetes?



Follow the healthy eating plan that you and your doctor or dietitian have worked out.



Be active a total of 30 minutes most days. Ask your doctor what activities are best for you.



Take your medicines as directed.



Check your blood glucose every day. Each time you check your blood glucose, write the number in your record book.



Check your feet every day for cuts, blisters, sores, swelling, redness, or sore toenails.



Brush and floss your teeth every day.



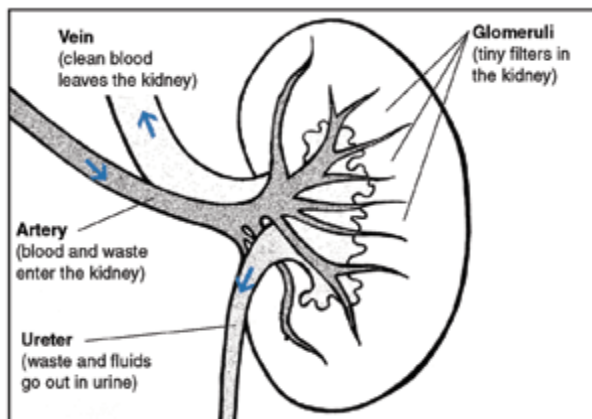
Control your blood pressure and cholesterol.



Don't smoke.

## What do my kidneys do?

The kidneys act as filters to clean the blood. They get rid of wastes and send along filtered fluid. The tiny filters in the kidneys are called glomeruli.



You have two kidneys. Your kidneys clean your blood and make urine. This drawing shows a cross section of a kidney.

When kidneys are healthy, the artery brings blood and wastes from the bloodstream into the kidneys. The glomeruli clean the blood. Then wastes and extra fluid go out into the urine through the ureter. Clean blood leaves the

kidneys and goes back into the bloodstream through the vein.

## How can I prevent diabetes kidney problems?

- Keep your blood glucose as close to normal as you can. Ask your doctor what blood glucose numbers are healthy for you.
- Keep your blood pressure below 130/80 to help prevent kidney damage. Blood pressure is written with two numbers separated by a slash. For example, 120/70 is said as “120 over 70.”

Ask your doctor what numbers are best for you. If you take blood pressure pills every day, take them as your doctor tells you. Keeping your blood pressure under control will also slow down or prevent damage to your eyes, heart, and blood vessels.



Keep your blood pressure below 130/80.

- Ask your doctor if you should take pills to slow down kidney damage. Two kinds are available:
  - ACE (angiotensin converting enzyme) inhibitor
  - ARB (angiotensin receptor blocker)
- Follow the healthy eating plan you work out with your doctor or dietitian. If you already have kidney problems, your dietitian may suggest you cut back on protein, such as meat.
- Have your kidneys checked at least once a year by having your urine tested for small amounts of protein. This test is called the microalbumin test.
- Have your blood tested at least once a year for creatinine. The result of this test should be used to estimate your glomerular filtration rate (GFR), a measure of kidney function.



Pills can help you control your blood pressure and slow down kidney damage.

- Have any other kidney tests your doctor thinks you need.
- Avoid taking painkillers regularly. Daily use of pills like aspirin or acetaminophen can damage the kidneys. Taking a single dose of aspirin every day to protect the heart, however, should be safe. Taking acetaminophen for occasional pain should also be safe. But if you are dealing with chronic pain, such as arthritis, work with your doctor to find a way to control your pain without putting your kidneys at risk.
- See a doctor right away for bladder or kidney infections. You may have an infection if you have these symptoms:
  - pain or burning when you urinate
  - a frequent urge to go to the bathroom
  - urine that looks cloudy or reddish
  - fever or a shaky feeling
  - pain in your back or on your side below the ribs

### **How can my doctor protect my kidneys during special x-ray tests?**

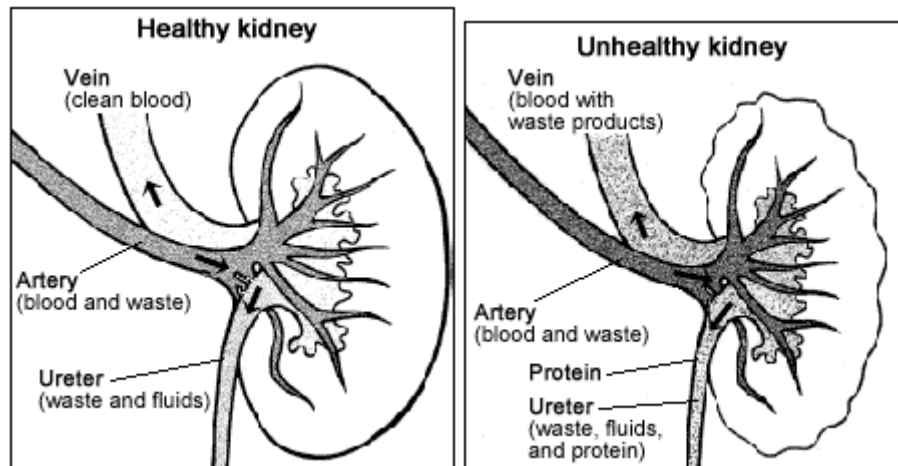
X-ray tests using a contrast agent pose a risk to your kidneys. If you need x rays, your doctor can give you extra water before and after the x rays to protect your kidneys. Or your doctor may decide to order a test that does not use a contrast agent.

### **How can diabetes hurt my kidneys?**

When the kidneys are working well, the tiny filters in your kidneys, the glomeruli, keep protein inside your body. You need the protein to stay healthy.

High blood glucose and high blood pressure damage the kidneys' filters. When the kidneys are damaged, the protein leaks out of the kidneys into the urine.

Damaged kidneys do not do a good job of cleaning out wastes and extra fluid. Wastes and fluid build up in your blood instead of leaving the body in urine.



No protein is leaking from the healthy kidney. Protein is leaking from the unhealthy kidney.

Kidney damage begins long before you notice any symptoms. An early sign of kidney damage is when your kidneys leak small amounts of a protein called albumin into the urine. But the only way to know about this leakage is to have your urine tested.

With more damage, the kidneys leak more and more protein. This problem is called proteinuria. More and more wastes build up in the blood. This damage gets worse until the kidneys fail.

Diabetic nephropathy is the medical term for kidney problems caused by diabetes. Nephropathy affects both kidneys at the same time.

### **What can I do if I have kidney problems caused by diabetes?**

Once you have kidney damage, you cannot undo it. But you can slow it down or stop it from getting worse by controlling your blood pressure, taking your ACE inhibitors or ARBs, and having your kidney function tested regularly. However, if you are pregnant, you should not take ACE inhibitors or ARBs.



Keeping blood pressure under control helps to keep your kidneys healthy.

### **How will I know if my kidneys fail?**

At first, you cannot tell. Kidney damage from diabetes happens so slowly that you may not feel sick at all for many years. You will not feel sick even when your kidneys do only half the job of normal kidneys. You may not feel any signs of kidney failure until your kidneys have almost stopped working. However, getting your urine and blood checked every year can tell you how well your kidneys are working.

Once your kidneys fail, you may feel sick to your stomach and tired all the time. Your hands and feet may swell from extra fluid in your body.



You may feel sick to your stomach when your kidneys stop working.

### **What happens if my kidneys fail?**

One way to treat kidney failure is with dialysis. Dialysis is a treatment that does some of the work your kidneys used to do. Two types of dialysis are available. You and your doctor will decide what type will work best for you.



Dialysis is a treatment that takes waste products and extra fluid out of your body.

1. **Hemodialysis.** In hemodialysis, your blood flows through a tube from your arm to a machine that filters out the waste products and extra fluid. The clean blood flows back to your arm.
2. **Peritoneal dialysis.** In peritoneal dialysis, your belly is filled with a special fluid. The fluid collects waste products and extra water from your blood. Then the fluid is drained from your belly and thrown away.

Another way to treat kidney failure is to have a kidney transplant. This operation gives you a new kidney. The kidney can be from a close family member, friend, or someone you do not know. You may be on dialysis for a long time. Many people are waiting for a new kidney. A new kidney must be a good match for your body.

### **Will I know if I start to have kidney problems?**

No. You will know you have kidney problems only if your doctor checks your blood for creatinine and your urine for protein. Do not wait for signs of kidney damage to have your blood and urine checked.

### **How can I find out if I have kidney problems?**

Two lab tests can tell you and your doctor how well your kidneys are working.

- Each year, make sure your doctor checks a sample of your urine to see

if your kidneys are leaking small amounts of protein called microalbumin.

- At least once each year, your doctor should check your blood to measure the amount of creatinine. Creatinine is a waste product your body makes. If your kidneys are not cleaning waste products from your blood, they can build up and make you sick. Your doctor can use your creatinine level to check your GFR. GFR stands for glomerular filtration rate. Results of this test tell you how well your kidneys are removing wastes from the blood.

## Pronunciation Guide

**albumin** (al-BYOO-min)  
**angiotensin** (AN-jee-oh-TEN-sin)  
**artery** (AR-tur-ee)  
**creatinine** (kree-AT-ih-noon)  
**dialysis** (dy-AL-ih-siss)  
**glomerular** (gloh-MAIR-yoo-lur)  
**glomeruli** (gloh-MAIR-yoo-ly)  
**hemodialysis** (HEE-moh-dy-AL-ih-siss)  
**inhibitor** (in-HIB-ih-tur)  
**microalbumin** (MY-kroh-al-BYOO-min)  
**nephropathy** (neh-FROP-uh-thee)  
**peritoneal** (PAIR-ih-toh-NEE-uhl)  
**proteinuria** (proh-teen-YOO-ree-uh)

This publication may contain information about medications used to treat a health condition. When this publication was prepared, the NIDDK included the most current information available. Occasionally, new information about medication is released. For updates or for questions about any medications, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (463-6332), a toll-free call, or visit their website at [www.fda.gov](http://www.fda.gov). Consult your doctor for more information.

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### *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 and Training 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 Wolfe, 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, DC

Resa Levetan, M.D.

*For the **Texas Diabetes Council***

Texas Department of Health

Austin, TX

Luby Garza-Abijaoude, M.S., R.D., L.D.

---

## **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](mailto:ndic@info.niddk.nih.gov)

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